

# HEATERS

SERVICE &  
INSTRUCTION MANUAL



DRAGONAIR LIMITED, FITZHERBERT RD. FARLINGTON, PORTSMOUTH, HANTS.

OPERATION AND MAINTENANCE

INSTRUCTIONS

FOR

HEATER TYPE DVLA/80

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IMPORTANT NOTE

When communicating with DRAGONAIR LIMITED, either to order spares or seek information, it is essential to quote the serial number of the heater unit which will be found on the name plate attached to the fan case, and the serial number of the heat exchanger which will be found on the brass plate attached to the heater end plate - see

Fig.2

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SECTION 1

General Description of Heating Unit and Automatic

Train Control

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S P E C I F I C A T I O N

1. DATA

Application	Specifically designed for use with Diesel Railcars
Type No.	DVLA.80
Heater Output	Maximum - 100,000 B.T.U./Hr. Rated - 80,000 B.T.U./Hr. Minimum - 35,000 B.T.U./Hr.
Fuel	Gas Oil/Diesel Oil - 35-45 Second Redwood No.1
Fuel Consumption	0.65 g.p.h. at rated output
Overall Thermal Efficiency	80% at rated output
Heated Air Temperature Rise	120°F at rated output
Ventilating Air Flow	600 c.f.m.
Fan Motor	½ h.p. 28 volt D.C. 2,800 r.p.m.
Burner	Pressure atomiser with high tension spark ignition
Flame Failure Protection	Integral Switch
Overheat Protection	Duct Thermostat
Temperature Setting of Temperature Limit Thermostat	220°F
Flame Failure Setting	10-12 secs. @ 28 volt D.C.
Weight	200 lbs.
<u>Overall Dimensions:</u>	
Length	33¾"
Width	13¼"
Height	26⅜" (over mounting brackets)
Fuel Pressure	100 p.s.i. @ 30 volt D.C. at control box input.

## 2. HEATER UNIT

### i. Heat Exchanger

Fabricated throughout from heat resisting stainless steel sheet to specification DTD.171.B, the heat exchanger is of welded construction and pressure tested at 5 p.s.i. after final assembly, to ensure there are no leaks.

Plugs are fitted on the end of the heat exchanger, which are easily removable for cleaning the inside of the return jacket.

Drains are fitted to the combustion tube and return jacket.

### ii. Burner

This is a Dragonair designed and developed pressure atomising burner, with high tension spark ignition on start up from a Booster Coil.

### iii. Heat Exchanger Casing

Cylindrical sheet steel case with a quickly detachable burner cover plate at one end.

### iv. Safety Devices

Overheat protection is provided by means of a duct thermostat.

Flame failure protection is provided by means of the Dragonair Patented Switch.

## 3. FAN

A centrifugal type fan having a multi-vane impeller enclosed in a steel plate case.

## 4. MOTOR

This is a ventilated compound wound,  $\frac{1}{2}$  h.p. electric motor, suitable for operation within the range of 20 volt - 31 volt D.C. and fitted with a double ended shaft.

The fan impeller is directly mounted on the shaft extension of one end of the motor. On the other end of the motor the shaft extension is connected through a flexible coupling to the fuel pump drive shaft.

## 5. FUEL PUMP

This is a two stage pump (6ft. suction lift). An adjustable relief valve is incorporated in the pump, which is set to the required pressure at the factory.

An orifice is also fitted, integral with the pump, which varies the fuel flow to the burner at different pump speeds.

As both the pump and fan impellers are directly driven from the motor, the air/fuel ratio for combustion is maintained (within the required range) for varying motor speeds between 20 and 31 volts D.C.

6. FUEL SYSTEM

Incoming fuel from the supply tank passes through the two-stage fuel pump which incorporates a fine mesh strainer element. From the delivery port of the pump, the fuel is passed through a sintered bronze filter, and the 'ON-OFF' solenoid and then into the combustion tube through the Burner atomising jet.

7. 'ON-OFF' SOLENOID VALVE

This is an electrically operated valve, which controls the fuel supply to the heater. On the automatic 'ON-OFF' cycling operation of the heater, this valve supplies fuel to the burner only when the saloon thermostat calls for heat. It also stops the fuel supply when overheat or flame failure conditions occur.

AUTOMATIC THROUGH-TRAIN CONTROL FOR DRAGONAIR  
HEATING SYSTEM

1. INTRODUCTION

The equipment comprises:-

- i. A control box fitted to each heater unit
- ii. A local control panel connected to each heater unit
- iii. A guard's control panel for each train set

Through train control enables any number of heaters to be operated simultaneously from one control point (i.e. guard's control panel). The heater units can be operated for either heating, or ventilating (i.e. delivering air at ambient temperature to the passenger saloon).

If required, individual heaters may be operated from their local control panels.

A flame failure lamp is fitted on the guard's control panel, which is illuminated when one or more heaters have failed to start, or have 'gone out' during normal running. A similar lamp is illuminated on the local control panel, and so the faulty heater (or heaters) can be quickly located by examining the local control panels.

The flame failure lamps are not illuminated when heaters are shut off due to the operation of the saloon or temperature limit thermostat.

In the event of failure of one, or more, heaters further attempts to start may be made from the guard's panel by pressing the starter button. After three such attempts the failed heater should be located, and tested by pressing the 'start' button on the local control panel.

If the heater fails to start, then no further attempts should be made, and the unit should be examined for the fault and rectified.

NOTE:

After the initial 'start', attempts to start a heater which is not operating by pressing the 'start' button either on the guard's or local control panel, does not affect the heaters which are already operating.

2. OPERATING INSTRUCTIONS

(a) To operate from the guard's control panel (i.e. through train control)

i. FOR HEATING

NOTE: All local control panels to have their isolator switches in 'OFF' position and selector switches in 'HEAT' Position.

To Start

- (a) Selector switch to 'HEAT' position
- (b) Isolator switch to 'ON' position. Isolator and flame failure indicators on all panels are illuminated.
- (c) Press 'START' button. Heater units start up and flame failure lamps go out.

To Stop

- (a) Isolator switch to 'OFF' position. All isolator indicators go out.

All heaters shut down but their fan units continue running for a short time until the flame failure switch automatically changes over to the start position.

NOTE: Until the flame failure switch has changed over (i.e. fan units have stopped) the heaters cannot be started up again.

ii. FOR VENTILATION

NOTE: All local control panels to have their isolator switches in the 'OFF' position and selector switches in the 'VENT' position.

To Start

- (a) Selector switch to 'VENT' position
- (b) Isolator switch to 'ON' position

Isolator indicators on ALL control panels are illuminated and heater fan units are operating, delivering air at ambient temperature to the passenger saloon.

To Stop

- (a) Isolator switch to the 'OFF' position.

All isolator indicators go out and heater fan units shut down.

(b) To operate from local control panel

i. FOR HEATING

NOTE: On the guard's control panel, the isolator switch is to be in the 'OFF' position.

To Start

- (a) Selector switch to the 'HEAT' position
- (b) Isolator switch to the 'ON' position. Local control panel isolator lamp and both local and guards flame failure indicators are illuminated.
- (c) Press 'START' button. Both flame failure lamps go out and heater starts up.

To Stop

- (a) Isolator switch to the 'OFF' position.

Isolator indicator goes out. Heater shuts down, but fan unit continues to run, until the flame failure switch changes over automatically to the start position.

NOTE: The heater cannot be started up again, until the fan unit has stopped operating on the 'close down' cycle.

ii. FOR VENTILATION

NOTE: On the guard's control panel the isolator switch is to be in the 'OFF' position.

To Start

- (a) Selector switch in the 'VENT' position
- (b) Isolator switch in the 'ON' position. Isolator indicator is illuminated.

Heater fan unit operates, delivering air at ambient temperature to the passenger saloon.

To stop

- (a) Isolator switch in the 'OFF' position.

Isolator indicator goes out and fan unit shuts down.

3. CIRCUIT DESCRIPTION - THROUGH TRAIN CONTROL (REF. DVLA.80/7)

(A) FOR HEAT

i. On Start Up

Local Control Panels

Isolator switches in the 'OFF' position and selector switches in the 'HEAT' position.

Guard's Control Panel

- (a) Selector switch to the 'HEAT' position
- (b) Isolator switch to the 'ON' position

All isolator indicators and flame failure indicators are illuminated showing that there is a battery supply to all control panels.

(c) When heater 'START' button is pressed:-

1. No.1 relay is energised and is held in on a circuit through its own contacts, when button is released.
2. All flame failure lamps go out since this circuit is broken when contacts of No.1 Relay change over.
3. No.2 Relay is energised on a circuit made through the flame failure switch.
4. Booster coil is energised through the contacts of No.2 Relay.
5. No.3 Relay is energised through No.2 Relay cont acts.
6. The solenoid valve is energised (allowing fuel to pass through to the combustion chamber) on a circuit made through No.3 Relay contacts.
7. The motor contactor is energised and so operating the motor, on a circuit made through No.2 Relay contacts.
8. Current is passing through the Thermal Delay Switch heater coil on a circuit made through No.2 Relay contacts.

All heaters are now operating and as the temperature of air, which is being supplied to the passenger saloon begins to rise, the flame failure switch changes over.

ii. Normal Running

(a) Flame failure switch automatically changes over:-

1. No.2 Relay coil circuit through the flame failure switch is broken and No.2 Relay de-energised.
2. Booster coil circuit is broken across No.2 Relay contacts.
3. No.3 Relay is held in on a circuit through its own contacts and so solenoid valve is still energised.
4. Motor contactor coil circuit is now made through the flame failure switch, and so the motor continues to operate.
5. Thermal delay switch heater coil circuit broken.

The heater is now automatically controlled for 'ON/OFF' cycling through the saloon and temperature limit thermostats.

(b) 'ON/OFF' Cycling

The temperature to be maintained in the passenger saloon is set on the saloon thermostat. When this temperature is reached the saloon thermostat automatically switches out No.3 Relay circuit.

1. No.3 Relay is de-energised
2. Solenoid valve circuit through No.3 Relay is broken. This stops the fuel supply to the combustion chamber.

3. The heat exchanger cools down and flame failure switch then changes over to start up position, at which time the fan motor is automatically switched off

NOTE: No.1 Relay is still held in.

When due to fall in saloon temperature, the saloon thermostat re-makes its circuit, a start up cycle and normal running change over is completed automatically.

(c) Overheat

Should overheat conditions occur, the temperature limit (stat) controls the heater exactly the same as the saloon thermostat as described above.

(d) Flame Failure

i. On Start

When the heater fails to start up the flame failure switch will not change over for normal running conditions. No.2 Relay therefore is held in and current continues to pass through the thermal delay switch heater coil. This switch will then break the circuit to No.1 Relay. All Relays will latch out and the motor will stop running. Flame failure lamp on local control panel and guard's control panel will be illuminated.

ii. On Normal Running

The heater will cool down, as the motor continues to run. When the flame failure switch changes over to its start position the start up cycle will automatically be repeated, and should the heater fail to start, the thermal delay switch will break the circuit and the motor stop running, with all relays latched out. The flame failure lamp on the local control panel and the guard's control panel will be illuminated.

NOTE: After the heater has shut down due to flame failure about 2 to 3 minutes should be allowed before attempting to re-start by pressing the start button on either control panels.

The thermal delay switch will have automatically re-set itself in this time and the circuit will be made for the start up cycle.

F. FOR VENTILATION

Local Control Panel

Isolator switches in the 'OFF' position and selector switches in the 'VENT' position.

