B-Heaters

1. Heaters supplied for certain vehicle types as optional extras

VW Passenger Cars

Code No.	Heater for	Remarks	Heater No.
01			
02			
03			
04			
05			
06	VW 1500 / VW Variant	6 V	20 1144 00 00 00
		12 V	20 1188 00 00 00
07			
08			
09			
10			
11			

VW Commercial Vehicles

21			
22	VW Transporter, Type BN 4	6 V	20 1104 00 00 00
		12 V	20 1147 00 00 00
23			
24			
25	VW Double Cab Pick-Up, Type BN 4	6 V	20 1127 00 00 00
		12 V	20 1176 00 00 00
26			
27	VW Ambulance, Type BN 4	6 V	20 1128 00 00 00
		12 V	20 1177 00 00 00
28			
29			
30			

Note: Fitting instructions are supplied with the heaters for service installation in all Volkswagen vehicles.

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This service manual for the

Eberspächer Heaters

has been made up to meet the requirements of the workshop.

The contents are divided into main sections and then sub-divided into the individual heater types.

The information given here is continually being amended and supplemented.

Supplements to this manual should be inserted in the same way as the supplements to the vehicle workshop manuals.

From August 1964, all spare parts for Eberspächer heaters will be supplied by the Parts Department of the Volkswagen factory and will be listed in the Parts Lists.

List of Heaters

Code No.	Vehicle Type and Optional Extra No.	Heater Type	Remarks	Eberspächer No.
06	Type 3 with M 60 (except Model 34) from April 63 up to October 64	B 2	6 V 12 V	20 1144 00 00 00 20 1188 00 00 00
11	Type 1 with M 60 (except Model 14) from January 64 up to August 66	B 2	6 V 12 V	20 1181 00 00 00 20 1190 00 00 00
12	Type 3 with M 119 from October 64 up to August 65	BN 2	6 V 12 V	20 1185 00 00 00 20 1205 00 00 00
14	Type 3 with M 246 (except Model 34) from August 65 up to August 66	BN 2	6 V 12 V	20 1215 00 00 00 20 1216 00 00 00
14	Type 3 with M 246 (except Model 34) from August 66	BN 2	12 V	20 1216 00 00 00
16	Type 1 with M 60 (except Model 14) from August 66	B 2	6 V 12 V	20 1245 00 00 00 20 1246 00 00 00
22	Type 2 with M 119 (Models 21, 22, 23, 24, 25) from March 61 up to August 66	BN 4	6 V 12 V	20 1104 00 00 00 20 1147 00 00 00
22	Type 2 with M 119 (Models 21, 22, 23, 24, 25) from August 66	BN 4	12 V	20 1147 00 00 00
25	Type 2 with M 203 (Models 265, 267, 268) from January 56 up to August 66	BN 4	6 V 12 V	20 1127 00 00 00 20 1176 00 00 00
25	Type 2 with M 203 (Models 265, 267, 268) from August 66	BN 4	12 V	20 1176 00 00 00
27	Type 2 with M 151 (Model 27) from October 58 up to August 66	BN 4	6 V 12 V	20 1128 00 00 00 20 1177 00 00 00
27	Type 2 with M 151 (Model 27) from August 66	BN 4	12 V	20 1177 00 00 00
28	Type 2 (reinforced floor plates) up to August 66	BN 4	6 V 12 V	20 1171 00 00 00 20 1178 00 00 00
28	Type 2 (reinforced floor plates) from August 66	BN 4	12 V	20 1178 00 00 00

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Example:

The heater for a Type 3 vehicle with M 60, heater number 20 1144 00 00 00 has the code number 06.

This means that you will find the operating instructions for this heater under A 06, the spare parts list under D 06 and the workshop bulletins under F 06.

Foreword

This service manual for the Eberspächer range of heating units has been made up to meet the requirements of the workshop.

The contents are divided into main sections and then sub-divided into the individual heater types. This makes the subject matter very clear and easy to understand and also facilitates the finding of any particular item.

The information given here is continually being amended and supplemented so that you always have the very latest and most complete data on the Eberspächer heaters to hand.

J. EBERSPÄCHER

Main Sections:

A	**Operating instructions and maintenance**
B	**Fitting instructions**
C	**Trouble shooting and repair instructions**
D	**Spare parts**
E	**Additional parts**
F	**Workshop Bulletins**
No letter	**Service**

A list of heaters with code numbers follows

Application example:

The heater for the VW 1500, heater number 20 1144 00 00 00 has the code number **06**.

This means that you will find the operating instructions for this heater under **A 06**, the spare parts list under **D 06** and the workshop bulletins under **F 06**.

Replacement of superseded pages

Every page has an index and heater code number and also an issue date and printing number. When an amendment has been made, you merely have to replace the old page (earlier issue date) by the new one and your book is complete and right up to date again.

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This service manual for the

Eberspächer Heaters

has been made up to meet the requirements of the workshop.

The contents are divided into main sections and then sub-divided into the individual heater types.

The information given here is continually being amended and supplemented.

Supplements to this manual should be inserted in the same way as the supplements to the vehicle workshop manuals.

From August 1964, all spare parts for Eberspächer heaters will be supplied by the Parts Department of the Volkswagen factory and will be listed in the Parts Lists.

List of Heaters

VW Passenger Cars

Code No.	Heater for	Heater Type	Remarks	Heater No.
01				
02				
03				
04				
05				
06	VW 1500 Sedan / Squareback Sedan		6 V	20 1144 00 00 00
	(Variant)		12 V	20 1188 00 00 00
07				
08				
09				
10				
11	VW 1200		6 V	20 1181 00 00 00
			12 V	20 1190 00 00 00
12	VW 1500 / Squareback Sedan (Variant)	BN 2	6 V	20 1185 00 00 00
			12 V	20 1205 00 00 00
14	VW 1500 Sedan /	BN 2	6 V	20 1215 00 00 00
	1600 Fastback Sedan (1600 TL)		12 V	20 1216 00 00 00
	VW 1500/1600 Squareback Sedan (Variant)			

VW Commercial Vehicles

21				
22	VW Transporter	BN 4	6 V	20 1104 00 00 00
			12 V	20 1147 00 00 00
23				
24				
25	VW Double Cab Pick-Up	BN 4	6 V	20 1127 00 00 00
			12 V	20 1176 00 00 00
26				
27	VW Ambulance	BN 4	6 V	20 1128 00 00 00
			12 V	20 1177 00 00 00
28	VW Transporter (reinforced floor plates)	BN 4	6 V	20 1171 00 00 00
			12 V	20 1178 00 00 00
29				
30				

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Example:

The heater for the VW 1500, heater number 20 1144 00 00 00 has the code number 06.

This means that you will find the operating instructions for this heater under A 06, the spare parts list under D 06 and the workshop bulletins under F 06.

The following warranty conditions only apply to Eberspächer heaters which are sold direct to workshops in the VW Organization by Messrs. Eberspächer without bringing in the Volkswagenwerk AG.

Warranty work on Eberspächer heaters which are supplied by the Volkswagenwerk AG (e. g. as M-equipment) is carried out in accordance with the instructions from the Volkswagenwerk AG.

1 - We warrant the articles to be as assured and free from defects in accordance with the technical standards existing at time of manufacture. General alterations in the construction or design which we make on an article before executing an order do not constitute grounds for complaint.

2 - The warranty period begins on the date of installation of the heater or the initial registration of the vehicle and lasts for 6 months.

3 - Warranty claims will only be recognized if the warranty card which is supplied with every article is filled out properly by the workshop carrying out the installation and presented to us with the defective part. The control card must be filled out properly, signed and sent to us immediately after installation.

4 - a) The warranty covers, at our choice, either repair or replacement of the defective product, which is to be forwarded to us post or carriage paid. Only the defective parts will be replaced and the parts of the article supplied by us which are damaged by the defect despite proper care. Replaced parts become our property.

b) The warranty covers only parts of articles supplied by us.

5 - If we recognize a warranty claim, the cost of returning the articles by the cheapest method (in Germany) will be charged to our account.

There is no liability for consequential loss or damage of any nature.

6 - The purchase contract cannot be cancelled or the purchase price reduced unless we are not in a position to repair the defect.

7 - The warranty becomes void if the articles supplied are altered by unauthorized persons or by the installation of parts which have not been approved. The warranty also becomes void if the handling and fitting instructions have not been following and if the appliance has been used under other than normal operating conditions.

8 - a) Natural wear and damage due to careless treatment are also excluded from the warranty. We shall, in particular, not accept responsibility for alterations in the condition or operating performance of our products which are caused by improper storage and climatic or other influences.

b) Expendable parts such as heater plugs, etc. are not covered by this warranty.

9 - Warranty claims will only be accepted if submitted in writing without delay. Furthermore, free-of-charge repair must be demanded expressly and immediately. The warranty period will not be extended or renewed by repair or replacement.

See also our Workshop Bulletin F, Printing No. 2216, Instructions for Warranty Work in VW Workshops.

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Heater No. 20 1144
for VW 1500 and Variant

Technical Description

The heater has a heat exchanger which consists of a cylindrical combustion chamber, and a concentrically arranged annular chamber. Both of these chambers are connected by two channels so that at one point the exhaust gases are flowing through the heat exchanger in a reverse direction. In the front part of the cylindrical space the combustion chamber (6) is sealed on the blower side by a safety ring and limited on the heat exchanger side by a flame nozzle.

The blower consists of an electric motor (10) which has an axial blower (9) for the fresh air on one end of the shaft and a radial blower (5) for the combustion air on the other end. As the static pressure is higher on the fresh air side than on the gas mixture side there is no danger of the exhaust gases getting into the fresh air and thus into the passenger compartment even if the heat exchanger (7) is leaking.

The **heater plug** (12) only works for a short period after the heater has been switched on. It is supplied with current via the thermo-switch (13). The thermo-switch cuts the current to the heater plug off as soon as the feeler tube of the switch is heated by the flame.

In the **antechamber** (3) the fuel is mixed with the combustion air and ignited. The actual combustion takes place in the combustion chamber (6) and the heat exchanger (7) attached to it.

The **jet carrier** (1) has three jets. A control jet W, an overflow jet Y and a feed jet Z. The control jet regulates the quantity of fuel flowing into the jet carrier. The feed jet Z controls the quantity flowing to the heater and the overflow jet Y regulates the pressure in the jet carrier and diverts excess fuel back to the tank.

The **fuel pump** (11) draws fuel from the vehicle tank through an adaptor (27), which also houses the fuel return line (26) (see illustration).

The **fuel suction line** (24) from tank to electric pump (11) includes a filter (23) with a water separator (see illustration).

The **exhaust pipe** (8) is sealed with a heat-resistant silicon ring where it passes through the body panel.

The **air control flap** (20) is fitted in the warm air elbow. When the heating is turned off by pushing in the knob, the flap closes the warm air outlet and opens a hole in the elbow through which the scavenging air can pass into the luggage compartment. An electric switch is fitted on the extended spindle of the flap.

The **warning light** on the warm air outlet shows that the heater is working properly. It lights up about 45 seconds after the heater has been switched on and goes out about $2^1/_2$ to 3 minutes after the heater has been switched off.

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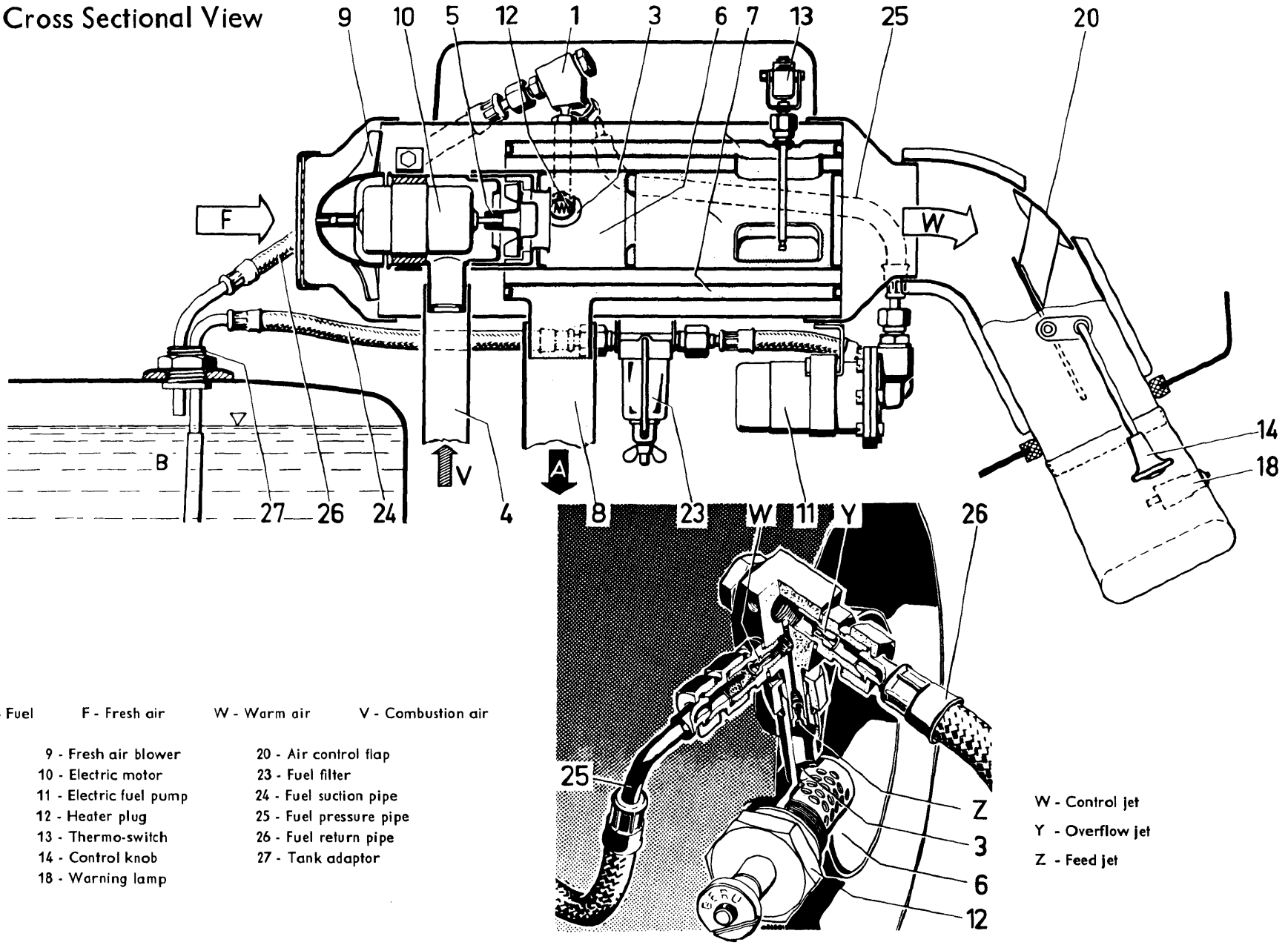
Cross Sectional View



A - Exhaust gas B - Fuel F - Fresh air W - Warm air V - Combustion air

1 - Jet carrier
3 - Antechamber
4 - Air intake pipe
5 - Combustion air blower
6 - Combustion chamber
7 - Heat exchanger
8 - Exhaust pipe
9 - Fresh air blower
10 - Electric motor
11 - Electric fuel pump
12 - Heater plug
13 - Thermo-switch
14 - Control knob
18 - Warning lamp
20 - Air control flap
23 - Fuel filter
24 - Fuel suction pipe
25 - Fuel pressure pipe
26 - Fuel return pipe
27 - Tank adaptor

W - Control jet
Y - Overflow jet
Z - Feed jet

Operation

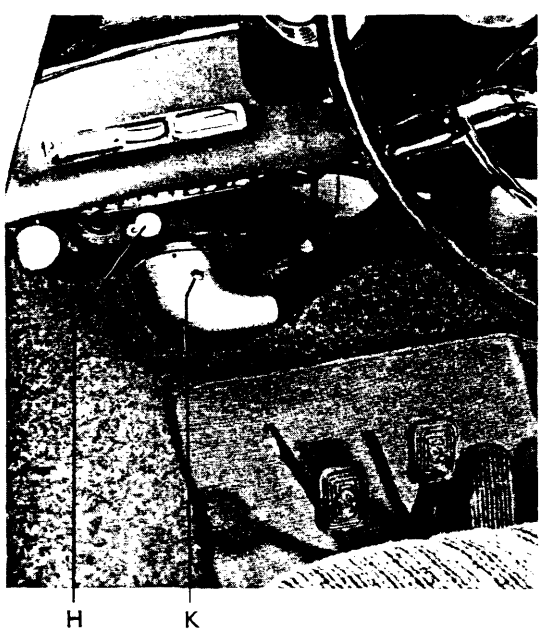
The heater is switched on and off with a push-pull switch underneath the instrument panel on the left. When the heater is switched on, the electric motor for the fresh air and combustion air blowers receives current via a resistor switch and the heater plug in the antechamber and the fuel pump are also supplied with current. The combustion chamber is surrounded by a heat exchanger in which the fresh air is heated up. The heater is enclosed in a sheet metal housing which carries the various parts.

As soon as the heater is put into operation, combustion air is drawn in and fuel flows from the fuel pump through the jet carrier into the combustion chamber where a combustible mixture of fuel and air is created. This mixture is ignited by the heater plug and the flame contacts the feeler tube of the thermo-switch and switches the heater plug off. The warning lamp in the warm air outlet pipe then lights up and shows that the heater is working properly. Further ignition takes place automatically. When the electric motor starts to turn, fresh air is drawn in, heated to about 90° C (194° F) above the outside temperature, and passed through the warm air outlet to the interior of the vehicle.

Operating instructions

Switching on

Pull knob H: The warning lamp K in the warm air outlet will light up after about 45 seconds and show that the heater is working properly.



Switching off

Press knob H in. The heater will then switch off automatically after about 3 minutes. The warning light K will then go out and show that the run-on period is ended.

Note:

When the heater is switched off, the blower motor continues to run until the heater has cooled off slightly and the combustion chamber is free of gas.

The warning light remains on during this flushing period and the heater must not be switched on again until the warning light has gone out.

Maintenance

Every year before heater is put into use:

Check condition of heater plug and renew if necessary.

Clean filter and jets in jet carrier.

Check security of electrical connections.

When necessary: Check that intake and exhaust pipes are clear.

Technical Data

Heat output	1750 kcal/h
Fuel	gasoline
Fuel consumption	0.27 liters per hour (approx. .5 pint per hour)
Current consumption	20 Watt
Voltage	6 Volt
Warm air temperature (above outside temperature)	up to approx. 90° C
Fresh air capacity	approx. 65 000 liter (2300 cu. ft./h)
Weight of heater	5.5 kg (12 lbs.)

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Heater No. 20 1144 (6 V)
20 1188 (12 V)
for VW 1500 and Variant

Heater No. 20 1181 (6 V)
20 1190 (12 V)
for VW 1200

Technical Description

The heater has a heat exchanger which consists of a cylindrical combustion chamber, and a concentrically arranged annular chamber. These chambers are connected by two channels so that at one point the exhaust gases are flowing through the heat exchanger in a reverse direction. In the front part of the cylindrical space the combustion chamber (6) is sealed on the blower side by a safety ring and limited on the heat exchanger side by a flame nozzle.

The blower consists of an electric motor (10) which has an axial blower (9) for the fresh air on one end of the shaft and a radial blower (5) for the combustion air on the other end. As the static pressure is higher on the fresh air side than on the gas mixture side there is no danger of the exhaust gases getting into the fresh air and thus into the passenger compartment even if the heat exchanger (7) is leaking.

The **heater plug** (12) only works for a short period after the heater has been switched on. It is supplied with current via the thermo-switch (13). The thermo-switch cuts the current to the heater plug off as soon as the feeler tube of the switch is heated by the flame.

In the **antechamber** (3) the fuel is mixed with the combustion air and ignited. The actual combustion takes place in the combustion chamber (6) and the heat exchanger (7) attached to it.

The **jet carrier** (1) has three jets: A control jet W, an overflow jet Y and a feed jet Z. The control jet regulates the quantity of fuel flowing into the jet carrier. The feed jet Z controls the quantity flowing to the heater and the overflow jet Y regulates the pressure in the jet carrier and diverts excess fuel back to the tank.

The **fuel pump** (11) draws fuel from the vehicle tank through an adaptor (27), which also houses the fuel return line (26) (see illustration).

The **fuel suction line** (24) from tank to electric pump (11) includes a filter (23) with a water separator (see illustration).

The **exhaust pipe** (8) is sealed with a heat-resistant silicon ring where it passes through the body panel.

The **air control flap** (20) is fitted in the warm air elbow. When the heating is turning off by pushing in the knob, the flap closes the warm air outlet and opens a hole in the elbow through which the scavenging air can pass into the luggage compartment. An electric switch is fitted on the extended spindle of the flap.

The **warning light** on the warm air outlet shows that the heater is working properly. It lights up about 45 seconds after the heater has been switched on and goes out about $2^1/_2$ to 3 minutes after the heater has been switched off.

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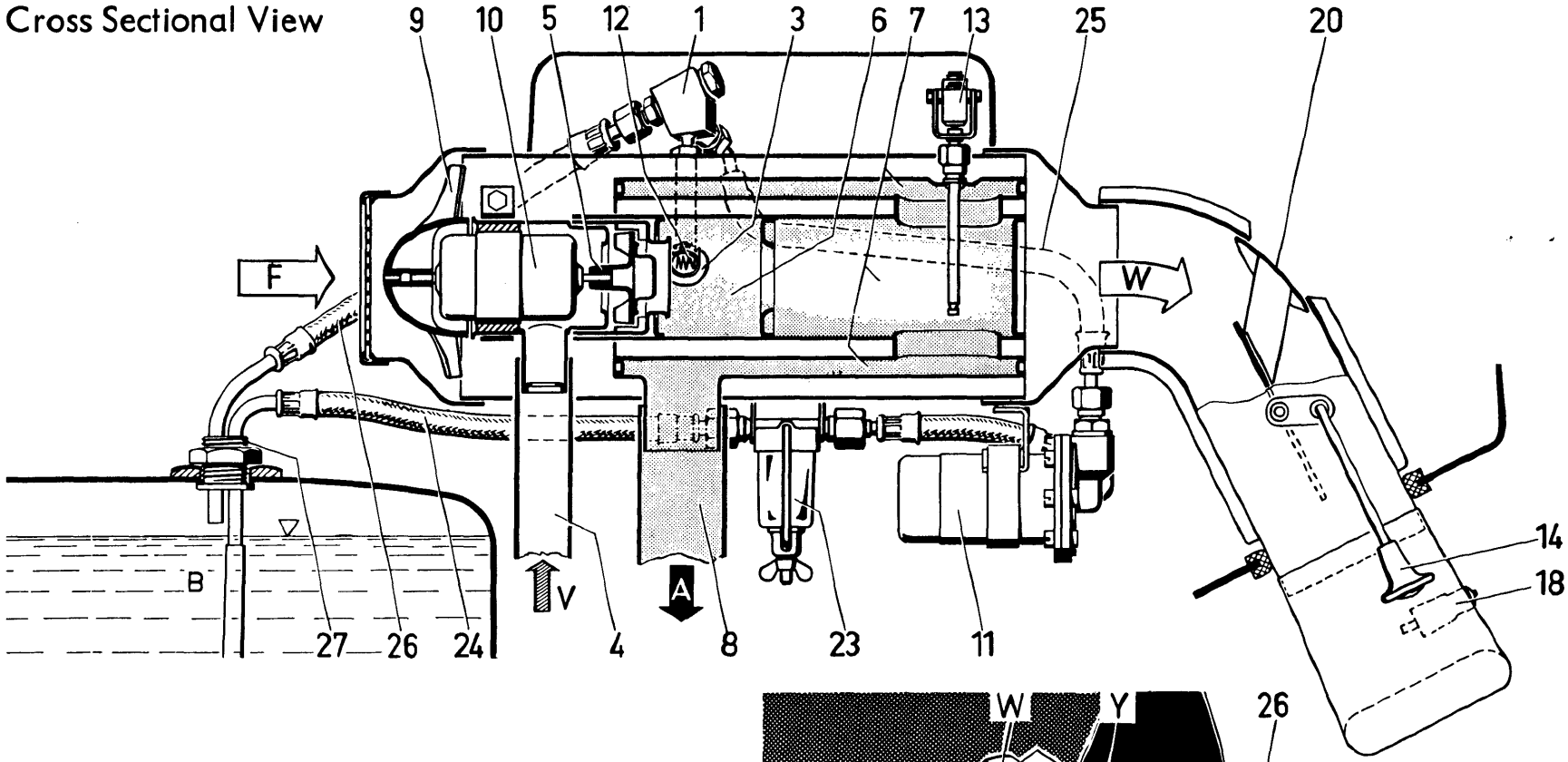
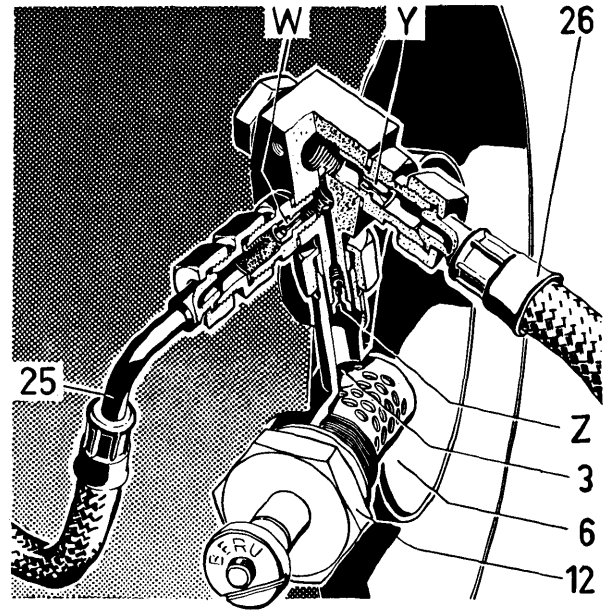
Cross Sectional View





W - Control jet
Y - Overflow jet
Z - Feed jet

A - Exhaust gas
B - Fuel
F - Fresh air
W - Warm air
V - Combustion air

1 - Jet carrier
3 - Antechamber
4 - Air intake pipe
5 - Combustion air blower
6 - Combustion chamber
7 - Heat exchanger
8 - Exhaust pipe
9 - Fresh air blower
10 - Electric motor
11 - Electric fuel pump
12 - Heater plug
13 - Thermo-switch
14 - Control knob
18 - Warning lamp
20 - Air control flap
23 - Fuel filter
24 - Fuel suction pipe
25 - Fuel pressure pipe
26 - Fuel return pipe
27 - Tank adaptor

Operation

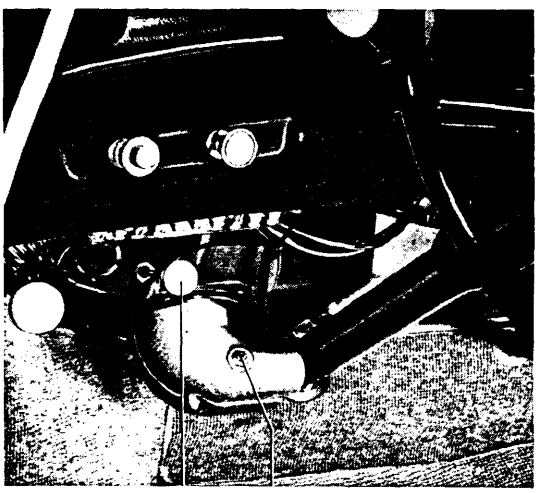
The heater is switched on and off with a push-pull switch underneath the instrument panel on the left. When the heater is switched on, the electric motor for the fresh air and combustion air blowers receives current via a resistor switch and the heater plug in the antechamber and the fuel pump are also supplied with current. The combustion chamber is surrounded by a heat exchanger in which the fresh air is heated up. The heater is enclosed in a sheet metal housing which carries the various parts.

As soon as the heater is put into operation, combustion air is drawn in and fuel flows from the fuel pump through the jet carrier into the combustion chamber where a combustible mixture of fuel and air is created. This mixture is ignited by the heater plug and the flame contacts the feeler tube of the thermo-switch and switches the heater plug off. The warning lamp in the warm air outlet pipe then lights up and shows that the heater is working properly. Further ignition takes place automatically. When the electric motor starts to turn, fresh air is drawn in, heated to about 90° C (194° F) above the outside temperature, and passed through the warm air outlet to the interior of the vehicle.

Operating instructions

Switching on

Pull knob H: The warning lamp K in the warm air outlet will light up after about 45 seconds and show that the heater is working properly.



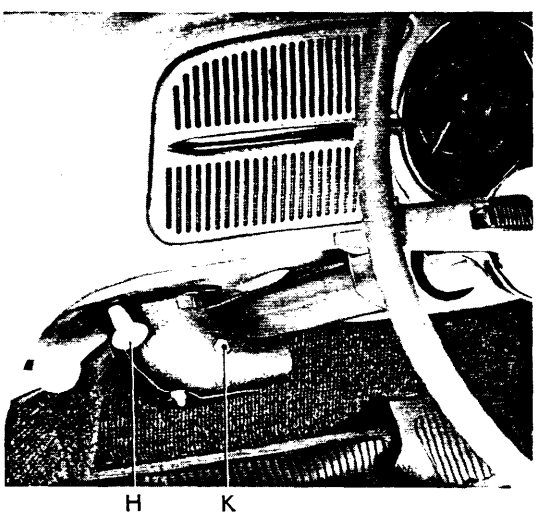
Switching off

Press knob H in. The heater will then switch off automatically after about 3 minutes. The warning light K will then go out and show that the run-on period is ended.

Note:

When the heater is switched off, the blower motor continues to run until the heater has cooled off slightly and the combustion chamber is free of gas.

The warning light remains on during this flushing period and the heater must not be switched on again until the warning light has gone out.



When it is very cold, the full battery capacity is required to start the engine. To avoid starting difficulties, it is advisable not to switch the heater on until the engine is running. It is also recommended that the heater is not left on for more than 30 minutes when the engine is not running, to avoid exhausting the battery.

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Maintenance

Deposits from the fuel tend to settle in the fuel system of the heater when it is not used for long periods. To avoid trouble, it is advisable to operate the heater briefly about once a month when the heater is not in regular use.

Every year before heater is put into use:

Check condition of heater plug and renew if necessary.

Clean filter and jets in jet carrier.

Check security of electrical connections.

During the winter or when driving over very poor roads, mud or snow may tend to accumulate on the exhaust and combustion air intake pipes. Have these pipes checked for blockage from time to time so the heater can continue to work properly.

Technical Data

Heat output	1750 kcal/h
Fuel	Gasoline
Fuel consumption	0.27 liters per hour (approx. .5 pint per hour)
Current consumption	20 Watts
Voltage	6 Volt / 12 Volt
Warm air temperature (above outside temperature)	up to approx. 90° C
Fresh air capacity	approx. 65 000 liters per hour
Weight of heater	5.5 kg (12 lbs.)

Heater No. 20 1144 (6 volt)
20 1188 (12 volt)

for Type 3 from April 1963 to October 1964

Heater No. 20 1181 (6 volt)
20 1190 (12 volt)

for Type 1 from January 1964 to August 1966

Heater No. 20 1245 (6 volt)
20 1246 (12 volt)

for Type 1 from August 1966

Technical Description

The heater has a heat exchanger which consists of a cylindrical combustion chamber, and a concentrically arranged annular chamber. These chambers are connected by two channels so that at one point the exhaust gases are flowing through the heat exchanger in a reverse direction. In the front part of the cylindrical space the combustion chamber (6) is sealed on the blower side by a safety ring and limited on the heat exchanger side by a flame nozzle.

The blower consists of an electric motor (10) which has an axial blower (9) for the fresh air on one end of the shaft and a radial blower (5) for the combustion air on the other end. As the static pressure is higher on the fresh air side than on the gas mixture side there is no danger of the exhaust gases getting into the fresh air and thus into the passenger compartment even if the heat exchanger (7) is leaking.

The **heater plug** (12) only works for a short period after the heater has been switched on. It is supplied with current via the thermo-switch (13). The thermo-switch cuts the current to the heater plug off as soon as the feeler tube of the switch is heated by the flame.

8/66

Note:
The heater plug on the 12 volt heater (Heater No. 20 1246) is equipped with a series resistance. The resistance is fitted in a screening cover which is mounted on the heater casing.

In the **antechamber** (3) the fuel is mixed with the combustion air and ignited. The actual combustion takes place in the combustion chamber (6) and the heat exchanger (7) attached to it.

The **jet carrier** (1) has three jets: A control jet W, an overflow jet Y and a feed jet Z. The control jet regulates the quantity of fuel flowing into the jet carrier. The feed jet Z controls the quantity flowing to the heater and the overflow jet Y regulates the pressure in the jet carrier and diverts excess fuel back to the tank.

The **fuel pump** (11) draws fuel from the vehicle tank through an adaptor (27), which also houses the fuel return line (26) (see illustration).

The **fuel suction line** (24) from tank to electric pump (11) includes a filter (23) with a water separator.

The **exhaust pipe** (8) is sealed with a heat-resistant silicon ring where it passes through the body panel.

The **air control flap** (20) is fitted in the warm air elbow. When the heating is turning off by pushing in the knob, the flap closes the warm air outlet and opens a hole in the elbow through which the scavenging air can pass into the luggage compartment. An electric switch is fitted on the extended spindle of the flap.

8/66

Note:
The air control flap has been discontinued on the closed circuit heaters No. 20 1245 (6 volt) and 20 1246 (12 volt). The operating travel of the switch is now limited by two metal brackets on the warm air outlet and not by the air control flap.

The **warning light** on the warm air outlet shows that the heater is working properly. It lights up about 45 seconds after the heater has been switched on and goes out about 2 1/2 to 3 minutes after the heater has been switched off.

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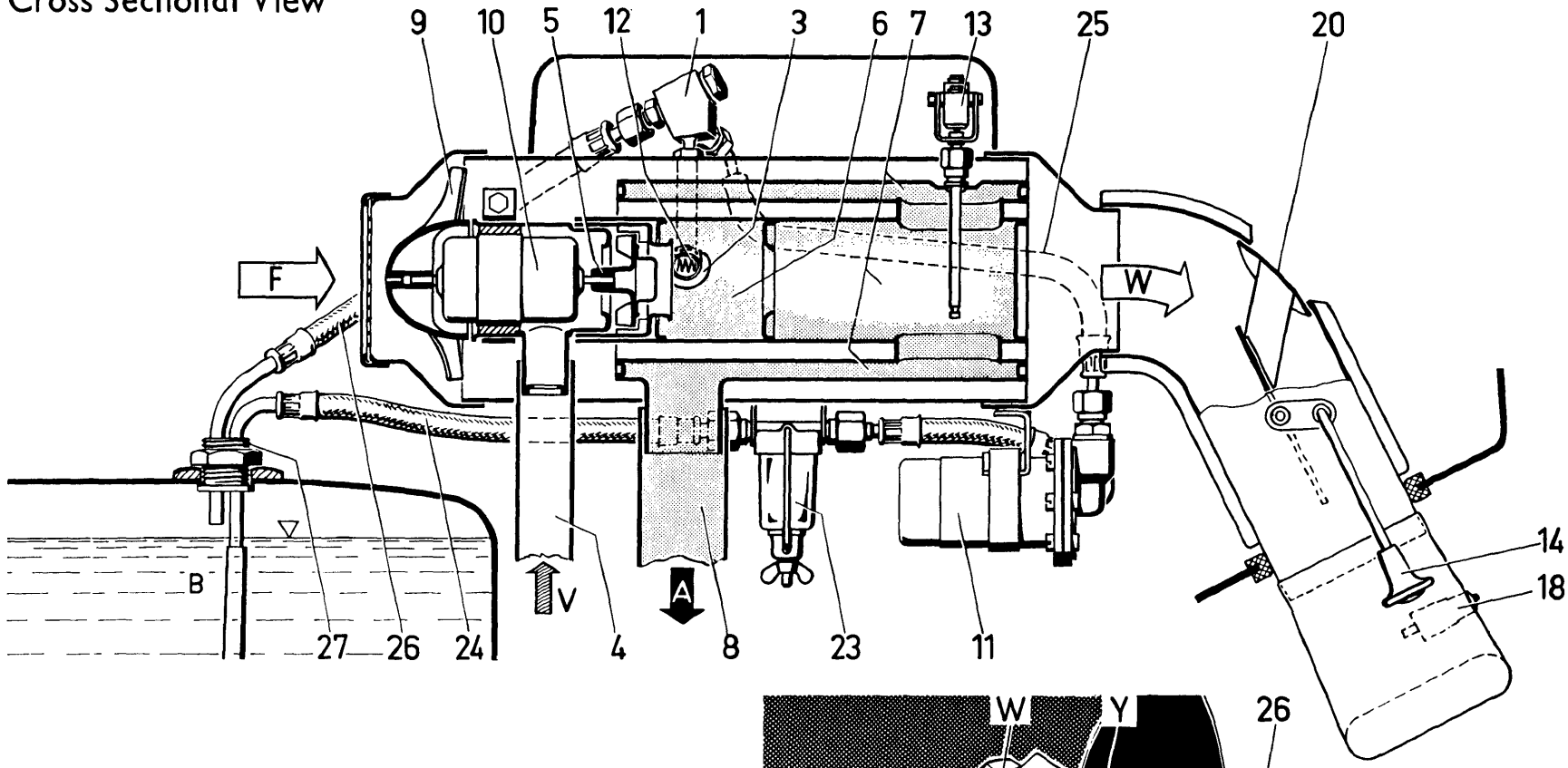
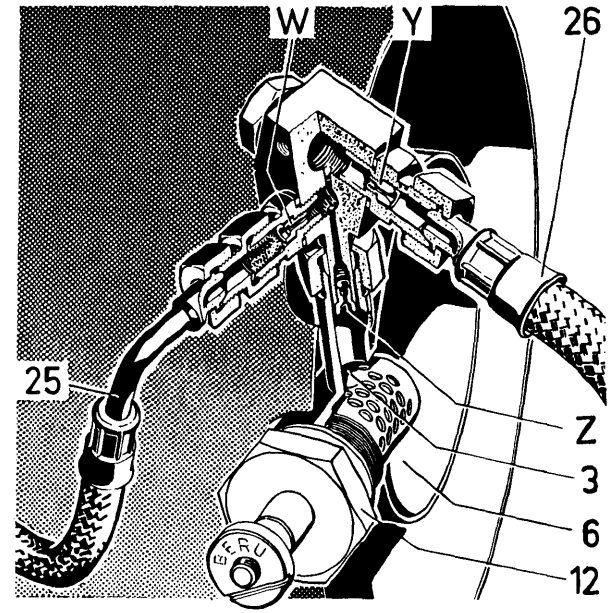
A 06 11 16

Cross Sectional View





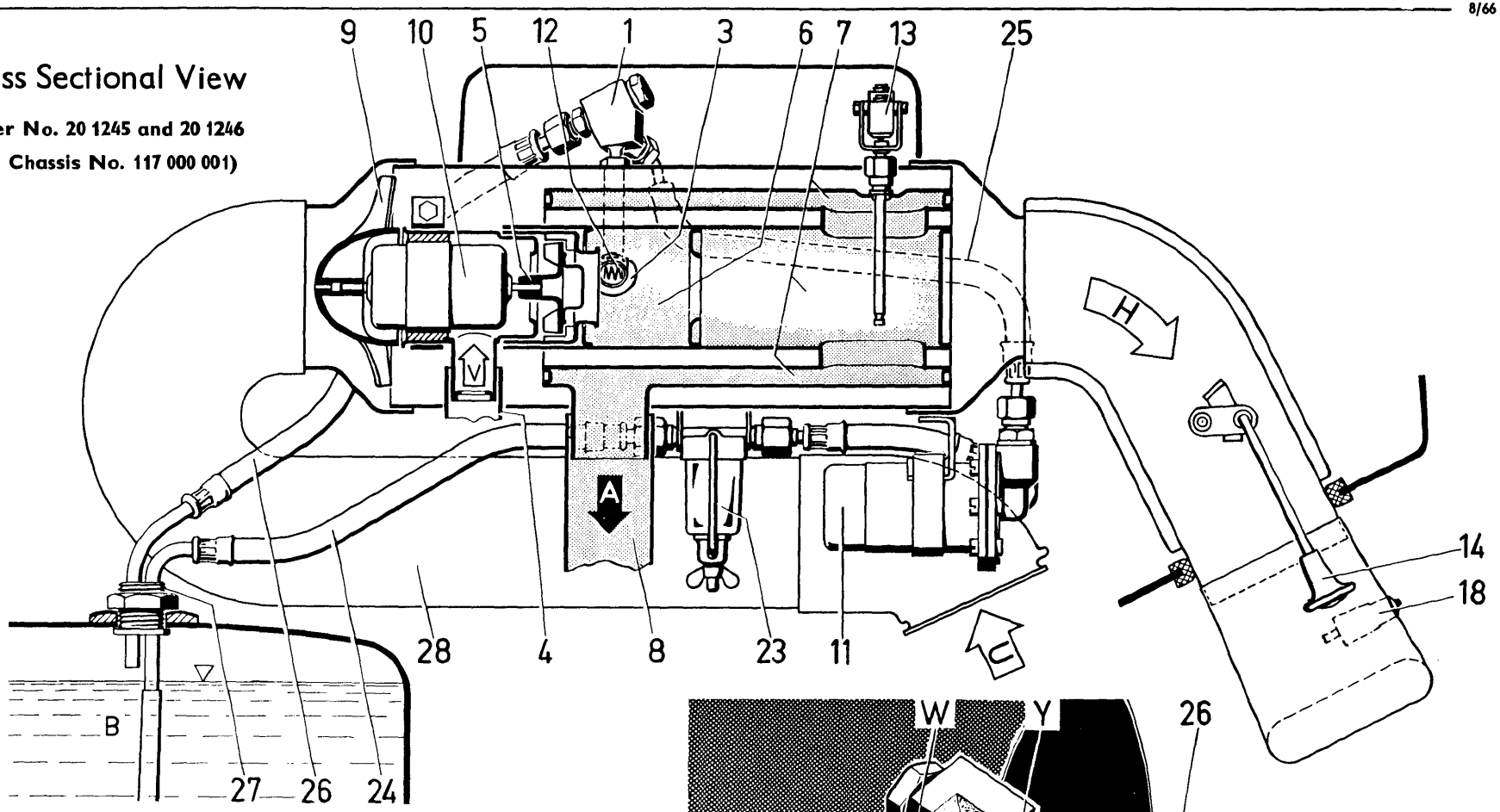
W - Control jet
Y - Overflow jet
Z - Feed jet

A - Exhaust gas B - Fuel F - Fresh air W - Warm air V - Combustion air

1 - Jet carrier
3 - Antechamber
4 - Air intake pipe
5 - Combustion air blower
6 - Combustion chamber
7 - Heat exchanger
8 - Exhaust pipe
9 - Fresh air blower
10 - Electric motor
11 - Electric fuel pump
12 - Heater plug
13 - Thermo-switch
14 - Control knob
18 - Warning lamp
20 - Air control flap
23 - Fuel filter
24 - Fuel suction pipe
25 - Fuel pressure pipe
26 - Fuel return pipe
27 - Tank adaptor

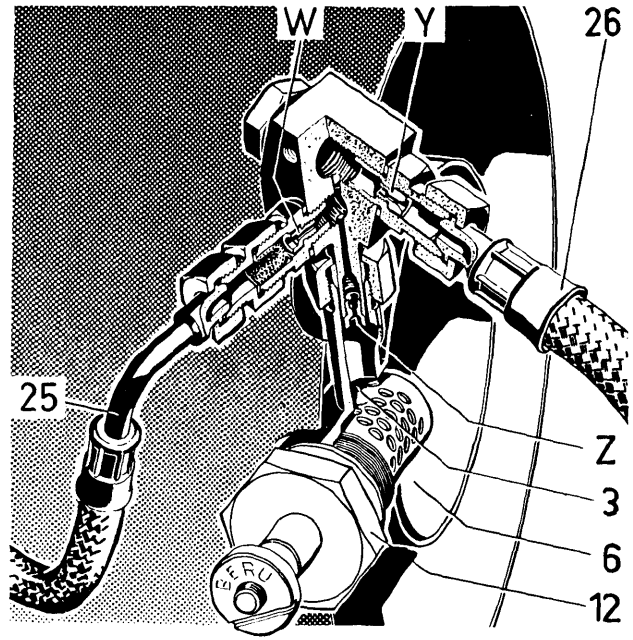
Cross Sectional View

Heater No. 20 1245 and 20 1246
(from Chassis No. 117 000 001)



A - Exhaust gas B - Fuel U - Circulating air H - Hot air V - Combustion air

1 - Jet carrier
3 - Antechamber
4 - Air intake pipe
5 - Combustion air blower
6 - Combustion chamber
7 - Heat exchanger
8 - Exhaust pipe
9 - Hot air blower
10 - Electric motor
11 - Electric fuel pump
12 - Heater plug
13 - Thermo-switch
14 - Control knob
18 - Warning lamp
23 - Fuel filter
24 - Fuel suction line
25 - Fuel pressure line
26 - Fuel return line
27 - Tank connection
28 - Air circulation pipe



W - Control jet
Y - Overflow jet
Z - Feed jet

Operation

The heater is switched on and off with a push-pull switch underneath the instrument panel on the left. When the heater is switched on, the electric motor for the fresh air and combustion air blowers receives current via a resistor switch and the heater plug in the antechamber and the fuel pump are also supplied with current. The combustion chamber is surrounded by a heat exchanger in which the fresh air is heated up. The heater is enclosed in a sheet metal housing which carries the various parts.