Guard's Control Panel

- (a) Selector switch to 'VENT' position
- (b) Isolator switch to the 'ON' position

1. All isolator indicators are illuminated showing that there is a battery supply to all panels.

2. Relay No.4 is latched in.
3. Motor contactor circuit is made through contacts of Relay No.4. Motor is running and fan delivers air to the passenger saloon at ambient temperatures.

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SECTION 2

Maintenance Instructions

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## MAINTENANCE INSTRUCTIONS

1. The Unit is designed to run continuously day and night with the minimum of attention. As with all machinery, however, some maintenance is needed to ensure continued good service and economy and the following details apply to the maintenance necessary at given periods.

### 2. PERIOD OF RUNNING

\* 300 Hours

Ref. Fig.1

1. Remove detachable portion of brass filter housing leaving fixed portion attached to solenoid valve. Remove sintered bronze filter element and wash in clean paraffin at the same time ensuring that no dirt is left in the two halves of the filter housing. Where a supply of moisture free compressed air is available, the filter element may with advantage be blown out before replacement.

SPECIAL NOTE:- Do not use tools to remove filter element. It must be removed and replaced by hand

Ref. Fig.2

2. Remove burner from heater and jet boss from burner, clean all parts and remove any carbon from combustion chamber. Check electrode setting using setting gauge shown in Fig.7, check all fuel pipes and unions for leaks and tightness.

Notes on stripping procedure for 2 above are on following pages.

#### Air Filter

Although not an actual part of the heater unit, the air filter located in the duct upstream of the fan should be cleaned and re-oiled with the approved type of oil at least once per month.

3,000 Hours or prior to commencement of each heating season

3. In addition to 1 and 2 above the following should be checked:-
  - (a) Fan impellor attachment
  - (b) Fuel Pump flexible drive coupling
  - (c) Fuel pump regulator setting - provision is made for a pressure gauge tapping, see Fig.3
  - (d) Fuel pump strainer - see Fig.4
  - (e) Overheat and flame failure switch settings - see Fig.5
  - (f) Booster coil (ignition) - see Fig.6
  - (g) Electric Motor
  - (h) Heater return jacket for carbon
  - (j) Electrical control box

Notes on stripping procedure for the above follow.

\* This figure is provisional and may be altered at some future date in the light of running experience.

### 3. STRIPPING OF PARTS DURING MAINTENANCE

#### i. Removal of Burner (see Fig.2)

- (a) Ensure that both isolating and heater switches are in OFF position
- (b) Remove burner access plate by unscrewing knurled knob in anti-clockwise direction.
- (c) Remove H.T. leads from ignition electrodes
- (d) Unscrew banjo bolt, collect sealing washers
- (e) Unscrew wing nuts, collect washers
- (f) Carefully withdraw burner assembly from heat exchanger making sure gasket is not damaged during this operation.

NOTE: A damaged gasket must be re-newed on assembly.

#### ii. Removal of Jet Boss and Igniter Assembly from Burner Head (see Fig.2)

- (a) Unscrew four 2 B.A. screws, collect washers
- (b) Carefully withdraw jet boss making sure gasket is not damaged during this operation

NOTE: A damaged gasket must be re-newed on assembly.

- (c) Unscrew electrode gland nuts. Remove electrodes and collect copper sealing washers. Care must be taken to ensure that they are not bent during removal.
- (d) Remove atomising nozzle with box spanner provided
- (e) Unscrew filter from nozzle. Unscrew central cone from nozzle. All parts of the burner are now ready for cleaning.

NOTE: On no account must a metal scraper be used on the nozzle.

A hard wood scraper only should be used to clean any carbon from the nozzle face. The orifice should be cleaned by blowing through with dry compressed air, no attempt should be made to use a wire for this purpose as the result could cause bad atomisation and excessive carbon formation. All parts must be washed in clean paraffin before re-assembly. On assembly the ignition electrodes should be adjusted so that the spark gap is  $3/16$ " using the setting tool provided (see Fig.7) and check that they are on the fringe of the fuel spray. With a setting too far out of the spray the heater will probably fail to light whilst a setting too far in the spray is liable to cause carbon formation across the electrodes, shorting them out with similar results.

#### iii. Fan Impellor Attachment

Check that the impellor is running true and that the allen screw is quite tight.

#### iv. Fuel Pump Flexible Drive Coupling

Check that the coupling is running true and that the two allen screws are tight.

#### v. Fuel Pump regulator setting (see Fig.3)

- (a) The pump pressure is set at the factory to suit the heater concerned. Should it be necessary to alter

the pressure the adjustment can be made with the pump in position and the heater running, a pressure gauge having first been fitted at the point indicated in Fig.3. Insert an allen key in the allen screw provided, turning clockwise raises the pressure, anti-clockwise lowers the pressure.

- (b) In the event of air locks causing fuel starvation the fuel system can be 'bled' by unscrewing the hexagonal nut on the pump casing (shown in Fig.3) by which a pressure gauge is attached when necessary (referred to in (a) above). This nut should only be unscrewed sufficiently to allow the air to escape and should not be completely removed. It is advisable to hold a small container underneath to catch the excess fuel. Care must be taken when re-tightening to see that the seal is sealing correctly, on the adaptor cone.

vi. Fuel Pump Strainer (see Fig.4)

- (a) Unscrew the six pump casing screws and carefully separate the two halves of the pump. Collect gasket, remove strainer element.
- (b) Holding the strainer element squeeze the ends and allow the retaining pin to drop out.
- (c) Remove the cover and strainer elements
- (d) Wash all filter components in clean petrol and re-assemble.

NOTE: Care should be taken that the strainer spindle is located properly in the pump half of the casing and that the rib in the other side of the casing is positioned over the filter.

vii. Overheat and Flame Failure Switch Settings (See Fig.5)

Both are set before leaving the factory but may require adjustment after the heater unit is installed.

- (a) The flame failure switch is accessible through the burner access plate (Fig.5) and is set to operate within 10-12 seconds after the heater is switched on when the supply voltage is 28 volt D.C. Should it be necessary to re-set the switch proceed as follows:-

The thermal delay switch in the control box has a 15 second delay so that with the heater working normally the setting on the flame failure switch must be such that it operates before this time has elapsed. By releasing the locknut and turning the cap nut, Fig.5, towards the switch, the time taken for the flame failure switch to operate will be increased. Conversely, turning the cap nut away from the switch will decrease the time taken for it to operate.

- (b) The overheat switch is a PROSCON thermostat located in the duct downstream of the heater outlet. Removal of the waterproof cover will reveal the adjustment knob, the setting on the graduated scale should be 220<sup>o</sup>F.

viii. Booster Coil (Ignition) - see Fig.6 - Type C2TS or C2TS/1.

To remove the booster coil from its mounting, remove the two 4 B.A. screws securing the end cover, remove the cover and disconnect the two L.T. leads from their terminals, collecting the two 4 B.A. nuts and washers. Withdraw the L.T. leads through the outer case. Disconnect the H.T. lead from the outer case.

Unscrew two jubilee clips, hold one (nearest to the fuel pump) and slide the coil towards the fan case until the coil is free from the clip. The other Jubilee clip remains on the coil.

(a) Maintenance

It is estimated that approximately 1,000 starting operations can be carried out before the contact setting of the coil will require adjustment. To adjust the contacts the following procedure should be followed after removing the contact breaker cover.

1. Loosen the adjustable contact locknut with spanner SKC.5935 and using the screwdriver end of the spanner, screw out the adjustable contact so that it is clear of the armature contact.
2. Screw down the adjustable contact so that it is just touching the armature contact.
3. Screw down the adjustable contact a further one to one and half turns from the position obtained in (2).
4. Tighten the adjustable contact locknut, making sure that contact does not turn. If the contacts are badly worn clean them as described in para. (d).

At intervals remove the terminal moulding shield and wipe the surfaces of the H.T. terminal moulding with a clean cloth moistened with lead free petrol.

Every precaution must be taken to keep the booster coil free from oil and moisture and to keep the ventilation holes unobstructed.

(b) Location of Faults - see Fig.6

If the booster coil fails to produce a spark when switched on, check the voltage across the L.T. terminal to see whether the fault is in the coil or in the L.T.cables to the coil. If a satisfactory voltage reading (not less than 12 volts on a 24 volt system) is obtained, the trouble is probably in the coil or in the H.T.cables to the igniter plugs.

Disconnect the H.T.cable from the coil, connect the primary circuit and check whether sparking occurs over the safety gap in the H.T.terminal moulding. If sparking is occurring it can be heard readily. If an H.T.discharge is not occurring at the safety gap or at the external spark gap, as the case may be, remove the contact breaker cover for examination of the contact breaker. If the necessary trembler action of the armature is not occurring, check the movement of the armature to see that the contacts have not welded together, and are thus preventing movement of the armature. If the armature is free to move but the trembler action is not present, it is evident that current is not flowing in the primary winding, and any of the following troubles should be investigated:-

1. Contact setting incorrect (see para. (a) )
2. Contacts dirty or burnt away
3. Capacitor faulty
4. Armature spring fractured
5. Primary winding open circuited or short circuited

If the armature movement is satisfactory and the coil still does not spark, any one of the following

faults may be present:-

6. Secondary winding open circuited, short circuited or earthed.
7. Terminal moulding faulty i.e. the H.T. discharge is tracked to an earth point.
8. Excessive leakage to earth due to the presence of moisture in the case.

When the faulty part has been traced, the necessary dismantling, correction and re-assembly should be carried out as detailed in paras. (c) (d) and (e) respectively, and the coil tested as detailed in para. (f).

If satisfactory sparking is not obtained, and it is established that the booster coil and H.T. cable are above suspicion, it is probable that there is a fault in the igniter plugs.

(c) Dismantling procedure (see Fig.6)

The following procedure should be adopted when dismantling. Remove the three screws securing the two end covers and take off the covers. If these are difficult to remove gently tap them with a hide mallet.

Take out six screws securing H.T. terminal moulding shield to the case, and gently pull off the shield.

Using a narrow bladed screwdriver, lift up the bent over end of the secondary winding in the bore of the terminal moulding and carefully withdraw the moulding.

Carefully bend down the insulated secondary lead from the coil so that it is pointing towards the L.T. terminal end of the coil. Remove two hexagonal pillars at the L.T. terminal end of the case. Pull gently on the capacitor end of the coil and remove the coil from the case, but take great care during this operation to avoid damaging the insulation tubing on the protruding H.T. cable. Remove the armature from the coil assembly after taking out its fixing screws.

If it is necessary to remove the capacitor, remove the solder locking of the fixing screws before attempting to release the nuts and screws.

Remove the adjustable contact locknut with spanner SKC.5935 and remove the adjustable contact by turning in a clockwise direction i.e. by screwing it inwards, using a narrow bladed screwdriver or the screwdriver end of spanner SKC.5935.

(d) Inspection and Testing of Components -(see Fig.6)

Before inspection wash all components with the exception of the coil, capacitor and contacts in lead free petrol. The coil and capacitor should be cleaned as far as possible with a jet of dry compressed air and then brushed with a petrol moistened soft brush. Clean the contacts with clean cloth moistened with trichlorethylene.

1. Coil

Examine the bonded fabric end cheeks for cracks and check that the outer taping of the coil does not show signs of severe local discoloration. If the end cheeks are cracked or if severe local discoloration of the taping is evident the coil must be changed. Check that all components

mounted on the contact breaker end coil flange are securely fixed to the flange and if necessary tighten the securing nuts. Check that the L.T. terminals are secured and that their soldered connections are sound. If the insulation tubing over the secondary lead is damaged a new coil must be fitted. If a trembler set is available, test the coil for five minutes with the secondary winding connected to an annular gap set to discharge at 18 K.V. If a trembler is not available the satisfactory performance of the coil when tested after re-assembly will be adequate indication that the coil is satisfactory. The coil can be tested for continuity however, noting that the start of the secondary winding is connected to the laminated core and the finish brought out on the outside diameter of the coil through insulating tubing. One end of the primary winding is connected to one of the L.T. terminals whilst the other end is connected to the adjustable contact bracket.