As soon as the heater is put into operation, combustion air is drawn in and fuel flows from the fuel pump through the jet carrier into the combustion chamber where a combustible mixture of fuel and air is created. This mixture is ignited by the heater plug and the flame contacts the feeler tube of the thermo-switch and switches the heater plug off. The warning lamp in the warm air outlet pipe then lights up and shows that the heater is working properly. Further ignition takes place automatically. When the electric motor starts to turn, fresh air is drawn in, heated to about 90° C (194° F) above the outside temperature, and passed through the warm air outlet to the interior of the vehicle.

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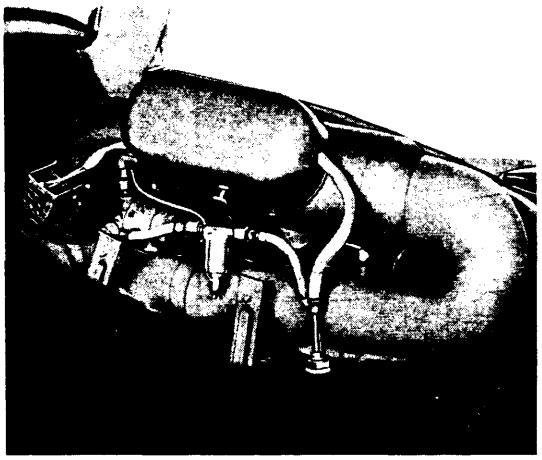
Note:

From August 1966, Heater No. 20 1245 (6 volt) and 20 1246 (12 volt), the heater works on the closed circuit principle. With this system, the air is drawn from the vehicle interior and warmed up in the heater before it passes back into the body again.

In this system, the heater output is used more effectively and furthermore there is less danger of unpleasant smells being drawn in from outside by the heater as could occur after filling the fuel tank or when driving in dense traffic.

The operation and maintenance of the heater has not changed.

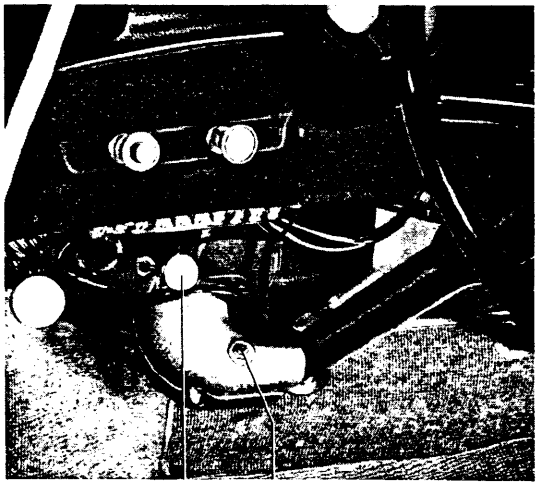
A conversion kit for the installation of the air circulation pipe is available from Messrs. Eberspächer under order number 20 1184 28 00 00. This kit can only be obtained from Messrs. Eberspächer.



Operating instructions

Switching on

Pull knob H: The warning lamp K in the warm air outlet will light up after about 45 seconds and show that the heater is working properly.



Switching off

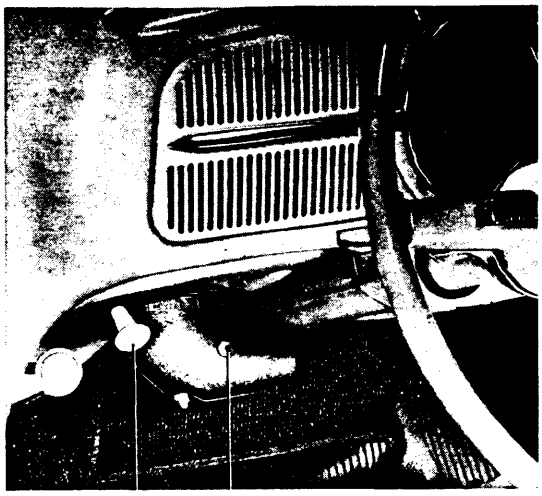
Press knob H in. The heater will then switch off automatically after about 3 minutes. The warning light K will then go out and show that the run-on period is ended.

Note:

When the heater is switched off, the blower motor continues to run until the heater has cooled off slightly and the combustion chamber is free of gas.

The warning light remains on during this flushing period and the heater must not be switched on again until the warning light has gone out.

When it is very cold, the full battery capacity is required to start the engine. To avoid starting difficulties, it is advisable not to switch the heater on until the engine is running. It is also recommended that the heater is not left on for more than 30 minutes when the engine is not running, to avoid exhausting the battery.



Maintenance

Deposits from the fuel tend to settle in the fuel system of the heater when it is not used for long periods. To avoid trouble, it is advisable to operate the heater briefly about once a month when the heater is not in regular use.

Every year before heater is put into use:

Check condition of heater plug and renew if necessary.

Clean filter and jets in jet carrier.

Check security of electrical connections.

During the winter or when driving over very poor roads, mud or snow may tend to accumulate on the exhaust and combustion air intake pipes. Have these pipes checked for blockage from time to time so the heater can continue to work properly.

Technical Data

Heat output	1750 kcal/h
Fuel	Gasoline
Fuel consumption	0.27 liters per hour (approx. .5 pint per hour)
Current consumption	20 watts
Voltage	6 volt / 12 volt
Warm air temperature (above intake temperature)	up to approx. 90° C
Air capacity	approx. 65 000 liters per hour
Weight of heater	5.5 kg (12 lbs.)

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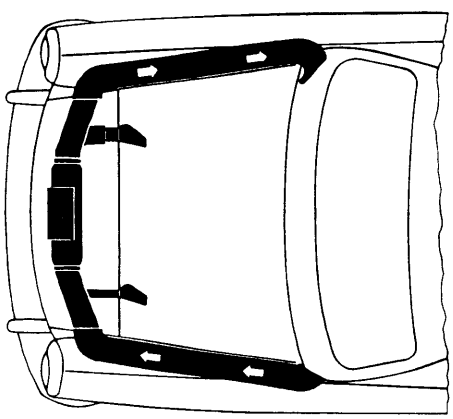
Type BN 2
Heater No. 20 1185 (6 Volt)
20 1205 (12 Volt)
for VW 1500 / VW Squareback Sedan

Technical Description

The BN 2 heating system consists of the heater unit itself, the combustion air intake and exhaust gas pipes, two insulated heater pipes, the fuel pump, the fuel filter with solenoid valve and a push-pull switch.



1 - Heater

The heater consists of a two-piece sheet metal casing which houses an electric motor (1) which drives a fan with an axial blower (2) for the fresh air and a radial blower (3) for the combustion air.

Attached to this casing is the heat exchanger (6) which in turn consists of a cylindrical combustion space with a concentrically arranged annular chamber. These chambers are connected by two passages. An adaptor leads from the annular chamber to the exhaust pipe (14). The combustion space is made up of an antechamber (4) and the combustion chamber (5). At the heat exchanger end (6) the combustion chamber (5) is limited by a flame jet and at the lower part of the combustion chamber is an overflow pipe adaptor.

The heater plug (7) and the fuel jet (8) project into the antechamber.

The thermo-switch (10) is secured with a union nut to a threaded boss on the end of the heat exchanger and the feeler tube of the switch projects into the combustion space.

The pressure regulator (9) which contains an inlet and a regulating valve is attached to the heater casing with 4 tapping screws. A hose connects the pressure regulator to the jet holder in which the fuel jet (8) is located.

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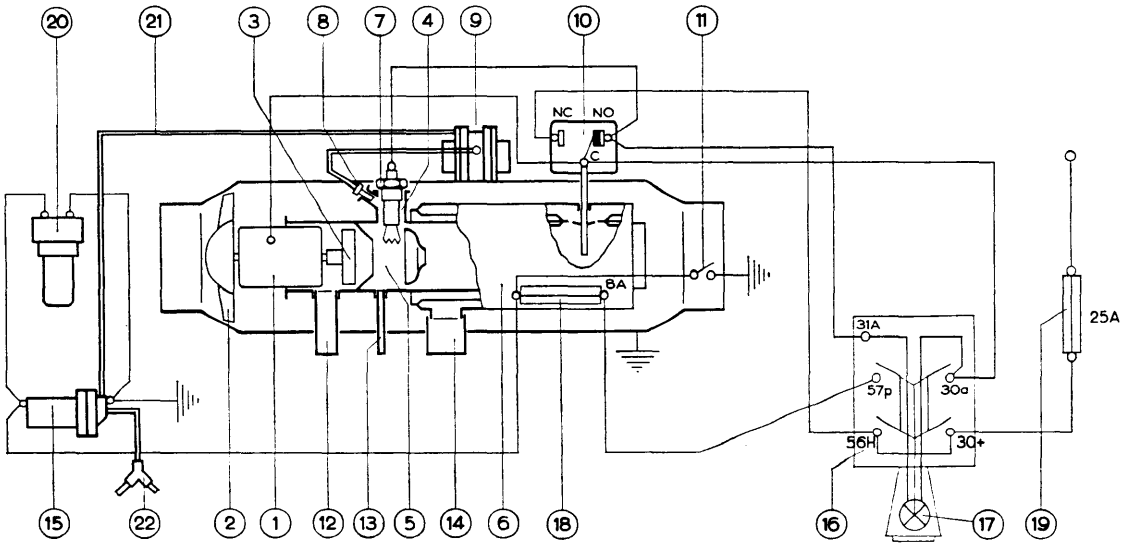
An overheating switch (11) is fitted on the warm air outlet side of the heater.

On the casing between the pressure regulator and thermo-switch is a safety switch with an 8 Amp. fuse (18). A plastic cap covers all the fittings on the outside of the casing.



1 - Electric motor
2 - Fresh air blower
3 - Combustion blower
4 - Antechamber
5 - Combustion chamber
6 - Heat exchanger
7 - Heater plug
8 - Fuel jet
9 - Pressure regulator
10 - Thermo-switch
11 - Overheating switch
12 - Air intake pipe
13 - Overflow pipe
14 - Exhaust pipe
15 - Electric fuel pump
16 - Switch
17 - Warning lamp
18 - Fuse, 8 Amp.
19 - Fuse, 25 Amp.
20 - Fuel filter with solenoid valve
21 - Fuel lines
22 - Y piece

2 - Combustion air intake pipe and exhaust pipe

A hose connects the combustion air intake adaptor on the heater to the combustion air intake on the left of the spare wheel carrier plate. The heater overflow pipe is also connected to this intake adaptor.

The exhaust pipe passes through the right side of the spare wheel carrier plate into the open. At the heater, the exhaust pipe is sealed with a silicon ring.

The ends of the combustion air intake pipe and the exhaust pipe are shielded from dirt by two deflector plates.

3 - Heater pipes

Two insulated pipes which are attached with clips in the wheel housings connect the heater to the passenger compartment.

4 - Fuel system

The suction line is connected to the vehicle fuel line and passes via the fuel filter with solenoid valve to the fuel pump. The fuel pump is connected to the pressure regulator on the heater.

5 - Switch

The heater is controlled with a push-pull switch which is located in the instrument panel to the left of the ashtray.

Operation

The heater is switched on by pulling out the switch on the instrument panel. This supplies current to the blower motor, the heater plug via the thermo-switch and the fuel pump.

The combustion air blower then starts to deliver air and mixes it with the fuel delivered by the fuel pump and sprayed into the antechamber via the pressure regulator.

The heater plug warms this combustible fuel/air mixture in the antechamber and ignites it. Combustion then extends through the combustion chamber and heats up the heat exchanger. As soon as the flame has heated the feeler tube of the thermo-switch sufficiently, the current supply to the heater plug from the thermo-switch is cut off. When the heater plug is switched off, the warning lamp in the switch knob lights up and shows that the heater is operating properly. The fuel/air mixture then continues to burn automatically.

The BN 2 heater on the Volkswagen 1500 works on the circulatory system.

Air is drawn from the vehicle interior through an insulated pipe by the fresh air blower, forced past the heat exchanger and thus heated to 90° C above the inlet temperature. The hot air then passes through an insulated pipe back into the vehicle interior.

As the fresh air blower is larger, the pressure on the fresh air side of the heat exchanger is higher than the combustion air pressure. This ensures that no exhaust gases can get into the hot air and thus into the vehicle interior even if the heat exchanger is leaking.

The heater is switched off by pressing the switch in. This stops the current flow to the fuel pump so that combustion ceases.

The motor for the fresh and combustion air blowers however, continues to run and this cools down the heater evenly and blows all traces of gas out of the combustion chamber.

The warning lamp remains on during this run-on period until, after about 3 minutes, the thermo-switch cuts off the current supply to the blower motor and switches off the warning lamp at the same time. The run-on period is finished then and the heater completely out of operation.

The heater has an overheating switch which cuts the current supply to the fuel pump by shorting the 8 Amp. fuse and stopping combustion if the heater gets excessively hot for any reason.

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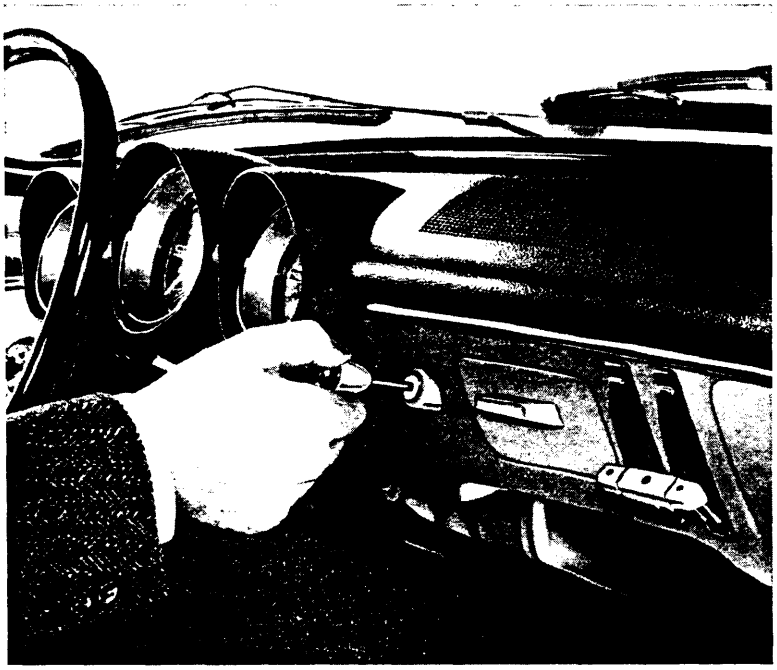
Operating instructions



To switch on

Pull out switch knob. After about 45 seconds, the red lamp in the knob lights up and shows that the heater is in operation.

To switch off

Push knob of switch in. This starts the run-on operation which lasts about 3 minutes. In this time, the flame goes out, the combustion chamber is cleared of residual gas and the heater cooled off all round. The current supply is then cut by the thermo-switch and the blower stops rotating.

The run-on is ended when the warning lamp in the switch knob goes out.

Note:

During the run-on period, that is, as long as the lamp is on, the heating must not be switched on again under any circumstances.

When it is very cold, the full battery capacity is required to start the engine. To avoid starting difficulties, it is advisable not to switch the heater on until the engine is running. It is also recommended that the heater is not left on for more than 20 minutes when the vehicle engine is not running, to avoid discharging the battery.

Maintenance

Deposits from the fuel tend to settle in the fuel system of the heater when it is not used for long periods. To avoid trouble, it is advisable to operate the heater briefly about once a month when the heater is not in regular use.

Every year before starting to use the heater:

Check heater plug for burning and fit new if necessary.

Clean fuel jet and fuel filter.

Check security of electrical connections.

During the winter and when driving over poor roads, mud or snow may tend to accumulate in the exhaust or combustion air intake pipes. Have these pipes checked for blockage from time to time so that the heater can always work properly.

Technical Data

Heat output	2000 kcal/h
Hot air temperature (above inlet temperature)	90° C
Fuel	Gasoline
Fuel consumption	0.33 liters per hour
Current consumption	40 Watts
Voltage	6 Volt / 12 Volt
Fresh air capacity	approx. 70000 liters per hour
Weight of equipment	approx. 8 kg

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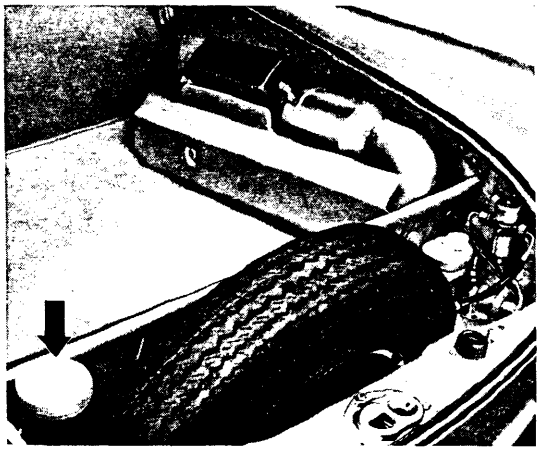
Type BN 2

Heater No. 20 1215 (6 volt)
20 1216 (12 volt)
for VW 1500 Sedan / 1600 Fastback Sedan
and VW 1500 / 1600 Squareback Sedan

Heater No. 20 1216 (12 volt)
for Type 3 vehicles from August 1966

Technical Description

The BN 2 heating system consists of the heater unit itself, the combustion air intake and exhaust gas pipes, air circulating pipe, the fuel pump, the fuel filter with solenoid valve and a switch.



1 - Heater

The heater consists of a two-piece sheet metal casing which houses an electric motor (1) which drives a fan with an axial blower (2) for the warm air and a radial blower (3) for the combustion air.

Attached to this casing is the heat exchanger (6) which in turn consists of a cylindrical combustion space with a concentrically arranged annular chamber. These chambers are connected by two passages. An adaptor leads from the annular chamber to the exhaust pipe (14). The combustion space is made up of an antechamber (4) and the combustion chamber (5). At the heat exchanger end (6) the combustion chamber (5) is limited by a flame jet and at the lower part of the combustion chamber is an overflow pipe adaptor with a stud screwed into it.

The heater plug (7) and the fuel jet (8) project into the antechamber.

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Note:

On the 12 volt heater (Heater No. 20 1216) the heater plug is equipped with a series resistance to protect the plug from overloading. The resistance is fitted between the heater casing and the electric motor.

The thermo-switch (10) is secured with a union nut to a threaded boss on the end of the heat exchanger and the feeler tube of the switch projects into the combustion space.

The pressure regulator (9) which contains an inlet and a regulating valve is attached to the heater casing with 4 tapping screws. A hose connects the pressure regulator to the jet holder in which the fuel jet (8) is located.

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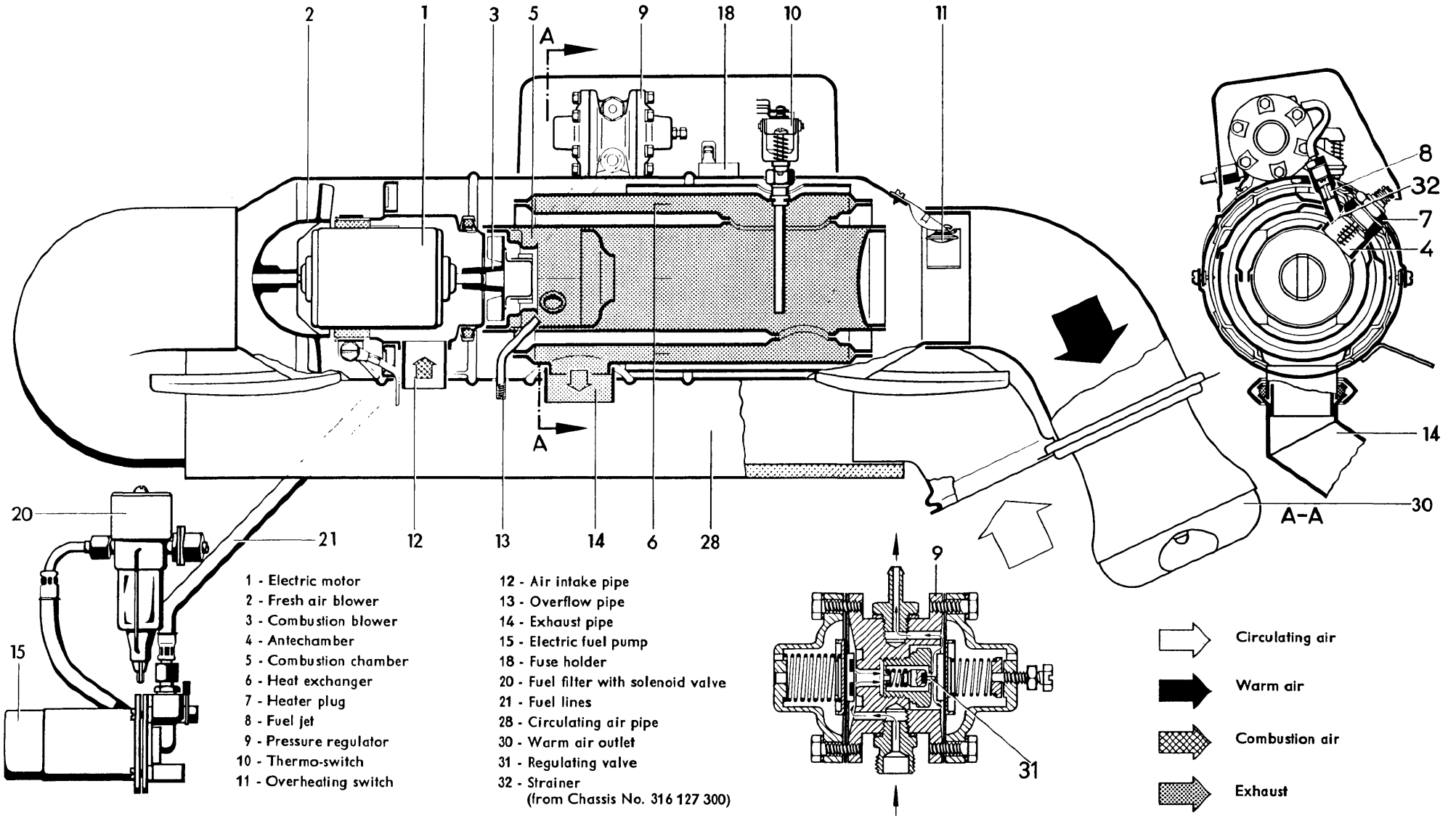

1 - Electric motor
2 - Fresh air blower
3 - Combustion blower
4 - Antechamber
5 - Combustion chamber
6 - Heat exchanger
7 - Heater plug
8 - Fuel jet
9 - Pressure regulator
10 - Thermo-switch
11 - Overheating switch
12 - Air intake pipe
13 - Overflow pipe
14 - Exhaust pipe
15 - Electric fuel pump
18 - Fuse holder
20 - Fuel filter with solenoid valve
21 - Fuel lines
28 - Circulating air pipe
30 - Warm air outlet
31 - Regulating valve
32 - Strainer
(from Chassis No. 316 127 300)

An overheating switch (11) is fitted on the warm air outlet side of the heater.

On the casing between the pressure regulator and thermo-switch is a safety switch with an 8 Amp. fuse (18). A plastic cap covers all the fittings on the outside of the casing.

2 - Combustion air intake pipe and exhaust pipe

A hose connects the combustion air intake adaptor on the heater to the combustion air intake in the left wheel housing.

The exhaust pipe passes through the left side panel into the wheel housing. At the heater, the exhaust pipe is secured with a clip and sealed with a conical ring and sealing washer.

3 - Air pipes

An air circulating pipe and a warm air hose connect the heater to the passenger compartment.

4 - Fuel system

The suction line is connected to the vehicle fuel line and passes via the fuel filter with solenoid valve to the fuel pump. The fuel pump is connected to the pressure regulator on the heater.

5 - Switch

The heater is controlled with a push-pull switch which is located in the instrument panel to the left of the ashtray.

From Chassis No. 316 029 853 the push-pull switch is replaced by a time switch with relay.

Operation

A. With push-pull switch

The heater is switched on by pulling out the switch on the instrument panel. This supplies current to the blower motor, the heater plug via the thermo-switch and the fuel pump.

The combustion air blower then starts to deliver air and mixes it with the fuel delivered by the fuel pump and sprayed into the antechamber via the pressure regulator.

The heater plug warms this combustible fuel/air mixture in the antechamber and ignites it. Combustion then extends through the combustion chamber and heats up the heat exchanger. As soon as the flame has heated the feeler tube of the thermo-switch sufficiently, the current supply to the heater plug from the thermo-switch is cut off. When the heater plug is switched off, the warning lamp in the switch knob lights up and shows that the heater is operating properly. The fuel/air mixture then continues to burn automatically.

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The BN 2 heater works on the recirculatory system.

Air is drawn from the vehicle interior by the warm air blower, forced past the heat exchanger and thus heated to 90° C above the inlet temperature. The hot air then passes through a warm air pipe and outlet back into the vehicle interior.

As the warm air blower is larger, the pressure on the warm air side of the heat exchanger is higher than the combustion air pressure. This ensures that no exhaust gases can get into the hot air and thus into the vehicle interior even if the heat exchanger is leaking.

The heater is switched off by pressing the switch in. This stops the current flow to the fuel pump so that combustion ceases.

The motor for the warm and combustion air blowers however, continues to run and this cools down the heater evenly and blows all traces of gas out of the combustion chamber.

The warning lamp remains on during this run-on period until, after about 3 minutes, the thermo-switch cuts off the current supply to the blower motor and switches off the warning lamp at the same time. The run-on period is finished then and the heater completely out of operation.

The heater has an overheating switch which cuts the current supply to the fuel pump by shorting the 8 Amp. fuse and stopping combustion if the heater gets excessively hot for any reason.

B. With time switch

When the knob is pulled out, the clockwork mechanism is wound up. The relay I is switched on by the time switch contacts B-A.

The electric motor then receives current via relay contacts B-M and the heater plug via thermo-switch contacts C-NO.

The electric fuel pump is switched on by contacts K-L in relay II and starts to deliver fuel via the pressure regulator to the antechamber. The fuel mixes with the air being forced in by the combustion blower. At the same time the heater plug warms up and ignites the mixture.

When the flame has heated the feeler tube of the thermo-switch to a certain point, the thermo-switch contacts C-NO open and switch the heater plug off. The fuel-air mixture then continues to burn automatically.

When the contacts have switched over from C to NC, the green warning lamp in the switch knob lights up and shows that the heater is working properly. The current for the warning lamp flows terminal B in the time switch through the bulb to NO terminal in the thermo-switch and from there to the heater plug which provides the ground connection.

After about 25—30 minutes, the clockwork mechanism has run down and pulled the knob of the switch back almost to its initial position. The contacts in the time switch are now in the center position.

If the ignition has not been switched on within this period — no current at terminal 15 of the time switch — the contacts of relay I open and the warning lamp goes out. The opening of contacts M-J in relay I breaks the

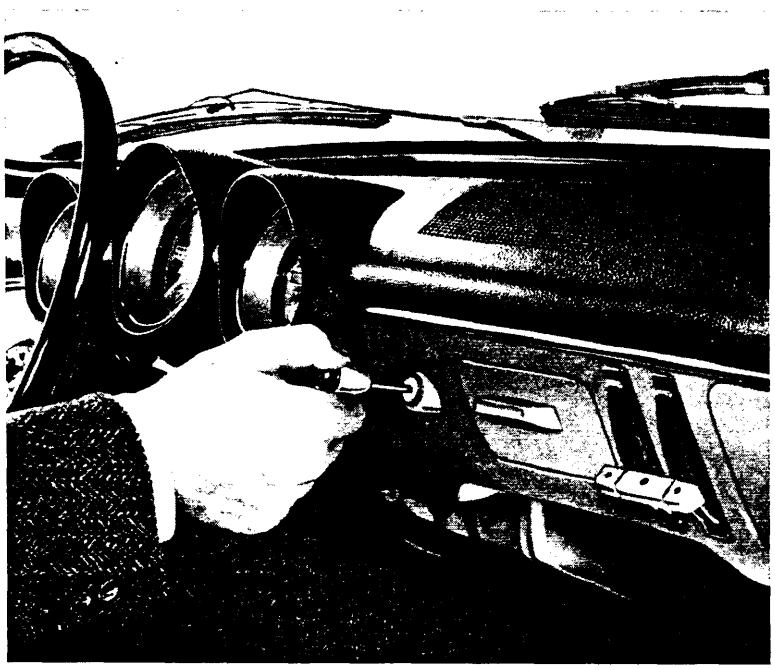
circuit to relay II. Contacts K-L then open and interrupt the flow of current to the fuel pump so that combustion ceases.

The electric motor still receives current via contacts NC-C in the thermo-switch and continues to run until the heater has cooled down slightly.

If the knob is pulled out during the run-on period, the new wiring layout ensures that the heater is not switched on again until the run-on is ended. The relay II then operates and closes contacts K-L. The fuel pump then starts to work again.

All other operations are the same as on the heater with push-pull switch.

Operating instructions



A. With push-pull switch

To switch on

Pull out switch knob. After about 25 to 45 seconds, the red lamp in the knob lights up and shows that the heater is in operation.

To switch off

Push knob of switch in. This starts the run-on operation which lasts about 3 minutes. In this time, the flame goes out, the combustion chamber is cleared of residual gas and the heater cooled off all round. The current supply is then cut by the thermo-switch and the blower stops rotating.

The run-on is ended when the warning lamp in the switch knob goes out.

Note:

During the run-on period, that is, as long as the lamp is on, the heating must not be switched on again under any circumstances.

When it is very cold, the full battery capacity is required to start the engine. To avoid starting difficulties, it is advisable not to switch the heater on until the engine is running. It is also recommended that the heater is not left on for more than 20 minutes when the vehicle engine is not running, to avoid discharging the battery.

B. With time switch

To switch on

Pull out the knob of the time switch on the left of the ashtray as far as it will go. After about 25—45 seconds, the green warning lamp in the switch knob lights up and shows you that the heater is fully in operation. The clockwork mechanism in the switch automatically switches the heater off after about 25—30 minutes if the engine is not started within this period. In this time the clockwork mechanism pulls the knob back almost to its initial position.

After the knob has returned, the heater remains in operation as long as the ignition is switched on.

To switch off

Push the knob in fully. The warning lamp goes out immediately and the blower motor continues to run until the heater has cooled down.

Note:

When it is extremely cold, it is advisable to manage without preheating of vehicle interior and not switch the heater on until the engine is running.

Maintenance

Deposits from the fuel tend to settle in the fuel system of the heater when it is not used for long periods. To avoid trouble, it is advisable to operate the heater briefly about once a month when the heater is not in regular use.

Every year before starting to use the heater:

Check heater plug for burning and fit new if necessary.

Clean fuel jet and fuel filter.

Check security of electrical connections.

Check security of heater securing screws.

During the winter and when driving over poor roads, mud or snow may tend to accumulate in the exhaust or combustion air intake pipes. Have these pipes checked for blockage from time to time so that the heater can always work properly.

Technical Data

Heat output	2000 kcal/h
Hot air temperature (above inlet temperature)	90° C
Fuel	Gasoline
Fuel consumption	0.32 liters per hour
Current consumption	36 Watts
Voltage	6 Volt / 12 Volt
Warm air capacity	approx. 70000 liters per hour

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Type BN 4
for VW Transporter
VW Double Cab Pick-up
VW Ambulance

Technical Description

The heater has a heat exchanger which consists of a cylindrical combustion chamber and a concentrically arranged combustion chamber. These chambers are connected by two openings so that at one point the exhaust gases are flowing through the heat exchanger in a reverse direction. In front of the central part of the heat exchanger is the combustion chamber which is extended to carry the electric motor with fresh air and combustion air blowers.

Under the cover on the outer part of the housing are the diaphragm pressure regulator with the fuel solenoid valve, the fuel jet, the ignition coil, the heater plug, the thermo-switch, the safety switch and the overheating switch.

At the side of the cover is the spark plug. The electric fuel pump and the fuel filter are underneath the heater near the combustion air intake pipe and the exhaust pipe.

A bimetal spring flap and a regulator switch are installed in the warm air duct which is connected to the heat exchanger.

A push-pull switch and a knob which regulates the heating are fitted on the left-hand side of the seat base in the drivers cab. A warning lamp is installed in the push-pull switch.

Operation

The heater is switched on by means of the push-pull switch on the left-hand side of the seat base. When the switch is operated, current is supplied to the electric motor and the combustion air and fresh air blowers start to turn.

At the same time, the electric fuel pump delivers fuel to the combustion chamber via the diaphragm pressure regulator, solenoid valve and fuel jet. Here the fuel impinges on a toothed ring on the combustion air blower and is atomized.

The combustion air which is given a rotary movement by a guide blade housing now mixes with the atomized fuel and forms a combustible mixture.

The heater plug also receives current and heats up the mixture so that it will ignite readily.

The spark plug receives current via the ignition coil and ignites the fuel/air mixture. The resulting flame contacts the feeler tube at the end of the heat exchanger and the thermo-switch switches the heater plug off again. The spark plug continues to work as long as the heater is in operation.

The fresh air being drawn in is forced past the heat exchanger into the interior of the vehicle body. A bimetal spring flap in the outlet prevents the flow of cold air and does not open until the air temperature is about 35° C (95° F).

The warm air temperature can be set between 40° and 100° C by means of the knob located near the push-pull switch. When the desired temperature has been reached, the regulator switch cuts off the current supply to the solenoid fuel valve and thus stops the flow of fuel to the combustion chamber.

When the warm air cools down to below the set temperature, the regulator switch remakes the circuit to the solenoid valve which opens so that fuel can pass into the combustion chamber and start the burning operation again.

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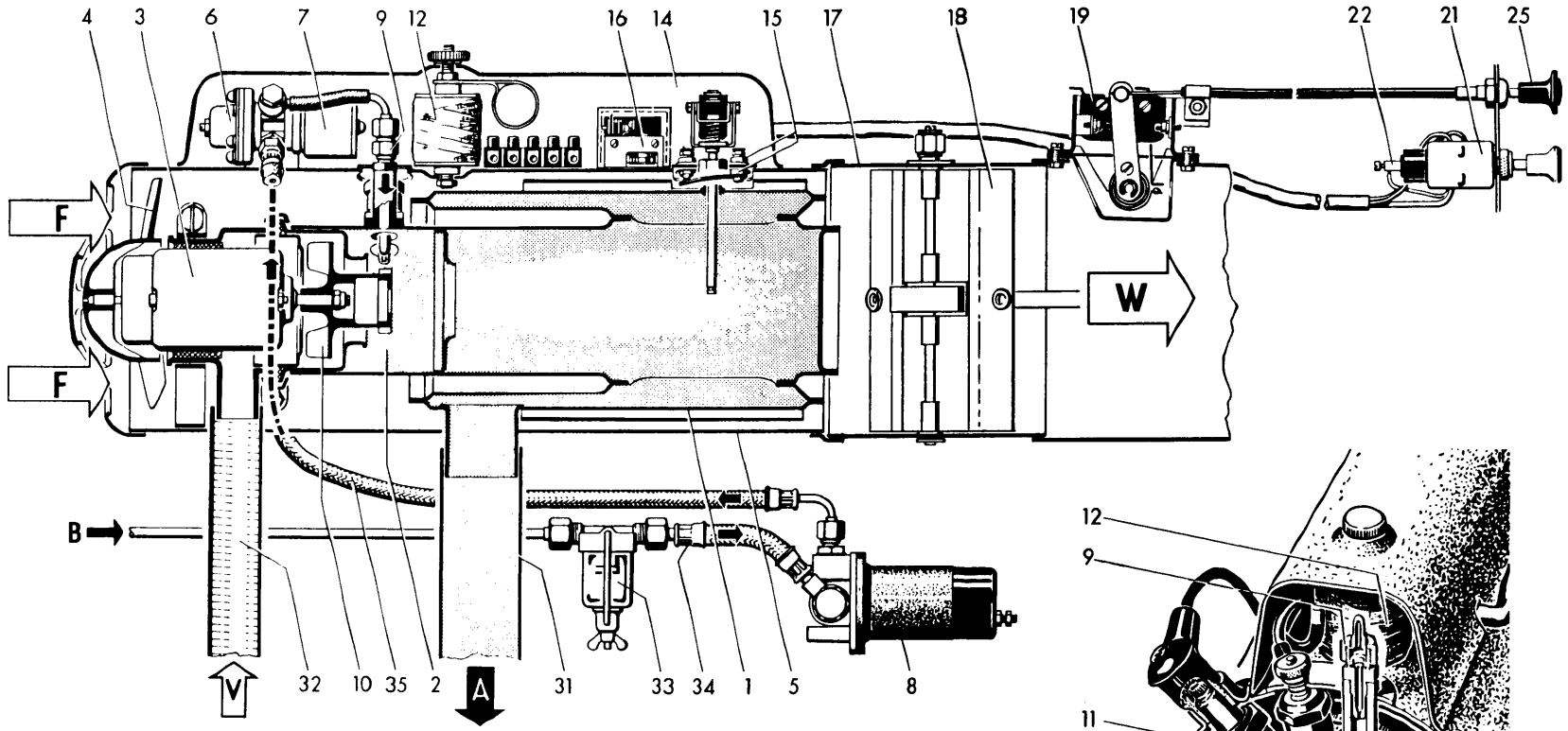
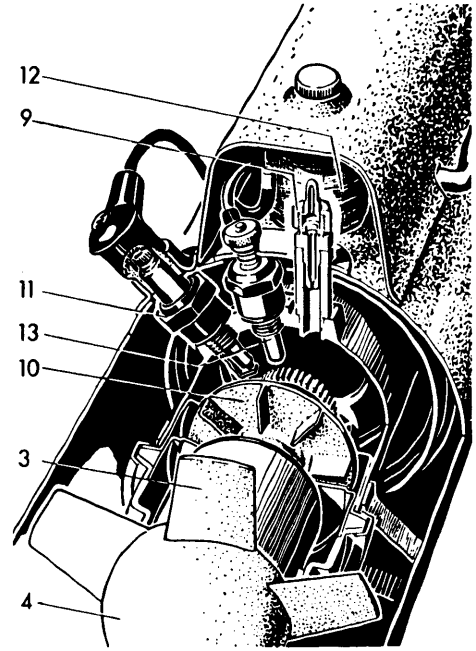
Cross sectional view of the Type BN 4 Heater





1 - Heat exchanger
2 - Combustion chamber
3 - Electric motor
4 - Fresh air blower
5 - Casing
6 - Diaphragm pressure regulator
7 - Solenoid fuel valve
8 - Electric fuel pump
9 - Fuel jet
10 - Combustion air blower
11 - Spark plug, 2 pole
12 - Ignition coil
13 - Heater plug
14 - Thermo-switch
15 - Overheating switch
16 - Safety switch
17 - Warm air outlet
18 - Bimetal spring flap
19 - Regulator switch
21 - Push-pull switch
22 - Warning lamp connection
25 - Knob for regulator switch
31 - Exhaust pipe
32 - Air intake pipe
33 - Fuel filter
34 - Fuel suction pipe
35 - Fuel pressure pipe

A - Exhaust gas B - Fuel F - Fresh air V - Combustion air W - Warm air

When the heater is switched off, the electric motor driving the fresh air and combustion air blowers continues to run for about a further 3 minutes. This cools the heat exchanger down and blows all traces of gas out of the combustion chamber. When the air temperature at the outlet drops to 40° C, the bimetal spring flap closes the air duct.

All current consumers are switched off when the warning lamp goes out.

Warning and Safety Arrangements

Thermo-switch

When the heater is switched on, this switch controls the operation of the heater plug and the safety switch.

When the heater is switched off, it permits the fresh air and combustion air motor to run on for 3 minutes.

Safety switch

This switch cuts off the supply of current to the solenoid fuel valve if ignition does not take place when the heater is switched on or if the combustion process is interrupted for any other reason. After rectifying the trouble, press the red lever on the switch to the right briefly (springs back to original position) to remake the fuel pump circuit.

Overheating switch

If the heater overheats, this switch cuts off the current to the solenoid fuel valve. This stops the flow of fuel to the fuel jet so that combustion ceases.

Warning lamp

The warning lamp in the push-pull switch lights up when the heater is switched on.

Operating instructions

To switch on

Pull out knob H. The warning lamp K lights up.

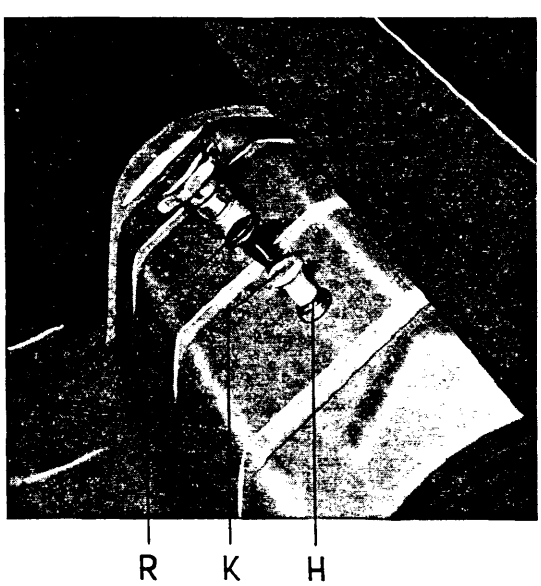
To regulate

Pull the second knob R to set the heating output between 1080 and 4000 kcal (40—100° C outlet air temperature).

The heat is increased by pulling the knob out.

To switch off

Push knob H in. After about 3 minutes the warning lamp goes out.



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Maintenance

Deposits from the fuel tend to settle in the fuel system of the heater when it is not used for long periods. To avoid trouble, it is advisable to operate the heater briefly about once a month when the heater is not in regular use.

Every year before the heater is put into use:

Check heater plug.

Clean spark plug, check electrode gap (2.5 mm) and adjust if necessary.

Clean fuel jet and filter.

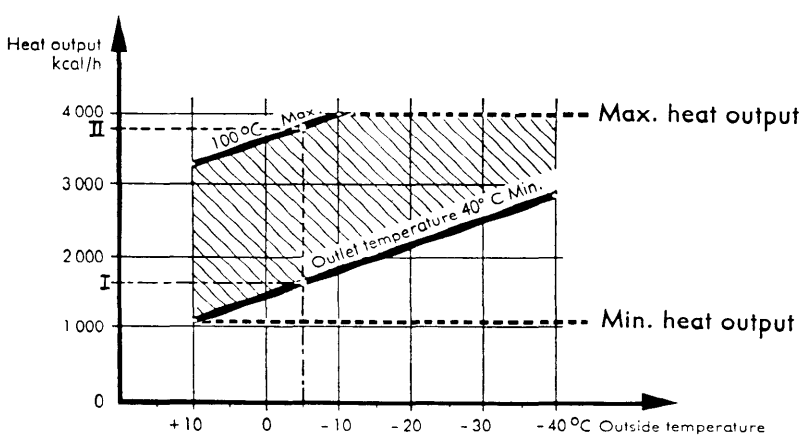
Check security of electrical connections.

During the winter or when driving over very poor roads, mud or snow may tend to accumulate on the exhaust and combustion air intake pipes. Have these pipes checked for blockage from time to time so the heater can continue to work properly.

Technical Data

Heat output	from 1080—4000 kcal/h
Warm air temperature	from 40—100° C (104—212° F)
Fresh air capacity	approx. 120 000 liters per hour
Fuel	Gasoline
Fuel consumption	from 0.2—0.65 liters per hour (.4—1.1 pints per hour)
Voltage	6 volt / 12 volt
Current consumption	50 watts
Weight	11 kg (22 lbs)

Heat output graph



Explanation of graph

Vertical line:	Heat output in kcal/h
Horizontal line:	Temperature of air to be heated (from +10° C to —40° C)
Diagonal lines:	Constant outlet temperature
Shaded area:	Range of heater control
Example:	At an outside temperature of —5° C the Min. heat output (I) is 1600 kcal/h Max. heat output (II) is 3800 kcal/h

Heater No. 20 1144
for VW 1500 and Variant

General

On the VW 1500, the Eberspächer heater 20 1144 is installed in the front luggage compartment on the left-hand side (looking in direction of travel).

The installation kit contains the following parts:

1 Heater
1 Warm air outlet
1 Combustion air pipe with air hose
1 Exhaust pipe
1 Warning plate
1 Fuel pipe set (feed and return pipes with filter)
various screws, nuts and grommets
2 Fitting templates
1 Cover plate
2 brackets for plate

Fitting sequence

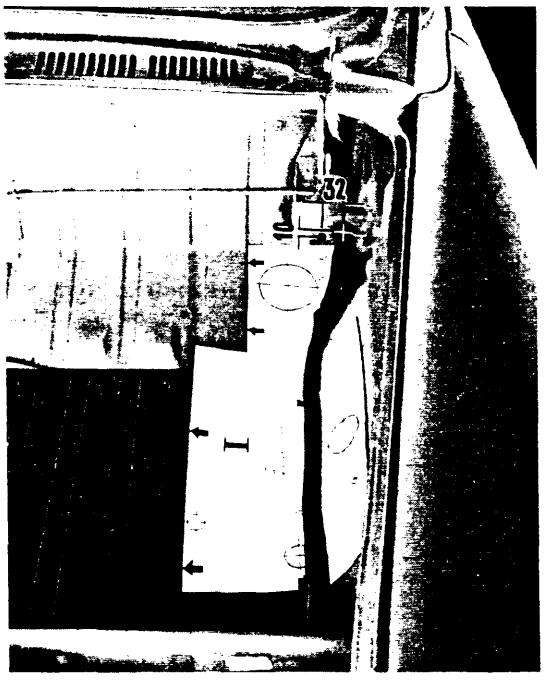


Fig. 1

1 - Disconnect battery and take luggage compartment lining out after removing the four tapping screws.

2 - Insert template I as shown in Fig. 1. Mark off holes for exhaust gas pipe (54 mm), combustion air pipe (32 mm), warm air outlet (83 mm), fuel suction and pressure pipes and 7 mm holes for the heater securing screws, with the template. The hole for the positive cable must also be marked off with template I.

The 10 mm hole for the operating rod is marked off to the measurements in Fig. 1.

Take template out, cut or drill holes and clean up edges.

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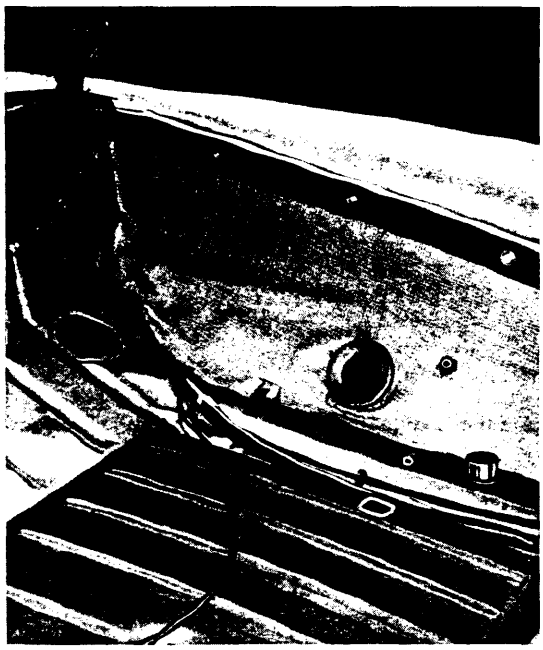
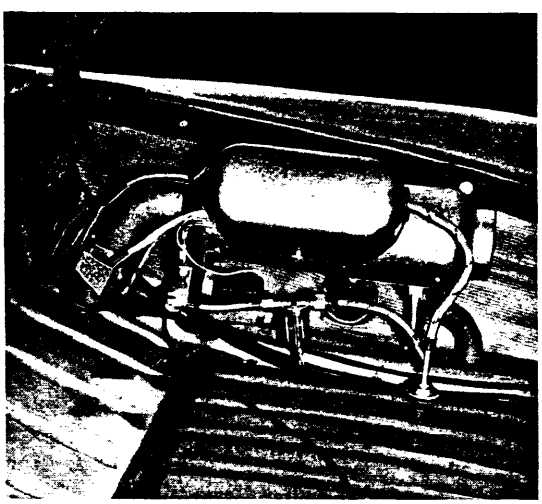


3 - Take tank out, rinse with cleaning benzine and install again.

4 - Install grommets in the holes for the warm air outlet, exhaust pipe and combustion air pipe and the two holes for the positive cable and the operating rod. Lay cables and plastic hose in the depression between tank and wheel housing.

5 - Lift vehicle and remove left front wheel. Push the combustion air pipe through the grommet from below so that the air hose can be installed from above. Drill a 3.8 mm hole and secure retainer with a 4.8 mm tapping screw. Figs. 2 and 4.

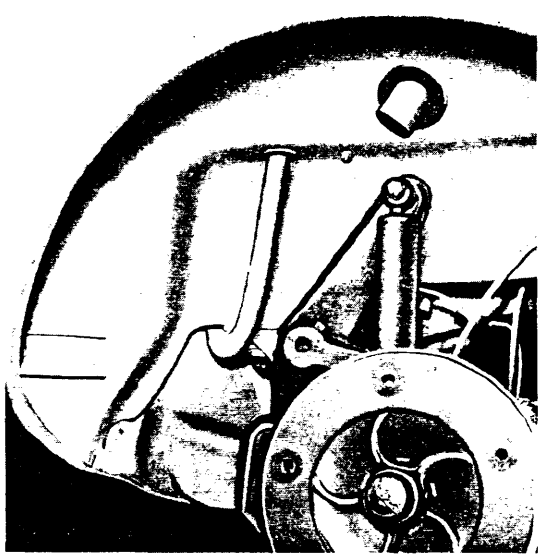
Fig. 2



6 - Take out the rear left fuel tank clamping plate (seen in direction of travel). Insert and secure the rear cover plate retainer in place of the clamping plate.

Install heater and locate the warm air outlet and operating rod in the holes with grommets and insert the exhaust adaptor at the same time. Secure the front cover plate retainer under the right hand bonded rubber heater mounting (seen in direction of travel). Attach heater to bonded rubber mountings with spring washers and M 6 nuts. Fig. 3.

Fig. 3



7 - Insert adaptor for fuel suction and pressure pipes into tank and secure. Connect suction pipe to filter and return pipe to jet carrier. Fig. 3.

8 - Insert exhaust pipe into exhaust adaptor and secure with a 3.5 × 6.5 mm tapping screw. Install air hose between combustion air blower adaptor and combustion air pipe. Fig. 4.

Fig. 4

8 - Removal and installation of resistor switch (Fig. 11).

Screw cap off switch plate.

Disconnect cables.

Take switch plate off tube.

Take switch off plate by loosening nut.

Install in reverse order.

Connect cables as shown in wiring diagram.

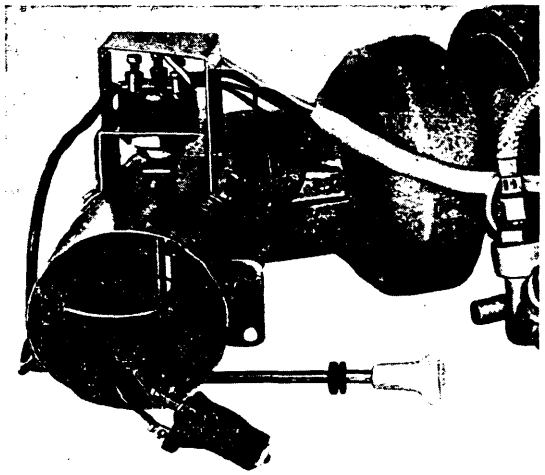


Fig. 11

9 - Removal and installation of operating rod

Screw knob off rod.

Remove cotter pin from rod.

Take rod off lever complete with washer and spring.
Install in reverse order. Do not forget the grommet in the partition.

10 - Removal and installation of warning lamp

Loosen cap nut on warm air outlet.

Remove retaining screw red warning lamp glass from air outlet.

Take outlet off with warning lamp and disconnect two cables.

Install in reverse order.

II. Removal and installation of heater

Take 25 Amp. fuse out of holder (Fig. 12a and 12b).

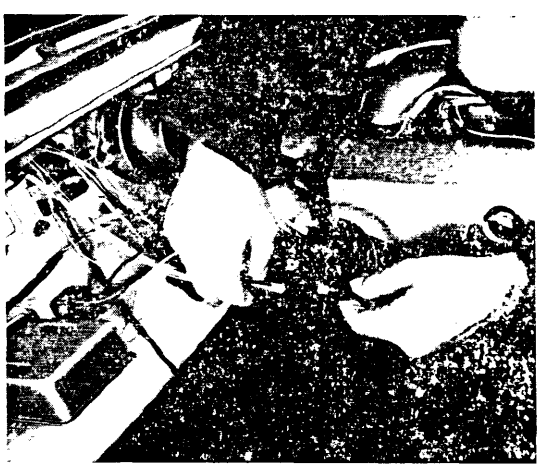


Fig. 12 a

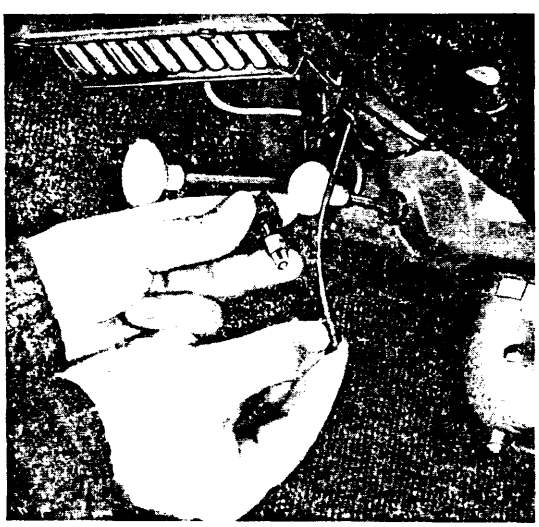
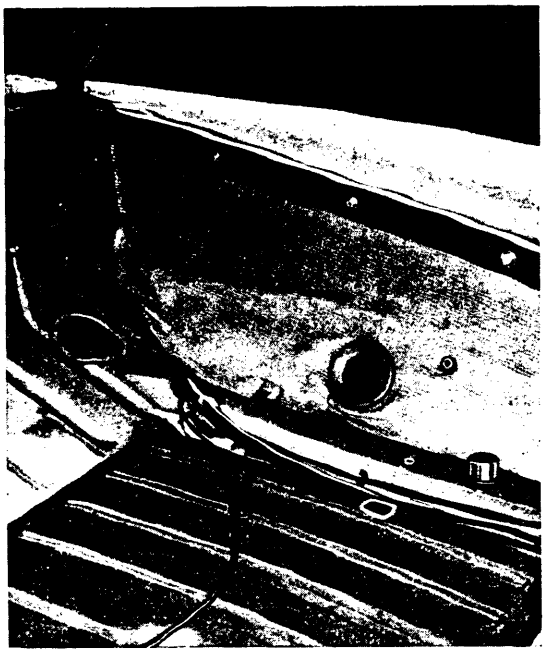


Fig. 12 b

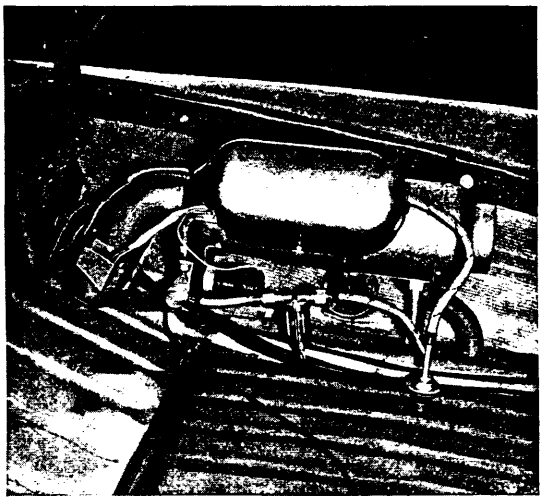


3 - Take tank out, rinse with cleaning benzine and install again.

4 - Install grommets in the holes for the warm air outlet, exhaust pipe and combustion air pipe and the two holes for the positive cable and the operating rod. Lay cables and plastic hose in the depression between tank and wheel housing.

5 - Lift vehicle and remove left front wheel. Push the combustion air pipe through the grommet from below so that the air hose can be installed from above. Drill a 3.8 mm hole and secure retainer with a 4.8 mm tapping screw. Figs. 2 and 4.

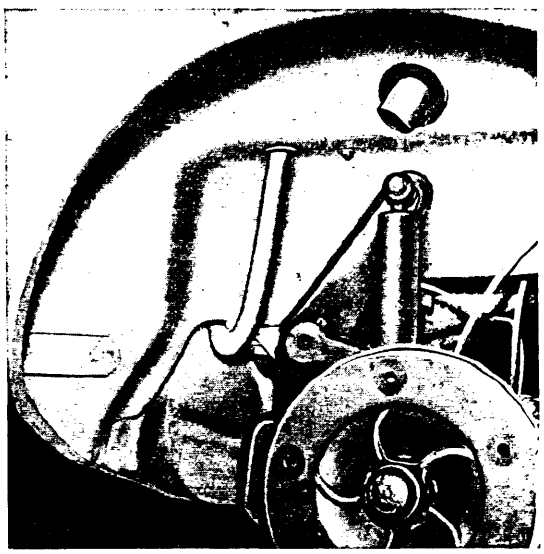
Fig. 2



6 - Take out the rear left fuel tank clamping plate (seen in direction of travel). Insert and secure the rear cover plate retainer in place of the clamping plate.

Install heater and locate the warm air outlet and operating rod in the holes with grommets and insert the exhaust adaptor at the same time. Secure the front cover plate retainer under the right hand bonded rubber heater mounting (seen in direction of travel). Attach heater to bonded rubber mountings with spring washers and M 6 nuts. Fig. 3.

Fig. 3



7 - Insert adaptor for fuel suction and pressure pipes into tank and secure. Connect suction pipe to filter and return pipe to jet carrier. Fig. 3.

8 - Insert exhaust pipe into exhaust adaptor and secure with a 3.5 × 6.5 mm tapping screw. Install air hose between combustion air blower adaptor and combustion air pipe. Fig. 4.

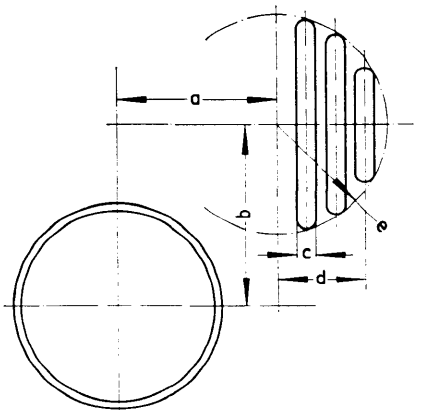
Fig. 4

9 - Screw knob on to operating rod and insert warning lamp into warm air outlet. Slide warm air outlet on to elbow and secure with a cap nut. Fig. 5.

10 - Push heater feed cable through the upper hole in the luggage compartment panel and connect it to terminal 30 (4 mm² red cable) in the fuse box with the adaptor included in the kit.

11 - a - On vehicles up to Chassis No. 483 592 remove the plastic material from three slots on the right-hand side of the front panel (seen in direction of travel).

b - On vehicles from Chassis No. 315 000 001 and 365 000 001 there are three slots in the front panel on the left (seen in direction of travel) as shown in drawing. If there are no slots, they must be made when the heater is fitted.



a = 65 mm
b = 75 mm
c = 7 mm
d = 3×12 mm
e = 45 mm

12 - Cut the cardboard lining to suit template II, install lining and secure with four tapping screws. Fig. 6.

13 - Connect battery. Switch heater on and check operation.

14 - Place the red warning plate with the text "Switch off Eberspächer Heater" on the fuel tank cap. (See arrow in Fig. 7.)

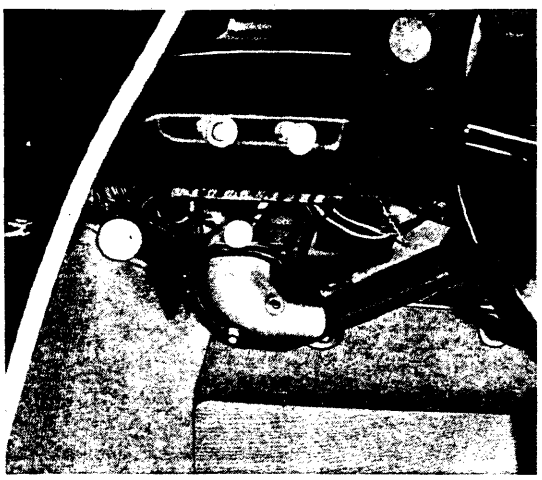


Fig. 5

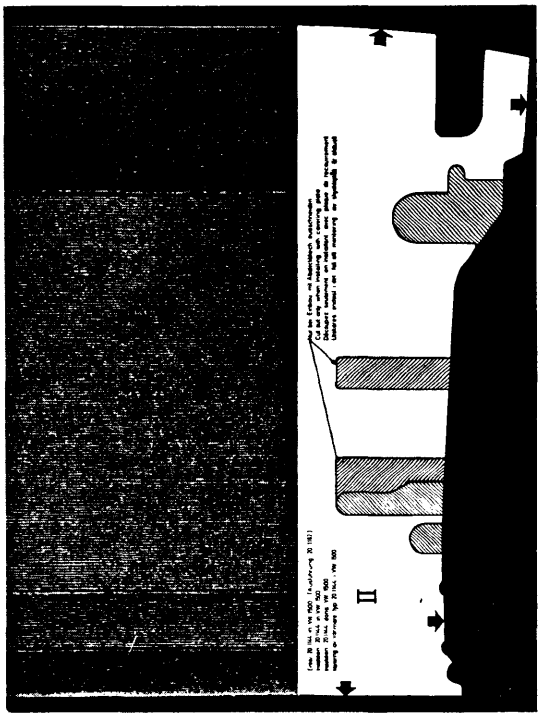


Fig. 6

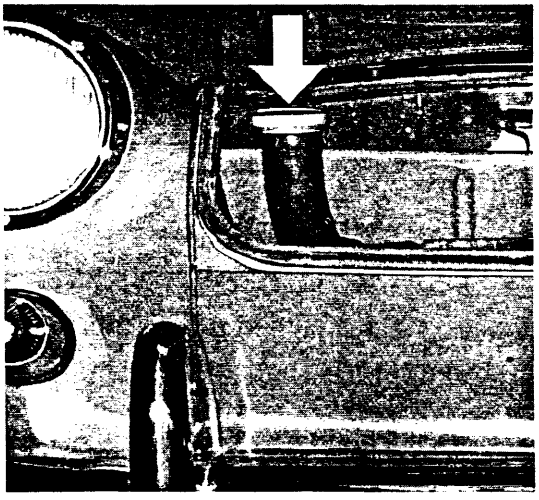
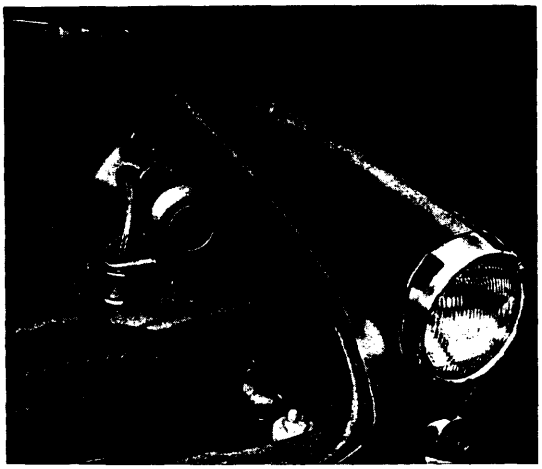


Fig. 7

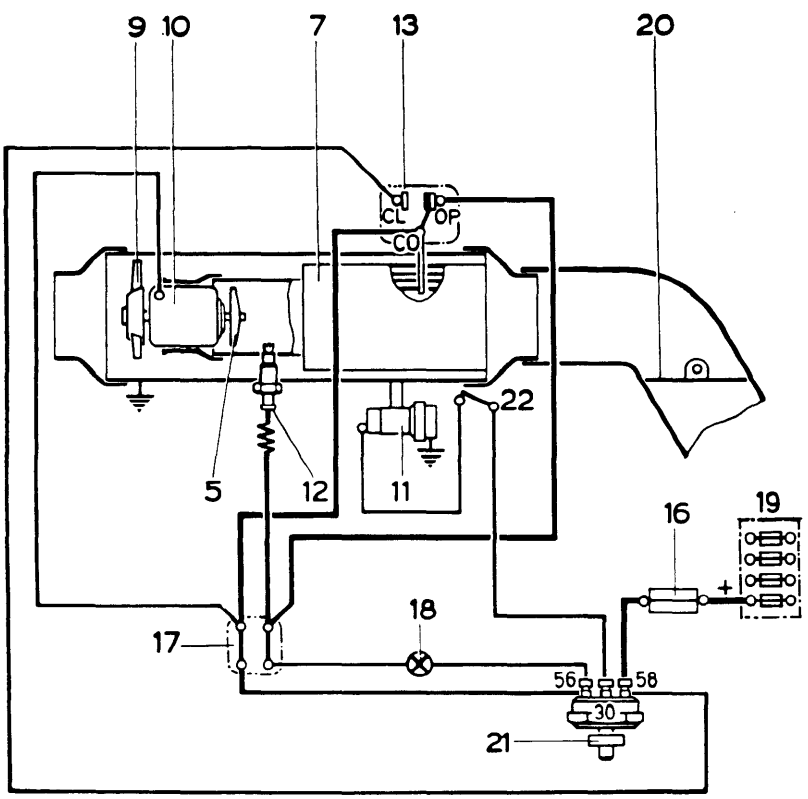


15 - Secure the cover plate to the two retainers with knurled nuts. Fig. 8.

16 - Install left front wheel and lower vehicle.

Fig. 8

Wiring diagram



5 - Combustion air blower
7 - Heat exchanger
9 - Fresh air blower
10 - Electric motor
11 - Electric fuel pump
12 - Heater plug
13 - Thermo-switch
16 - Fuse
17 - Cable connector
18 - Warning lamp
19 - Fuse box
20 - Air control flap
21 - Resistor switch
22 - Overheating switch

Heater No. 20 1181 (6 Volt)
20 1190 (12 Volt)
for VW 1200 (Type 11 and 15)

On the VW 1200, the Eberspächer heater is installed in the front luggage compartment on the left-hand side (looking in direction of travel).

The installation kit contains the following parts:

1 Heater
1 Warm air outlet
1 Combustion air pipe with air hose
1 Inlet pipe (metal)
1 Exhaust pipe
1 Warning plate
1 Set of fuel pipes (feed and return pipes with filter)
1 Cover plate
2 Brackets
various screws, nuts and grommets
3 Fitting templates

Fitting sequence

1 - Disconnect battery and take luggage compartment lining out after removing the two knurled nuts. Remove cardboard and detach damping material on the left-hand side.

2 - Insert template 1 as shown in Fig. 1. Mark off holes for exhaust pipe (54 mm), combustion air pipe (32 mm) and the holes for the fixing screws (7 mm). The holes for the suction and return pipes (24 mm) must be marked off to the measurements given in Fig. 1.

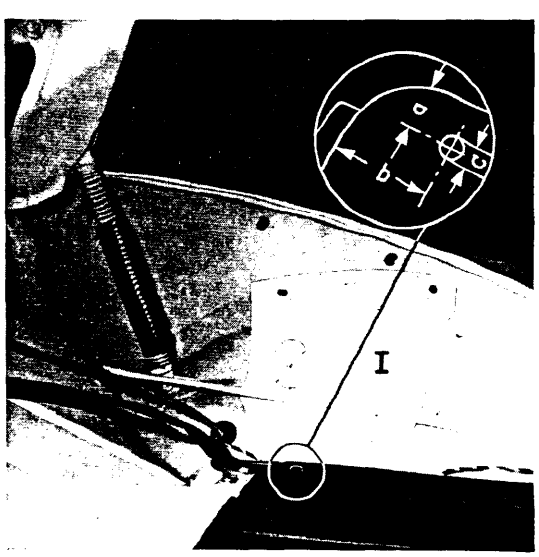


Fig. 1

a = 46 mm b = 65 mm c = 24 mm dia.

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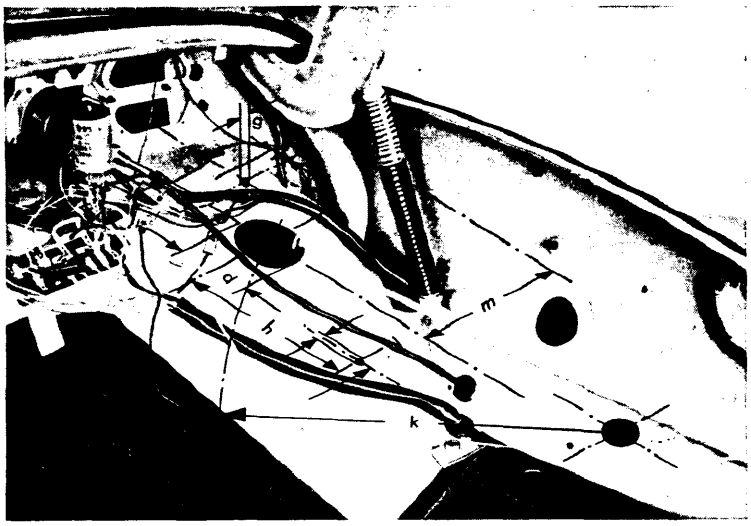


Fig. 2

3 - Mark off the holes for the warm air outlet (83 mm), the operating rod (10 mm) and the 7 mm hole for the short cover plate bracket screw, to the measurements given in Fig. 2.

4 - Cut or drill all holes and clean up edges.

d = 83 mm dia.
e = 60 mm
h = 112.5 mm
k = 450 mm
m = 220 mm

f = 10 mm
g = 10 mm dia.
i = 7 mm dia.
l = 72 mm

5 - Remove fuel tank, rinse it with benzine and install again.

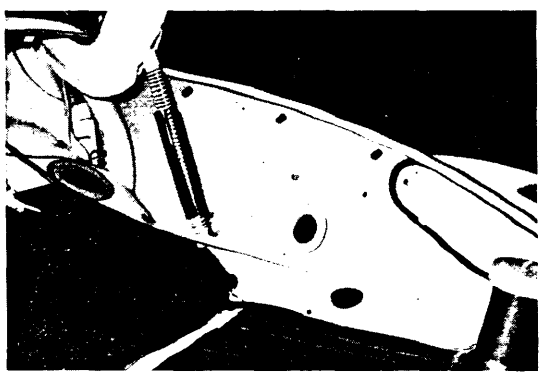
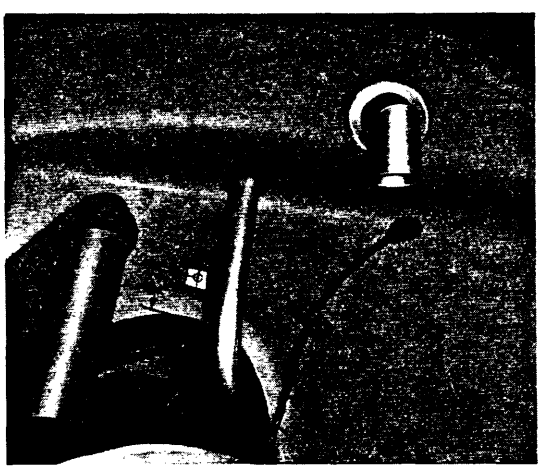


Fig. 3

6 - Install grommets in the holes for the warm air outlet, the combustion air pipe and the operating rod. Fig. 3.

Take out the rear fuel tank packing piece and insert the long cover plate bracket in its place. Secure the short bracket with an M 6 screw and nut in hole i (Fig. 2).



k = 35 mm

Fig. 4

7 - Remove left front wheel and push the combustion air pipe through the grommet from below so that the air hose can be installed from above.

Drill a 3.8 mm dia. hole to the measurements in Fig. 4 and secure bracket with a cheese head tapping screw BZ 4.8×9.5.

8 - Install heater and fit the outlet, operating rod and exhaust pipe adapter into the holes fitted with grommets.

Secure heater with 2 M 6×12 screws, 2 B 6 spring washers and 2 M 6 nuts. (Fig. 5.)

Insert exhaust pipe through grommet from below and secure it with a BZ 3.5×6.5 tapping screw. Fig. 5.

Install air pipe between the combustion air blower connection and the combustion air pipe (see arrow!)

Insert fuel line adaptor into tank and secure it. Connect suction line to fuel filter and return line to jet carrier.

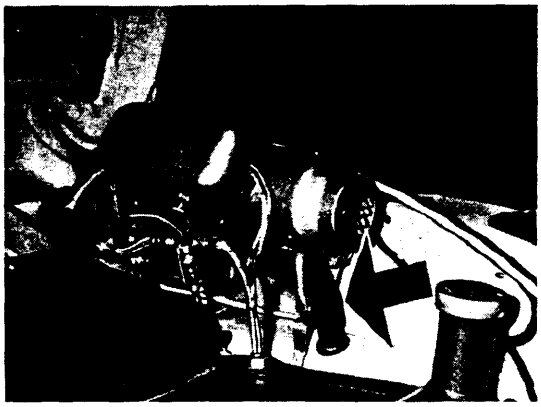


Fig. 5

9 - Install warning lamp in warm air outlet. Slide outlet on to heater elbow, align it properly and secure it with cap nut. Screw knob on to operating rod.

10 - Connect heater positive to KL 30 in the fuse box with the adaptor provided. Fig. 6 and wiring diagram.

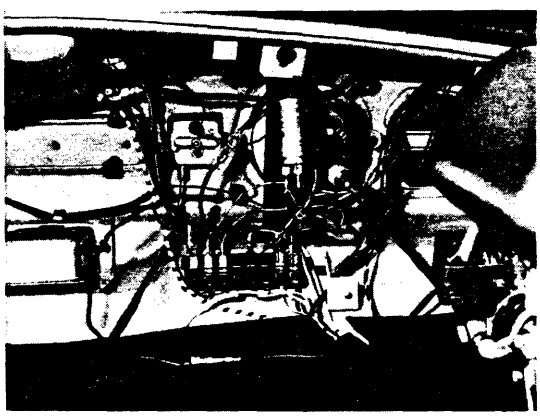


Fig. 6

11 - Cut instrument panel cover to template III, install lining again and secure it. Fig. 7.