## 2. Capacitor

Examine the capacitor to check that the eyelets are firmly secured and that there are no signs of cracking on the moulded tube or the metal end caps. Measure the insulation resistance using a 500 volt megger, a reading of at least 100,000 ohms must be obtained. If one of the megger leads is removed or the megger is delivering full voltage a spark should be obtained when the capacitor is short circuited with a length of wire. If the capacitor is faulty in any way a new one must be fitted.

## 3. H.T. Terminal Moulding

Examine this moulding closely for cracks and signs of tracking particularly in the bore and around the circular safety gap insert, when fitted. If the moulding is faulty in any way it must be changed.

## 4. Armature

The spring should show no signs of fracture, and should be firmly secured to the armature. The contact should also be firmly secured to the armature and show no signs of movement.

## 5. Contacts

Clean the contacts with a clean cloth moistened with trichlorethylene and if the contact faces are burnt or pitted clean them carefully with a contact stone. It is important that this operation is carried out carefully so that the two contact faces will be parallel when the parts are re-assembled. Remove completely any high spots found on the contact faces but in the case of a contact having a deep crater it is not necessary to stone until the pitting disappears completely, as this is wasteful. As long as the major portion of the contact face is flat, satisfactory operation will be obtained. After stoning, wipe the contact faces clean with a cloth moistened in trichlorethylene to remove all traces of abrasive.

If the depth of the platinum tip is less than 0.010" after stoning fit a new adjustable contact or armature.

## 6. Case

Examine the case for cracks and check that all riveted components are firmly secured. Check that the  $\frac{1}{2}$ " diameter x 26 T.P.I. Whitworth form threads on the L.T. lead unions are not damaged.

## 7. Terminal Moulding Shield

Examine the shield for cracks and check that the  $\frac{5}{8}$ " diameter x 26 T.P.I. whitworth form thread for the H.T. cable union connection is not damaged. Blow the ventilation holes clear with a jet of dry compressed air.

## 8. Covers

Examine the covers for cracks and signs of damage. Blow the ventilation holes in the contact breaker cover clear with a jet of dry compressed air.

### (e) Re-assembly Procedure (see Fig.6)

New lock washers, locking tab washers, sealing washers etc. must be fitted.

Screw the adjustable contact into its mounting bracket from the inside, using the screwdriver end of tool SKC.5935 and turn in an anti-clockwise direction. It may be found on some coils that it will be necessary to remove the adjustable contact mounting bracket in order to assemble the contact, if it is necessary a 6 B.A. spanner will be required to remove the fixing nuts, which should be thoroughly tightened after assembly of the contact. Fit the contact locknut and lockwasher but do not tighten at this stage.

Fit the armature together with its securing screws, lockwashers and washers. Position the armature so that the contacts line up satisfactorily before the securing screws are tightened.

The contact setting should now be obtained as follows:-

1. Screw out the adjustable contact so that it is clear of the armature contact.
2. Screw down the adjustable contact so that it is just touching the armature contact.
3. Screw down the adjustable contact a further one to one and a half turns from the position obtained in (2)
4. Tighten the adjustable contact locknut using spanner SKC.5935 taking care that the contact does not turn.

Place the capacitor on its supporting brackets and assemble its securing screws, washers and lock washers, the screw heads being uppermost. Note that the L.T. lead connection is made to the side of the capacitor nearer to the terminal moulding, and place its eyelet on the screw shank, followed by the washer, lockwasher and nut. Position the eyelet so that its tag is close to the capacitor bracket this will ensure that the lead is clear of the case. Thoroughly tighten all screws and nuts. After tightening run a film of solder over the faces of the nuts and projecting screw shanks. It is important that non-corrosive flux be used for this soldering operation. Place the coil in the case, positioning it so that its H.T. lead corresponds with the hole in the wall of the case. Great care must be taken during this operation to avoid damaging the insulation tubing on the H.T. lead.

Assemble the two hexagonal pillars and their locking washers to the L.T. terminal end of the case. Tighten the pillars with a 3 B.A. box spanner and bend up the tabs of the lockwashers against the flats of the pillars. Carefully bend the H.T. lead so that it is projecting at right angles to the outer surface of the case. Fit the lockwashers, washers and nuts to the L.T. terminals.

#### Type C2TS Booster Coil

If the original sealing washer on the mounting face of the terminal moulding is damaged, remove it and stick a new washer into position using Bostick 'C' compound made by B.B. Chemical Co. Ltd. Leicester. Position the terminal moulding in the case so that the H.T. lead passes through the hole in the central insert and the profile of the mounting face of the moulding corresponds with the profile of the coil.

Carefully fit the terminal moulding shield over the moulding and assemble its securing screws and lockwashers. Carefully bend over the H.T. lead in the bore of the moulding so that it lies across the face of the insert.

#### Type C2TS/1 Booster Coil

The method of assembling the terminal moulding and its shield for these types of coil is the same as for Type C2TS except for the following:-

1. No sealing is to be fitted to the mounting face of the moulding.
2. Before fitting the ceramic terminal moulding pass a synthetic rubber sealing washer through the opening in the case wall and position it with its corrugated face against the coil winding, the H.T. lead passing through the hole in the washer.
3. Place a synthetic rubber sealing washer in the bore of the terminal shield before fitting it over the terminal moulding and fitting it to the case.

The booster coil is now ready to be tested as described in para. (f). After test the end covers should be fitted and their securing screws assembled. If the coil is not required for immediate use, protect the threads of the connection unions against damage during storage.

#### (f) Testing Procedure

In the following tests input voltages must be obtained by means of batteries giving the correct voltages (within the limits  $\pm 1.0$  volt) and not by the use of rheostats in a higher voltage supply. Regular sparking shall be deemed to have been obtained if the total number of 'misses' during each period of operation does not exceed 10% of the total number of sparks across the gap.

#### Types C2TS and C2TS/1 Booster Coils

Connect the H.T. terminal of the coil to a standard ball gap, set to discharge at 9 K.V., by an 8'6" length of metal braided cable. The capacitance of the cable should be within the limits  $340 \pm 10$  pico-farads.

The coil must comply with the following test requirements:-

1.	<u>Input Voltage (volts)</u>	<u>Duration (minutes)</u>
	16	1
	20	3
	24	1

Regular sparking must be maintained at the gap throughout every period of operation. During the one minute test on 24 volts input the primary current should be measured with a moving coil ammeter and must not exceed 2.5 amperes. (It may be found that slight adjustment of the contact setting will be necessary to prevent the input current from exceeding this figure. If, however, the input current still exceeds 2.5 amperes it is suggested that the set of the armature spring be altered slightly).

2. With 24 volts applied to the input terminals and the H.T. lead disconnected from the ball gap, check over a period of one minute, that sparking occurs at the safety gap. No damage to the coil must result from this test.
3. Check that the insulation resistance between the primary winding and the case is not less than 2 megohms when measured with a 500 volt megger with the booster coil at room temperature.

ix. Electric Motor

Disconnect fuel pipes on fuel pump, remove fan impeller and remove four  $\frac{3}{8}$ " bolts attaching motor to framework, collect nuts and washers.

Slide motor sufficiently to give access to two 2 B.A. cap nuts on motor end casing (fan end). Remove these and withdraw end casing for access to brush gear and commutator.

Examine and clean brushes and brush holders renewing brushes if worn.

Examine and clean commutator.

Remove 3 - 2 B.A. screws and withdraw bearing end cap and re-pack bearing with grease if necessary. Repeat at opposite end bearing.

Grease Specification

Power Petroleum Co.Ltd., Type LS3 Lithium Based

Working temperatures  $-30^{\circ}\text{F}$  to  $280^{\circ}\text{F}$

Re-assemble, making sure that all parts are clean, mount motor in framework, re-fit impellor and re-connect fuel lines to fuel pump.

x. Heater Return Jacket

Unscrew five brass plugs in end plate of return jacket, collect copper sealing washers. The return jacket can now be inspected and cleaned of any carbon which may be present.

NOTE: New copper sealing washers must be fitted if original ones are damaged.

xi. Heater Drains

The two heater drains are designed to clear any excess fuel from both the combustion tube and the return jacket. These should be kept clear by the use of a length of stiff wire.

xii. Electrical Control Box

No routine preventive maintenance is required on this item. It is intended that faults developing in service should be cured by replacement of the control box unit, the defective part being returned to workshops for examination and repair.

However, in the event of a blown fuse this may be quickly and simply changed as follows:-

Unscrew the six thumb screws on the side face of the box. The control box can then be partly withdrawn from its housing exposing the 30A H.R.C. fuse. After removing the two retaining nuts the damaged fuse can be withdrawn and replaced.

In order to completely remove the control box it is further necessary to detach the main two pole socket and the 16 way distribution socket on the side face of the box, and the multi-way plug on the back face of the box adjacent to the fuel pump. The box will then withdraw completely.

All relay contacts should be inspected annually and replaced if found to be excessively pitted.

SECTION 3

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Fault Finding Table

FAULT FINDING

C A U S E

C U R E

HEATER FAILS TO START

(a) No Spark

1. Electrode gap disturbed
2. Dirty electrodes causing shorting
3. Ceramic insulators broken on spark electrodes
4. Insulation breakdown in ignition leads
5. Incorrect booster coil contacts setting - dirty contacts.
6. Poor contact at No.2 Relay

- Re-set in accordance with schedule  
Clean and replace  
Fit new electrodes  
Fit new leads  
Clean and re-set  
Fit new contacts

(b) No Fuel at Atomising Nozzle

1. Choked nozzle strainer or blocked orifice
2. Choked Fuel Filter
3. ON/OFF fuel solenoid valve not operating
4. Fuel pump not turning
5. No fuel in supply tank
6. Air locks in pipe system
7. Choked fuel pump strainer

- Remove nozzle, clean and replace  
Remove sintered bronze filter, clean and replace  
Renew valve, check operation of relay No.3  
Check electrical supply to driving motor, check flexible drive to fuel pump.  
Check supply  
Bleed system  
Dismantle pump, clean strainer and replace

HEATER RUNNING BUT EXHAUST SMOKEY

1. Choked air filter
2. Fuel pressure too high
3. Poor atomization at nozzle
4. Excessive carbon deposit in heat exchanger or burner.

- Clean and re-oil filter  
Check pressure with gauge and reduce by adjusting fuel pump relief valve.  
Clean and check nozzle - if no improvement renew.  
Clean heat exchanger and/or burner and check items 1, 2 and 3.

C A U S E

C U R E

HEATER STOPS AFTER A FEW MINUTES SATISFACTORY RUNNING

1. Incorrect setting of overheat thermostat

Check warning light, adjust and set thermostat.

HEATER CONTINUALLY STOPS A FEW SECONDS AFTER STARTING

1. Incorrect setting of flame failure switch

Check warning light, adjust and set switch.