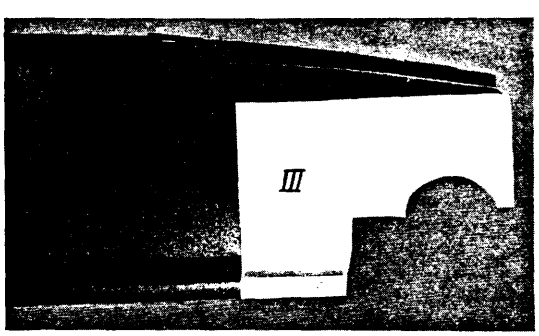


Fig. 7

12 - Cut cardboard lining to template II and place it in luggage compartment. Fig. 8.

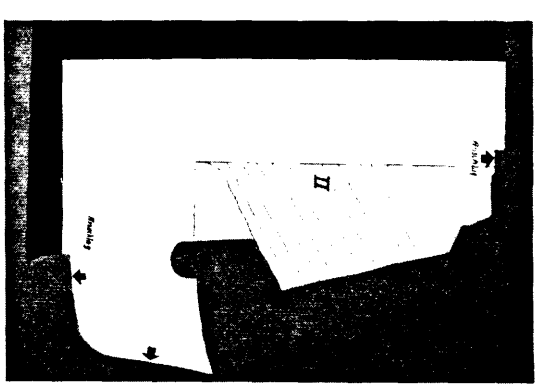
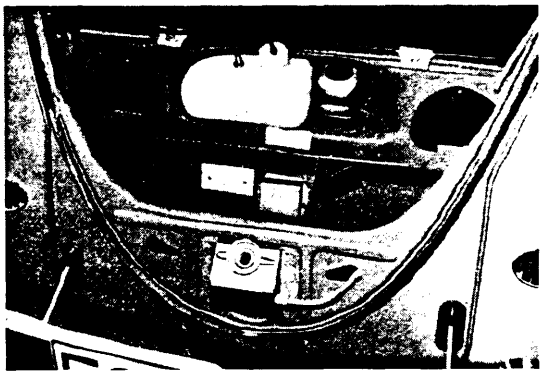


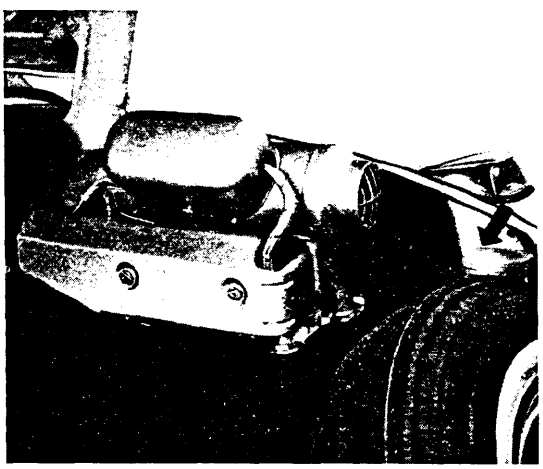
Fig. 8



13 - Take spare wheel out.

Remove center plate for reinforcement panel, insert air intake pipe and secure it. Fig. 9.

Fig. 9



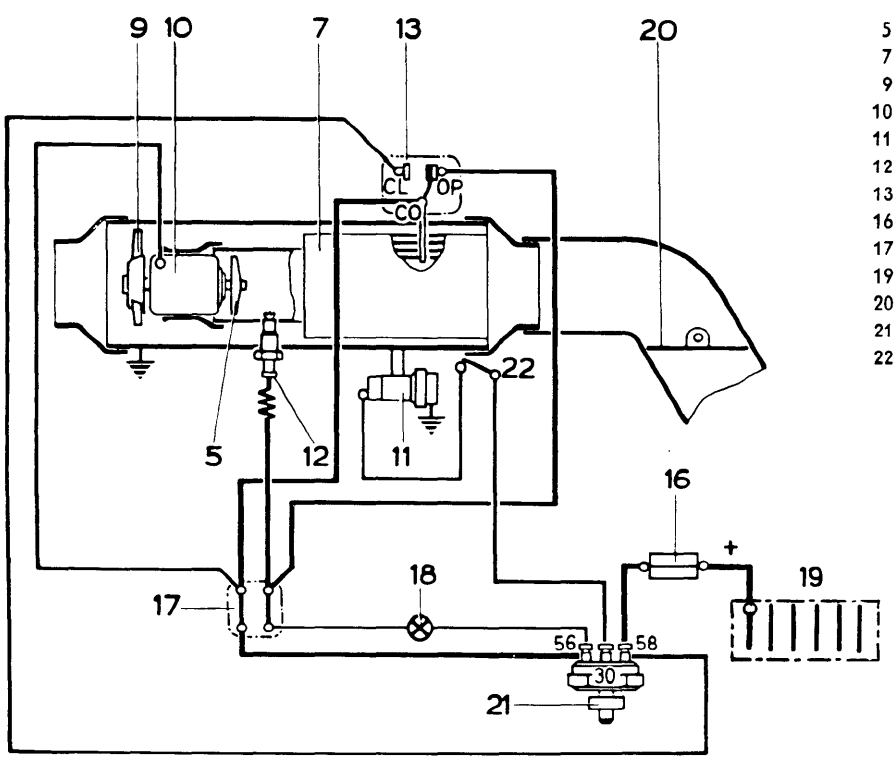
14 - Connect battery, switch heater on and check operation.

15 - Place the red warning plate with the text "Switch off Eberspächer Heater" on the fuel tank cap. Arrow Fig. 10.

16 - After checking heater, attach the cover to the two brackets with the knurled nuts. Fig. 10.

Fig. 10

Wiring diagram



5 - Combustion air blower
7 - Heat exchanger
9 - Fresh air blower
10 - Electric motor
11 - Electric fuel pump
12 - Heater plug
13 - Thermo-switch
16 - Fuse
17 - Cable connector
19 - Fuse box
20 - Air control flap
21 - Resistor switch
22 - Overheating switch

Heater No. 20 1181 (6 volt)
20 1190 (12 volt)
for Type 1 (except Model 14 from January 1964 to August 1966

Heater No. 20 1245 (6 volt)
20 1246 (12 volt)
for Type 1 (except Model 14) from August 1966

The Eberspächer heater No. 20 1181 (6 volt) and 20 1190 (12 volt) is installed in the front luggage compartment on the left-hand side (looking in direction of travel).

The installation kit contains the following parts:

1 Heater
1 Warm air outlet
1 Combustion air pipe with air hose
1 Inlet pipe (metal)
1 Exhaust pipe
1 Warning plate
1 Set of fuel pipes (feed and return pipes with filter)
1 Cover plate
2 Brackets
various screws, nuts and grommets
3 Fitting templates

8/66

Note:

If the heaters 20 1245 and 20 1246 (closed circuit type) are partially or completely removed when carrying out repairs to the body, certain additional operations, which are noted in the instructions, must be carried out.

Fitting sequence

1 - Disconnect battery and take luggage compartment lining out after removing the two knurled nuts. Remove cardboard and detach damping material on the left-hand side and take left-hand front wheel off.

2 - Insert template 1 as shown in Fig. 1. Mark off holes for exhaust pipe (54 mm), combustion air pipe (32 mm) and the holes for the fixing screws (7 mm). The holes for the suction and return pipes (24 mm) must be marked off to the measurements given in Fig. 1.

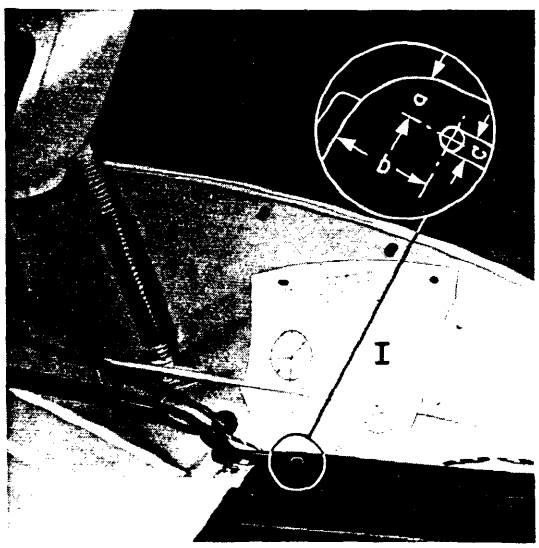


Fig. 1

a = 46 mm b = 65 mm c = 24 mm dia.

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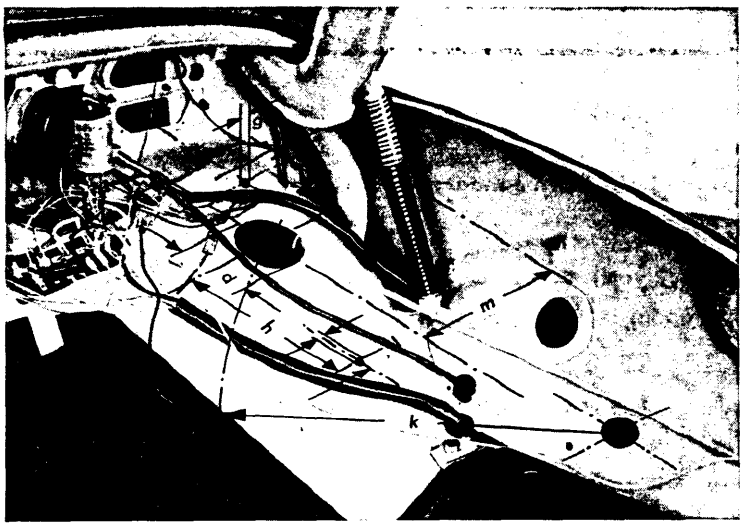


d = 83 mm dia.
e = 60 mm
h = 112.5 mm
k = 450 mm
m = 220 mm

f = 10 mm
g = 10 mm dia.
i = 7 mm dia.
l = 72 mm

Fig. 2

3 - Mark off the holes for the warm air outlet (83 mm), the operating rod (10 mm) and the 7 mm hole for the short cover plate bracket screw, to the measurements given in Fig. 2.

4 - Cut or drill all holes and clean up edges.

Note:

For the closed circuit heater, an extra hole must be made for the air circulation pipe. This is done by placing the heater in the holes already made and fitting the pipe. Mark out a 75 mm dia. hole in luggage compartment floor, take heater out again, cut hole and clean up edges.

8/66

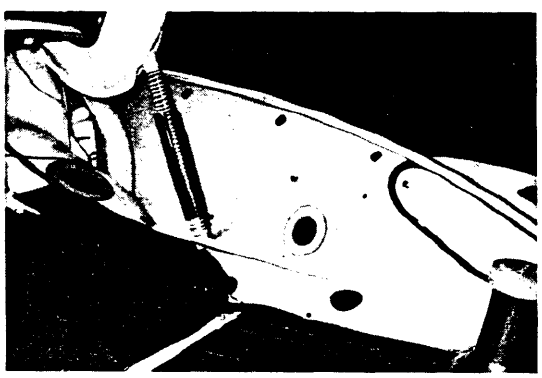
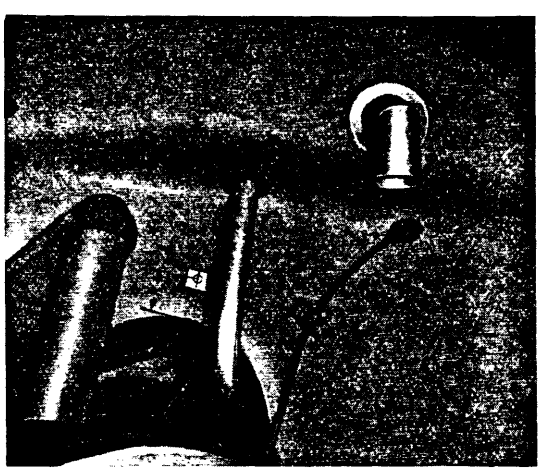


Fig. 3

5 - Remove fuel tank, rinse it with benzine and install again.

6 - Install grommets in the holes for the warm air outlet, the combustion air pipe and the operating rod. Fig. 3.

Take out the rear fuel tank packing piece on left side of vehicle and insert the long cover plate bracket in its place. Secure the short bracket with an M 6 screw and nut in hole i (Fig. 2).



k = 35 mm

Fig. 4

7 - Push the combustion air pipe through the grommet from below so that the air hose can be installed from above.

Drill a 3.8 mm dia. hole to the measurements in Fig. 4 and secure bracket with a cheese head tapping screw BZ 4.8 × 9.5.

8 - Install heater and fit the outlet, operating rod and exhaust pipe adapter into the holes fitted with grommets.

Secure heater with 2 M 6×12 screws, 2 B 6 spring washers and 2 M 6 nuts. (Fig. 5.)

Insert exhaust pipe through grommet from below and secure it with a BZ 3.5×6.5 tapping screw.

Install air pipe between the combustion air blower connection and the combustion air pipe (see arrow).

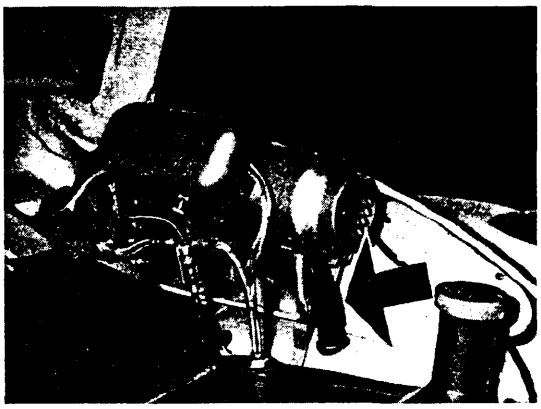


Fig. 5

8/66

Note:

On closed circuit heaters, fit pipe on heater and push pipe through hole in luggage compartment floor.

Insert fuel line adaptor into tank and secure it. Connect suction line to fuel filter and return line to jet carrier.

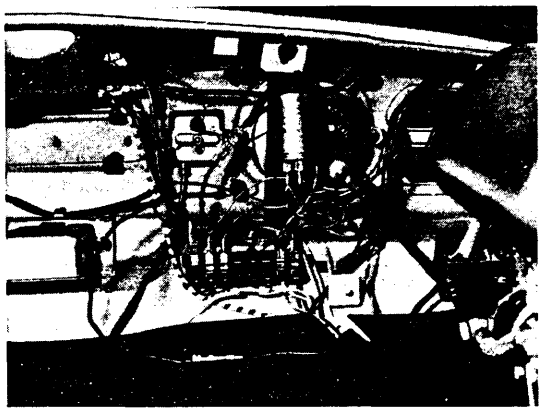


Fig. 6

9 - Install warning lamp in warm air outlet. Slide outlet on to heater elbow, align it properly and secure it with cap nut. Screw knob on to operating rod.

10 - Connect heater positive cable to terminal 30 in the fuse box with the adaptor provided. Fig. 6 and wiring diagram.

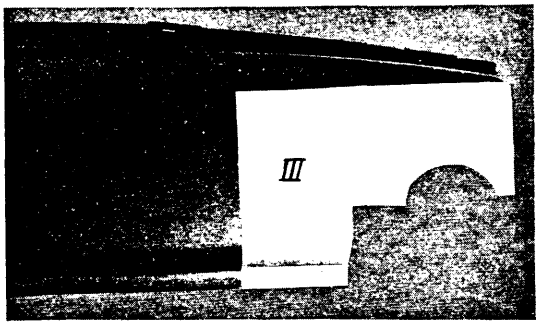


Fig. 7

8/66

Note:

On heaters 20 1245 and 20 1246, connect cable to the second fuse in the fuse box (terminal 30). See wiring diagram from August 1966.

11 - Cut instrument panel cover to template III, install lining again and secure it. Fig. 7.

12 - Cut cardboard lining to template II and place it in luggage compartment. Fig. 8.

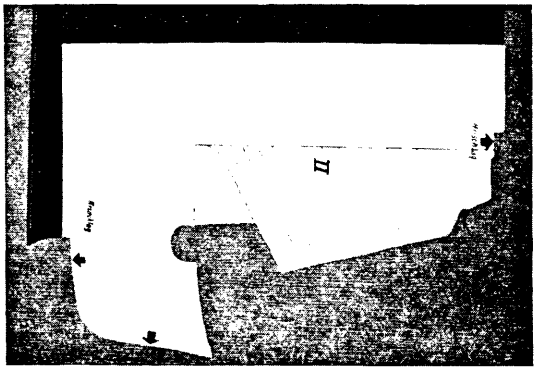


Fig. 8

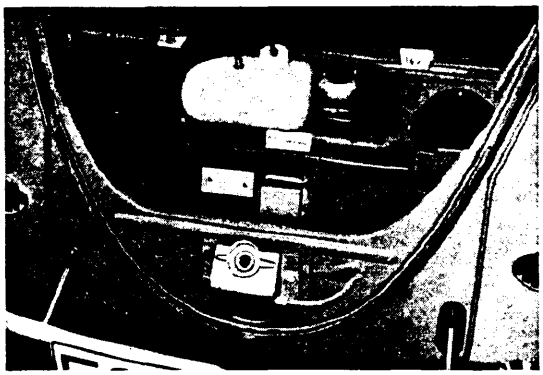


Fig. 9

13 - Take spare wheel out.

Remove center plate in reinforcement panel, insert air intake pipe and secure it. Fig. 9.

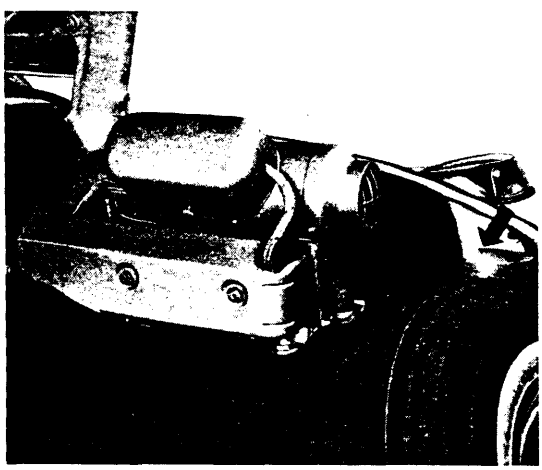


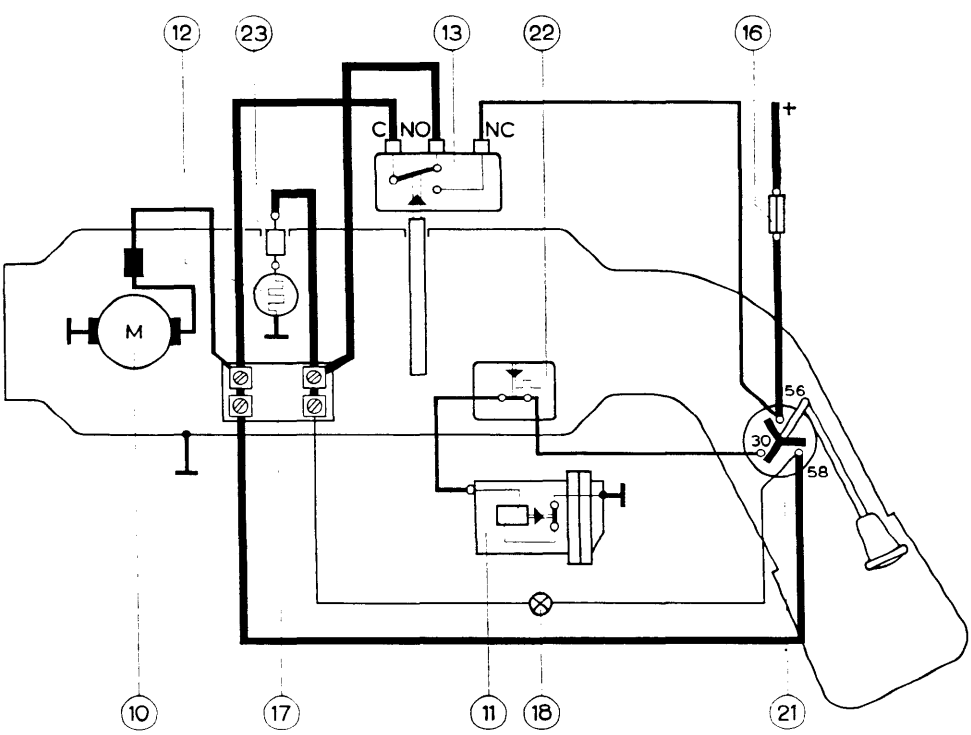
Fig. 10

14 - Connect battery, switch heater on and check operation.

15 - Place the red warning plate with the text "Switch off Eberspächer Heater" on the fuel tank cap. Arrow Fig. 10.

16 - After checking heater, attach the cover to the two brackets with the knurled nuts. Fig. 10.

Wiring Diagram

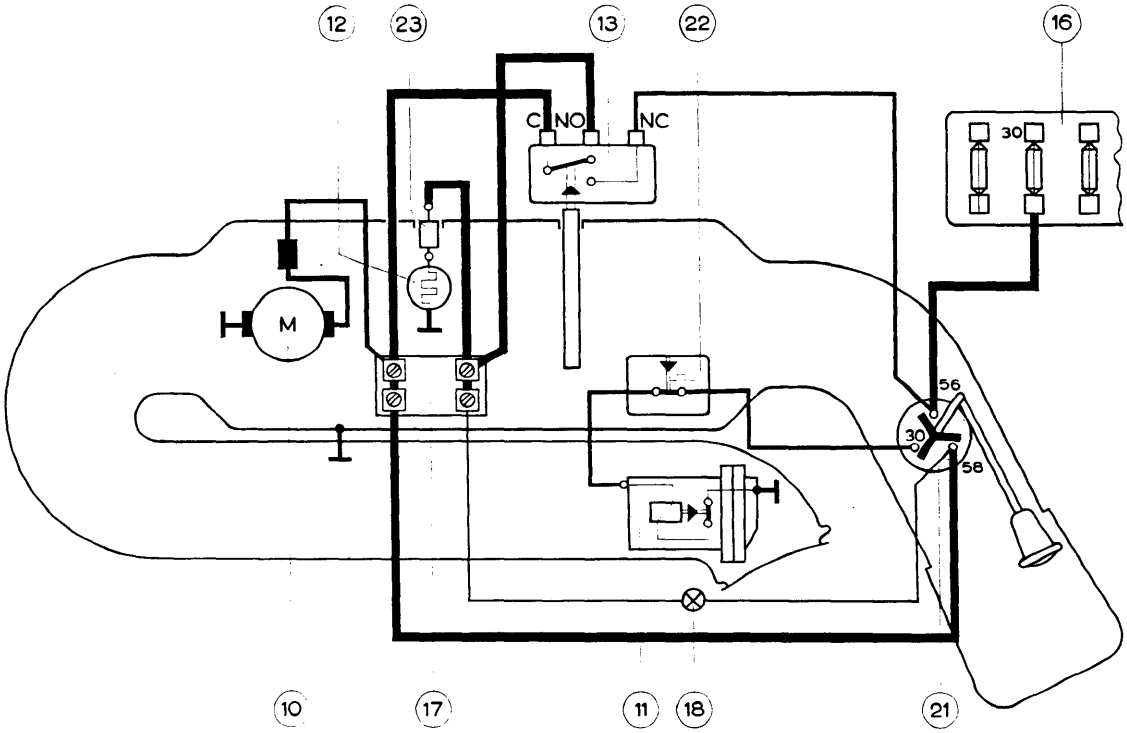


10 - Electric motor
11 - Electric fuel pump
12 - Heater plug
13 - Thermo-switch
16 - Fuse, 25 amp.
17 - Terminal plate
18 - Warning lamp
21 - Switch
22 - Overheating switch
23 - Resistance

8/66 **Note:**

Wiring diagram for Heater No. 20 1245 (6 volt) and 20 1246 (12 volt) from August 1966.

The 6 volt heater has a 25 amp. fuse and the 12 volt heater a 16 amp. fuse.



10 - Electric motor
11 - Electric fuel pump
12 - Heater plug
13 - Thermo-switch
16 - Fuse box
17 - Terminal plate
18 - Warning lamp
21 - Switch
22 - Overheating switch
23 - Resistance

Type BN 2
Heater No. 20 1185 (6 Volt)
20 1205 (12 Volt)
for VW 1500 and Variant

The BN 2 type heater is fitted behind the front cross panel under the lock support plate at right angles to the vehicle centerline on the VW 1500 and Variant.

Fitting sequence

1 - Disconnect battery and take luggage compartment lining out. Detach side panel lining for about 300 mm on both sides (Fig. 1). Take out spare wheel and jack and remove spare wheel well.

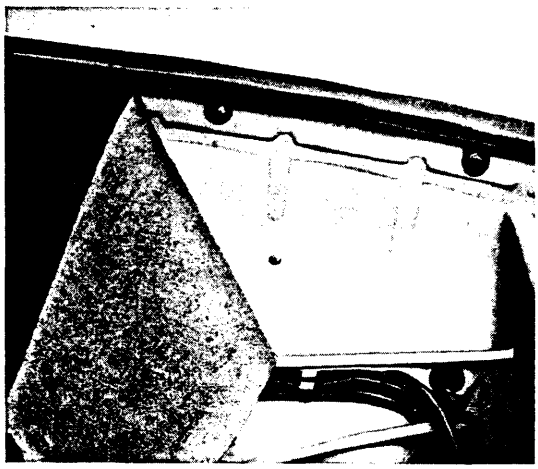


Fig. 1

2 - Lift vehicle and take both front wheels off.

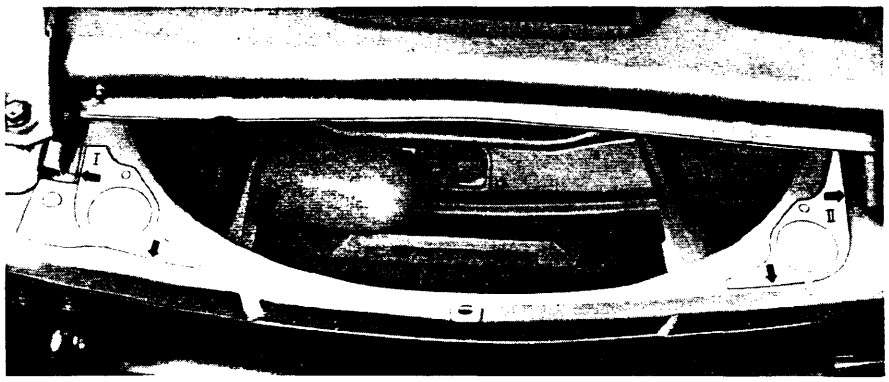


Fig. 2

3 - Place template I on left of spare wheel well support plate and template II on right (Fig. 2). Mark off 52 mm dia. holes and cut them out. Drill a 16 mm dia. hole on the left for the fuel line. Drill 7 mm holes for mounting screws. Clean edges of all holes and paint them.

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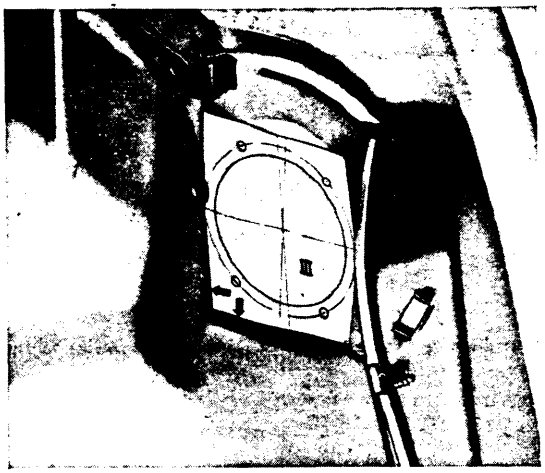
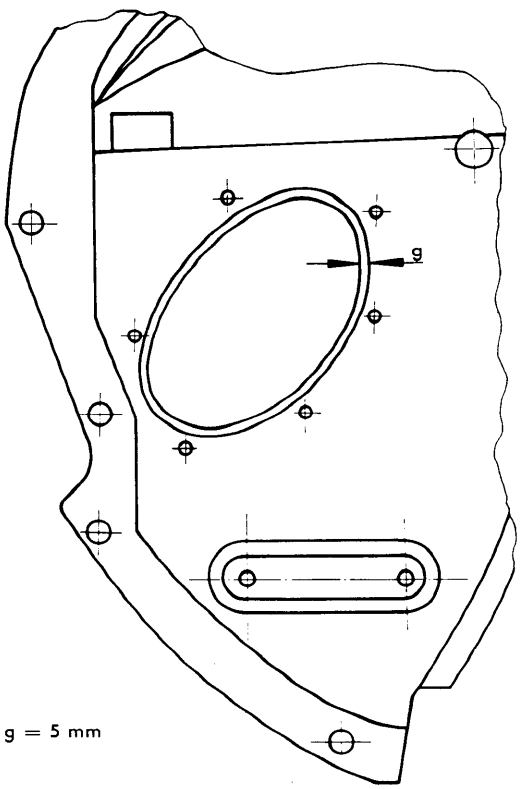


4 - Remove both parking lamps and pull cables out of clips. Remove wheel housing linings. Insert templates II and IV for the rear holes in the wheel housings (Fig. 3). Mark off and cut hole. Drill 5 mm holes for flange screws. Clean up hole edges and paint them.

5 - Cut the carpet on the wheel housings to suit the holes in the metal and bind the edges again.

Fig. 3



g = 5 mm

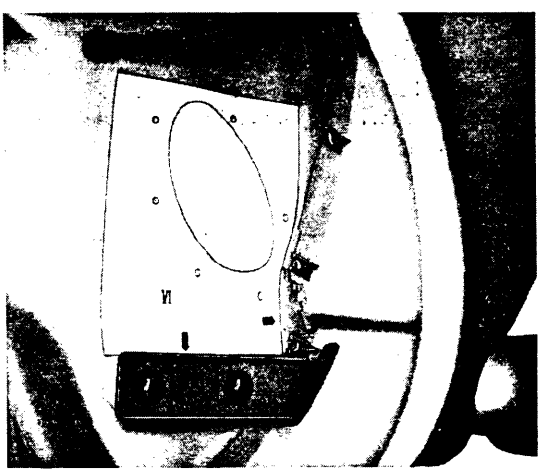


Fig. 4

6 - Cut a hole in each wheel housing in the oval depression so that a 5 mm wide border is left (see drawing). Place templates V and VI in position and mark off and drill 6 mm flange screw holes. Clean up and straighten edges (Fig. 4).

n = 52 mm

Fig. 5

7 - Drill a 6 mm hole in each side panel at the third rib from the front, for the heater hose retaining clip screws. Secure the clips with M 6 screws and nuts. A sealing washer — 311 821 185 — should be used with each screw. Drill a hole for the lower securing screw to the measurements given in Fig. 5.

8 - Locate the brackets for the fuel pump and filter in the depressions provided in the left-hand side panel and then mark off and drill holes. Secure filter bracket with 2 tapping screws and the pump bracket with 2 M 6 screws and nuts (Fig. 6).

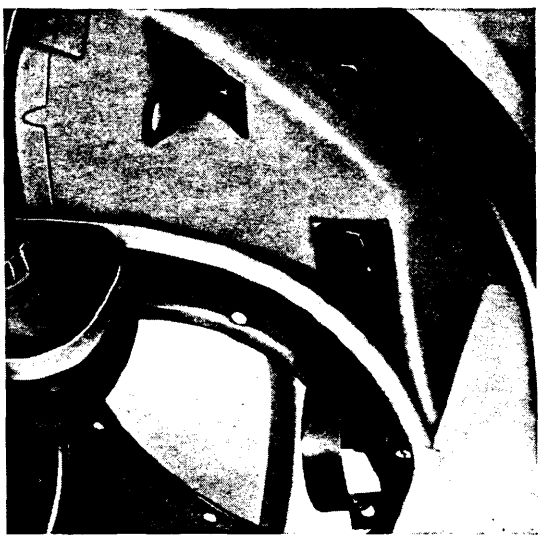


Fig. 6

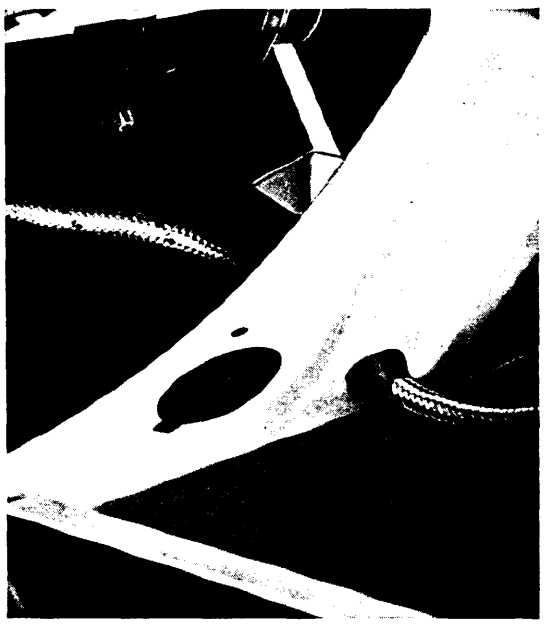
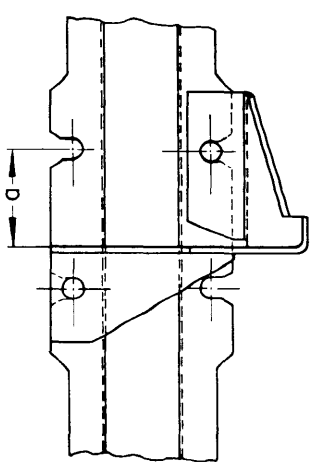


Fig. 7

9 - Install fuel pump and filter. Pass the fuel line to the heater through the 16 mm hole with grommet in the support plate for the spare wheel well (Fig. 7).

10 - Clip the fuel line at tank, cut it in half, insert "Y" piece and connect heater fuel line to "Y" piece. Take clip off line and test for leakage (Fig. 8).



a = 27.5 mm

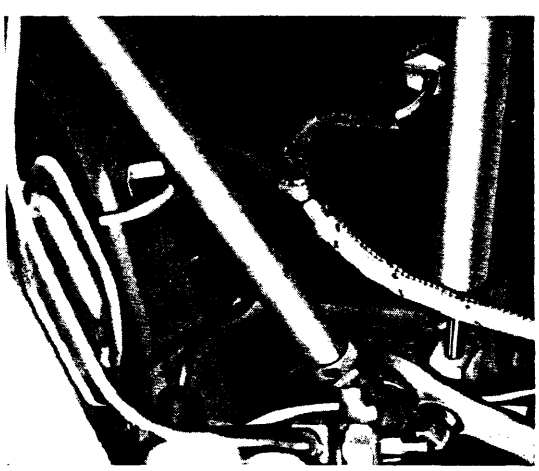


Fig. 8

11 - Place heater brackets on the lock plate supports at left and right and mark off and drill holes. Secure brackets with two M 6 screws and nuts each.

12 - Remove plate in front panel and replace it with the plate with support bracket.

13 - Install exhaust pipe and secure it to the bracket with one screw. At the hole through the spare wheel well support plate, attach the exhaust pipe and deflector plate together. Seal the joint between support plate, deflector plate and exhaust pipe carefully with sealing tape D 19 (Fig. 9).

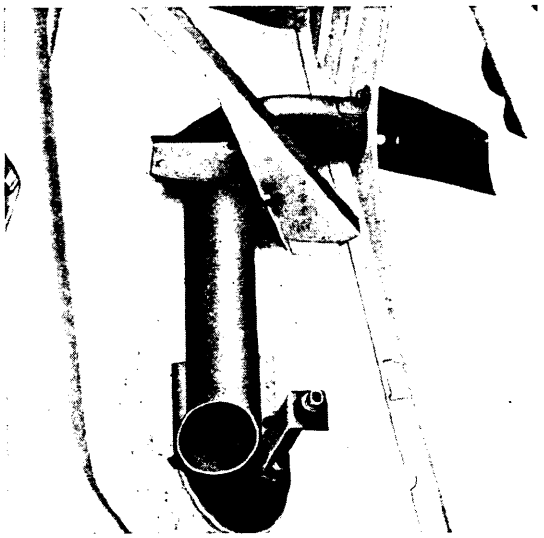


Fig. 9

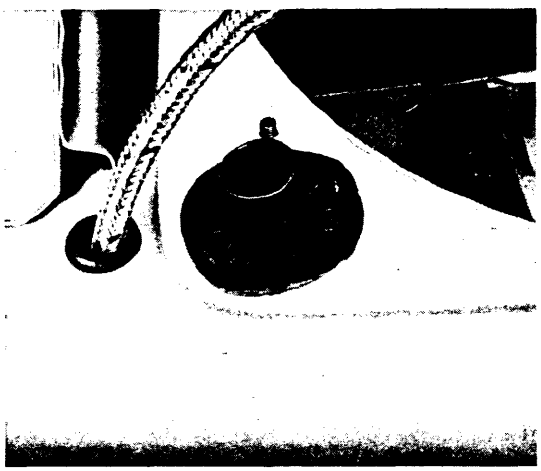


Fig. 10

14 - At the left-hand hole, secure the adaptor for the combustion air intake pipe together with the deflector plate and seal this joint with sealing tape B 19 (Fig. 10). Attach the fuel line to the deflector with a chassis clip.

15 - Install the heater. It is secured with three bonded rubber mountings on the left and right brackets and on the center support.

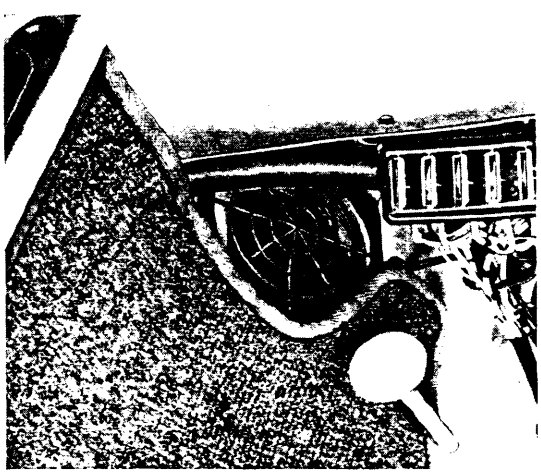


Fig. 11

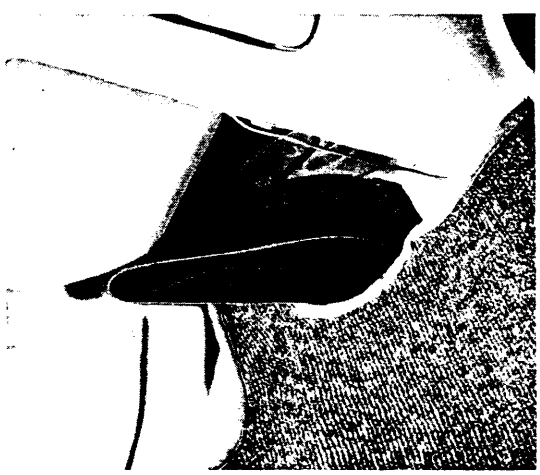


Fig. 12

16 - Before fitting the heater pipes, install the rubber hoses in the pipes so that they project about 300 mm at the front. Shorten the hoses at the rear so that the ends are level with the flange. Fit the gaskets and install pipes. Attach the protective grille on left (Fig. 11) and plastic outlet vent on right (Fig. 12) using the welding screws and nuts. Install a speed nut on each retaining clip and secure them to the wheel housing with a tapping screw (Fig. 13). Check that all gaskets are located properly.

17 - Slide hoses on to heater and secure them with hose clips.

18 - Connect fuel lines, hose for combustion air and fuel overflow pipe (Fig. 14).

Fig. 13

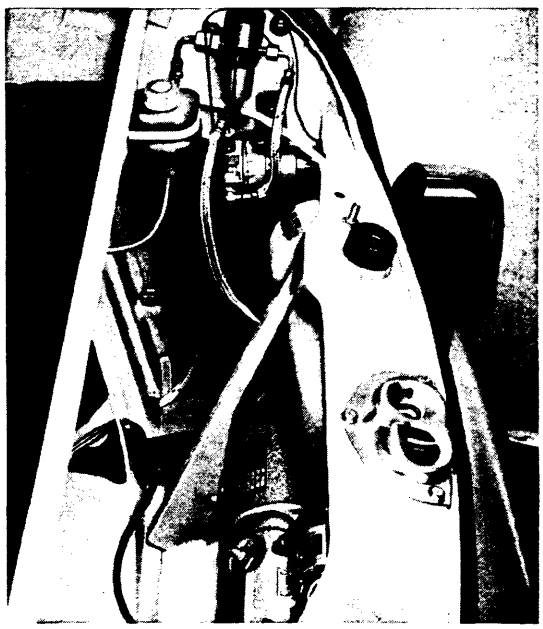


Fig. 14

19 - Secure rubber flap in left-hand wheel housing with three tapping screws (Fig. 15).

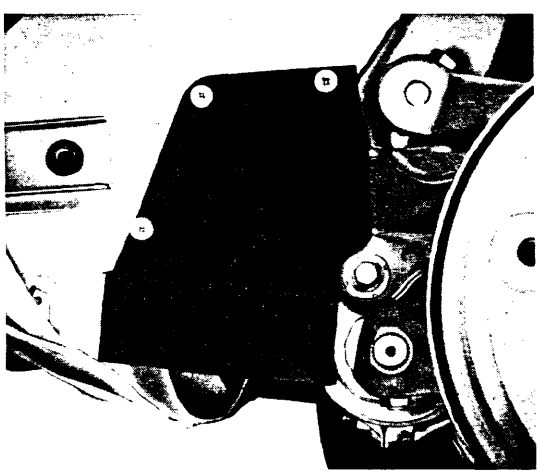


Fig. 15

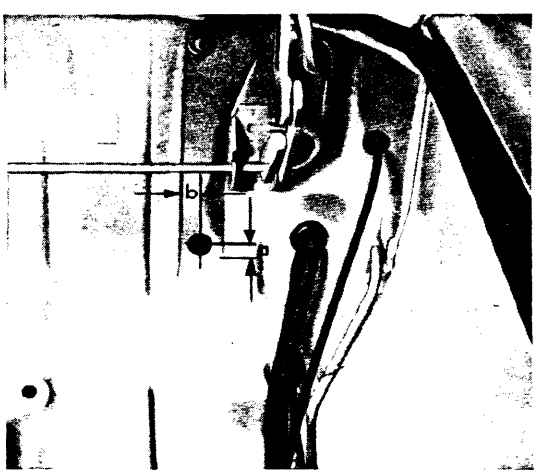
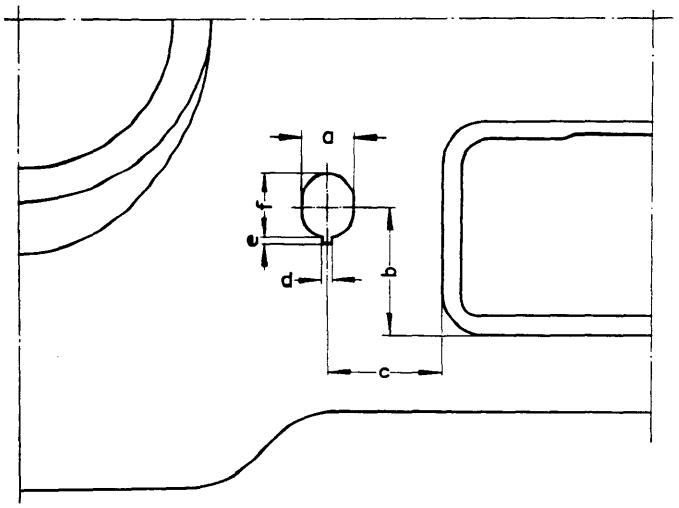


Fig. 16 a = 15 mm b = 15 mm

20 - Drill a hole in the luggage compartment panel to the measurements given in Fig. 16 and fit a grommet.



a = 14,2 mm
b = 35 mm
c = 32 mm
d = 2.2 mm
e = 1.3 mm
f = 17.2 mm

21 - Mark off and drill a hole for the switch in the instrument panel using the measurements in the drawing. Clean up and paint hole edges.

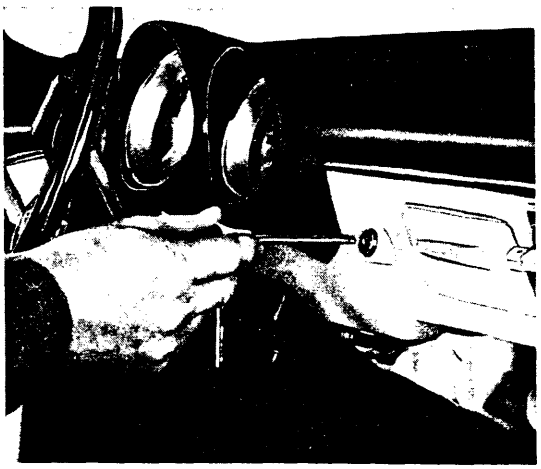


Fig. 17

22 - Route heater cable alongside front harness through the spare wheel well support plate, through the hole in the luggage compartment panel, under the instrument panel and connect it to the switch as shown in wiring diagram. Connect positive cable to terminal 30 mm in the fuse box. Install push/pull switch in instrument panel (Fig. 17).

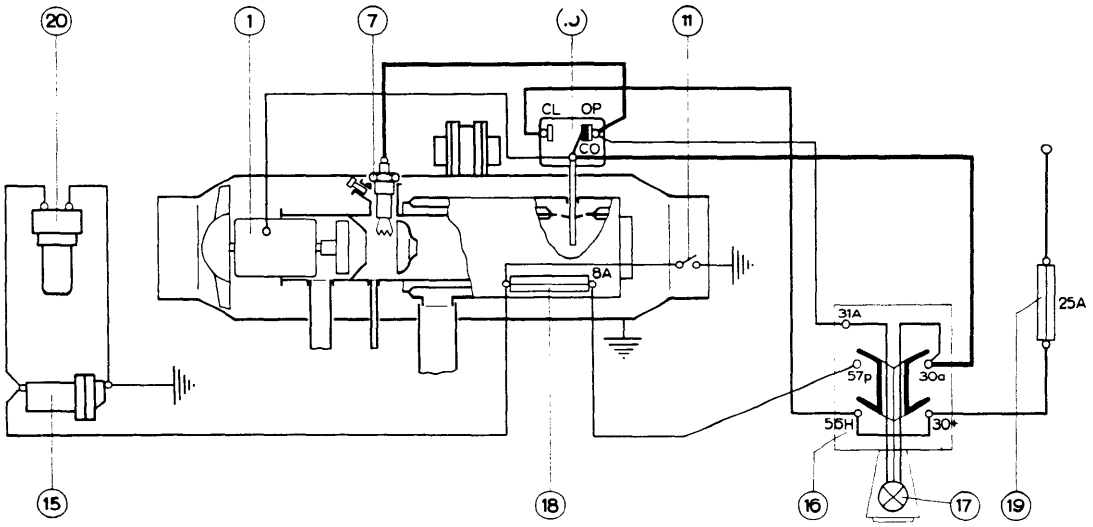
23 - Connect fuel pump and solenoid valve, pass ground cable through spare wheel well support plate and attach it together with the headlamp ground cable. Ensure that a good ground contact is made.

24 - Install 25 Amp. fuse in the holder in the positive cable, connect vehicle battery and check operation of heater. Fit protective cap on heater. Secure protective plate on exhaust pipe with clips.

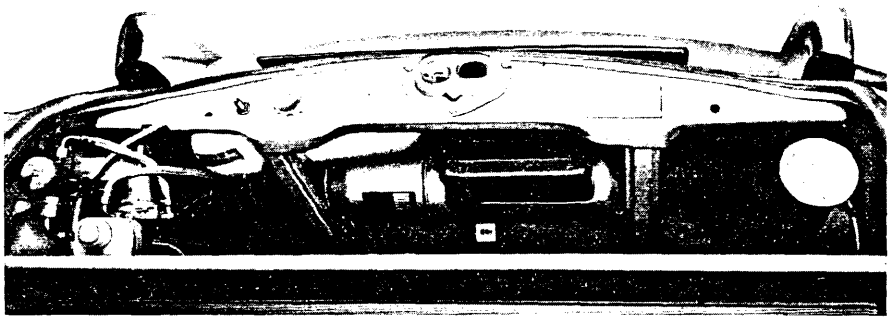
25 - Install luggage compartment lining or stick it on again. Install spare wheel well and spare wheel. Fit wheels and install parking lamps. Lower vehicle and install carpet on wheel housings.

26 - Place red cap with wording "Switch Eberspächer Heater off" on tank filler cap.

Wiring diagram



1 - Electric motor
7 - Heater plug
10 - Thermo-switch
11 - Overheating switch
15 - Electric fuel pump
16 - Switch
17 - Warning lamp
18 - Fuse, 8 Amp.
19 - Fuse, 25 Amp.
20 - Fuel filter with solenoid valve



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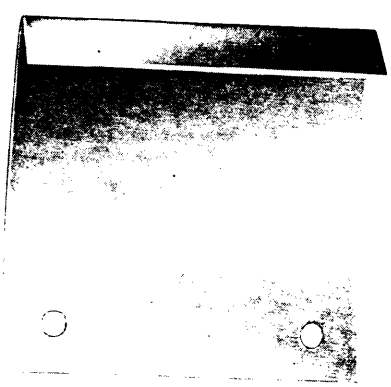
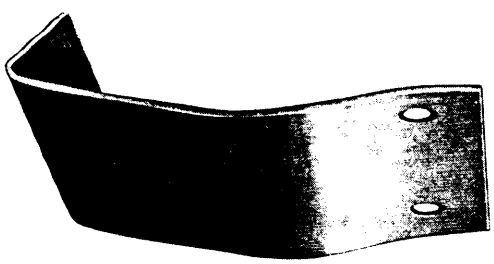
II - To point 18 of the fitting instructions

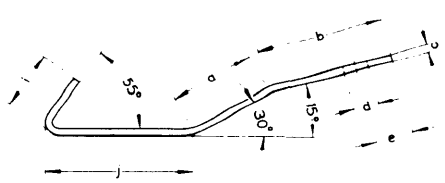
The overflow hose is routed through the drain hole in the front panel. The drain hole must be enlarged until the overflow hose goes through and there is still room for the water to drain off.

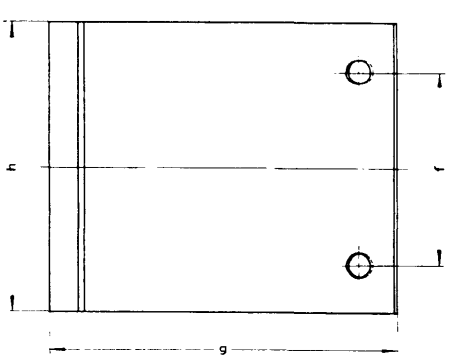
The overflow pipe is shortened to a length of 270 mm and the end which projects through the front cross panel is covered by a protection plate.

The projection plate can be made with the aid of the illustrations and the sketch shown here. The 55° angled end should contact the spare wheel well. The holes in the front cross panel should be drilled to suit the holes in the plate.









a — 18 mm (.708″)
b — 26 mm (1.023″)
c — 15 mm (.060″)
d — 5 mm (.2″)
e — 8 mm (.3″)
f — 40 mm (1.6″)
g — 71 mm (2.8″)
h — 60 mm (2.36″)
i — 12 mm (.47″)
j — 30 mm (1.18″)

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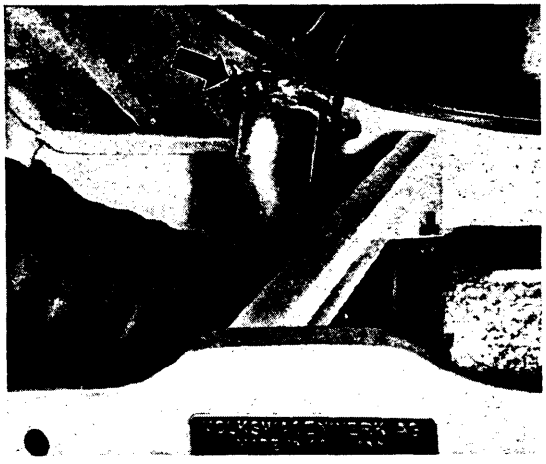
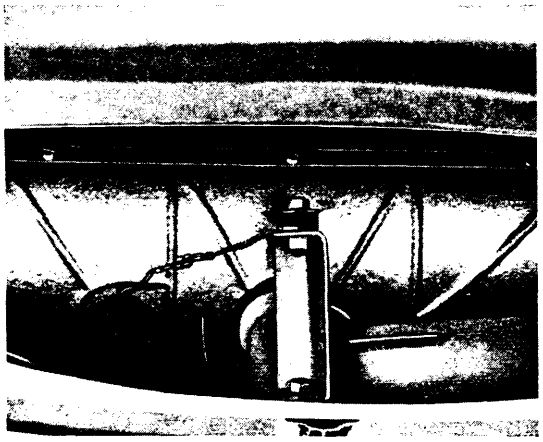


III - To points 13 and 14 in the fitting instructions

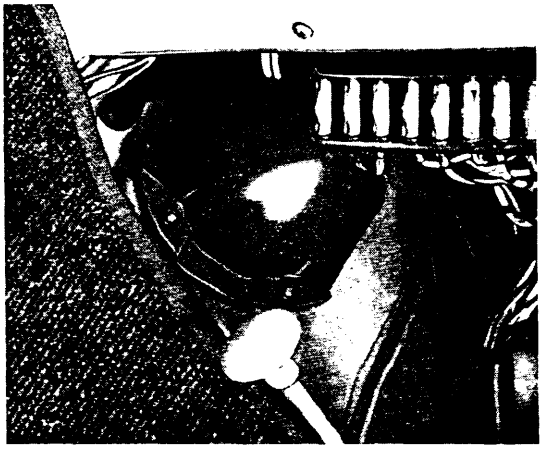
The hole in the spare wheel well support (311 805 381 B) for the exhaust pipe must be sealed carefully with Airo-Plast with Airo's special hardener (plastic body filler) or a sealer of the same quality from another manufacturer. The sealer must be applied to the joint between heater exhaust pipe and spare wheel well support until the gap at this point is completely sealed. When the sealer has hardened, it should be painted.

If Airo-Plast or a similar sealer is not available, VW sealing compound D 2 can be used.



IV - To point 15 of the instructions

A second sealing ring (311 261 187) must be fitted on the exhaust pipe of the heater. The additional sealing ring is pushed over the pipe.



V - To point 16 of the instructions

A protective cap (311 261 743 A) is installed on the grille (311 261 743).

Type BN 2
Heater No. 20 1215 (6 Volt)
20 1216 (12 Volt)
for VW 1500 Sedan / 1600 Fastback Sedan
and VW 1500 / 1600 Squareback Sedan

When carrying out repairs to the body, it may be necessary to remove the BN 2 heater or parts of the system. When installing the heater again, note the following points:

1 - Disconnect battery. Take out spare wheel and luggage compartment lining. Remove trim from left-hand side of luggage compartment and take off left front wheel.

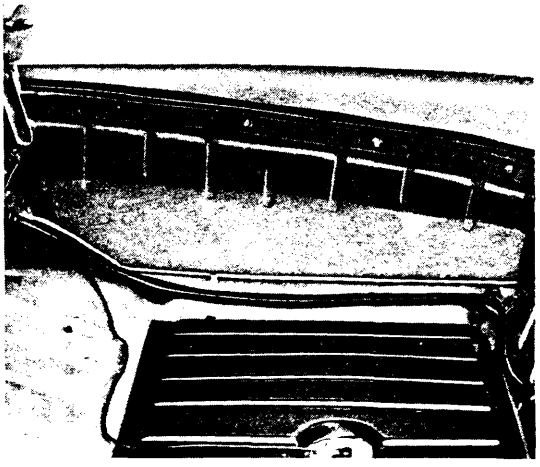


Fig. 1

2 - Place template I in luggage compartment and mark off holes for exhaust pipe (54 mm), combustion air pipe (36 mm), warm air outlet (84 mm) and the 7 mm holes for the heater securing screws.

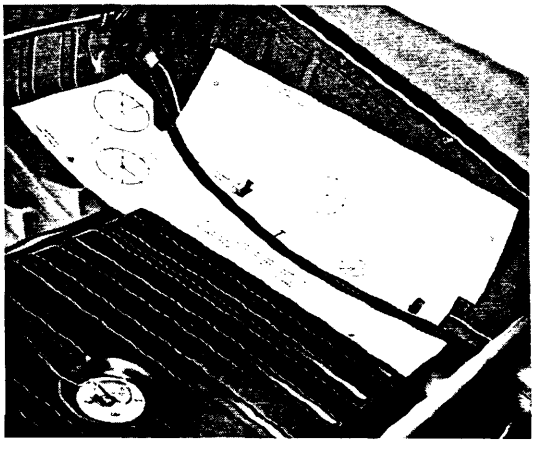


Fig. 2

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Fig. 3

Take template out. The center point of the hole for the air circulation duct (75 mm dia.) lies at the intersection of arcs a and b.

a = 123 mm from the center of the warm air outlet hole

b = 73 mm from the center of the paint drain hole

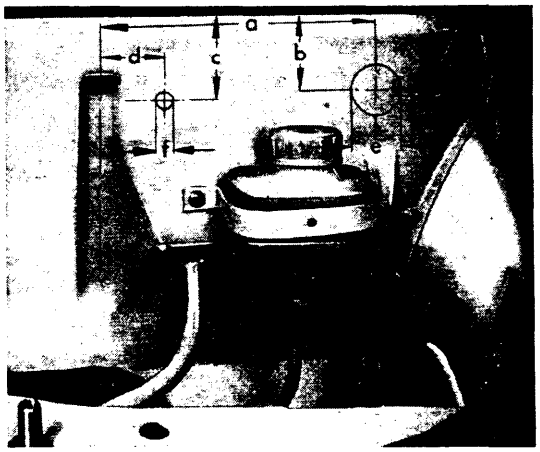
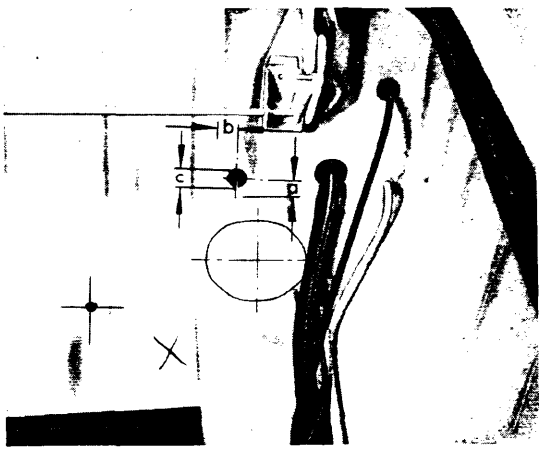


Fig. 4

3 - Mark off the holes for the cover plate screws and the hole for the fuel hose in the front cross panel according to measurements in Fig. 4.

a — 120 mm (4.7″)
b — 42 mm (1.65″)
c — 45 mm (1.8″)
d — 27 mm (1.06″)
e — 23 mm (.9″)
f — 6 mm (.24″)



4 - Mark off a hole in the upper part of front partition to the measurements in Fig. 5.

a — 15 mm (.6″) b — 15 mm (.6″) c — 19 mm (.75″)

Fig. 5

5 - Mark off the hole for the fuel hose in the spare wheel well support to the measurements in Fig. 6.

a — 35 mm (1.38″) b — 50 mm (1.9″)
c — 19 mm (.75″) d — Center of rib

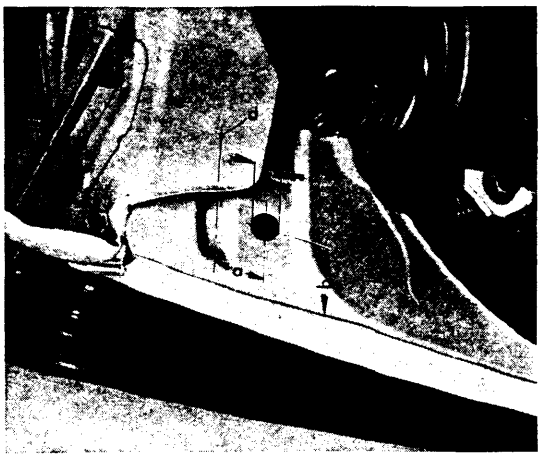


Fig. 6

6 - Cut or drill all holes and clean up edges.

7 - Place suitable gaskets or grommets in the holes for warm air outlets, combustion air intake pipe exhaust pipe, cable harness and fuel hoses. Install plug (311 415 535) in the steering column tube underneath the cap for the horn half-ring.

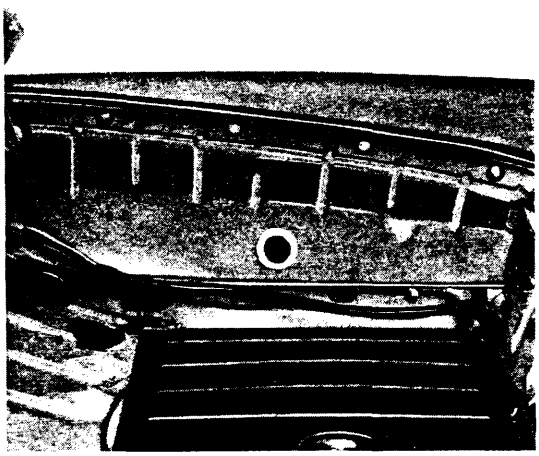


Fig. 7

8 - Locate brackets for fuel pump and filter in the depression provided on the left side panel. Mark off and drill holes for securing screws. Secure filter bracket with two tapping screws and pump bracket with two M 6×10 screws and nuts.

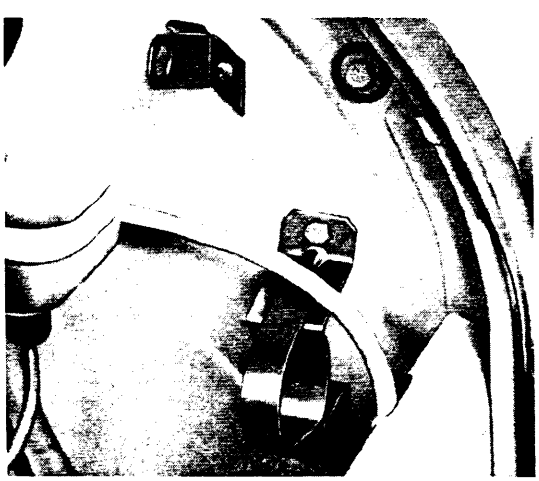


Fig. 8

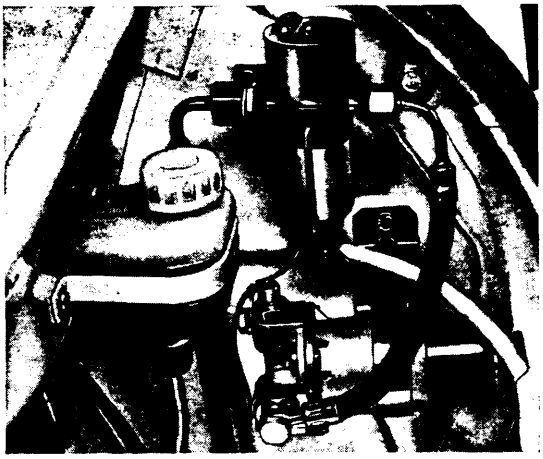


Fig. 9

9 - Install fuel filter and pump. Stick a piece of plastic material on the inside of the cross panel level with the fuel pump. Pass the fuel hose to the filter through the hole in spare wheel well support. Slide a protective hose (311 261 521) over the fuel hose (see arrow in Fig. 10).

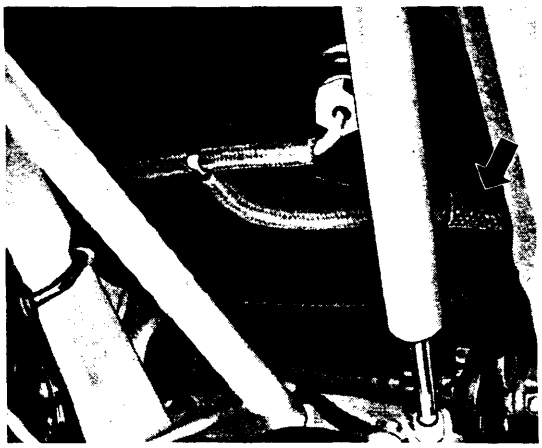


Fig. 10

10 - Close fuel hose at the tank with a clip and cut hose in center. Insert "T" piece and connect fuel hose to filter at "T" piece end. Take clip off hose and check hoses for leakage.

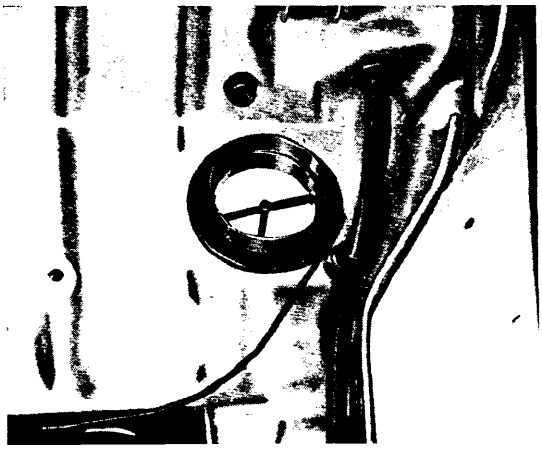


Fig. 11

11 - Place adaptor in hole for the warm air outlet.

12 - Slide warm air outlet on to adaptor from inside body, align it properly and secure with cap nut.

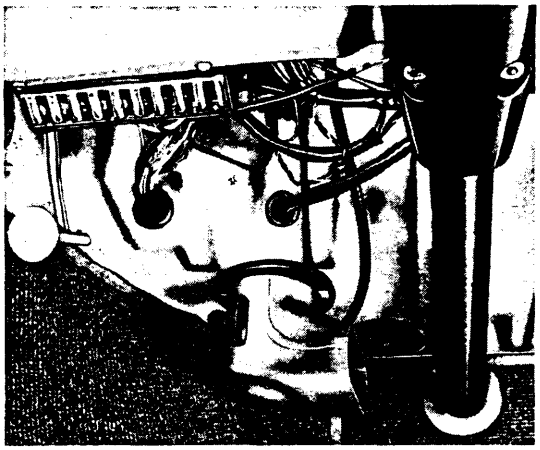


Fig. 12

13 - Cut a 64 mm diameter hole in left side panel trim for exhaust pipe, stick trim in place and make holes for heater mounting screws.

14 - Secure rear heater mounting bracket to wheel housing, mark off second screw hole, drill hole and insert second screw. Secure front bracket together with tank retaining plate. Take out left rear tank retaining plate, install bracket for cover plate and secure with tank retaining screw. Attach center mounting bracket.

Fig. 13

15 - Slide exhaust elbow into pipe in heater and secure it with clamp, sealing ring and seal. Push overflow hose on to overflow adaptor and air hose on to air intake pipe.

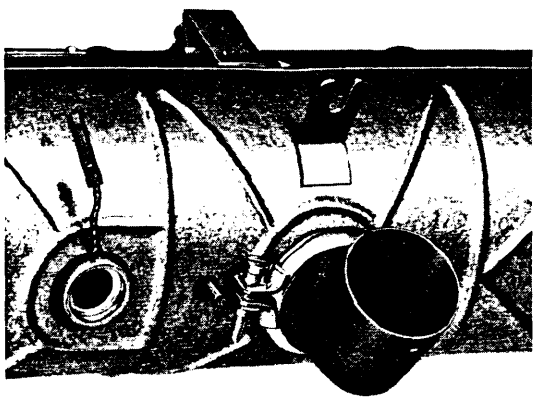


Fig. 14

16 - Connect heater ground cable and ground cable (311 971 495 A) with a cable connector (111 971 939).

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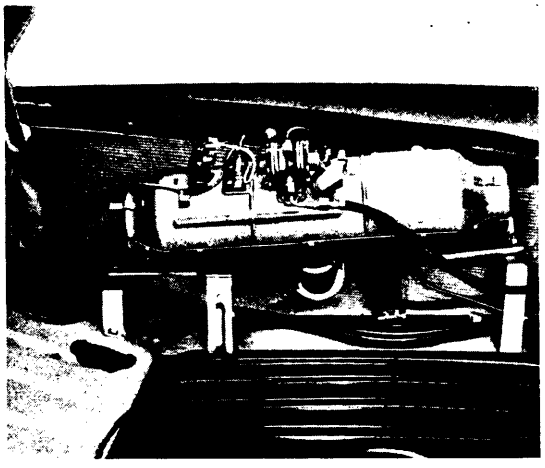
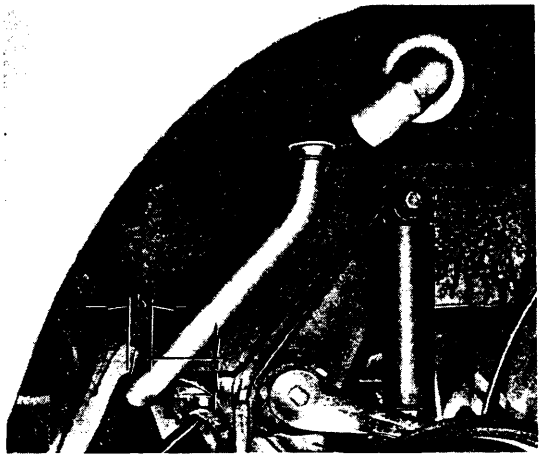


Fig. 15

17 - Install warm air hose on outlet adaptor and connect other end to heater. Then place heater on brackets, fit bonded rubber pads and bolt heater in position. Route overflow hose to the front along cable harness and through the hole in spare wheel well support. Push lower exhaust pipe on to upper elbow and secure it with a B·4.8×13 tapping screw.



a = 10 mm (.4")
b = 20 mm (.8")

Fig. 16

18 - Insert combustion air intake pipe through grommet from below, drill 3.8 mm hole for securing screw to measurements given in Fig. 16 and secure pipe with a cheese head BZ 4.8×13 tapping screw. Secure combustion air intake hose to intake pipe with a clip.

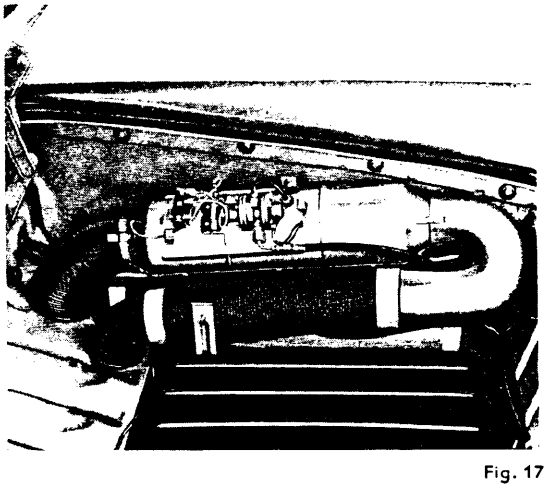


Fig. 17

19 - Pass fuel pressure pipe from heater through spare wheel well support and connect to fuel pump. The pressure pipe must be attached to the pressure regulator at a an angle of 45° downwards. This will prevent the pipe from being jammed and damaged by the cover plate.

20 - Place air circulation hose on heater and press it into the hole in the luggage pan.

21 - Mark off hole for switch on instrument panel to measurements given in sketch. Cut hole, clean edges carefully and paint.

a = 14.2 mm (.56") b = 35 mm (1.4")
c = 32 mm (1.26") d = 2.2 mm (.08")
e = 1.3 mm (.05") f = 17.2 mm (.67")

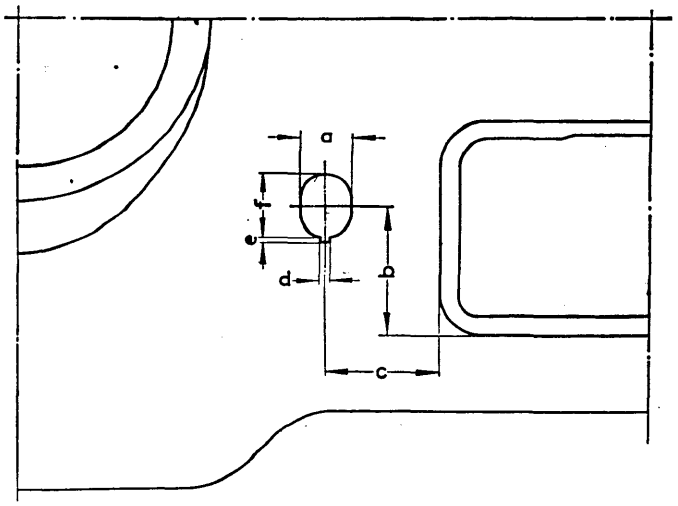


Fig. 18

22 - On heaters with time switches, two relays are fitted as shown in illustration. Relay 1 is located on the third rib from the left, relay 2 (with diode) on the fourth rib from the left.

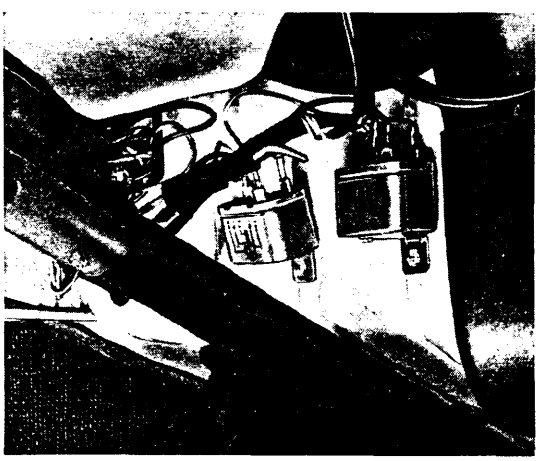


Fig. 19

23 - Pass cable harness through the hole in the upper part of the partition and connect cables as in wiring diagram (Fig. 20 with push/pull switch, Fig. 21 with time switch).

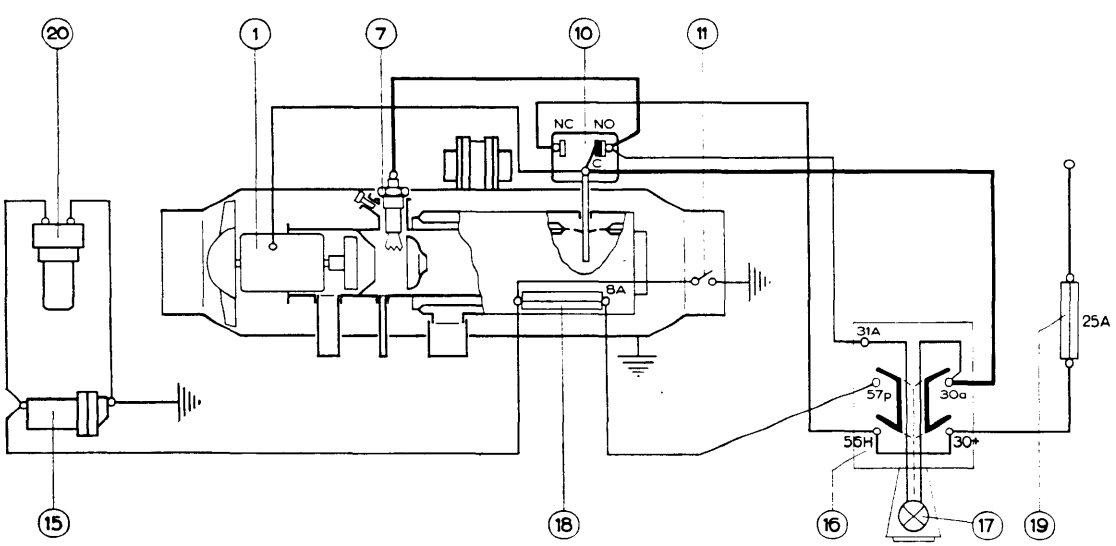


Fig. 20

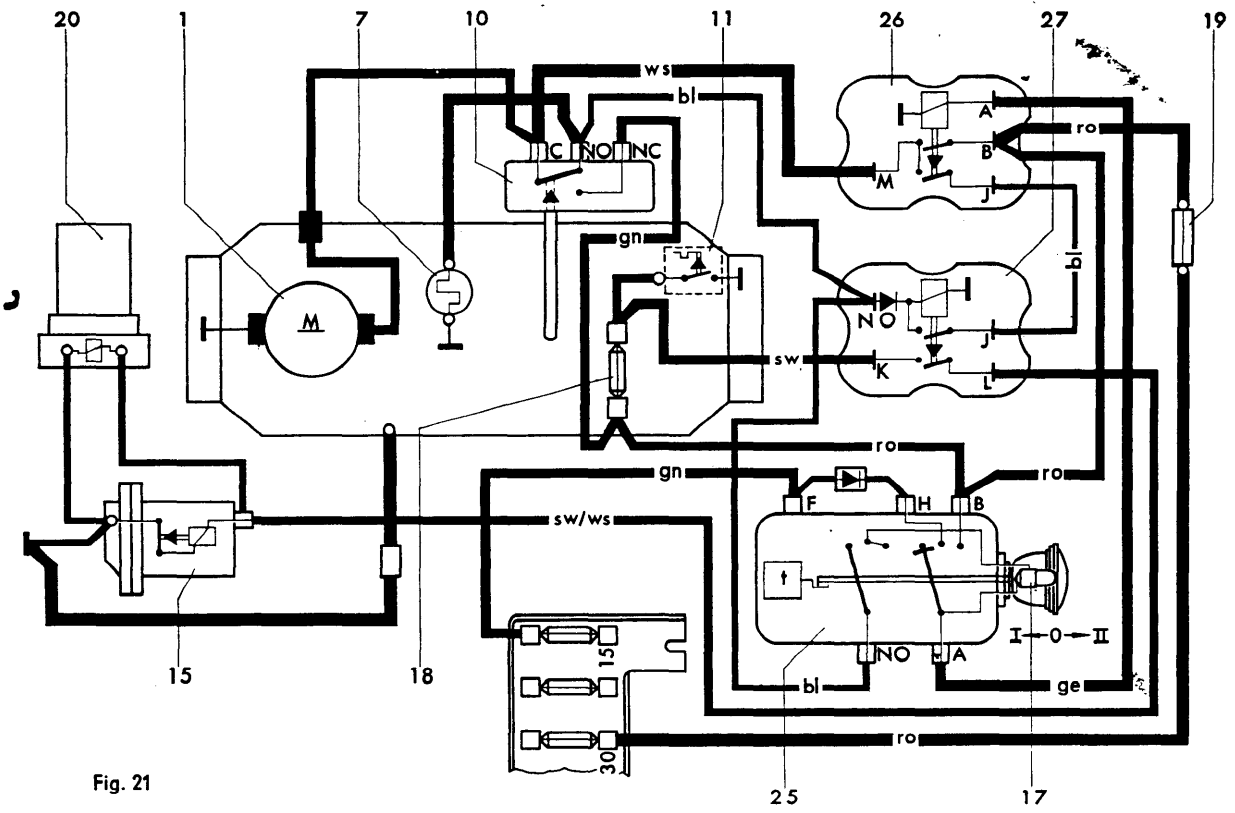


Fig. 21

1 - Electric motor
7 - Heater plug
10 - Thermo-switch
11 - Overheating switch
15 - Fuel pump
16 - Push/pull switch
17 - Warning lamp
18 - Fuse 8 amp.
19 - Fuse 25 amp.
20 - Fuel filter with solenoid valve
25 - Time switch
26 - Relay 1
27 - Relay 2

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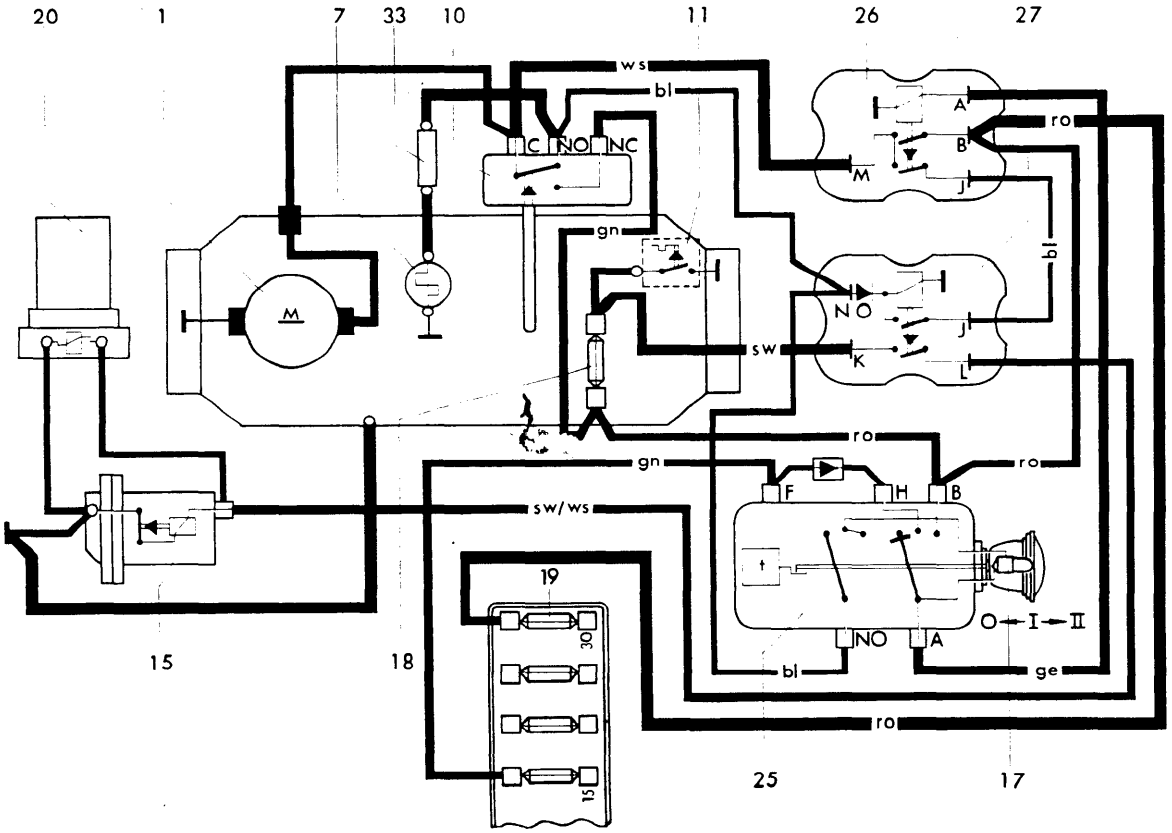
Note:

Wiring diagram for Heater No. 20 1216 from August 1966 (12 volt version only).