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SECTION 4

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Heater Spares Lists

S P A R E S   L I S T

HEATER TYPE DVLA.80

<u>Component Part No.</u>	<u>Issue</u>	<u>No. off Per Unit</u>	<u>Description</u>
<u>1. DVLA.80/1 HEAT EXCHANGER - 1 off/unit</u>			
DVLA.80/1001	A	1	Burner Head Banjo Bolt
DVLA.80/1002	A	1	Drain Plate (Combustion Tube)
DVLA.80/1003	A	1	Return Jacket Drain Adaptor
DVLA.80/1004	A	1	Burner Head Gasket
DVLA.80/1006	A	1	Combustion Tube Drain Adaptor
DDA.250/1007	A	1	Front Drain Gasket
CRS.21009	A	1	Drain Adaptor Spring
AGS.113.C		6	Wing Nut
-		6	Shakeproof Washer for 2 B.A.Screw
-		2	Dowty Seal for $\frac{1}{8}$ " B.S.P.
-		2	Micro Switch Screws - 4 B.A. x 1" long
5CW/4638/X		1	Burgess Micro Switch
DVLA.80/1408	A	5	End Plug
-		5	Copper Sealing Washer for $\frac{1}{4}$ " B.S.P. End Plug
GSS/14A		6	Burner Mounting Studs - 2 B.A.
-		6	2 B.A. Aerotight Nuts (For Studs)
DVLA.80/16	A	1	Micro Switch Setting Cap Nut
<u>DVLA.80/12 BURNER ACCESS PLATE ASSY. - 1 off/unit</u>			
DVLA.80/1202	A	1	Burner Access Plate Retainer
DVLA.80/1205	A	1	Burner Access Plate
DVLA.80/1206	A	1	Sealing Ring
DVLA.80/1203	A	1	Screwed Rod
CRS.21009	A	1	Spring
<u>DVLA.80/2 BURNER HEAD ASSY. - 1 off/unit</u>			
-		1	Burner Shell
DPA.250/2003	A	1	Igniter Gasket
-		4	Hex.Hd. Bolt 2 B.A. x $\frac{1}{2}$ " long - Jet Boss fixing
-		4	Spring Washers for 2 B.A. bolt
DVLA.80/21	A	1	Jet Boss Assy.
<u>DVLA.80/21 JET BOSS ASSY. - 1 off/Burner Head Assy.</u>			
ST.108	A	1	Jet Boss
ST.107	A	2	Igniter Electrodes complete with gland nut type F.50 and copper seating washer
DANFOSS 30B.105		1	Atomising nozzle .63 imp.galls/hr. x 60° spray angle
DANFOSS 30-516		1	Atomising nozzle sinter-bronze strainer
<u>2. FAN ASSY</u>			
DVLA.80/4	A	1	Fan Case
Type MVL-6FA		1	Fan Impeller - Airscrew Co. & Jicwood
DVLA.80/8	A	1	Fan Intake Assy.
		8	Screw for Fan Intake - P.K. Type Z - No.10 x $\frac{3}{8}$ " long.

<u>Component Part No.</u>	<u>Issue</u>	<u>No. off Per Unit</u>	<u>Description</u>
<b>3. <u>PANEL ASSEMBLY</u></b>			
DVLA.80/51	A	1	Access Panel Assy.
<u>The Access Panel Spare Parts</u>			
DVLA.80/5101	A	1	Access Panel
Stores Ref. DTA-DH/4		2/Panel	Size 4" Chrome Handle
-		4/Panel	3/16" Whit. x 3/8" long Rnd.Hd.Screw for handles
-		4/Panel	Shakeproof Washer for 3/16" dia. Screw
DVLA.80/52	A	1	Fixed Panel Assy.
DVLA.80/53	A	1	Top Panel Assy.
DVLA.80/0006	B	1	Bottom Plate
-		4	1/2" BSF. N.P.K. Thumb Screw for Access Panel
-		4	Plain Washer for 1/2" dia. Screw
-		4	Spring Washer for 1/2" dia. Screw
-		14	Screw P.K. Type Z - No.10 x 3/8" long for Panel Fitting
<b>4. <u>FUEL SYSTEM</u></b>			
DVLA.80/6001	A	1	Fuel Pipe - Bulkhead to Fuel Unit
DVLA.80/6002	A	1	Fuel Pipe - Fuel Unit to Filter
DVLA.80/6003	A	1	Solenoid to Burner (complete with Grommet SIC. 631/AGS.475 fitted)
DVLA.80/62	A	1	Burner Fuel Pipe
<u>NOTE:</u> All fuel pipes are Tecalemit Nylon Tube Type TTR-L, 1/2" O/Dia. fitted with Tecalemit Cone 101304/T (2 off) and Cap 150235/T (2 off) and Bush ST.175.			
DVLA.80/0007	B	1	Bulkhead Union (Connection from fuel supply to unit)
-		1	Locknut 1/4" B.S.P. for Bulkhead Union
Tecalemit 7146/2/T		1	Straight Connector - (Solenoid)
-		2	Dowty Seal for 1/4" B.S.P. (Solenoid)
-		2	Bolt - Hex Hd. - 2 B.A. x 1/2" long for Solenoid fitting
-		2	Spring Washer for 2 B.A. Bolt (Solenoid fitting)
ALCON ACO.30 Volt F/6	A	1	Solenoid
		1	Fuel Filter
<u>FILTER SPARES</u>			
1F/6	A	1/Filter	Outlet Adaptor
2F/6	A	1/Filter	Filter Body
DANFOSS 30-516		1/Filter	Sinter Bronze Strainer
Tecalemit 7146/2/T		1/Filter	Straight Connector 1/4" B.S.P.
-		1/Filter	Dowty Seal for 1/4" B.S.P.
-		1/Filter	Dowty Seal for 1/2" B.S.P.
DVLA.80/61	A	1	Fuel Unit
<u>FUEL UNIT SPARES</u>			
Danfoss Code 56-L.100		1	Fuel Unit
DVLA.80/6102	A	1	Union - Suction Port

<u>Component Part No.</u>	<u>Issue</u>	<u>No. off Per Unit</u>	<u>Description</u>
DVLA.80/6103	A	1	Orifice Screw
DVLA.80/6101	A	1	Fuel Unit Nozzle
<u>Danfoss Code Nos.</u>			
U1-4A		1	Union - Pressure Tapping Port
B1-4		1	Blanking Washer - Pressure Tapping Port
NS-4		1	Nut - Pressure Tapping Port
56-0004		1	Fuel Strainer
56-0322		1	Fuel Strainer Gasket
MG.6X.50		6	Cover Screw
56-0802		1	Cover Sealing Gland
25B.0007		1	Pressure Regulating Needle Valve Assy. (with Nozzle Modified as DVLA.80/6101)
25B.0305		1	Piston
25.B-1316		1	Piston Spring
56-0519		1	Pressure Adjustment Hexagon Key
Tecalemit 7146/1/T		1	Straight Connector $\frac{1}{8}$ " B.S.P.
-		1	Dowty Seal for $\frac{1}{8}$ " B.S.P.

5. DRIVE UNIT

DVLA.80/9	A	1	Flexible Coupling Assy. (Fuel Unit Drive)
DVLA.80/0002	A	1	Fuel Pump Mounting Plate
DVLA.80/0003	A	4	Mounting Plate Spacer
Danfoss 71-0009		1	Fuel Unit Flange
-		2	Socket Hd. Cup Point Grub Screw for Flexible coupling $\frac{1}{4}$ " B.S.F. x $\frac{5}{16}$ " long
-		4	Bolt Hex.Hd. $\frac{3}{8}$ " B.S.F. x 1" long
-		4	Hex Nut $\frac{3}{8}$ " B.S.F.
-		4	Plain Washer for $\frac{3}{8}$ " dia. bolt
-		4	Spring Washer for $\frac{3}{8}$ " dia. bolt
-		2	Bolt Hex.Hd. $\frac{7}{16}$ " B.S.F. x 1" long
-		2	Nut $\frac{7}{16}$ " B.S.F.
-		2	Spring Washer for $\frac{7}{16}$ " dia. bolt
-		8	Hex. Nut $\frac{3}{8}$ " B.S.F. Aerotight for fitting Fuel Pump Mounting Plate and Spacers.
CRS.22008		1	Crompton Parkinson Electric Motor .5 H.P. at 2,800 r.p.m. to operate over voltage range 20 to 31 volt D.C. Frame Size SDE.76 - double ended shaft - foot and flange mounting.

SPARES FOR MOTOR

KP.126	Bearings OD & ODE
143.QF	Brushgear, complete with brushes
KP.5278	Brush Holders
KP.5559	Brushes
SM.75B.82	Driving End Cover
SD.75B.59	End Shield (Opposite driving end)
SD.75A.144	End Shield Cover (Opposite driving end)
KP.5547	Radio Interference Suppressor

<u>Component Part No.</u>	<u>Issue</u>	<u>No. off Per Unit</u>	<u>Description</u>
6.	<u>ELECTRICAL SYSTEM</u>		
BTH. No. C2TS or C2TS/1		1	Booster Coil
<u>SPARES FOR BOOSTER COIL AS FOLLOWS:</u>			
CX.53310		1	Lock-Washer for Adjustable Contacts
CX.52205		9	Lock-Washer for Capacitor Fixing Screws, Cover Fixing Screws and Terminals
CX.54658		1	Lock Washer for Terminal Cover Pillar
CX.53335		8	Lock Washer for Terminal Shield Fixing Screws and Armature Fixing Screws
<u>Additional Part for Type C2TS Booster Coil:-</u>			
CX.56064		1	Sealing Washer
DVLA.80/01	A	1	Ignition Lead (Booster Coil to Burner Electrodes) complete with Grommet
<u>SPARES FOR IGNITION LEAD AS FOLLOWS:</u>			
Lodge Type M.90		2	Terminal Cover
DQLA.250/7001		1	Cable Clip
-		1	Nut Aerotight 4 B.A.
-		1	Bolt Ch.Hd. 4 B.A. x $\frac{1}{2}$ " long
			} For Cable Clip
DVLA.80/74	A	1	Heater Cable Harness Assy. (Control Box to Terminal Block, Booster Coil and Flame Failure Micro Switch)
<u>SPARES FOR HEATER CABLE HARNESS</u>			
AN.3057-16		1	Cable Outlet
4798-24G		1	Split Shell Size 24
MS.3108-B24-11P		1	Plug
			} "AMPHENOL"
Process Controls Ltd.			
NUI.2/7"/MO		1	Overheat Thermostat 130°F - 300°F Range
1007		1	Terminal Strip - 2 Way Nylon
L.744		1	Terminal Strip - 2 Way P.V.C.
ST.135		1	Terminal Block Ticket, Nos. 1 to 4 inclusive
7.	<u>CONTROL BOX ASSY. DVLA.80/71</u>		
DVLA.500/75		1	Box Assy.
-		6	Hex.Hd. Bolt $\frac{1}{2}$ " B.S.F. x $\frac{5}{8}$ " long
-		6	Hex Hd. Nut $\frac{1}{4}$ " B.S.F.
-		6	Spring Washer for $\frac{1}{4}$ " dia. Bolt
			} For fitting Control Box
DVLA.80/7101		1	Location Screw
-		1	$\frac{3}{8}$ " B.S.F. Locknut for Location Screw