1 - Electric motor
7 - Heater plug
10 - Thermo-switch
11 - Overheating switch
15 - Fuel pump
17 - Warning lamp
18 - 8 amp. fuse
19 - 16 amp. main fuse
20 - Fuel filter with solenoid valve
25 - Time switch
26 - Relay 1
27 - Relay 2
33 - Resistance

24 - Route heater ground cable and fuel pump cable to the front along the harness and through the spare wheel well support. Secure heater ground cable and fuel pump ground cable together under the brake fluid reservoir mounting screw. Ensure that a good ground contact is made.

25 - Cut luggage compartment lining to shape place it in luggage compartment and secure it. Fit heater cover plate and put spare wheel in. Install left front wheel.

26 - Connect battery, place fuse in fuse holder in cable and check that the heater works properly.

27 - Place the red warning cap with the text "Switch off Eberspächer Heater" on the fuel tank cap (see arrow in Fig. 22).

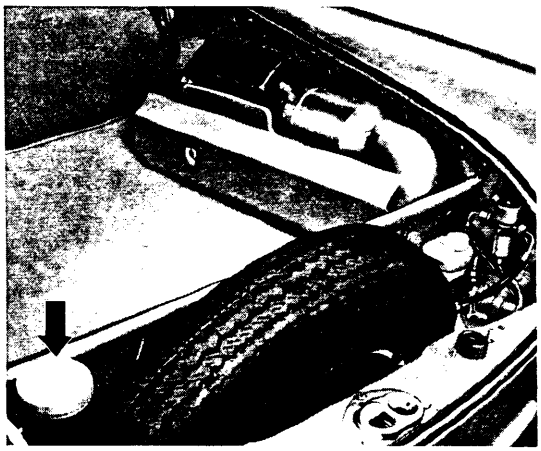


Fig. 22

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Type BN 4
Heater No. 6 Volt 20 1104
12 Volt 20 1147
for VW Transporter

General

The BN 4 Eberspächer heater is installed in the engine compartment of the Transporter.

The installation kit contains the following parts:

1 Heater

1 Exhaust pipe

1 Combustion air pipe

1 T-piece

1 Set of controls

1 Warm air hose (1220 mm long) for pre-heating the carburetor, various screws, nuts and grommets

2 Templates for installation purposes

Fitting sequence

1 - Disconnect battery and clip fuel hose.

2 - a - On 1.2 liter engines (up to Chassis No. 1 197 688, Engine No. 8 147 071) and on 1.5 liter engines (up to Chassis No. 1 197 411, Engine No. 0 318 868), the oil bath air cleaner must be moved from the left side of the engine to the right.

On 1.2 liter engines, the air cleaner bracket (Fig. 1, Eberspächer Part Number 20 1104 21) must be attached on the right of the fan housing and on 1.5 liter engines the oil bath air cleaner is attached to the load compartment floor by a securing bracket which should be locally manufactured.

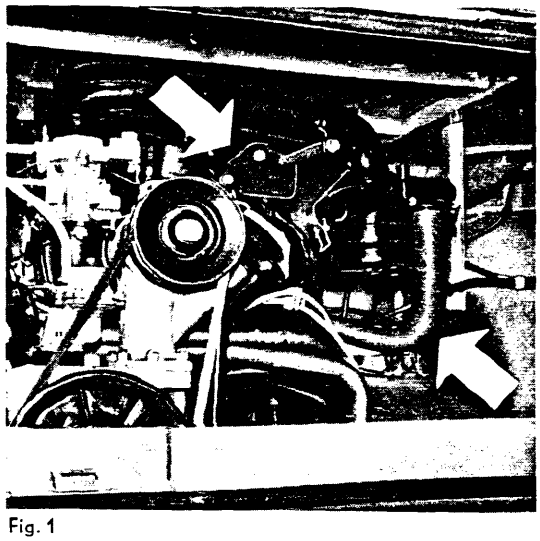

Fig. 1

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b - The oil breather hose should be relocated as shown in Fig. 1a or Fig. 1b according to the position of the fitting on the oil bath air cleaner.

The hose must not sag as otherwise condensate can collect. This condensate would then freeze at low outside temperatures and block the breathing of the crankcase.

c - Replace the pre-heating air connecting hose with the longer one supplied in the kit.

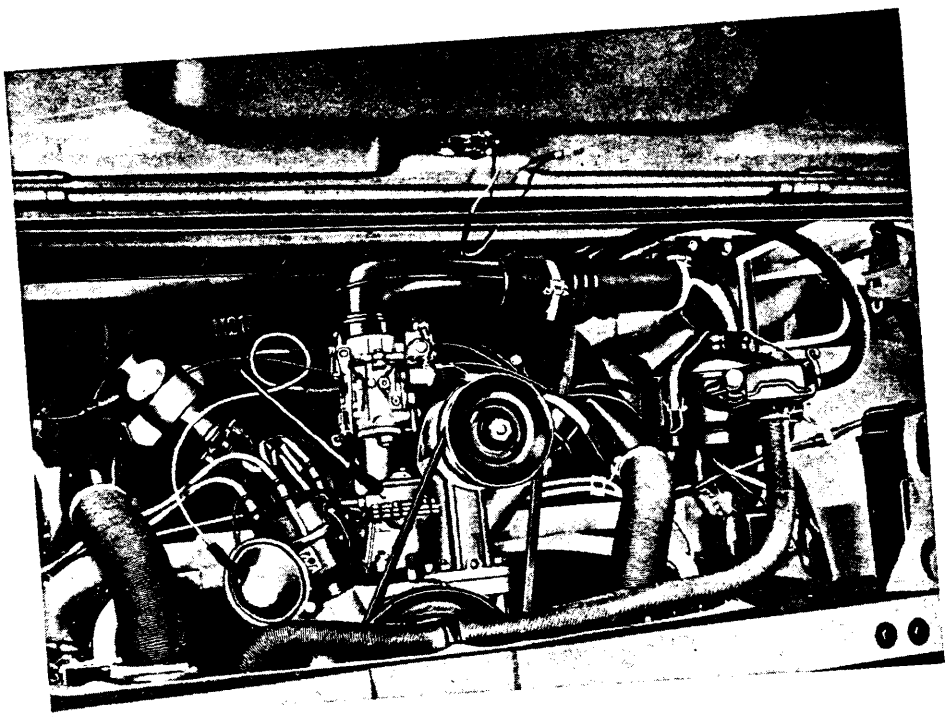

Fig. 1a

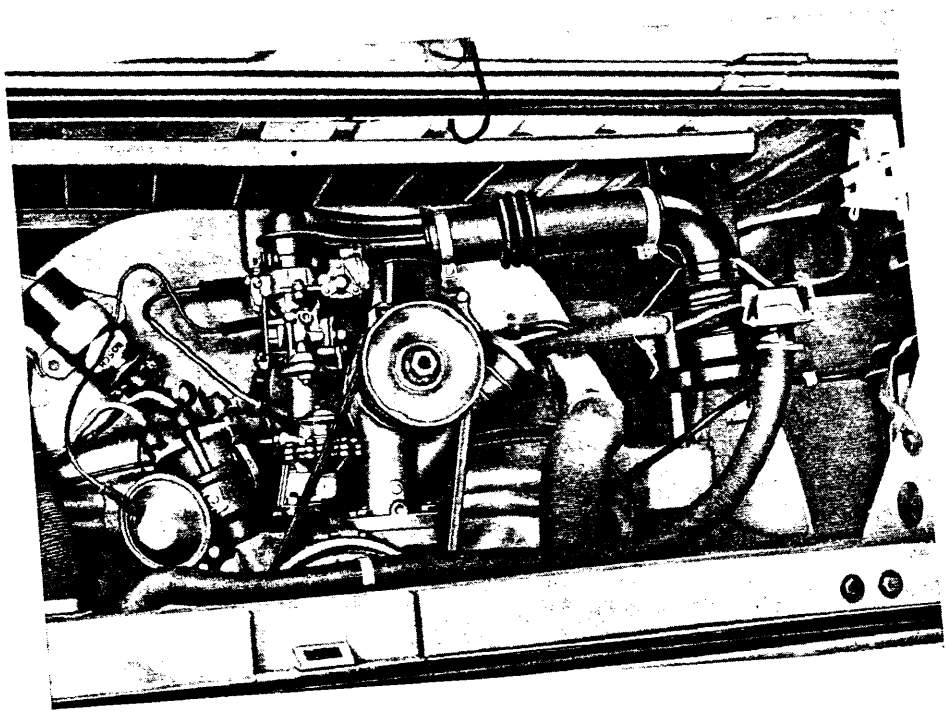

Fig. 1b

3 - Mark and drill a .4" (10 mm) diameter hole for the fuel line in the partition below the fuel tank support (Fig. 2).

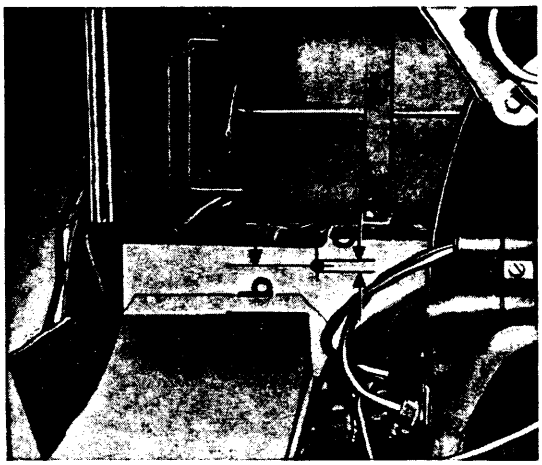

Fig. 2 a = 6.1" (155 mm)
b = 1.7" (42 mm)
c = .4" (10 mm)

4 - With template I, mark and drill the opening for the exhaust pipe and two holes for the heater mounting in the left engine cover plate (Fig. 3). Clean up edges of holes.

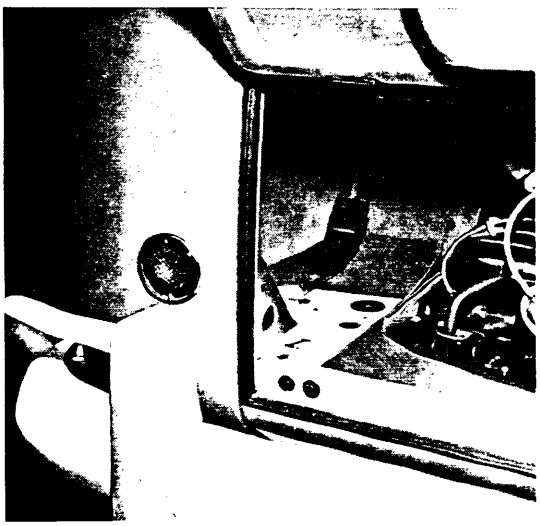

Fig. 3

5 - Lift rear end of vehicle. Using template II mark and drill the hole for the intake pipe and the holes for the pipe bracket, from underneath (Fig. 4). Clean up edges of holes.

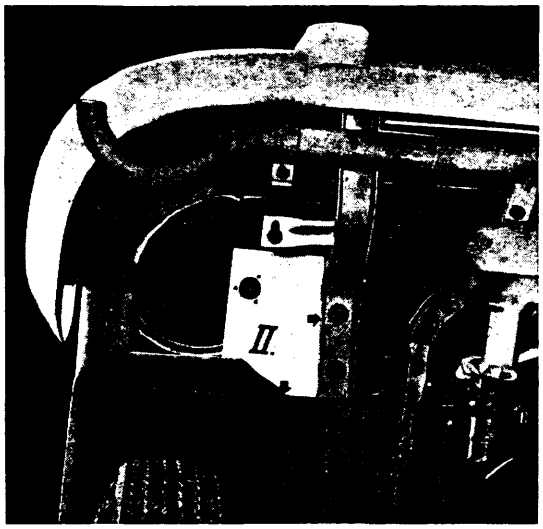

Fig. 4

6 - Mark and drill the opening for the warm air outlet in the engine compartment partition inside the vehicle. Clean up edges of hole. Next to the opening, mark and drill two holes for the Bowden cable and the push/pull switch wiring. Insert the grommets provided into the holes (Fig. 5).

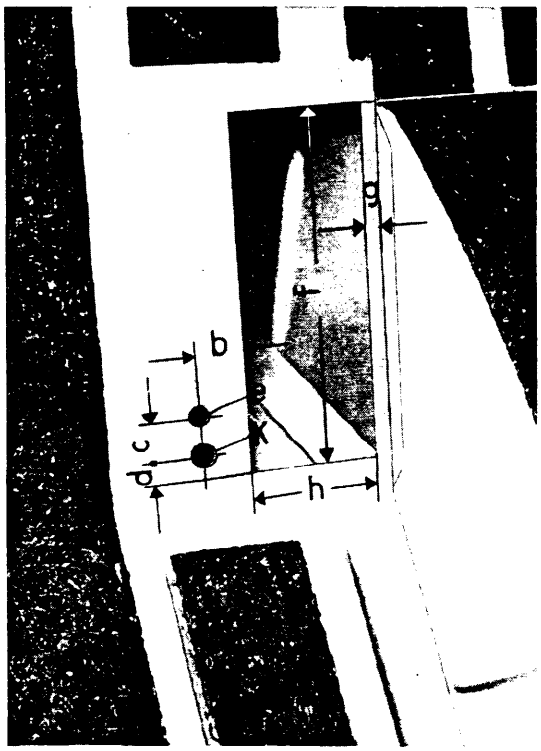

Fig. 5 b = 1" (25 mm) f = 6.5" (166 mm)
c = .8" (20 mm) g = .2" (4 mm)
d = .4" (10 mm) h = 2.6" (67 mm)
e = .4" (10 mm) dia. k = .6" (14 mm) dia.

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7 - Mark and drill two .4" (10 mm) diameter holes in the cab, between the center and left ribs of the seat box, level with the rotary knob and 2.8" (70 mm) apart.

Drill a .6" (14 mm) diameter hole for the switch wiring and a .4" (10 mm) diameter hole for the Bowden cable in the base of the seat box (Fig. 6).

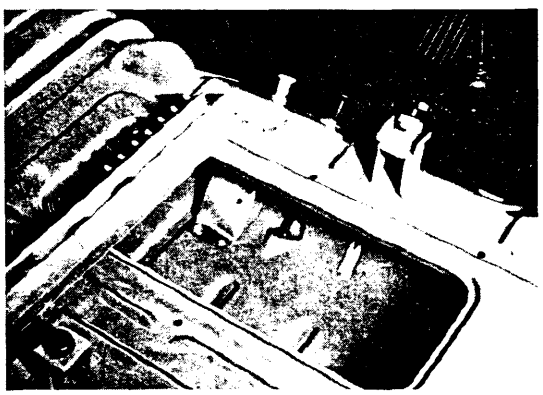

Fig. 6

8 - a - In the twelfth rib from left (looking in driving direction) mark and drill two holes .6" (14 mm) and .4" (10 mm) diameter in the floor panel as near to each other as possible, from inside the load compartment (Fig. 7).

Insert the grommets provided in the kit into the holes.

Pull the Bowden cable and switch wiring through the holes in the seat box and attach them at the accelerator cable guide tube (Fig. 6a).

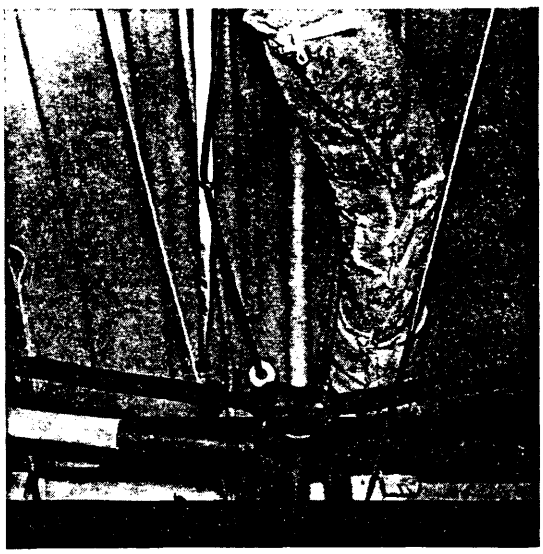

Fig. 6a

b - Install the cap together with the switch and attach to floor with two tapping screws.

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Note:

Cable harness (push-pull switch to heater)

To facilitate installation, the cable harness has been changed to a plastic covered cable. The following table shows how the new cable is connected:

Cable		Color	
from	to	old	new
Push/pull switch	Terminal plate		
terminal 56 H/30a	terminal 2	green	gray
terminal 57p	terminal 4	brown	black
terminal 30a	terminal 1	red	red

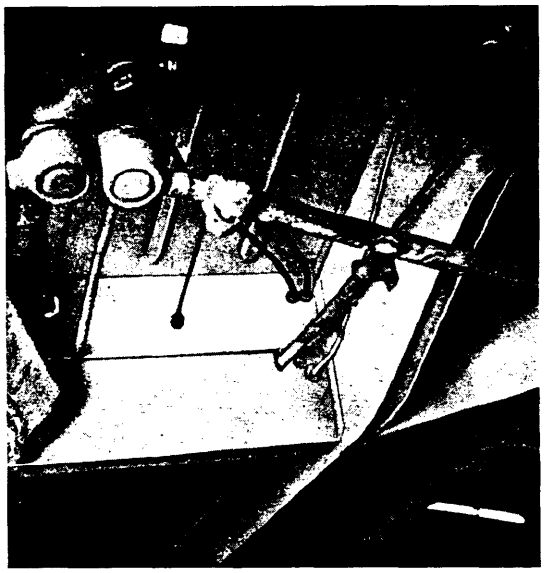


Fig. 7

9 - Fit a grommet into the large opening and insert the square warm air outlet into the opening from inside the vehicle. Mark off and drill 3.8 mm holes at top and sides and secure the outlet with 4.8 mm tapping screws (Fig. 8).

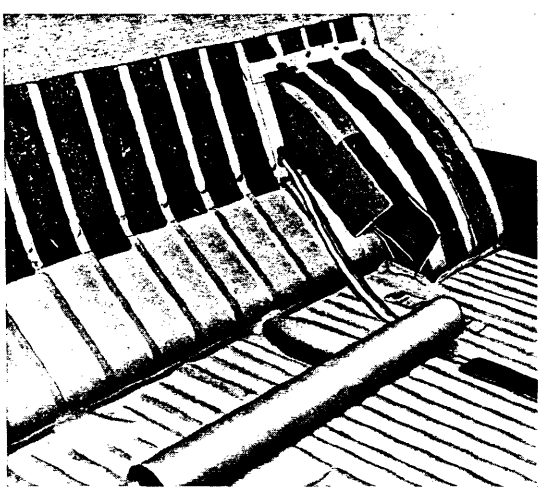


Fig. 8

10 - Install seal for exhaust pipe. Insert exhaust and intake pipes into the holes provisionally. Place heater in position and locate warm air flange into the outlet already installed. Bolt heater to base (Fig. 9).

11 - Secure intake and exhaust pipes. Slide exhaust elbow on to the exhaust pipe and secure with clamp screw. Drill a 6.5 mm hole in the left rear bumper bracket level with the exhaust pipe elbow support and secure support with a hexagon head M 6×15 screw, nut and spring washer (Fig. 10).

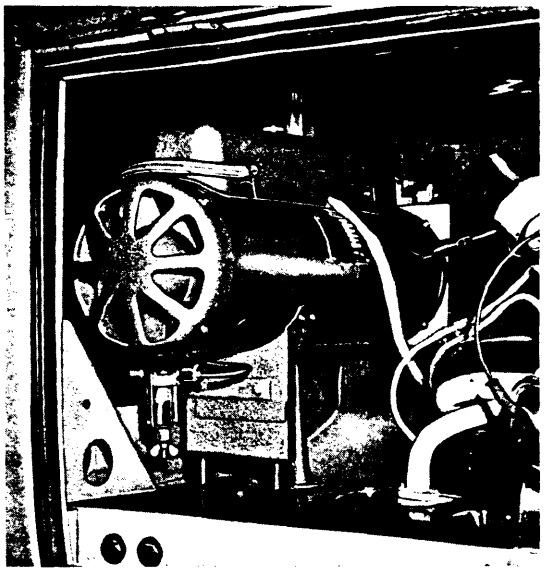


Fig. 9

12 - Cut a 6 cm long piece out of the fuel hose underneath the tank and install the "T" piece. Place the cut-out section of the hose on the free end of the "T" piece (Fig. 11). Push fuel line from engine compartment through the partition and into the hose on the "T" piece. Insert filter and connect it to the fuel lines with union nuts (Fig. 9).

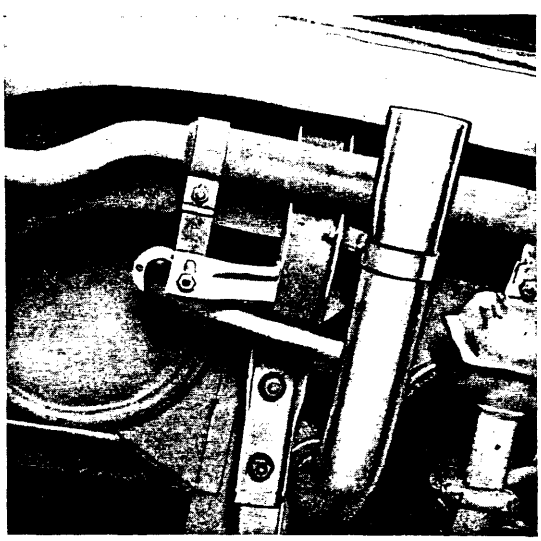


Fig. 10

13 - Attach Bowden cable to regulator switch.

Connect cables to heater as shown in wiring diagram.

Fig. 11

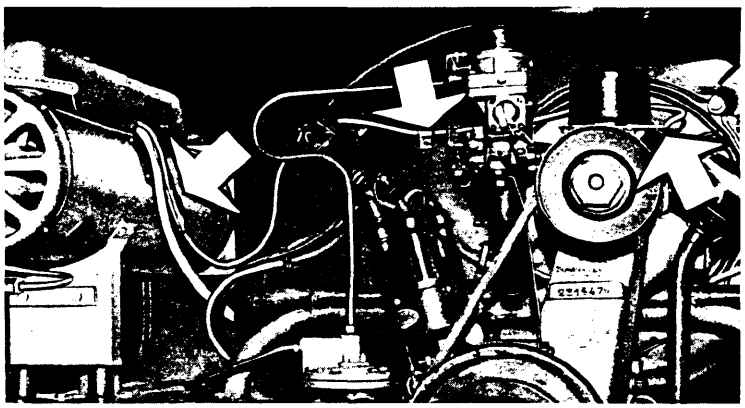


Fig. 12 Connection on generator

14 a - If the voltage regulator is on the generator, the positive cable is connected to Terminal 51 of the regulator.

The positive cable is connected to the cable adaptor together with the green cable and installed on terminal 2 on the heater.

The cable is then placed under the existing clip on the fan housing and connected to terminal 51 on the voltage regulator (Fig. 12).

14 b - If the voltage regulator is not in the engine compartment, the positive cable should be connected to terminal 30 on the starter.

The feed cable (700 mm long, 2.5 mm, black) must be replaced with a Part No. 20 9147 25 11 12 cable (1120 mm long, 2.5 mm, black).

The positive cable is connected to the cable adaptor together with the green cable and installed on terminal 2 on the heater.
The cable is then placed under the existing clip on the fan housing and routed behind the ignition coil to the generator cable harness.

The positive cable is laid along the harness, through the existing grommet to the starter where it is connected to terminal 30 (Fig. 13).

Ensure that the ground connections on the heater and all other electrical connections are making good contact.

15 - Open fuel hose and connect battery.

Lover vehicle.

16 - Check heater operation. If ignition has not taken place within 3—4 minutes after switching on for the first time (no fuel in line), the heater should be switched off and the red lever of the safety switch on the side of the cover moved forward briefly after about 5 minutes so that the heater can be switched on again.

17 - On the Micro Bus, the opening in the panel under the rear seat must be extended by 315 mm on the warm air outlet side (Fig. 14).

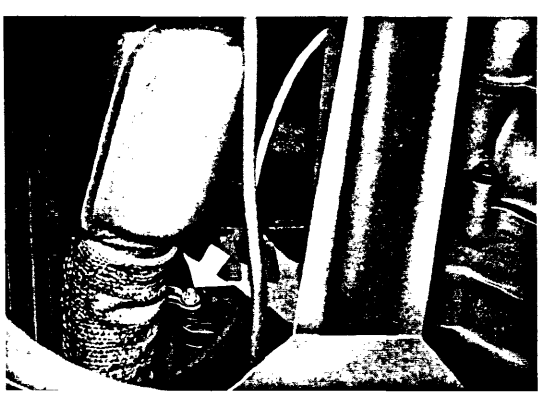


Fig. 13 Connection on starter

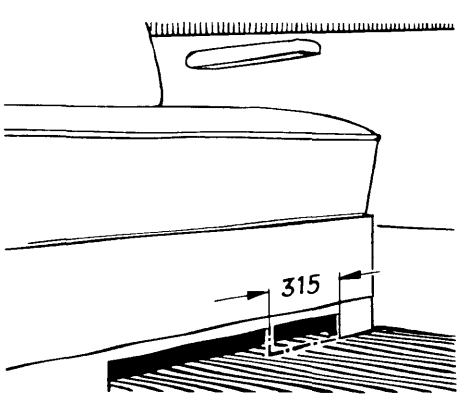
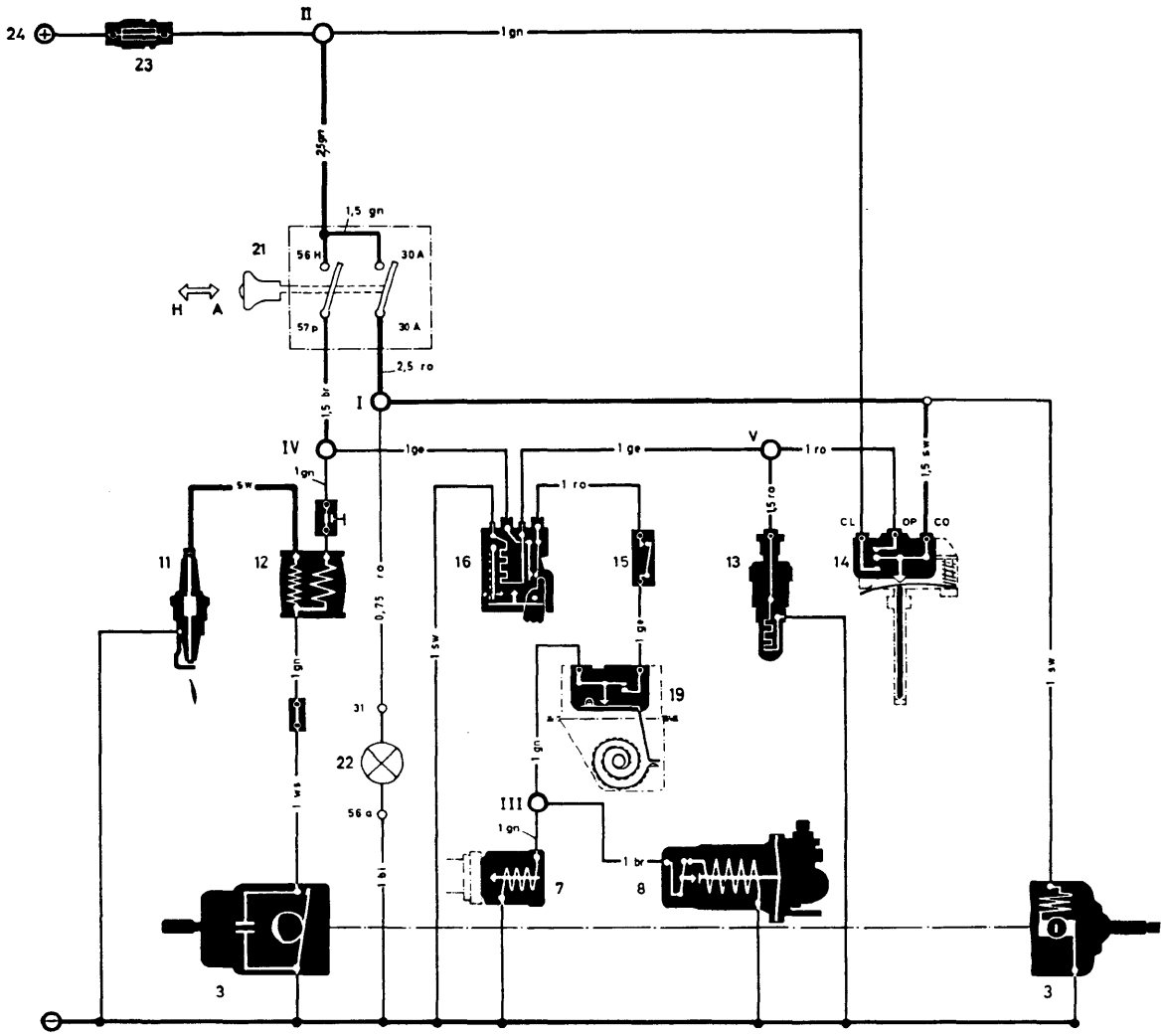


Fig. 14

Wiring diagram



H - On A - Off

3 - Electric motor with contacts
7 - Solenoid fuel valve
8 - Electric fuel pump
11 - Spark plug
12 - Ignition coil
13 - Heater plug
14 - Thermo-switch
cold: CO—OP
warm: CO—CL
15 - Overheating switch opening at 180° C
16 - Safety switch
19 - Regulating switch
20 - Terminal plate
21 - Push-pull switch
22 - Warning lamp
23 - Fuse holder and 25 A fuse
24 - To vehicle starter (Terminal 30)
○ Terminal on terminal plate

Color key

bl - blue	ro - red
br - brown	sw - black
ge - yellow	ws - white
gn - green	

J. EBERSPÄCHER
7300 ESSLINGEN/N., P.O. BOX NO. 289
TEL. 35 65 55 · TELEX. 072 3584

Type BN 4

Heater No. 20 1104 (6 Volt)
20 1147 (12 Volt)

for VW Transporter

Heater No. 20 1171 (6 Volt)
20 1178 (12 Volt)

for VW Transporter (reinforced floor plates)

The BN 4 heater can be subsequently installed in all models of the Transporter, including the Micro Bus.

The installation kit contains the following parts:

1 Heater
1 Exhaust pipe
1 Combustion air pipe
1 „Y" piece
1 Set of controls
various screws, nuts and grommets
2 Templates

Fitting sequence

1 - Disconnect battery and clip fuel hose.

2 - Mark off and drill holes for the fuel line (10 mm) and the cable (14 mm) in the partition below the tank support, using the measurements in Fig. 1.

Insert the grommets supplied in the kit.

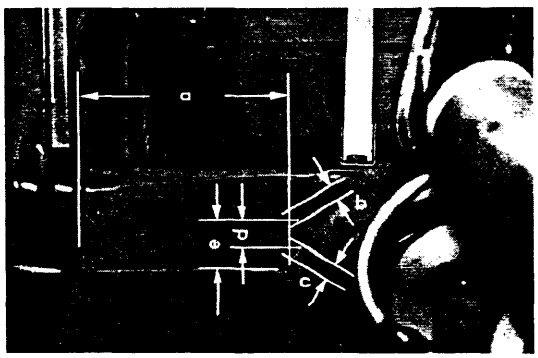


Fig. 1

a = 155 mm
b = 10 mm dia.
c = 14 mm dia.
d = 20 mm
e = 42 mm

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3 - With template I, mark off and drill the opening for the exhaust pipe and two holes for the heater mounting in the left-hand engine cover plate (Fig. 2). Clean up edges of holes.

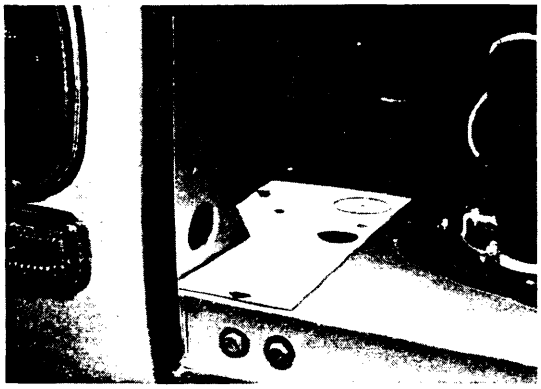


Fig. 2

4 - Mark off and drill two 10 mm holes in the cab between the center and left hand ribs of the seat box, level with the rotary knob and 70 mm apart (Fig. 3).

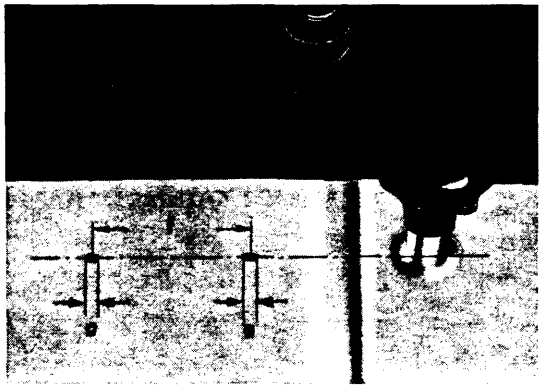
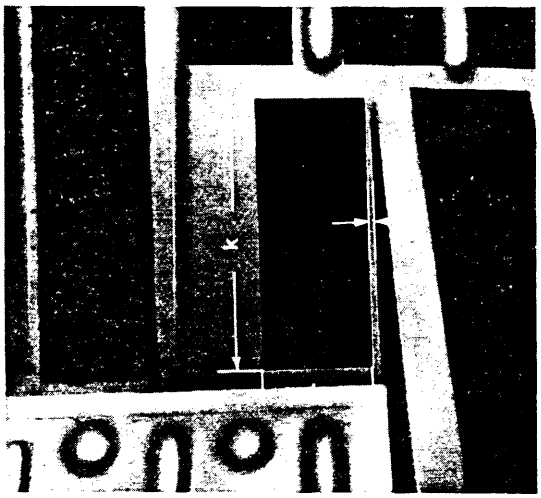


Fig. 3

f = 70 mm
g = 10 mm dia.



h = 67 mm k = 166 mm
i = 4 mm

Fig. 4

5 - Mark off and cut the opening for the warm air outlet in the engine compartment partition inside the vehicle, using the measurements in Fig. 4.

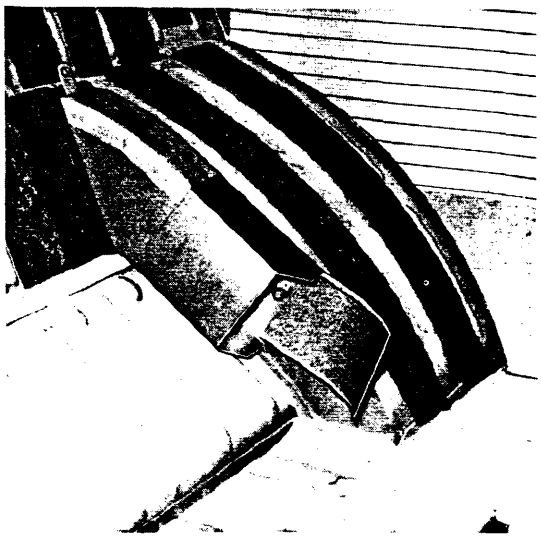


Fig. 5

6 - Fit a grommet into the large opening and insert the square warm air outlet into the opening from inside the vehicle. Mark off and drill a 3.8 mm hole at top and side and secure outlet with two 4.8 × 13 tapping screws (Fig. 5).

7 - With template II mark off and drill the hole for the intake pipe and the holes for the pipe bracket, from underneath (Fig. 6). Clean up edges of holes.

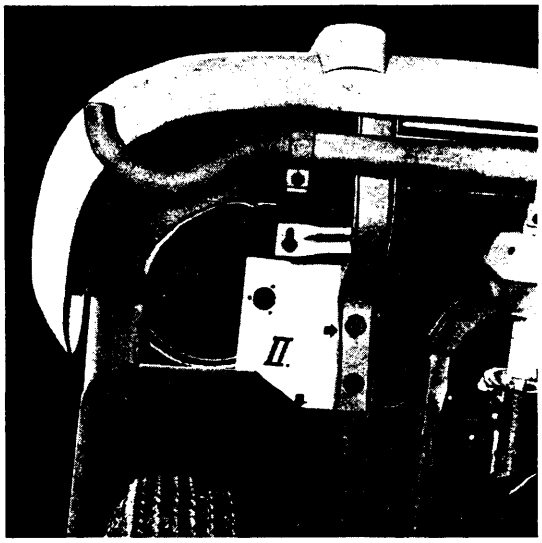


Fig. 6

8 - Cut a 6 cm long piece out of the fuel hose underneath the fuel tank. Install the "Y" piece and fit the cut out section of hose on the free end (Fig. 7).