<u>Component</u> <u>Part No.</u>	<u>Issue</u>	<u>No. off</u> <u>Per Unit</u>	<u>Description</u>
		1	Mating Socket for "AMPHENOL" Plug.
DVLA.80/78	A	1	Draw Assy.
DVLA.80/7102	A	1	Flange Gasket
DVLA.80/7103	A	2	Fuse Retaining Nut
DVLA.80/7104	A	2	Fuse Post
DVLA.80/7105	A	1	Bracket for Cable Harness Socket
DVLA.80/7106	A	1	Tufnol Relay Platform
G.E.C. Y .30.SA		1	Fuse H.R.C. 30 amps
<u>Modern Accoustics Ltd.</u>			
CP.232523		1	2 Pole 25 amp. Plug (Mains supply)
T.2021		1	16 Pole Socket Strip
T.1146V		1	Fixed Socket with Spring Locking Clamp
			} Control gear supply
Westinghouse			
15.D.866		2	Rectifier 4 B.A. Threaded Shank
Belling & Lee			
L.413/QS.955		1	Thermal Delay Switch
Arrow Electric			
46.0281U		1	Motor Contactor 28 volt Rating
<u>SPARES FOR CONTACTOR AS FOLLOWS:-</u>			
Cat.No.MS.148		1	Hood Moulding
-		1	Side Auxiliary Switch Type No. /N.C. for 46 Series D.C. Contactor 28 volt
-		1	Economy Resistor for 46 series D.C. Contactor 28 volt.
-		2	Contact Sets for 46 Series D.C. Contactor 28 volt
-		1	Coil for 46 Series D.C. Contactor 28 volt
-		1	Pole Link - 46 Series Contactor D.C. 28 volt
28.300U		2	Relay - Single Pole
28.308U		1	Relay - Double Pole Change Over
28.315U		1	Relay - Four Pole - Normally 'Open'
<u>SPARES FOR RELAYS AS FOLLOWS:-</u>			
-		1set	Contacts - for 28.300U Relay
-		1 set	Contacts - for 28.308U Relay
-		1set	Contacts - for 28.315U Relay
-		1	Coil for 28.300U Relay
-		1	Coil for 28.308U Relay
-		1	Coil for 28.315U Relay
-		4	N.P.K. Thumb Screw for Control Panel Drawer Fitting - $\frac{1}{4}$ " B.S.F. x $\frac{1}{2}$ " long Shoulder Type
-		4	Plain Washer for $\frac{1}{4}$ " dia. Bolt
-		2	Screw Ch.Hd. 4 B.A. x $\frac{7}{8}$ " long (For fitting Thermal Delay Switch)
-		2	Locknut 4 B.A. } For fitting
-		2	Shakeproof Washer for 4 B.A. Screw } rectifier
-		4	Ch.Hd.Screw 4 B.A. x $\frac{1}{2}$ " long } For fitting 2
-		4	Nut Aerotight 4 B.A. } Pole Plug

<u>Component Part No.</u>	<u>Issue</u>	<u>No. off Per Unit</u>	<u>Description</u>
-		4	Screw 6 B.A. x $\frac{3}{8}$ " long C'Sunk Hd. } For fitting
-		4	Nut Aerotight 6 B.A. } 16 pole
-		2	Screw 2 B.A. x $\frac{5}{8}$ " long C'Sunk Hd. (For Fuse } Socket Strip
-		8	Posts) Screw 4 B.A. x $\frac{1}{2}$ " long C'Sunk Hd. (For Relays)
-		3	Screw 2 B.A. x $\frac{1}{2}$ " long CH.Hd. (For Contactor)
-		7	Screw 4 B.A. x $\frac{1}{4}$ " long C'Sunk Hd. (For Tufnol Platform)
-		3	Shakeproof for 2 B.A. screw (Contactor)

### CONTROL PANEL ASSY'S.

DVLA.80/72	B	1	Local Control Panel Assy.
DVLA.80/73	B	1	Guard's Control Panel

### SPARES FOR CONTROL PANELS

DVLA.80/7201	B	1	Control Box
DVLA.80/7202	A	1	Front Panel
DVLA.80/7203	A	1	Back Panel
<u>Arrow Electric:</u>			
81051/13		1	'HEAT/VENT' Switch - Single Pole Changeover
81045/13		1	'ISOLATOR' Switch - Single Pole 'ON/OFF'
81045/E/13		1	Push Button Start Switch - Normally 'OFF'
<u>Arcoelectric:</u>			
SL.90/1/5		2	Signal Lamp Holder - Blue Lens
MES.2455		2	Bulb - 24 volt 1.32 watt
L.1350		1	6 Way Terminal Block
SIC.654.HSW		2	Grommet (Cable Outlets)
-		1	Screw 6 B.A. x $\frac{5}{8}$ " long Ch.Hd. } Terminal
-		1	Nut 6 B.A. } Block
-		1	Washer for 6 B.A. Screw }
-		2	Screw C'Sunk Hd. 2 B.A. x $\frac{3}{8}$ " long (For Front Panel)
-		4	Screw Ch.Hd. 4 B.A. x $\frac{1}{4}$ " Long ) Back
-		4	Shakeproof Washer for 4 B.A.Screw) Panel

### 8. FRAME WORK AND MAIN ASSY.

DVLA.80/3	A	1	Frame Assy.
DVLA.80/0001	B	1	Solenoid Bracket
-		2	Bolt Hex.Hd. $\frac{1}{4}$ " B.S.F. x $\frac{7}{8}$ " long } Solenoid
-		2	Nut $\frac{1}{4}$ " B.S.F. } Bracket
-		2	Spring Washer for $\frac{1}{4}$ " Bolt }
DVLA.80/0004	B	1	Heat Exchanger Support Strap
-		1	Bolt Hex.Hd. $\frac{1}{4}$ " B.S.F. x 1" long } Support
-		1	Aerotight Nut $\frac{1}{4}$ " B.S.F. } Strap
DVLA.80/0005	B	1	Booster Coil Cradle
-		2	Screw C'Sunk Hd. $\frac{1}{4}$ " BSF. x $\frac{5}{8}$ " long } Dooster
-		2	Nut $\frac{1}{4}$ " B.S.F. } Coil
-		2	Spring Washer for $\frac{1}{4}$ " dia. bolt } Cradle
-		2	Booster Coil Jubilee Clip Size No.3

<u>Component Part No.</u>	<u>Issue</u>	<u>No. off Per Unit</u>	<u>Description</u>	
DVLA.80/0010		4	Channel Section Mounting Bracket	} Channel Section Mounting Bracket
-		8	Bolt Hex Hd. $\frac{1}{2}$ " B.S.F. x $1\frac{1}{4}$ " long	
-		8	Nut $\frac{1}{2}$ " B.S.F.	
-		3	Taper Washer For $\frac{1}{2}$ " Bolt	
-		3	Spring Washer for $\frac{1}{2}$ " Bolt	
DVLA.80/0008	B	2	Fan Case Gasket (Side)	
DVLA.80/0012	A	2	Fan Case Gasket (End)	
-		11	Bolt Hex Hd. $\frac{3}{4}$ " B.S.F. x $\frac{1}{2}$ " long	} For Fitting Heat Exchange to Fan
-		1	Bolt Hex Hd. $\frac{1}{2}$ " B.S.F. x $\frac{7}{8}$ " long	
-		12	Nuts $\frac{1}{2}$ " B.S.F.	
-		12	Spring Washers for $\frac{1}{4}$ " dia. Bolts	
DVLA.80/0009		1	Pipe Clip (Inside Heat Exchanger)	

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SECTION 5

Special Tools List

SPECIAL TOOLS REQUIRED DURING  
MAINTENANCE AND OVERHAUL

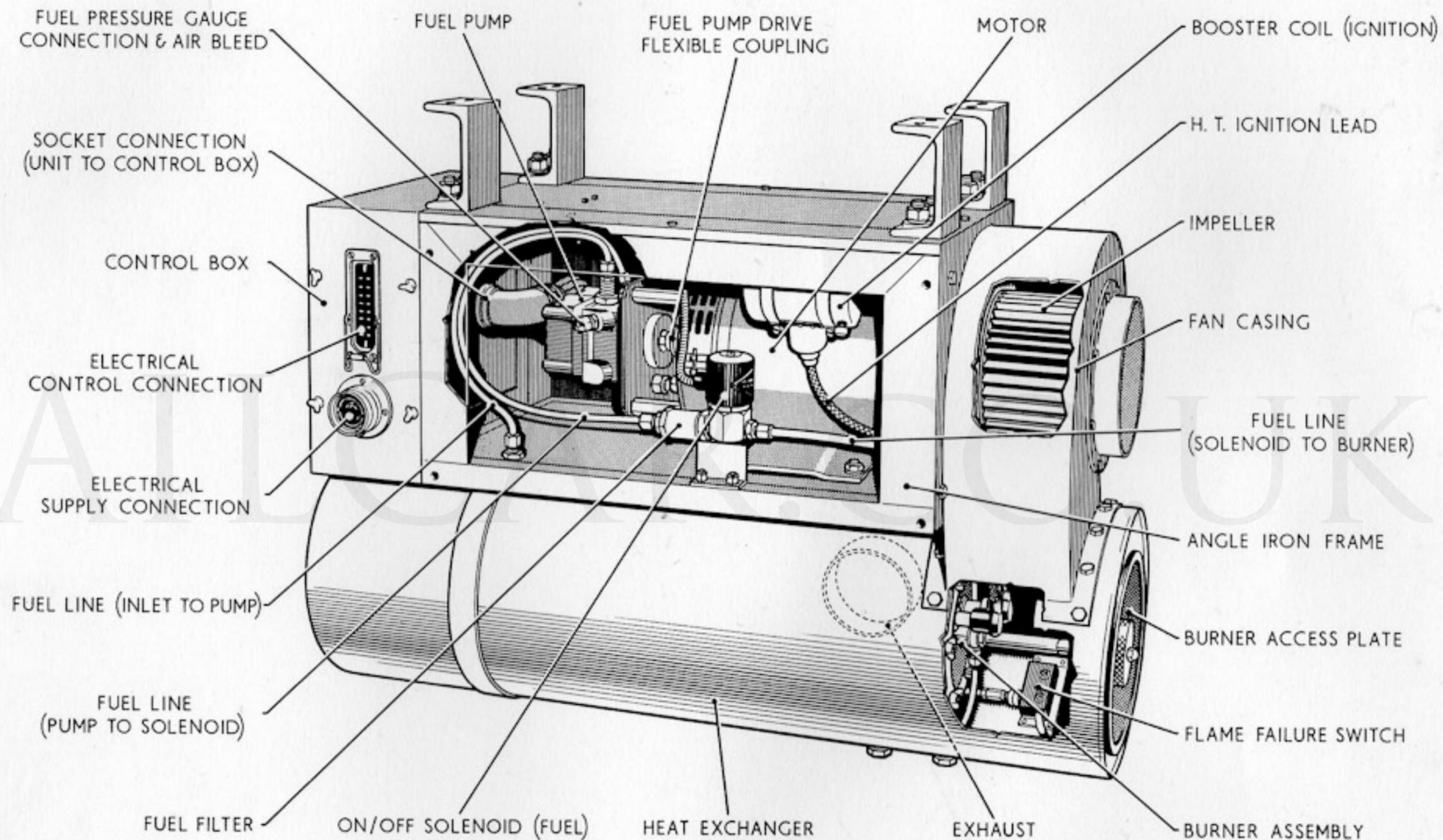
1. Box Spanner 16 m.m. A/F for removal of atomizing nozzle.
2. Igniter Electrode Setting Gauge - Tool No.CRS.22013 - for setting igniter electrodes - see Fig.7.
3. Spanner for Booster Coil maintenance Part No.SKC.5935.
4. Allen Key for adjusting fuel pump pressure - see Fig.3

The above tools are all available from Messrs.Dragonair Limited. Do not attempt to 'make do' or permanent damage to the unit may result.

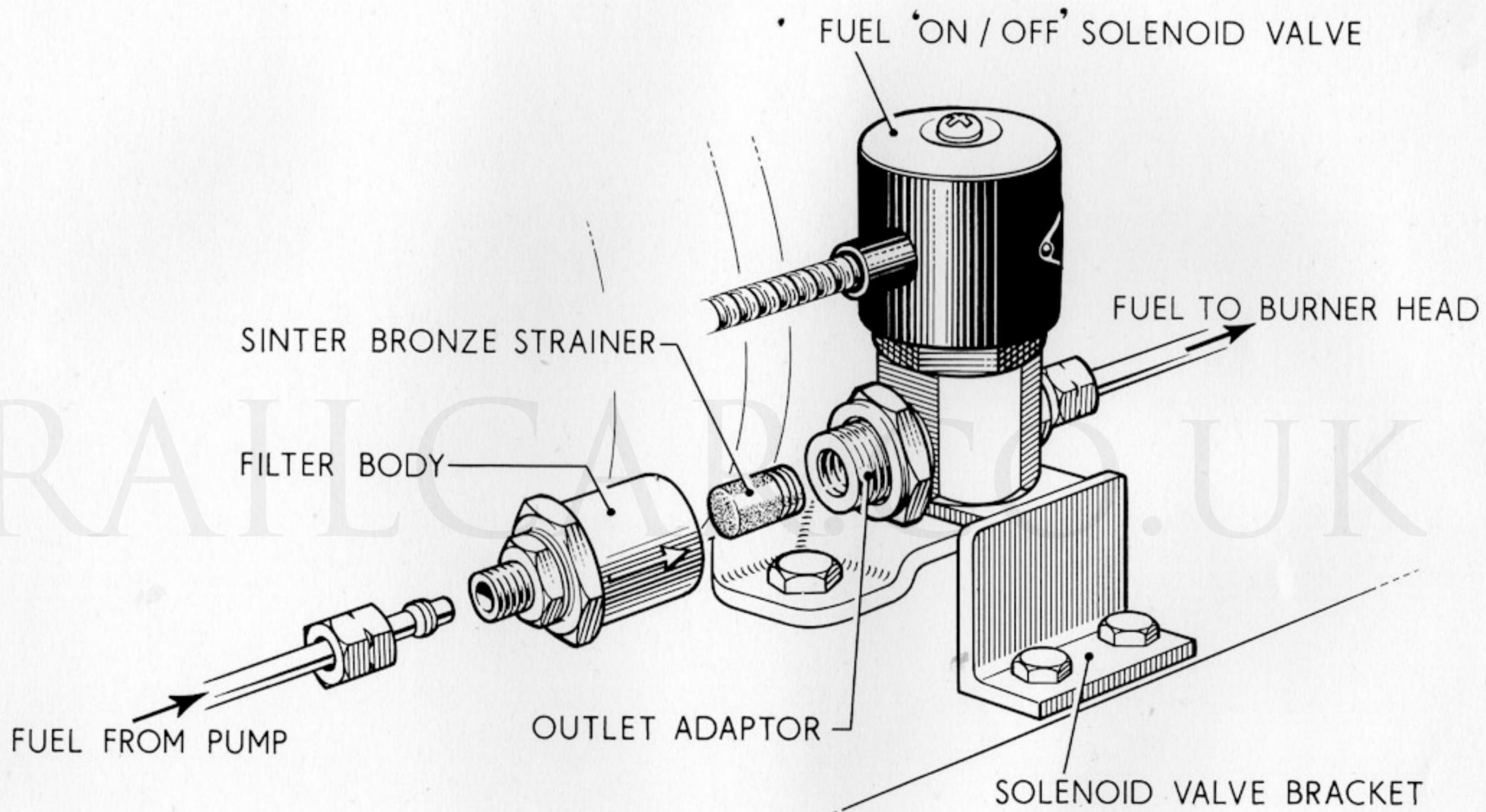
SECTION 6

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Illustrations

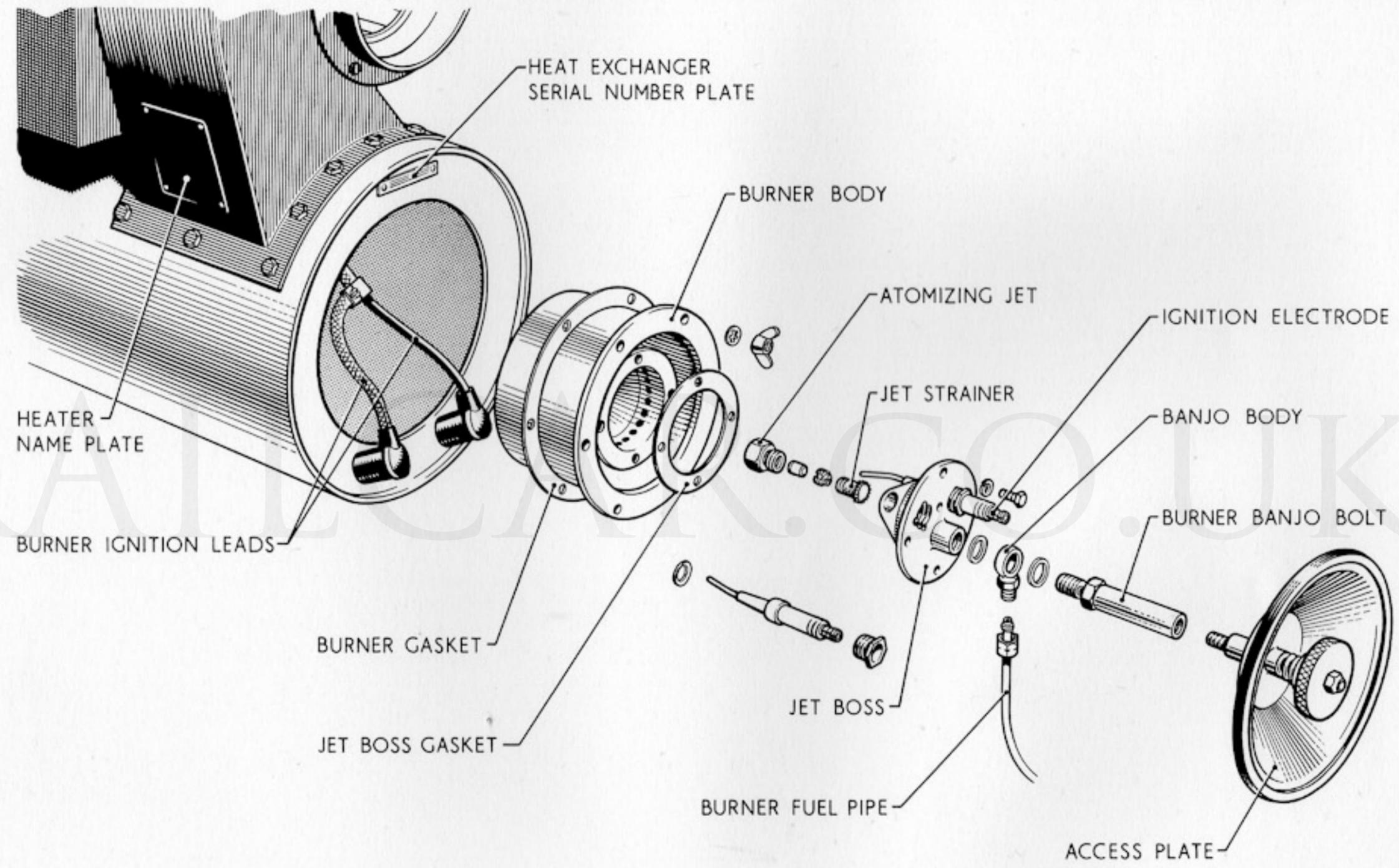


HEATER TYPE DVLA 80

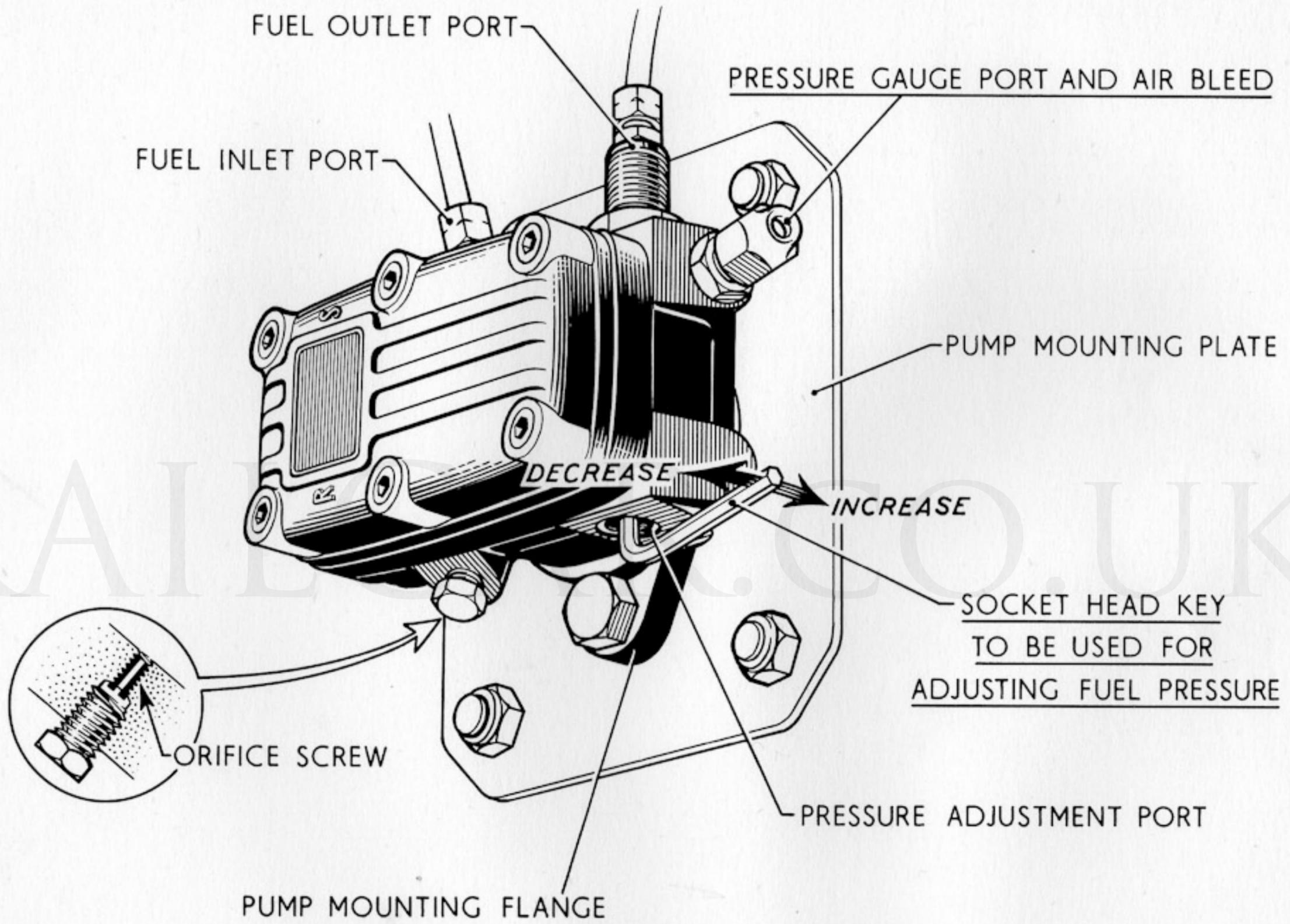


FUEL FILTER. PART No. F/6

FIG. 1