Push fuel pipe from engine compartment through the partition and into the hose on the "Y" piece. (See Fig. 16 for position of fuel pipe in engine compartment.)

Fig. 7

9 - **Cable routing on the VW Transporter**
(Normal version)

a - Drill a 14 mm hole for the switch cable and a 10 mm hole for the Bowden cable in the seat box from below using the measurements in Fig. 8. Insert the two grommets included in the kit.

b - Install a guide tube for each cable in the existing holes in the cross members on the inside of the left side member. Secure the tubes with a 3.5 × 6.5 tapping screw (Fig. 11a).

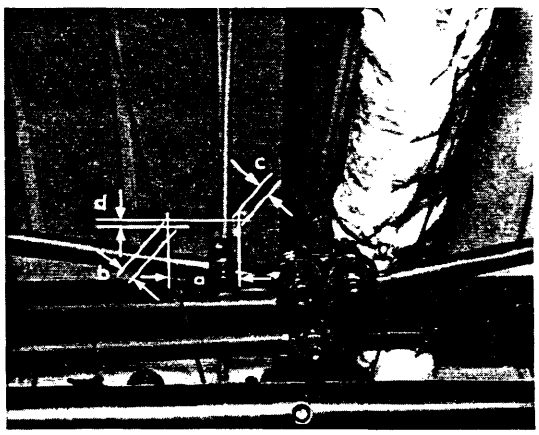


Fig. 8 a = 65 mm c = 10 mm dia.
b = 14 mm dia. d = 20 mm

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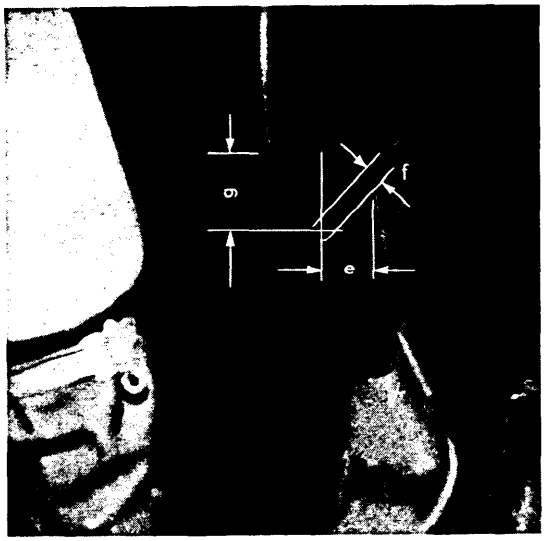


e = 30 mm
f = 10 mm dia.
g = 50 mm

Fig. 9

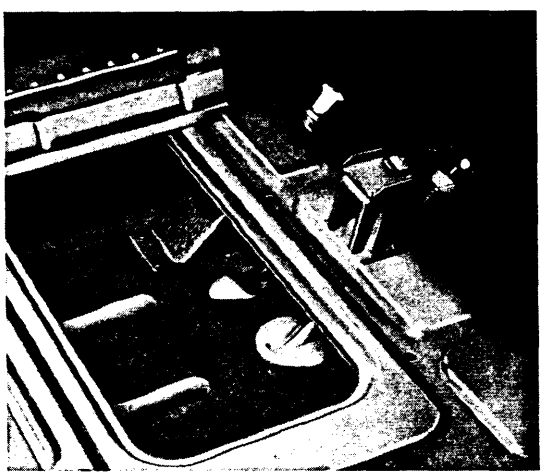


Fig. 10

Important!

When drilling the holes for the securing screws, take care not to damage the brake pipes.

c - Drill a 10 mm hole for the Bowden cable between the reinforcement plate and left side member at rear of vehicle, using the measurements given in Fig. 9.

Insert a grommet.

d - Pull the Bowden cable and the switch cable through the holes drilled in the seat box. Screw the switch and cap together and secure cap to floor of tool box with two tapping screws (Fig. 10).

e - Lay the Bowden cable along the accelerator cable guide tube and secure it to guide tube with the cable clips provided in the kit.

Feed the Bowden cable into the engine compartment through the hole shown in Fig. 9.

Route the switch cable through the front guide tube along the brake pipe on the left side member and secure it here with 4 clips. Pull the cable through the rear guide tube, secure it to the upper end of the engine cross member with the clip provided and feed it into the engine compartment through the cross panel under the tank support. (Fig. 11 a and 11 b).

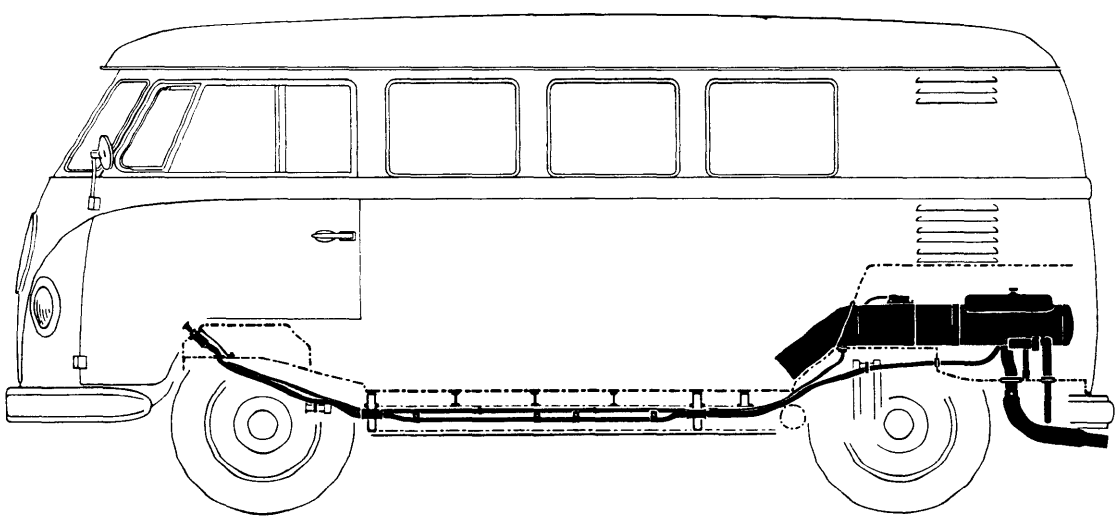


Fig. 11 a

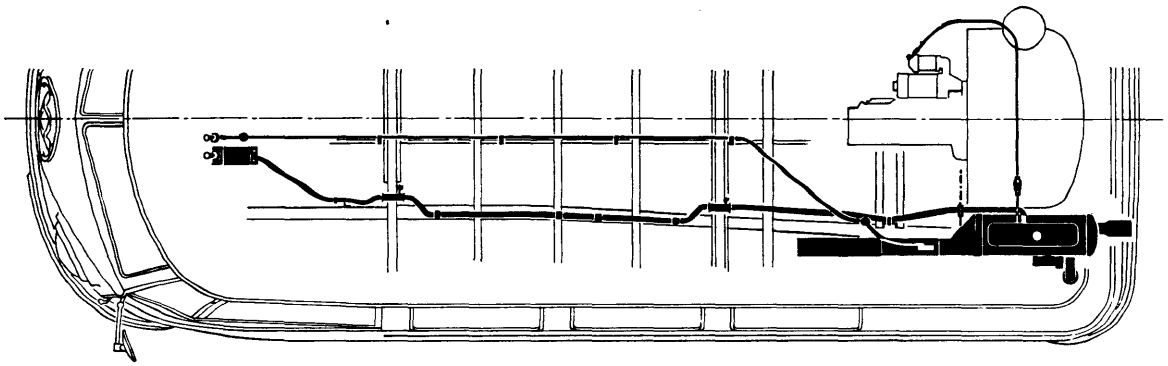


Fig. 11 b

10 - Cable routing on VW Transporter
(reinforced floor plates)

a - Drill a 14 mm hole for the switch cable and a 10 mm for the Bowden cable in the seat box from below, using the measurements in Fig. 12. Insert two grommets.

b - Insert the guide tube for the cable into the existing hole on the inside of the left side member. The tube is secured at the holes in the reinforcement plate with two pieces of hose and two clips.

The guide tube for the Bowden cable is routed alongside the accelerator cable guide tube and secured to it with pieces of hose and two hose clips (Fig. 13a).

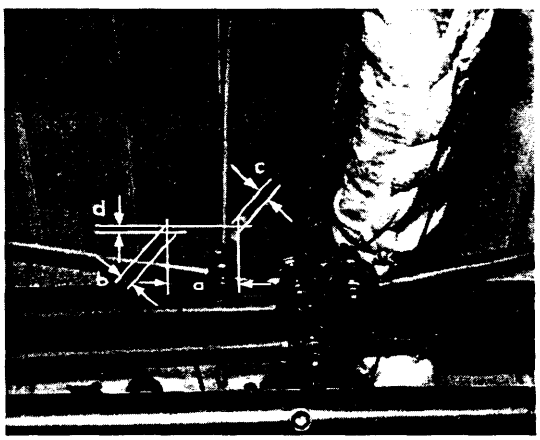


Fig. 12 a = 65 mm c = 10 mm dia.
b = 14 mm dia. d = 20 mm

The hoses should be fitted so that both tubes are tensioned longitudinally.

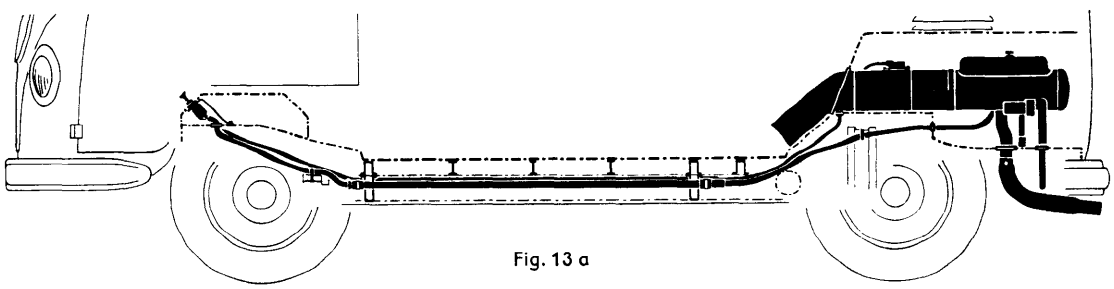


Fig. 13 a

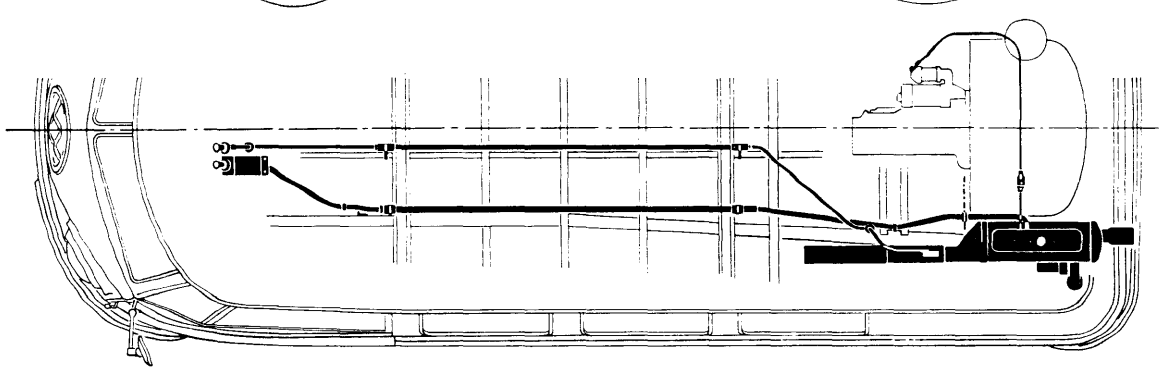
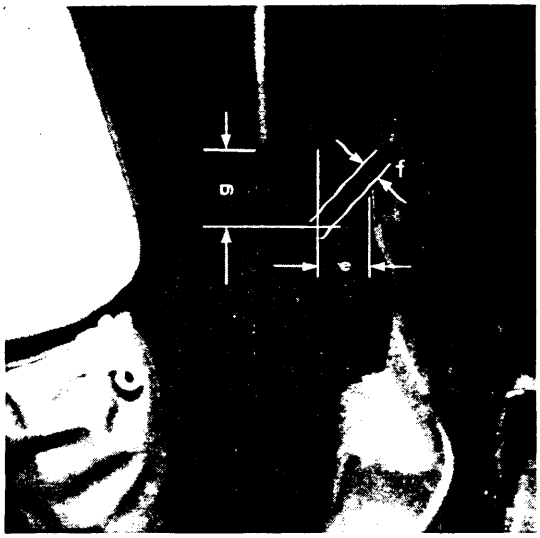


Fig. 13 b



e = 30 mm
f = 10 mm dia.
g = 50 mm

Fig. 14

c - Drill a 10 mm hole for the Bowden cable between reinforcement plate and left side member at the rear of vehicle, using the measurements given in Fig. 14. Insert the grommets supplied in kit.

d - Pull the Bowden cable and switch cable through the holes drilled in the seat box. Screw the switch and cap together and secure it to the floor of tool box with two tapping screws (Fig. 15).

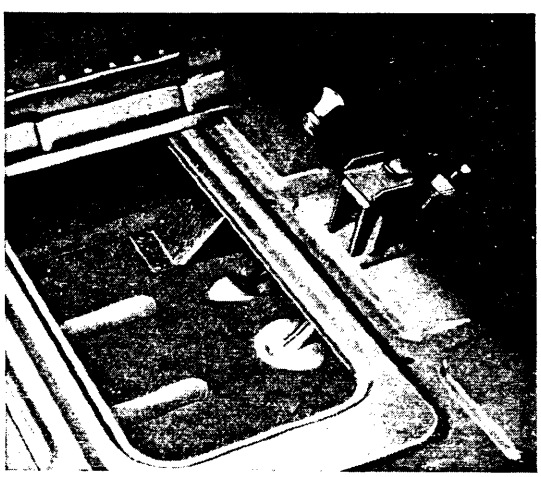


Fig. 15

e - Pass the Bowden cable through the guide tube and feed it into the engine compartment via the hole shown in Fig. 14.

Pull the switch cable through the guide tube, clip it to the upper end of the engine cross member and feed it into the engine compartment through the partition below the tank support (Figs. 13a and b).

11 - Install gasket for exhaust pipe and insert exhaust pipe and intake pipe into the openings provisionally.

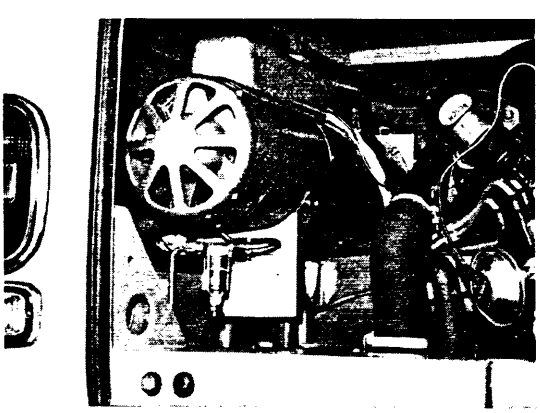


Fig. 16

Install heater and slide warm air duct into the outlet fitted in the body. Secure heater to mountings.

Install fuel filter and connect pipes (Fig. 16).

Connect Bowden cable to regulator switch on heater and connect cables as shown in wiring diagram.

12 - Secure intake and exhaust pipes. Slide exhaust elbow on to pipe and tighten clamp screw. Drill a 6.5 mm hole in the left bumper bracket level with the exhaust pipe elbow support and secure support with a hexagon head M 6×15 screw, nut and spring washer (Fig. 17).

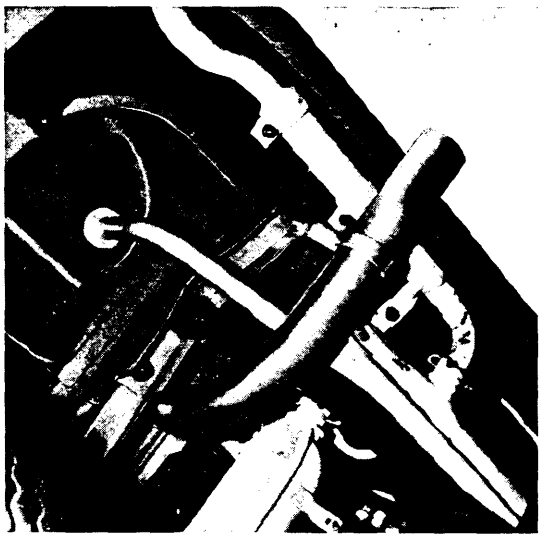


Fig. 17

13 - The positive cable is connected to the cable adaptor together with the green cable and installed on terminal 2 on the heater. From here the cable is routed behind the coil to the generator cable harness.

The cable is routed along the harness through the existing grommets to the starter where it is connected to terminal 30 (Fig. 18).

Ensure that the heater ground cable and all other electrical connections make good contact.

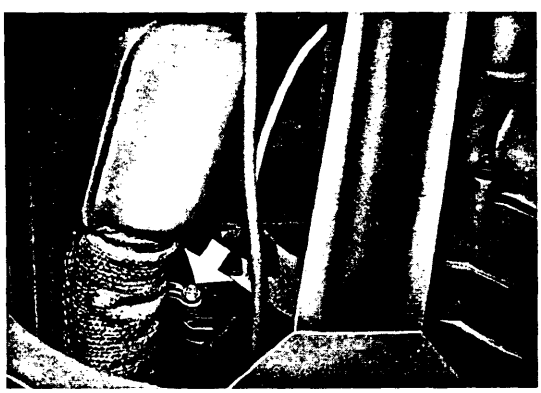


Fig. 18

14 - Open fuel hose and connect battery.

15 - Check operation of heater. If the heater has not ignited within 3—4 minutes of being switched on for the first time (empty fuel pipes), switch heater off and move the red lever of the safety switch which projects through the cover briefly forward after about 5 minutes so that the heater can be switched on again.

16 - On the Micro Bus, the slot in the kick plate under the rear seat should be extended 315 mm on the heater side (Fig. 19).

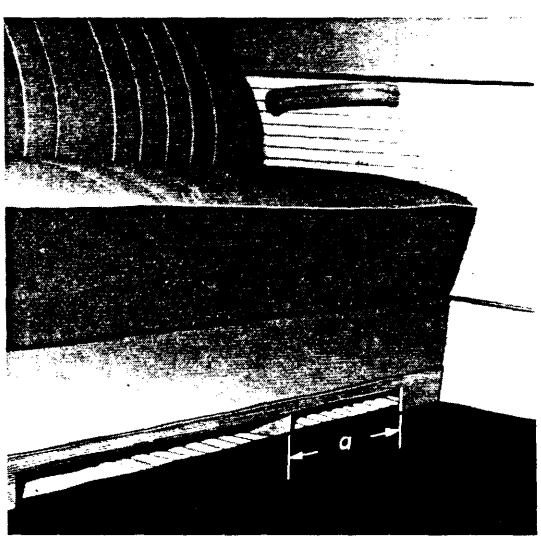


Fig. 19 a = 315 mm

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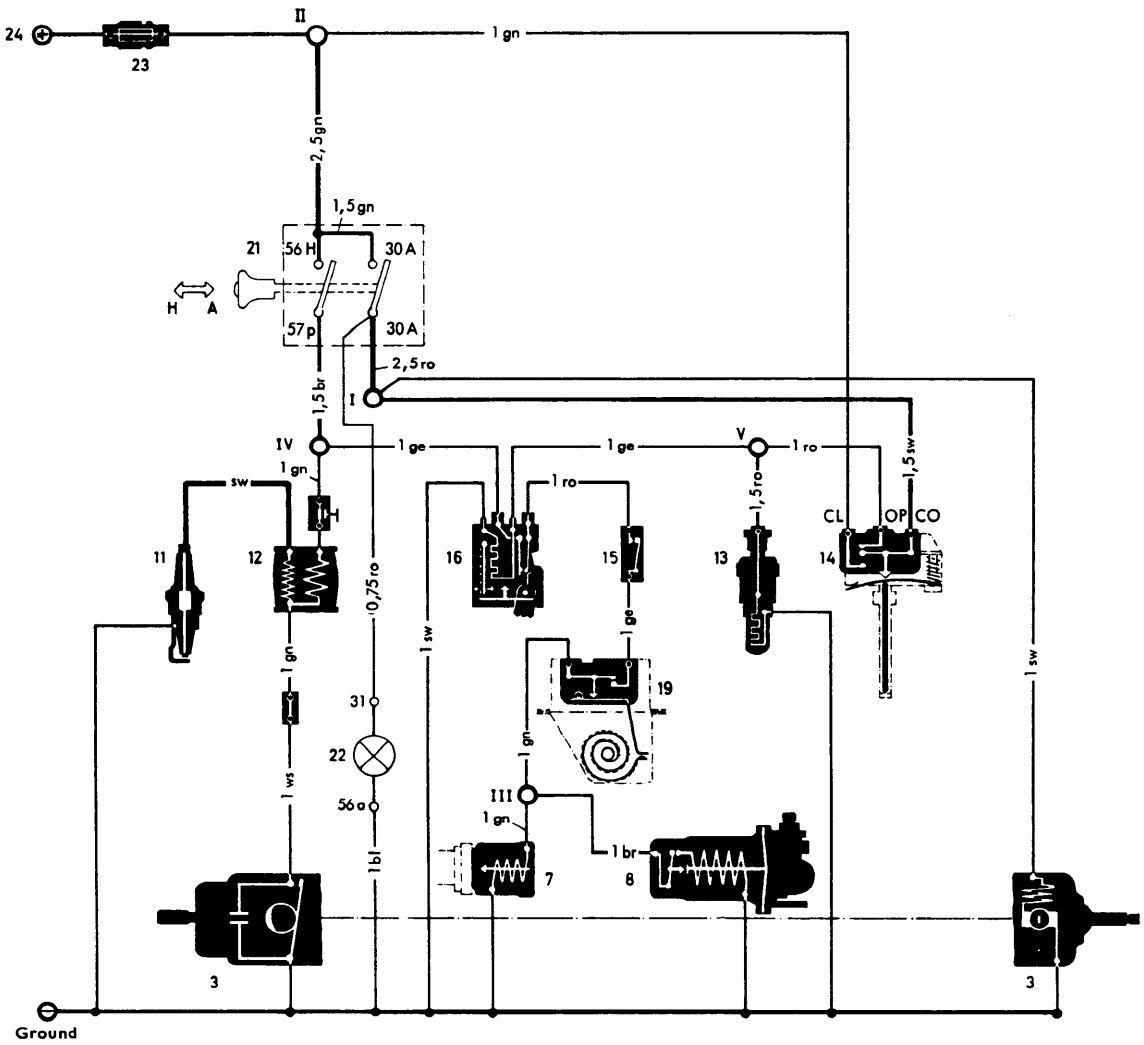
Wiring diagram



H - On A - Off

○ Terminal on terminal plate

3 - Electric motor with contacts
7 - Solenoid fuel valve
8 - Electric fuel pump
11 - Spark plug
12 - Ignition coil
13 - Heater plug
14 - Thermo-switch
cold: CO—OP
warm: CO—CL
15 - Overheating switch which opens at 180° C
16 - Safety switch
19 - Regulating switch
21 - Push-pull switch
22 - Warning lamp
23 - Fuse holder and 25 A fuse
24 - To vehicle starter (Terminal 30)

Color key

bl - blue
br - brown
ge - yellow
gn - green
ro - red
sw - black
ws - white

Type BN 4

Heater No. 20 1127 (6 Volt)
20 1176 (12 Volt)

for the VW Pick-up with Double Cab

In conjunction with
Fitting Instructions B 22/28

The installation of the above version of the BN 4 Eberspächer heater, differs from the procedure for the heater for the VW Transporter as described below.

Fitting sequence

Paras 1—4 remain unchanged.

Paras 5 + 6 are deleted and replaced by:

From the engine side, mark off and cut out the opening for warm air outlet in the engine compartment partition using template III (Fig. 20).

Remove the seat frame and the cover plate behind it so that the openings for the warm air hose and warm air outlet can be cut.

Mark off and cut out an opening in the seat frame as shown in Fig. 21. Mark off and drill holes for the screws.

Attach warm air outlet with hose adaptor (Fig. 22).

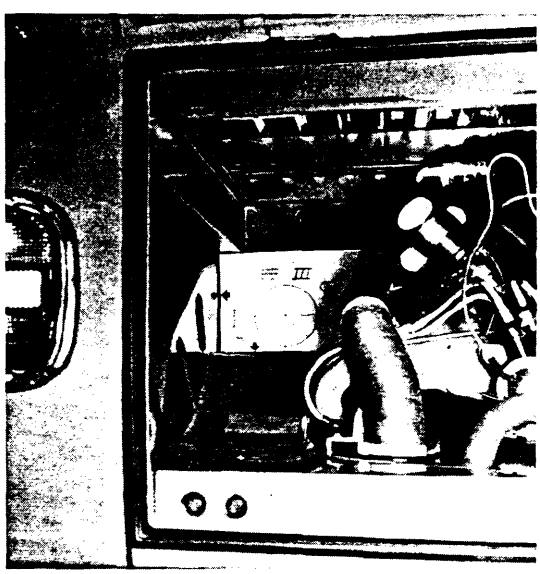


Fig. 20

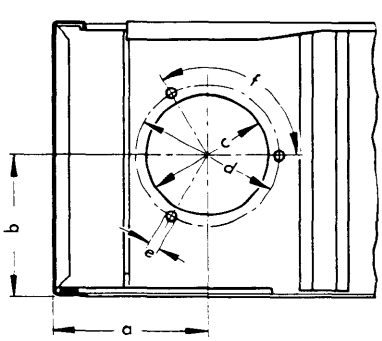


Fig. 21

a = 130 mm
b = 120 mm
c = 96 mm dia.
d = 120 mm dia.
e = 5 mm dia.
f = 3×120°

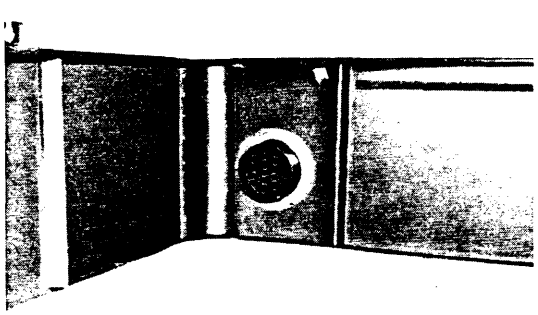
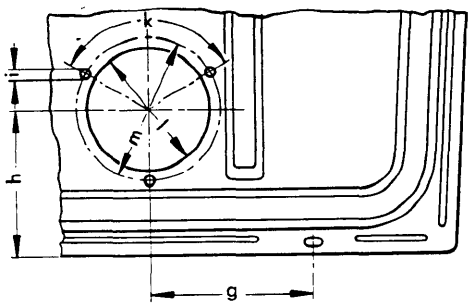


Fig. 22



g = 135 mm k = 3×120°
h = 120 mm l = 96 mm dia.
i = 5 mm dia. m = 120 mm dia.

Fig. 23

With the cover plate out, mark off and cut out the opening as shown in Fig. 23. Install the sleeve insert as in Fig. 24.

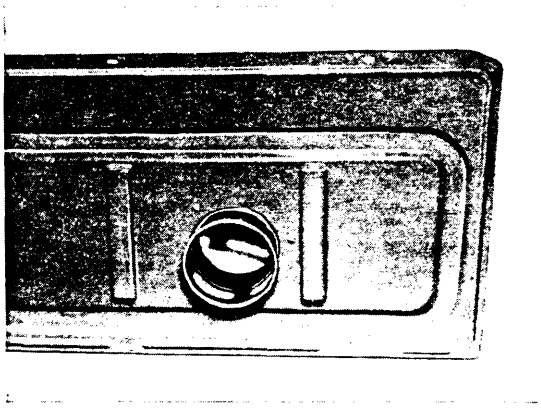
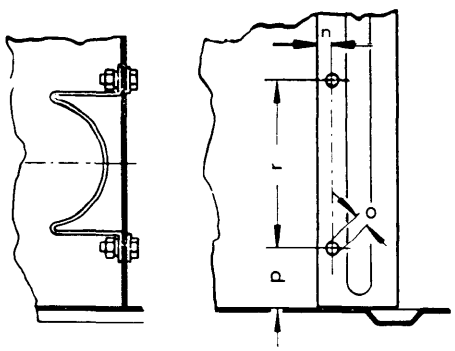


Fig. 24

Drill two 8.5 mm holes in reinforcement support (see Fig. 20) and secure bracket with two M 8×15 screws.

Paras 7—9 unchanged.

Para 10 deleted.



n = 10 mm p = 53 mm
o = 8,5 mm dia. r = 134 mm

Fig. 25

Paras 11—13 unchanged, followed by:

Slide 735 mm long warm air hose on to warm air outlet and secure hose to sleeve insert with a hose clip. Then pull hose through cover plate and install plate again.

Secure sleeve insert with three M 5 screws (Fig. 26).

Install seat frame.

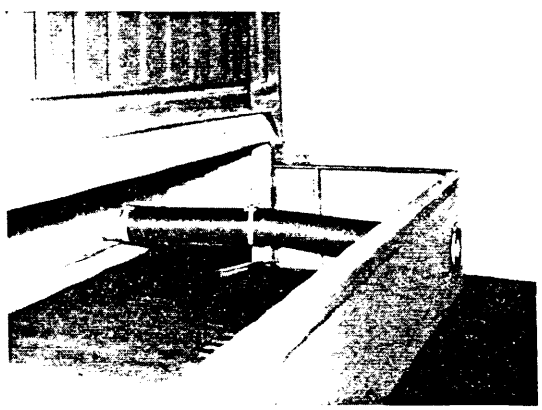


Fig. 26

Insert warm air hose (900 mm long) with pipe, secured with a hose clip into sleeve insert. Secure hose on outlet with a clip.

Paras 14 + 15 unchanged.

Para 16 deleted.

Type BN 4
Heater No. 20 1128 (6 Volt)
20 1177 (12 Volt)
for VW Ambulance

In conjunction with
Fitting Instructions B 22/28

The installation of the above version of the BN 4 heater differs from the procedure for the heater for the VW Transporter as described below.

Fitting sequence

Paras 1—4 remain unchanged and are followed by:

Take stretchers out.

Remove the screws securing the rear and side trim lining and take the lining off where it frames the linoleum covered stretcher platform (Fig. 27).

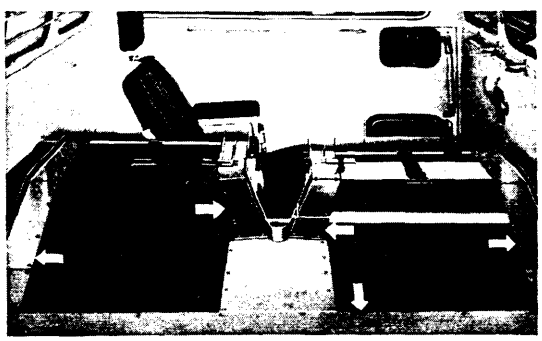


Fig. 27

Remove all the screws securing the center part of the runners and the left and right runner and take runners out (Fig. 27).

Remove screws securing the left and right retaining brackets and the lugs and take these parts out (Fig. 28).

Take sliding plate out and remove screws holding the large aluminium plate.

Lift the edges of the linoleum all round and take out platform securing screws.

Lift platform and take it out.

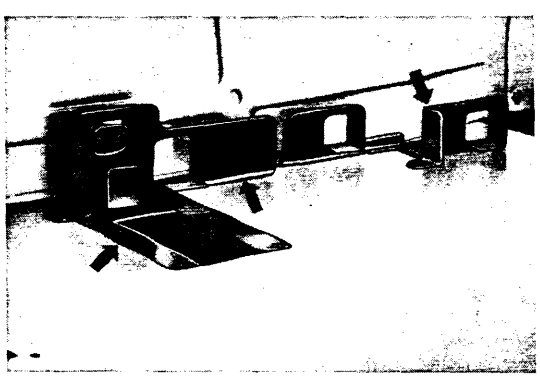


Fig. 28

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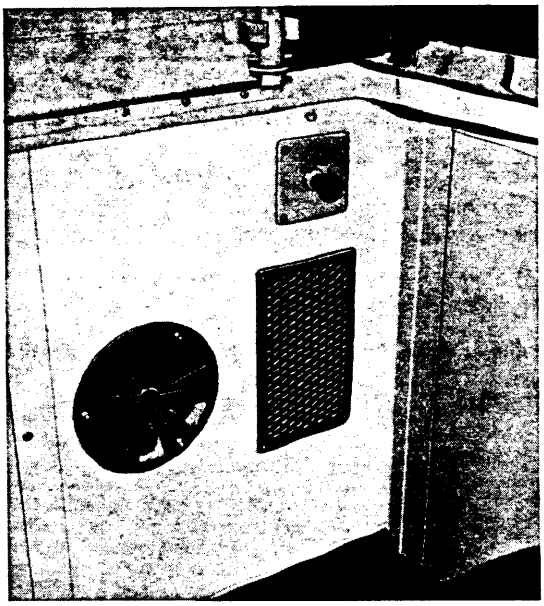

Fig. 29

Fig. 30

Para 5 unchanged.

Para 6 deleted and replaced by:

Mark off the opening for the warm air outlet on the wooden panel to the left of the center door.

Ensure that the centers of the standard heating outlets and of the Eberspächer heater are in line (Fig. 29).

Cut the opening for the warm air outlet with a pad saw.

Place outlet in the panel from the rear and secure it with wood screws.

Insert warm air elbow into the opening fitted with a grommet, from inside the vehicle. Mark off and drill a hole (3.8 mm) at top and side and secure the warm air outlet with two screws (4.8×13).

Slide connecting hose on to the adaptors on the warm air elbow and on the outlet and stick it in position (Fig. 30).

Paras 7 + 8 unchanged, followed by:

Place the grille on the opening from the front and secure it with wood screws (Fig 29). Fit the grille so that expanded metal directs the warm air downwards.

Para 9 unchanged.

Para 10 deleted.

Paras 11—15 unchanged.

Para 16 deleted, followed by:

Replace all parts removed to fit the heater.

Heater No. 20 1144
for VW 1500 and Variant

Trouble — Cause	Remedy
Heater does not ignite	
1 - Fault in electrical circuit	
Fuse blown.	Check heater, rectify fault, install new 25 Amp fuse in holder in cable.
No ground connection.	Clean contact surfaces of ground strap between battery and body (examine battery terminals).
Main cable on resistor switch incorrectly connected.	Feed cable must be connected to terminal 58.
Terminal plate contacts faulty.	Check connections and tighten.
Thermo-switch incorrectly set or defective.	Adjust thermo-switch (see note) or replace.
Motor and fuel pump circuit defective.	Check circuit and voltage.
2 - Voltage drop	
Poor ground connection.	Check ground connection from battery to vehicle frame, and between heater and body.
Battery voltage low so that heater plug does not glow properly.	Start engine to get full generator voltage. If necessary, remove and charge battery.
3 - Heater plug defective	
Heater plug coils bent.	Straighten and clean coils under 4 Volt current (2 battery cells).
Heater plug damaged.	Fit new plug (Beru 194 Grn, 20 0092 00 00 00).

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Heater does not ignite

4 - No fuel

Vacuum in tank.	Check tank breather pipe (iced up in winter).
Tank empty.	Fill tank.
Fuel feed interrupted.	Check if fuel flows from jet carrier (by removing return pipe).
Fuel feed, filter or jets blocked.	Check and clean fuel pipes, filter, fuel pump filter, fine filter in jet carrier and jets.
Fuel pump drawing in air (Pump works unevenly or too fast).	Check pipe from tank to pump for leaks, particularly at the filter and filter glass.
Fuel pump does not work (Short circuit or burnt contacts).	Check contacts, replace pump if necessary.

5 - Blower motor defective

Motor does not reach the specified speed of 4550—5400 rpm.	See "Voltage Drop" under 2. If one of the blowers is rubbing on housing it must be straightened. If motor is faulty it must be replaced.

6 - Shortage of combustion air

Radial blower loose or damaged.	Secure or replace.
Screening cap detached.	Fit new radial blower.
Combustion air pipe dirty or blocked.	Clean pipe.

Heater goes out

7 - Shortage of fuel	see "No fuel" under point 4.
Suction and return pipes badly routed.	Return pipe must not be kinked or hang down. Use new pipe 20 1144 13 01 00.
8 - Shortage of combustion air	see "Shortage of combustion air" under point 6.

9 - Exhaust back pressure too high

Exhaust pipe partially blocked.	Clean exhaust pipe.

Heater goes out

10 - Electrical circuit faulty

Overheating switch has worked and cut off current.	Check for reduced cross section in outlet duct. Check fresh air blower for short blades.

Heater does not switch off

11 - Thermo-switch incorrectly set	Adjust thermo-switch (see note).
12 - Resistor switch defective	Fit new switch.

Heater becomes sooted up and smokes

13 - Too much fuel

Overflow jet in jet carrier (0.70 mm) or return pipe blocked.	Check jet and pipe (If necessary, fit 0.75 mm jet).
Incorrect sized control and feed jets.	Try interchanging control and feed jets (0.325 mm) or fit new jets.
14 - Shortage of air	see "Blower Motor" under 5. "Shortage of Combustion Air" under 6. "Exhaust back pressure too high" under 9.
Heater smokes when used with vehicle engine switched off.	Start engine to get full generator current and note if smoke stops. If so, have battery charged up.

Heat output insufficient

15 - Insufficient fuel

Fuel pipes, filter or jets blocked.	Check and clean fuel pipes, filter, fuel pump filter and fine filter and jets in jet carrier.
Fuel pump drawing in air or delivering insufficient fuel (pump works unevenly or too fast).	Check pipe from tank to pump for leakage, particularly at the filter and filter glass.
Fuel hose leaking.	Fit new hose.
Pump diaphragm damaged.	Fit new pump.

Heat output insufficient

16 - Poor heat readiation

Combustion deposits inside heat exchanger.	Clean heat exchanger (see note).

Excessive heater plug wear

17 - Heater plug coil damaged by excessive current.	Fit new plug (Beru 194 Grn, 20 0092 00 00 00). Check if series resistance is fitted. If not, install new series resistance (20 8456 12 00 62).
18 - Heater plug remains on longer than necessary to ignite mixture.	
Thermo-switch incorrectly set or defective.	Adjust switch (see note) or replace.
Shortage of fuel.	see "No fuel" under 7.
Shortage of combustion air.	see "Shortage of combustion air" under 6.

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Heater No. 20 1144
for VW 1500 and Variant

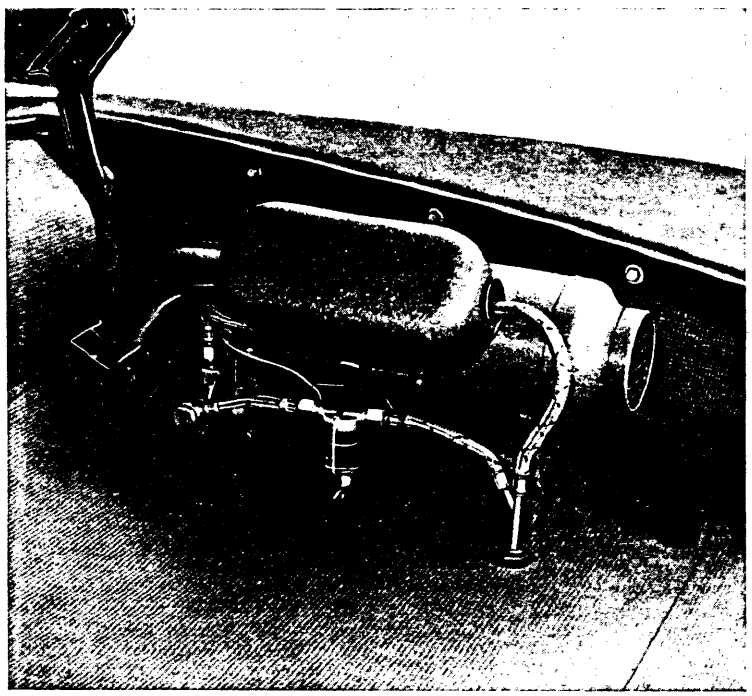

Fig. 1

Contents

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I. Work with heater installed

1 - Removal and installation of suction and return pipes

Remove suction pipe at filter.
Remove return pipe at jet carrier, **holding carrier with wrenches SW 14 and SW 12.**
Lift luggage compartment lining.
Unscrew nuts at tank end and take suction and return pipes out.
Tighten properly when installing.
Check tank breather.
Maintain uniform drop from jet carrier to tank.