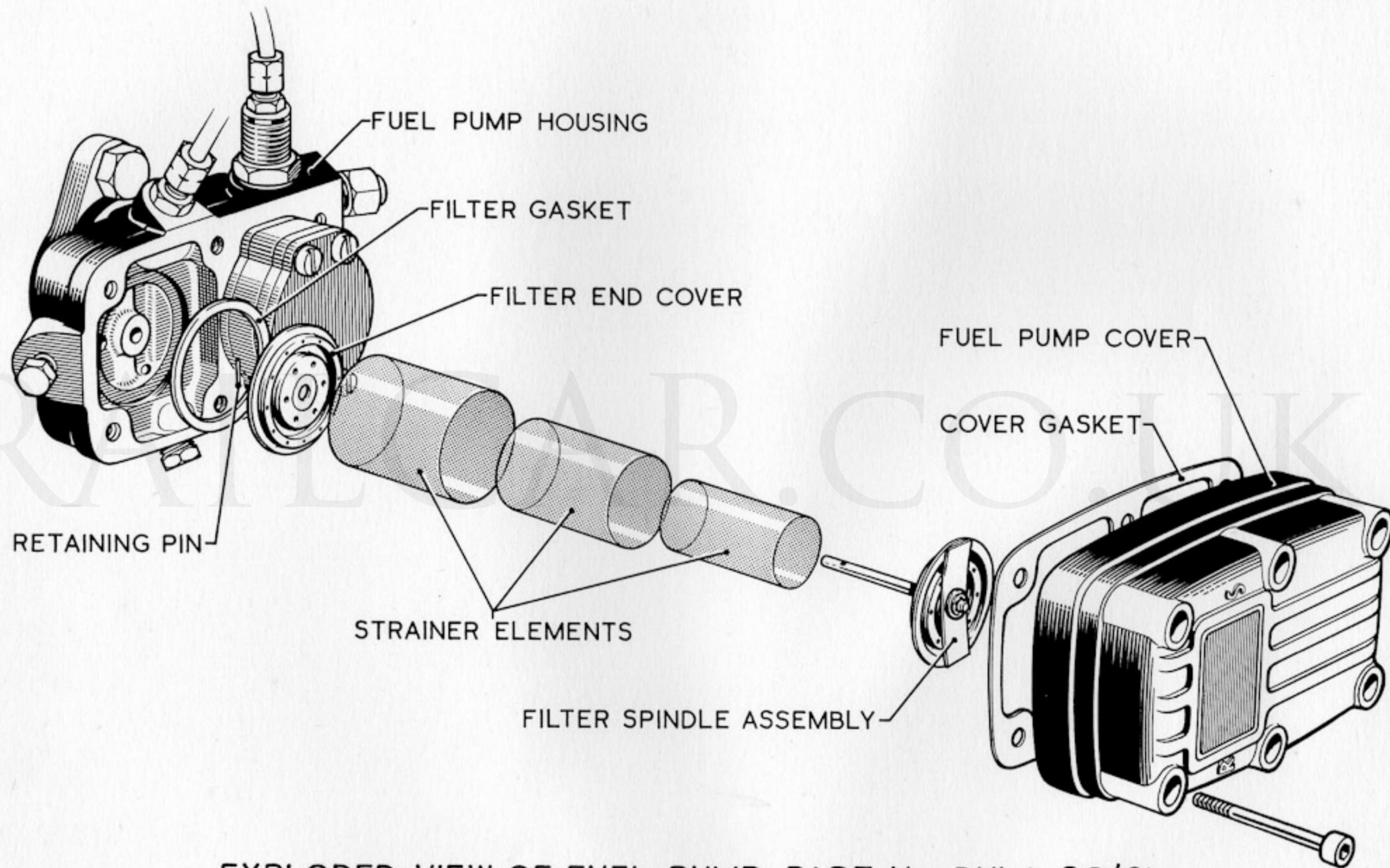


BURNER HEAD. PART No. DVLA.80/2  
 FIG. 2



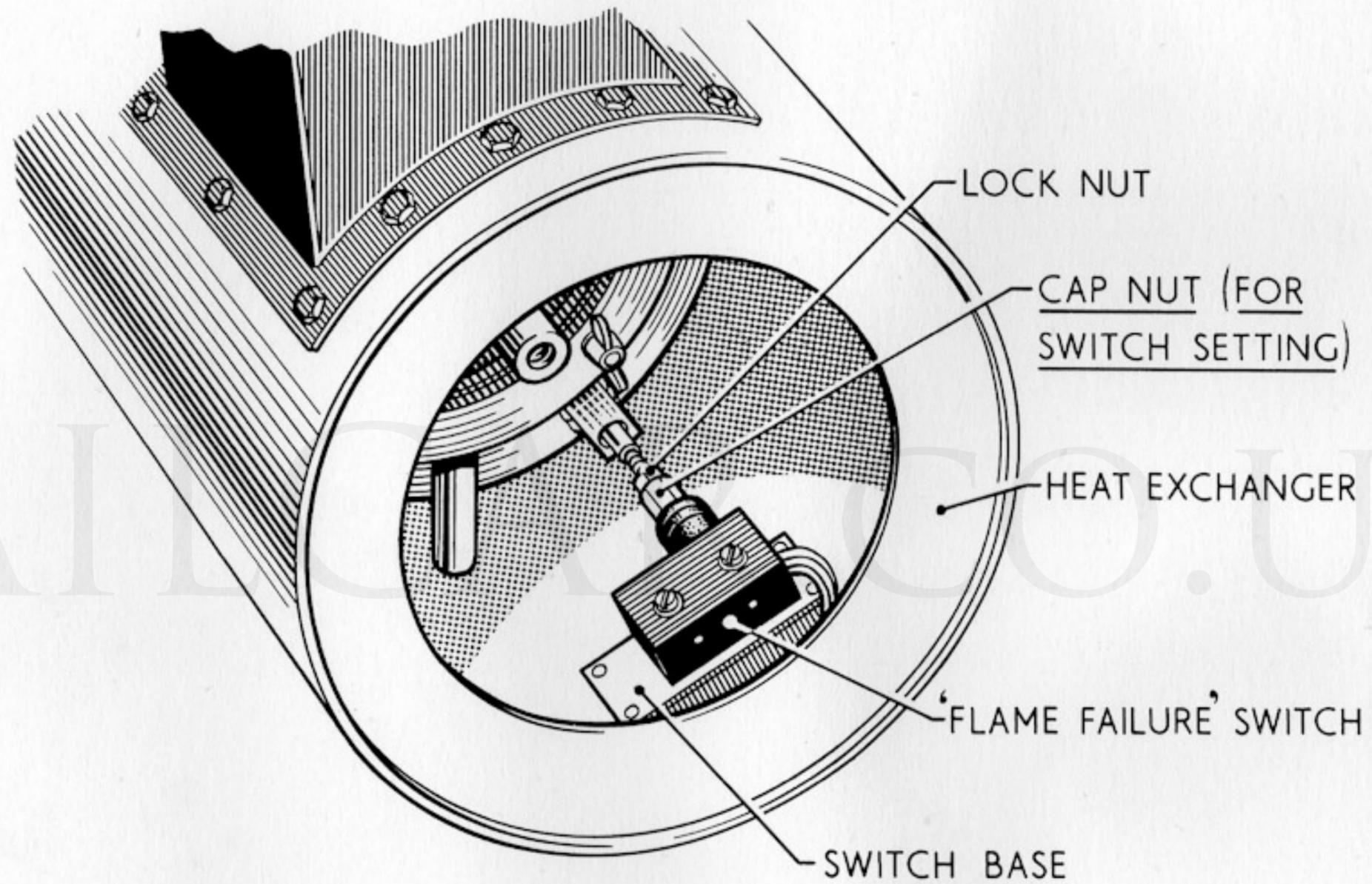
FUEL PUMP. PART No. DVLA. 80/61

FIG. 3



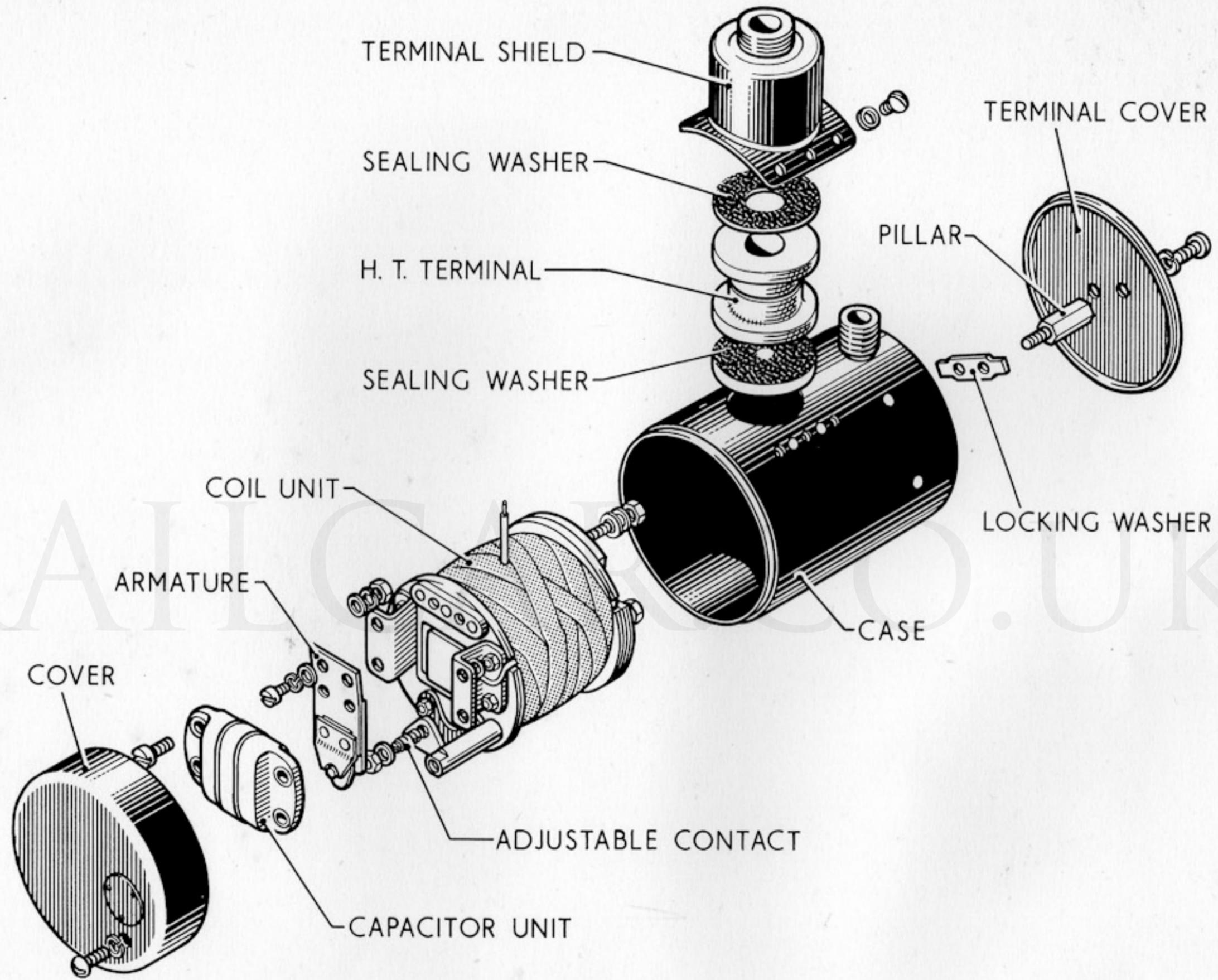
EXPLODED VIEW OF FUEL PUMP. PART No. DVLA. 80/61

FIG. 4



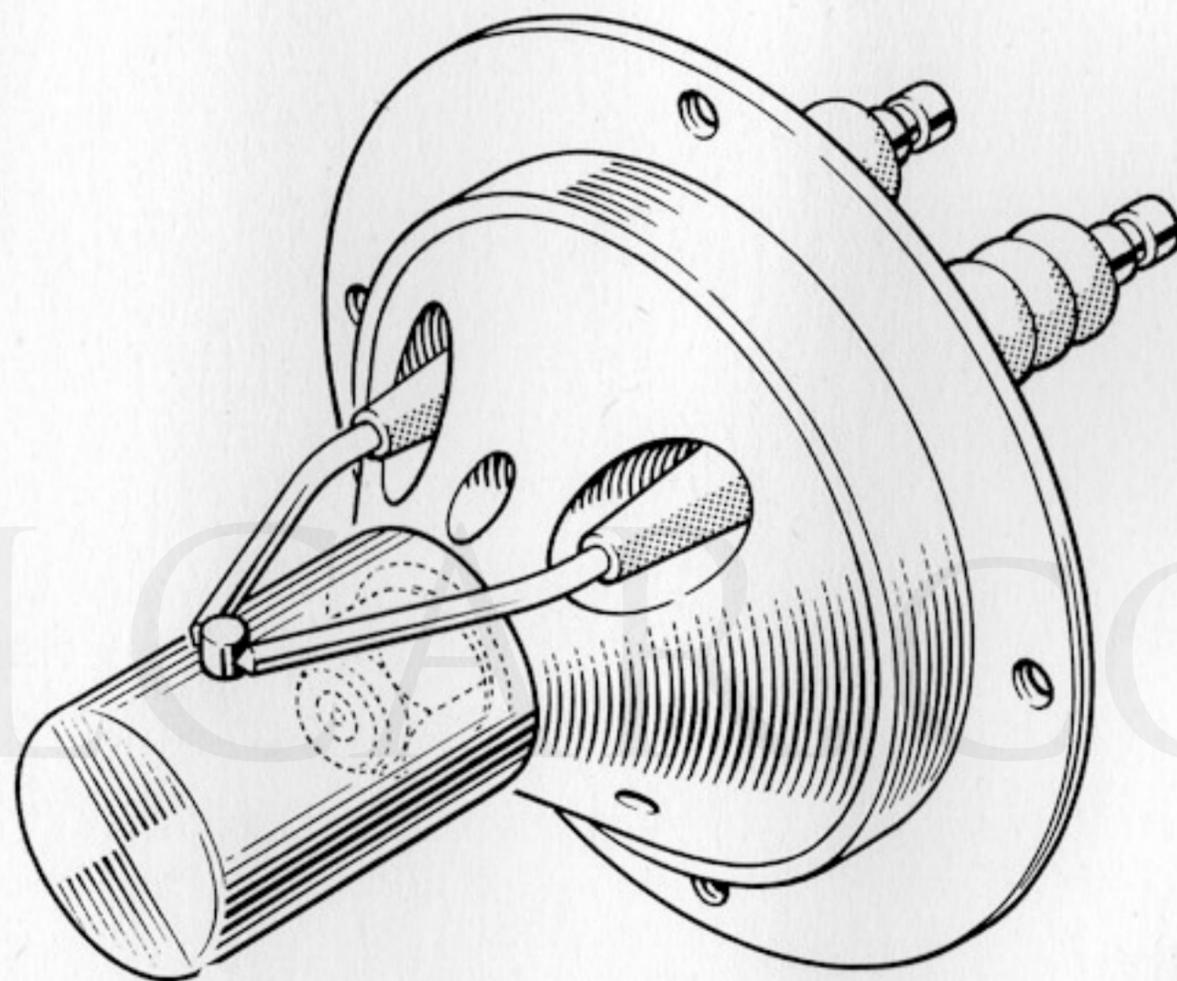
'FLAME FAILURE' SWITCH ON PART No. DVLA 80/1

FIG. 5



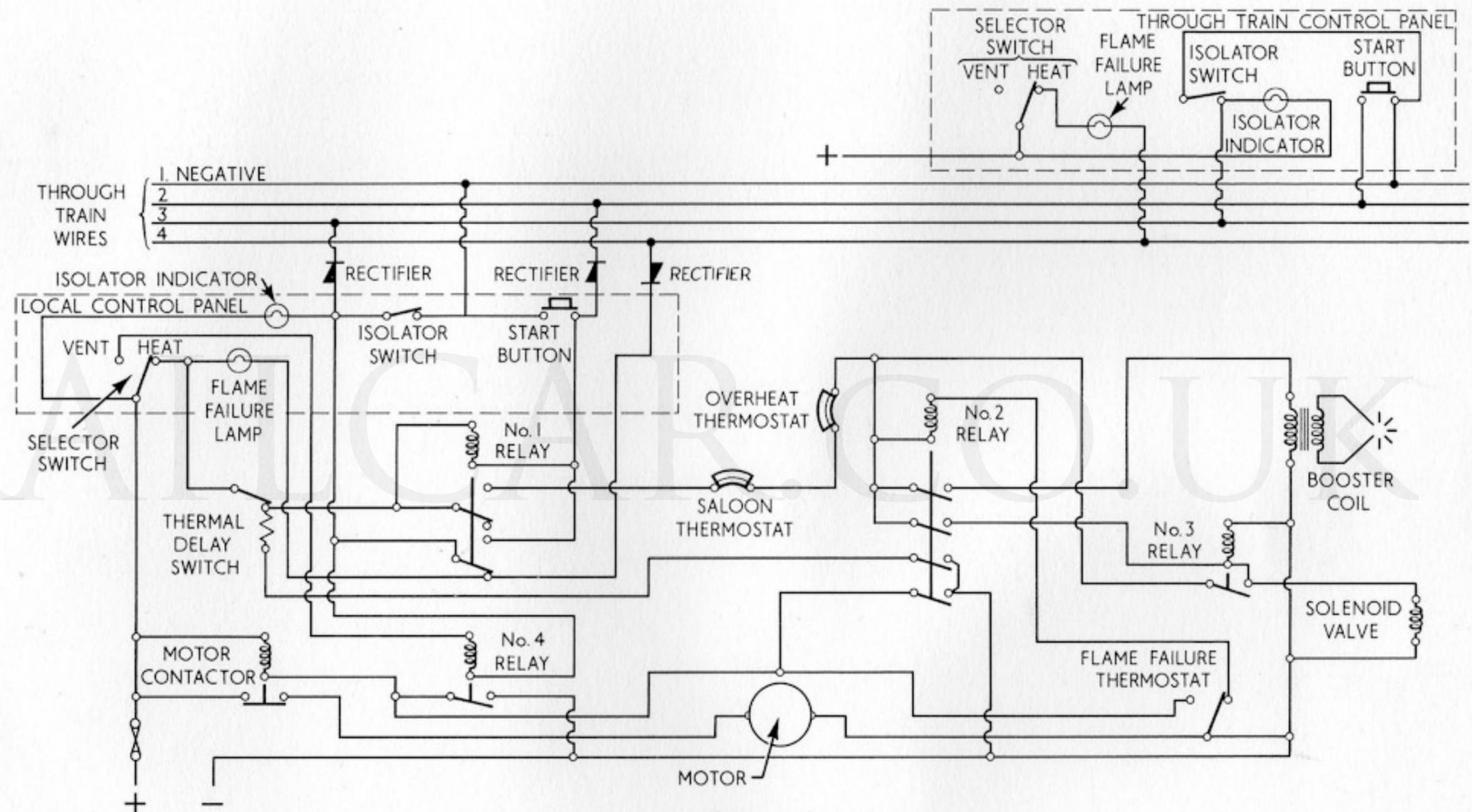
EXPLODED VIEW OF TYPE C2TS/1-BOOSTER COIL COMPONENTS

FIG. 6

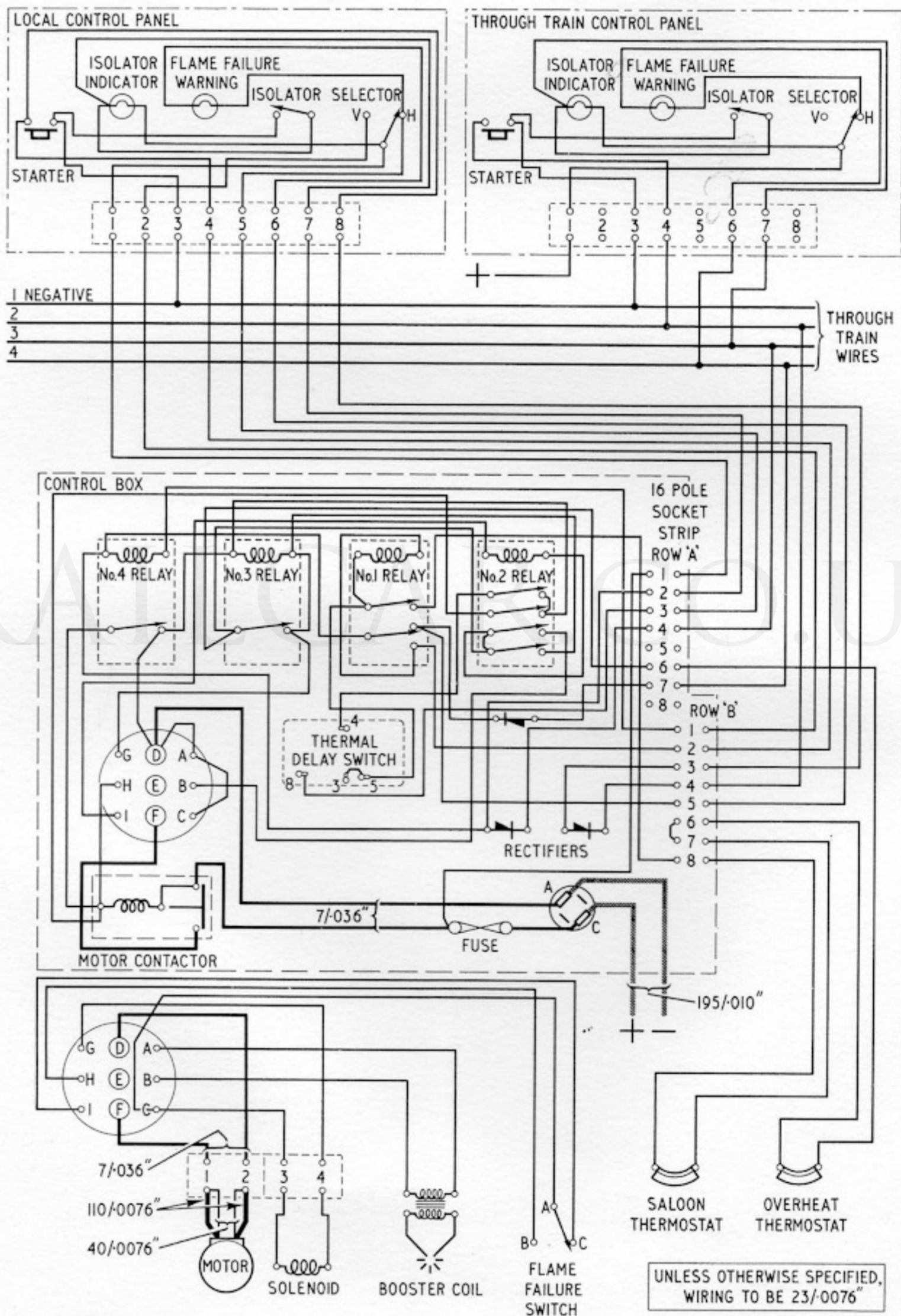


IGNITER ELECTRODE SETTING GAUGE. PART No. CRS. 22013

FIG. 7



CIRCUIT DIAGRAM FOR FULLY AUTOMATIC  
THERMOSTATIC CONTROL SYSTEM WITH B.R. THROUGH TRAIN LINK UP



CIRCUIT WIRING FOR FULLY AUTOMATIC THERMOSTATIC CONTROL HEATING SYSTEM WITH B.R. THROUGH TRAIN LINK UP