2 - Removal of filter

Remove pipe from tank to pump.
Loosen wing nut and swing bracket to side.
Take glass bowl off. (Fit new glass bowl even if only slightly damaged).
Remove filter insert, clean insert and glass bowl.
Note direction of flow when installing (arrow on housing).

3 - Removal and disassembly of jet carrier (Fig. 2 and 3)

Remove pump pressure and return pipes, **holding the union with an SW 14 wrench.** Remove union nut on heat exchanger housing

Take jet carrier out and clamp in a vise.

Remove union and adaptor on the feed side.

Take adaptor out and clean it.

Separate union from adaptor.

Unscrew .325 mm jet now visible and clean it with compressed air (do not use wire).

Unscrew union adaptor on the return pipe side.

Take .70 mm jet out of adaptor and clean with compressed air (do not use wire).

Screw .325 mm injector jet out of the jet carrier and clean it with compressed air (not wire).

Do not interchange jets because the jet sizes control the fuel quantity and ensure clean, soot-free burning.

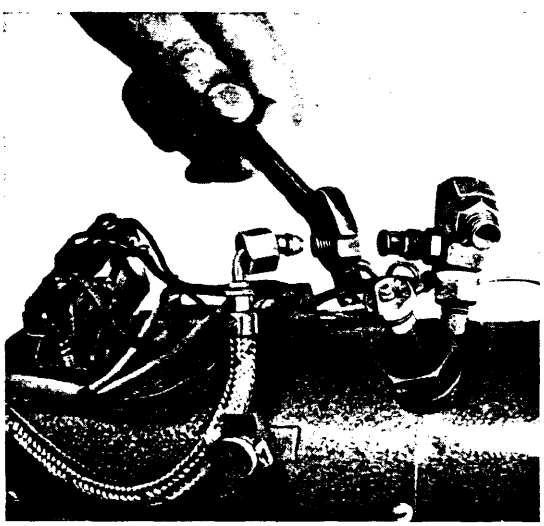

Fig. 2

4 - Removal of fuel pump (Fig. 4)

Disconnect cables and take fuel pipes off.

Loosen clamp and take pump off. Remove nut on connection screw and take cover off.

Check contacts and oil bearings and springs **lightly** if necessary.

The pump must be fitted so that the pressure union is vertical, as shown by arrow.

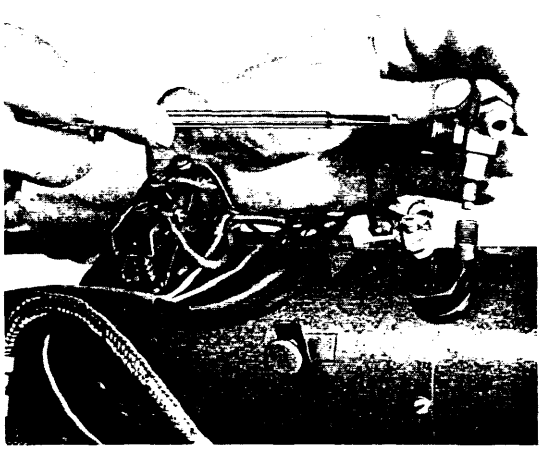

Fig. 3

The contact breaker gap to the stop (lower contact spring pressed against housing) should be 1 mm. Gap is set with adjusting screw.

Bleed the fuel system if necessary after installing pump and moisten the leaf of the pressure value with a few drops of fuel.

Fit new seals in the union nuts of the suction pipe.

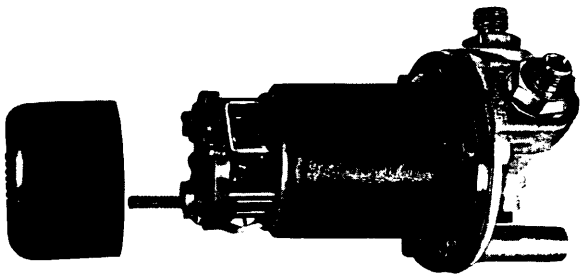

Fig. 4

5 - Removal of heater plug (Fig. 5).

Remove heater plug resistance.

Remove heater plug and clean thoroughly. If necessary straighten heater coils, using a 4 Volt current because if bent cold the wire will break (Fig. 6).

If a new plug is fitted, use only the correct type.

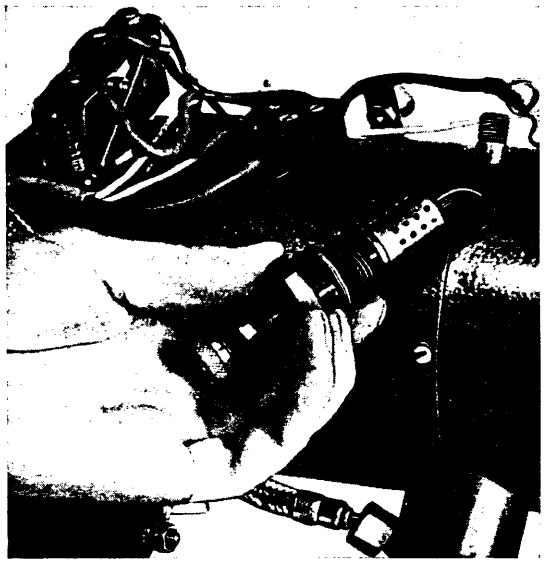

Fig. 5

6 - Removal and disassembly of thermo-switch (Fig. 7).

Disconnect cables from terminals CL, OP and CO.

Loosen union nut under the switch. Using a turning movement, lift switch out vertically without bending the feeler tube. If tight, use a suitable easing solvent.

Take adjusting screw out of nut in switch mounting (Fig. 8).

Take out pressure spring and leaf spring.

Fold adjustment mounting and micro switch over.

Slide quarz rod out of feeler tube.

When assembling the switch, ensure that the feeler tube is not bent and that the quarz rod slides easily in the feeler tube.

The adjustment mounting must turn freely in the switch mounting.

Basic adjustment of thermo-switch outside the heater:

Turn the adjusting screw in until switch operates (audible click), turn back to the switching point, then tighten 120° ($^1/_3$ of a turn) past the switching point (Fig. 9).

When installing the switch in the heater, ensure that the nut in the switch mounting does not contact the casing as otherwise the switch will not work properly.

The final adjustment is made with the heater at operating temperature.

The run-on time should be 150—210 seconds. If longer, tighten adjusting screw by turning to the right, if too short, loosen slightly by turning to the left.

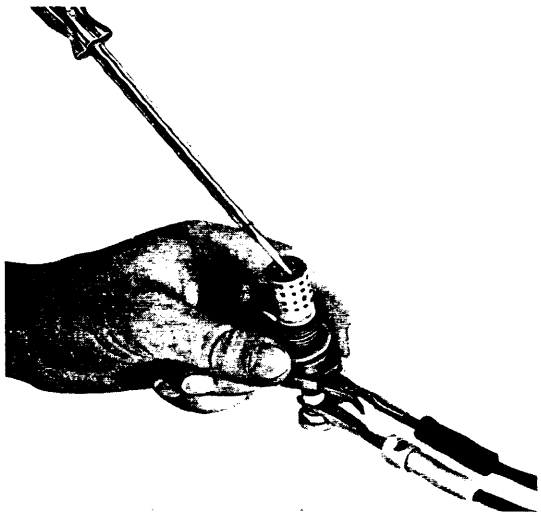

Fig. 6

7 - Removal of overheating switch

Disconnect cables. Remove tapping screws and take switch off.

The switch contacts must be closed when the heater is operating normally and should interrupt the supply of current to the fuel pump at a temperature of 125—180° C.

The switch is set by the manufacturer and the spring must not be bent. Replace the switch if it does not work properly.

8 - Removal and installation of resistor switch (Fig. 11).

Screw cap off switch plate.

Disconnect cables.

Take switch plate off tube.

Take switch off plate by loosening nut.

Install in reverse order.

Connect cables as shown in wiring diagram.

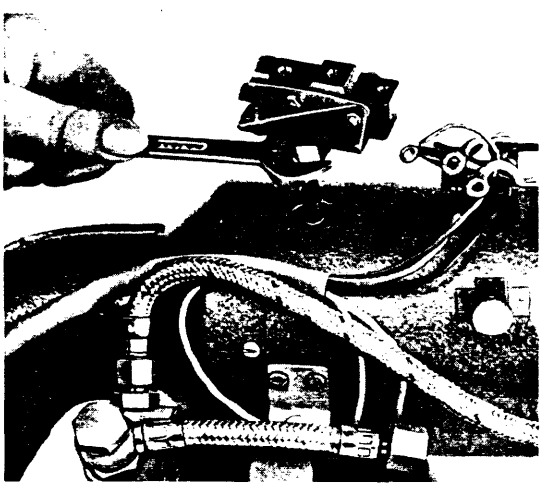

Fig. 7

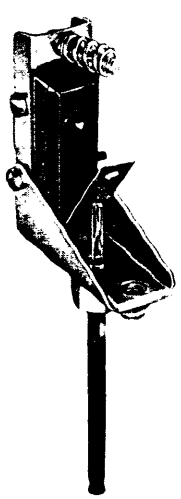

Fig. 8

Fig. 9

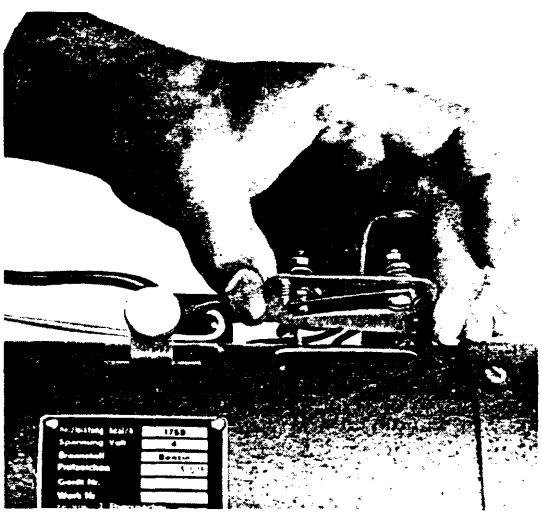

Fig. 10

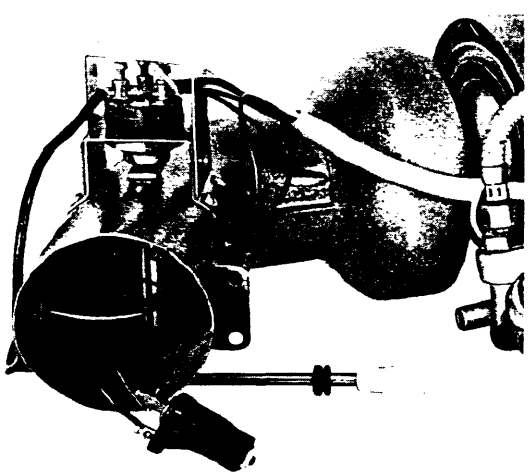

Fig. 11

9 - Removal and installation of operating rod

Screw knob off rod.
Remove cotter pin from rod.
Take rod off lever complete with washer and spring.
Install in reverse order. Do not forget the grommet in the partition.

10 - Removal and installation of warning lamp

Loosen cap nut on warm air outlet.
Remove retaining screw red warning lamp glass from air outlet.
Take outlet off with warning lamp and disconnect two cables.
Install in reverse order.

II. Removal and installation of heater

Take 25 Amp. fuse out of holder (Fig. 12).

Loosen cap nut on air outlet.

Screw warning lamp out of air outlet.

Take knob off operating rod.

Take cap off heater.

Disconnect fuel suction pipe at filter.

Disconnect return pipe from jet carrier, **using SW 14 wrench to hold union.**

Pull return pipe out of cap and take cap off completely.

Loosen two M 6 nuts in bonded rubber mountings.

Take air hose off combustion air pipe and heater.

Take heater out of warm air outlet and exhaust pipe seals.

Installation takes place in the reverse order.

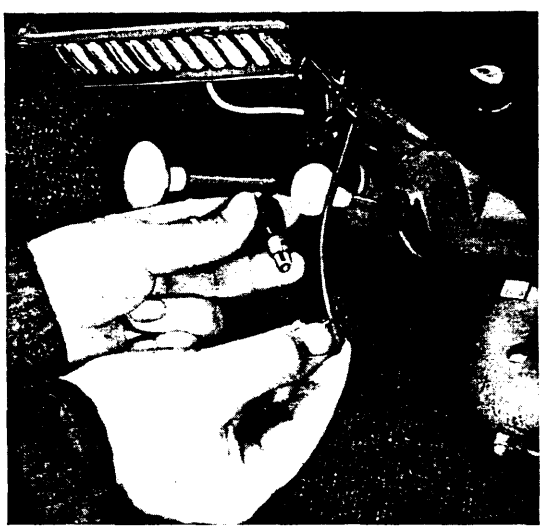

Fig. 12

Important:

All openings must be fitted with grommets or seals. Pay particular attention to the condition of the exhaust pipe seal and replace if the slightest damage is apparent.

Clean all paint and rust from ground strap securing surfaces to ensure a good electrical contact.

Position fuel suction and return pipes carefully. The return pipe in particular must not be pulled or squeezed and must be routed without bend or sag.

III. Work with heater removed from vehicle

1 - Dismantling heater

Remove heater plug after taking off the resistance.
Remove fuel pressure pipe, holding union with a SW 14 wrench.
Loosen union nut and take jet carrier out of heater.

Disconnect electrical cables.

a - at the cable connector

b - at the thermo-switch

c - at the overheating switch

d - at the fuel pump

Remove thermo-switch by loosening the union nut under the switch mounting and pulling the switch out of the heat exchanger with a turning movement. Take care not to bend the feeler tube. If very tight use easing oil.

Remove overheating switch.

Remove fuel pump after loosening clamp.

Remove air inlet cap (Fig. 13).

Remove warn air outlet with control switch.

Remove the four screws at the joint between front and rear parts of casing.

Pull front casing half over combustion air blower, withdrawing the blower cable through the grommet in the casing (Fig. 14).

Loosen the three screws in the combustion air blower slightly and take blower out of heat exchanger (Fig. 15).

When installing the blower, seal the joint between blower and heat exchanger with Teroson-Atmosit.

Take the heat exchanger out of the rear casing half taking care not do damage the threaded sleeve for the thermo-switch (Fig. 16).

If the heat exchanger is very dirty, burn it out with a gentle welding flame and blow out with compressed air.

Assembly takes place in the reverse order.

Connect electrical cables according to wiring diagram.

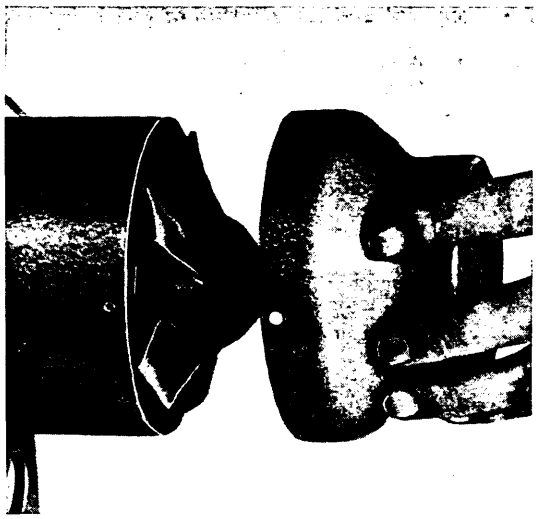

Fig. 13

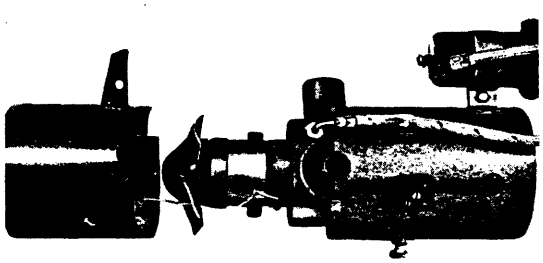

Fig. 14

2 - **Dismantling combustion air blower** (Fig. 17).

Take the axial blower off the motor shaft by screwing a screw into the centering hole in the wheel.

Remove guide blade housing after taking out the securing screws and taking ground strap off motor.

Check radial blower for damage and replace if necessary.

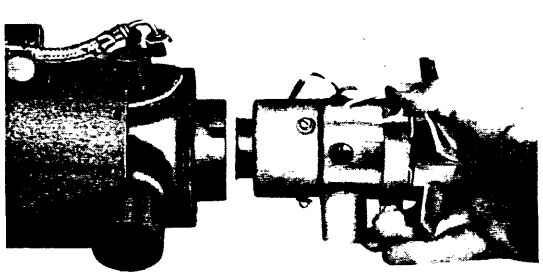

Fig. 15

Loosen the stud through the hole in the motor locating housing and then lever the radial wheel off the motor shaft with two screwdrivers.

Loosen clamp and take motor housing off motor.

When installing in the reverse order, ensure that the rubber band which seals the motor and motor locating housing does not extend into the combustion air intake adaptor as otherwise the air intake will be restricted. The distance from radial wheel to motor locating housing must be 1.5 mm.

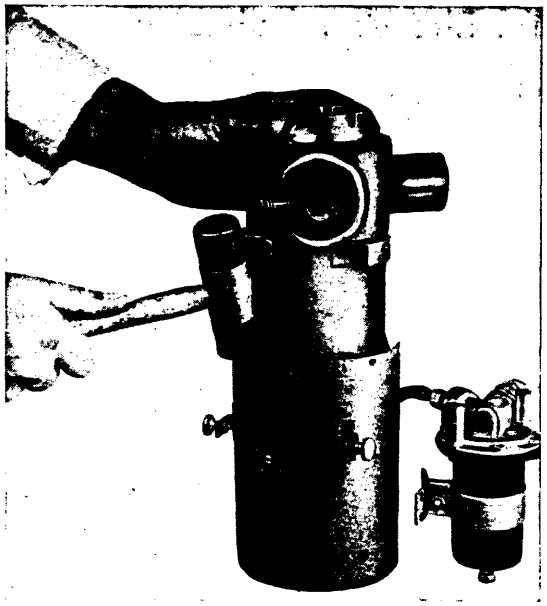

Fig. 16

3 - Removal of warm air outlet with resistor switch (Fig. 18)

Disconnect cables from connector, thermo-switch and overheating switch.

Loosen screws and take outlet off rear part of casing.

Take protection cap off switch plate.

Disconnect switch cables.

Take switch plate off elbow.

Take resistor switch off switch plate

Pull cotter pin out of operating rod and remove rod with washer and spring When installing, do not forget grommet in hole.

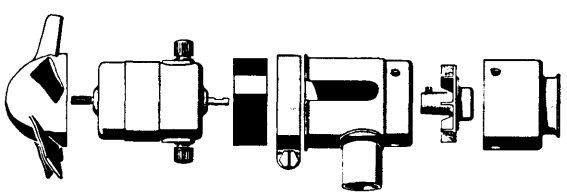

Fig. 17

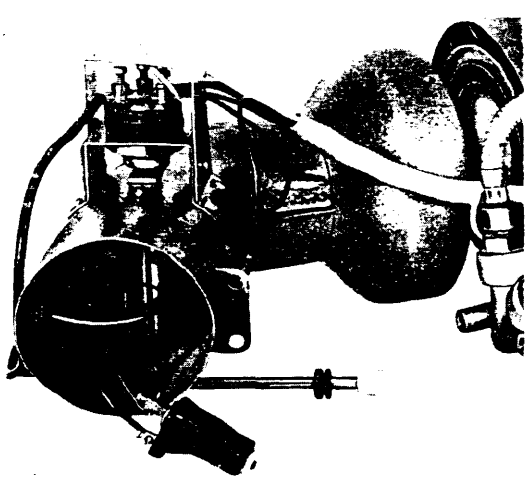

Fig. 18

IV. Checking the heater

Every time the heater has been dismantled or when parts have been replaced, the heater should be given a trial run to check all the adjustments specified by the makers to ensure satisfactory operation as well as heater and vehicle safety.

1 - Checking heater when out of vehicle

Set the heater up horizontally as it is installed in the vehicle.

The exhaust gases must not be obstructed in any way and the exhaust pipe must not be extended. Install the air hose on the combustion air intake adaptor.

Connect a fuel pipe of the same length as the original pipe to the filter.

Connect a return fuel pipe, preferably a hose, to the threaded adaptor of the jet carrier. The cross section of this pipe must under no circumstances be smaller than the proper pipe used in the vehicle. It must be routed perfectly straight, without bends or kinks, to a container which collects the fuel overflow. The end of the pipe must not be immersed in the fuel but must be above the fuel level so that there is no back pressure which would cause an increased delivery of fuel and sooty burning.

Connect electrical cables.

The test voltage is 5.8 Volts.

Switch heater on.

A 100 cc measuring container with suitable markings should be used for the fuel consumption test. The fuel suction pipe should be placed in a suitable container and also the return pipe, noting the above instructions.

When the ignition period is ended (Thermo-switch switches off the current to the heater plug) the test begins.

The consumption should be 0.22—0.27 liters/hour, or 15 cc in 225—200 seconds.

Note soot formation during the consumption test and then for a further 3 minutes.

Check that the pressure pipe of the fuel pump is vertical to the installation surface. Check all cables and screws for security.

Check the operating point of the overheating switch (125—180° C) by partially blocking the air inlet (about $^2/_3$ of intake opening).

If the heater smokes badly, check the blower speed. It should be 4550—5400 rpm at 6 Volts.

The run-on at 6 Volts should be 150—200 seconds, otherwise the thermo-switch setting must be rectified.

2 - Checking with heater installed

If the heater is to work properly when installed even though it has been checked thoroughly beforehand it must be installed in accordance with the makers instructions.

Do not alter exhaust pipe and combustion air intake.

Check routing of fuel suction and return pipes.

Prevent poor ground connections (voltage drop) by cleaning paint and rust from ground strap contact surfaces.

Check wiring with diagram.

Connect the heater KL 30 (continuous positive) to the vehicle fuse box in front of 8 Amp. fuse.

Check condition of vehicle battery and change if necessary.

Switch heater on and check operation of heater plug.

If the battery is discharged, start the engine and put heater into operation again when red charging lamp goes out.

Check heater run-on and rectify thermo-switch setting if necessary.

3 - Technical data for Heater No. 20 1144

Test voltage	5.8 Volts
Fuel consumption	15 cc/225—200 seconds
or	0.22—0.27 liter/hour
Safety switch cut out temperature	125—180° C
Blower speed at 6 Volts	4550—5400 rpm
Heater run-on at 6 Volts	150—200 seconds

V. Repair times for the VW 1500/Variant

Heater No. 20 1144

I. 1 -	Remove and install fuel suction and return pipes	15 min.
2 -	Remove filter	5 min.
3 -	Remove and strip jet carrier	15 min.
4 -	a) Replace fuel pump	15 min.
	b) Adjust pump contacts	25 min.
5 -	Replace or clean heater plug	5 min.
6 -	a) Remove and strip thermo-switch	20 min.
	b) Adjust thermo-switch	10 min.
7 -	Remove overheating switch	10 min.
8 -	Remove and install resistor switch	25 min.
9 -	Remove and install operating rod	10 min.
10 -	Replace warning lamp	20 min.
11 -	Replace inlet cowl	10 min.
12 -	Replace air outlet	15 min.
13 -	Replace exhaust pipe	15 min.
14 -	Replace combustion air pipe	10 min.
15 -	Replace axial blower	15 min.
II.	**Remove and install**	60 min.
III. 1 -	a) Replace heat exchanger	80 min. + operation II
	b) Replace front casing	20 min. + operation II
	c) Replace rear casing	45 min. + operation II
	d) Replace complete casing	70 min. + operation II
2 -	a) Replace combustion air blower	30 min. + operation II
	b) Replace radial blower	40 min. + operation II
	c) Replace motor	45 min. + operation II
	d) Replace carbon brushes	35 min. + operation II
3 -	Replace outlet with resistor switch	15 min. + operation II
IV.	**Check heater**	20 min.

Heater No. 20 1144 (6 Volt)
20 1188 (12 Volt)
for VW 1500 and Squareback Sedan

Heater No. 20 1181 (6 Volt)
20 1190 (12 Volt)
for VW 1200

Trouble	Cause	Remedy
Heater does not ignite	1 - Fault in electrical circuit Fuse blown.	Check heater, rectify fault, install new 25 Amp. fuse in holder in cable.
	No ground connection.	Clean contact surfaces of ground strap between battery and body (examine battery terminals).
	Main cable on switch incorrectly connected.	Feed cable must be connected to terminal 56.
	Terminal plate contacts faulty.	Check connections and tighten.
	Thermo-switch incorrectly set or defective.	Adjust thermo-switch (see note) or replace.
	Motor and fuel pump circuit defective.	Check circuit and voltage.
	2 - Voltage drop Poor ground connection.	Check ground connection from battery to vehicle frame, and between heater and body.
	Battery voltage low so that heater plug does not glow properly.	Start engine to get full generator voltage. If necessary, remove and charge battery.
	3 - Heater plug defective Heater plug coils bent.	Straighten and clean coils under 4 Volt current (2 battery cells).
	Heater plug damaged.	Fit new plug (Beru 194 Grn).
	4 - No fuel Vacuum in tank.	Check tank breather pipe (iced up in winter).
	Tank empty.	Fill tank.
	Fuel feed interrupted.	Check if fuel flows from jet carrier (by removing return pipe).

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Trouble	Cause	Remedy
Heater does not ignite	Fuel feed, filter or jets blocked.	Check and clean, fuel pipes, fine filter in jet carrier and jets.
	Fuel pump drawing in air (Pump works unevenly or too fast).	Check pipe from tank to pump for leaks, particularly at the filter and filter glass.
	Fuel pump does not work (Short circuit or burnt contacts).	Check contacts, replace pump if necessary.
	5 - Blower motor defective	
	Motor does not reach the specified speed of 4550—5400 rpm.	See "Voltage Drop" under 2.
	One of the blowers rubbing on housing.	Straighten.
	Motor defective.	Motor must be replaced.
	6 - Shortage of combustion air Radial blower loose or damaged.	Secure or replace.
	Screening cap detached.	Fit new radial blower.
	Combustion air pipe dirty or blocked.	Clean pipe.
Heater goes out	7 - Shortage of fuel	See "No fuel" under point 4.
	Suction and return pipes badly routed.	Return pipe must not be kinked or hang down.
	8 - Shortage of combustion air.	See "Shortage of combustion air" under point 6.
	9 - Exhaust back pressure too high. Exhaust pipe partially blocked.	Clean exhaust pipe.
	10 - Electrical circuit faulty Overheating switch has worked and cut off current.	Check for reduced cross section in outlet duct. Check fresh air blower for short blades. Blower must be replaced even if only slightly damaged.
Heater does not switch off	11 - Thermo-switch incorrectly set	Adjust thermo-switch (see repair instructions).
	12 - Switch defective	Fit new switch.

Trouble	Cause	Remedy
Heater becomes sooted up and smokes	13 - Too much fuel. Overflow jet in jet carrier or return pipe blocked.	Check jet and pipe and clear with compressed air.
	Incorrect sized control and feed jets	Fit new jet (0.325 mm).
	14 - Shortage of air	see "Blower Motor" under 5. "Shortage of Combustion" Air under 6. "Exhaust back pressure too high" under 9.
	Heater smokes when used with vehicle engine switched off.	Start engine to get full generator current and note if smoke stops. If so, have battery charged up.
Heat output insufficient	15 - Insufficient fuel Fuel pipes, filter or jets blocked.	Check and clean fuel pipes, filter, fuel pump filter and fine filter and jets in jet carrier.
	Fuel pump drawing in air or delivering insufficient fuel (pump works unevenly or too fast).	Check pipe from tank to pump for leakage, particularly at the filter and filter glass.
	Fuel hose leaking.	Fit new hose.
	Pump diaphragm damaged.	Fit new pump.
	16 - Poor heat radiation Combustion deposits inside heat exchanger.	Clean heat exchanger (see repair instructions).
Excessive heater plug wear	17 - Heater plug coil damaged by excessive current.	Fit new plug (Beru 194). Check if series resistance is fitted. If not, install new series resistance.
	18 - Heater plug remains on longer than necessary to ignite mixture.	
	Thermo-switch incorrectly set or defective.	Adjust switch (see repair instructions) or replace.
	Shortage of fuel.	See "No fuel" under 7.
	Shortage of combustion air.	See "Shortage of combustion air" under 6.

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Heater No. 20 1144 (6 volt)
20 1148 (12 volt)

for Type 3 (except Model 34) up to October 1964

Heater No. 20 1181 (6 volt)
20 1190 (12 volt)

for Type 1 (except Model 14) up to August 1966

Heater No. 20 1245 (6 volt)
20 1246 (12 volt)

for Type 1 (except Model 14) from August 1966

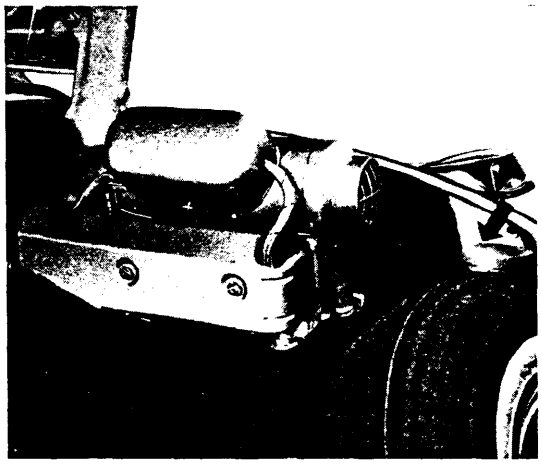

Fig. 1

Contents

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I. Work with heater installed

1 - Removal and installation of suction and return pipes

Remove suction pipe at filter.

Remove return pipe at jet carrier, holding carrier with 14 mm and 12 mm wrenches.

Lift luggage compartment lining.

Unscrew nuts at tank end and take suction and return pipes out.

Install in reverse order and check tank connection for leakage.

Check tank breather.

2 - Removal of filter

Remove pipe from tank to pump.

Loosen wing nut. Take glass bowl off. (Fit new glass bowl even if only slightly damaged.)

Remove filter insert, clean insert and glass bowl.

Note direction of flow when installing (arrow on housing).

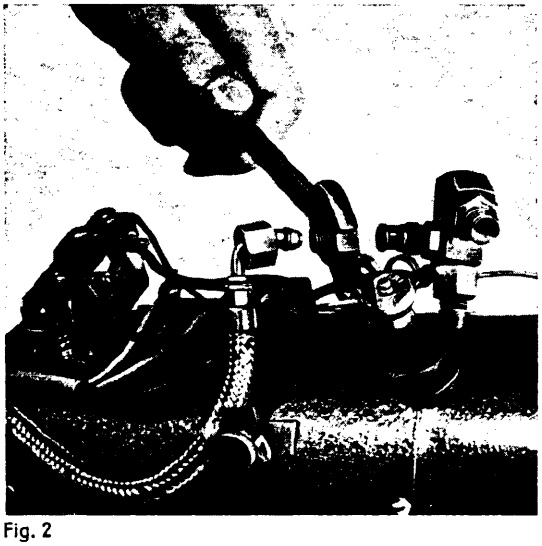

Fig. 2

3 - Removal and disassembly of jet carrier
(Fig. 2 and 3)

Remove pump pressure and return pipes, holding the union with a 14 mm wrench. Remove union nut on heat exchanger housing.

Take jet carrier out and clamp in a vise.

Remove union and adaptor on the feed side.

Take adaptor out and clean it.

Separate union from adaptor.

Unscrew metering jet (0.325 mm) now visible and clean it with compressed air (do not use wire).

Unscrew union adaptor on the return pipe side.

Take overflow jet (0.75 mm) out of adaptor and clean with compressed air (do not use wire).

Screw feed jet (0.325 mm) out of the jet carrier and clean it with compressed air (not wire).

Do not interchange jets because the jet sizes control the fuel quantity and ensure clean, soot-free burning.

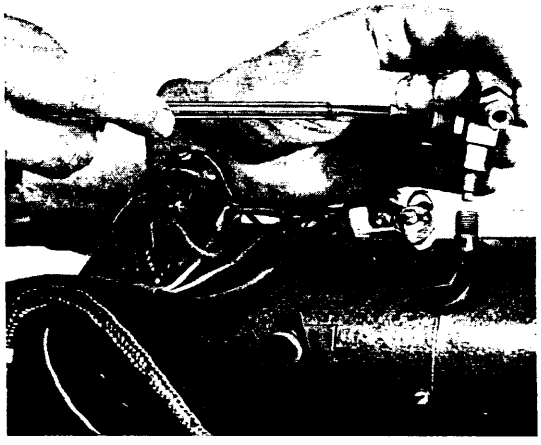

Fig. 3

Heater No. 20 1144 (6 Volt)
20 1148 (12 Volt)
for VW 1500 and Variant

Heater No. 20 1181 (6 Volt)
20 1190 (12 Volt)
for VW 1200

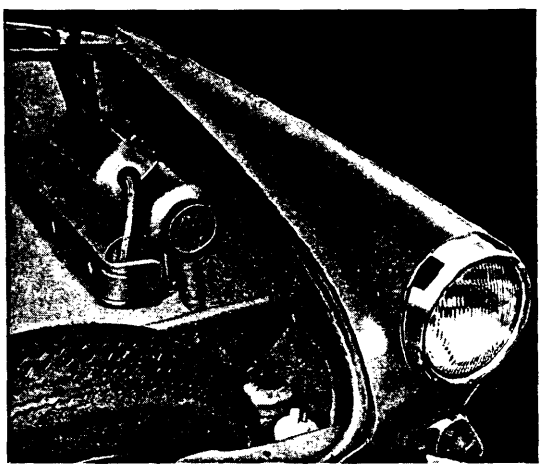

Fig. 1 a

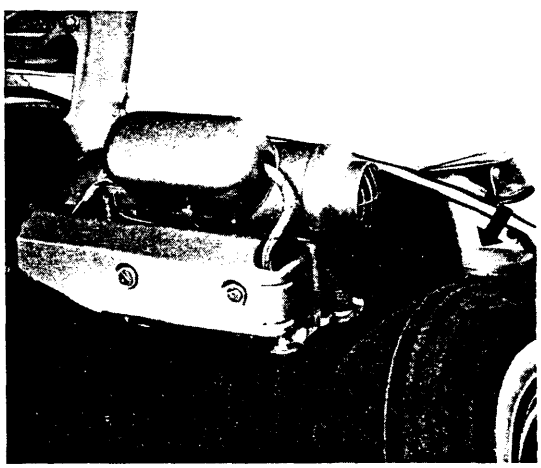

Fig. 1 b

Contents

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I. Work with heater installed

1 - Removal and installation of suction and return pipes

Remove suction pipe at filter.

Remove return pipe at jet carrier, holding carrier with 14 mm and 12 mm wrenches.

Lift luggage compartment lining.

Unscrew nuts at tank end and take suction and return pipes out.

Install in reverse order and check tank connection for leakage.

Check tank breather.

2 - Removal of filter

Remove pipe from tank to pump.

Loosen wing nut. Take glass bowl off. (Fit new glass bowl even if only slightly damaged).

Remove filter insert, clean insert and glass bowl.

Note direction of flow when installing (arrow on housing).

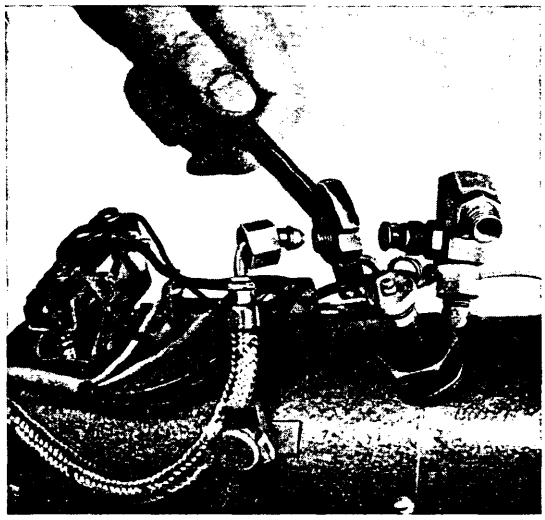

Fig. 2

3 - Removal and disassembly of jet carrier (Fig. 2 and 3)

Remove pump pressure and return pipes, holding the union with a 14 mm wrench Remove union nut on heat exchanger housing.

Take jet carrier out and clamp in a vise.

Remove union and adaptor on the feed side.

Take adaptor out and clean it.

Separate union from adaptor.

Unscrew jet (0.325 mm) now visible and clean it with compressed air (do not use wire).

Unscrew union adaptor on the return pipe side.

Take return jet (0.75 mm) out of adaptor and clean with compressed air (do not use wire).

Screw injector jet (0.325 mm) out of the jet carrier and clean it with compressed air (not wire).

Do not interchange jets because the jet sizes control the fuel quantity and ensure clean, soot-free burning.

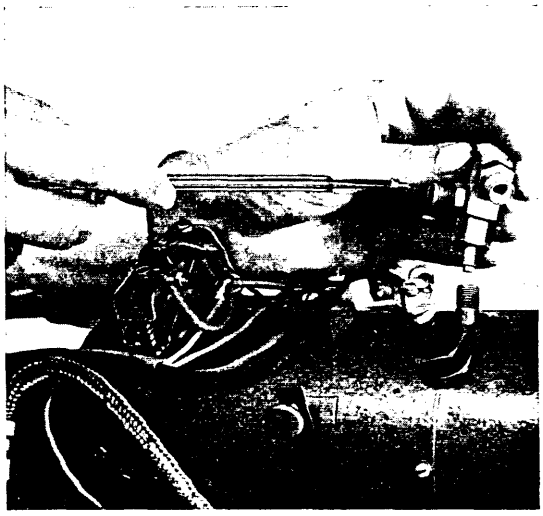

Fig. 3

4 - Removal of fuel pump (Fig. 4)

Disconnect cable and take fuel pipes off.

Loosen clamp and take pump off. Remove nut on connection screw and take cover off.

Check contacts and oil bearings and springs lightly if necessary.

The pump must be fitted so that the pressure union is vertical. The suction and pressure sides of the pump are shown by the arrows.

The contact breaker gap should be 1 mm. Gap is set with adjusting screw and moving point pressed against housing.

Bleed the fuel system if necessary after installing pump and moisten the leaf of the pressure valve in the union with a few drops of fuel.

Fit new seals in the union nuts of the suction pipe.

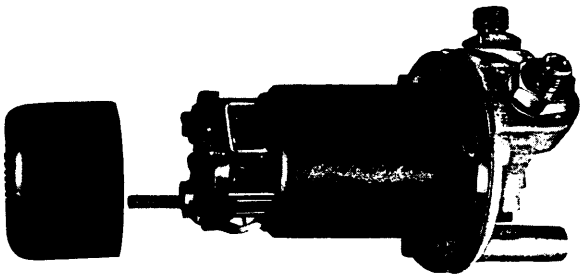

Fig. 4

5 - Removal of heater plug (Fig. 5).

Remove heater plug resistance.

Remove heater plug and clean thoroughly. If necessary straighten heater coils, using a 4 Volt current because if bent cold the wire will break (Fig. 6).

If a new plug is fitted, use only the correct type.

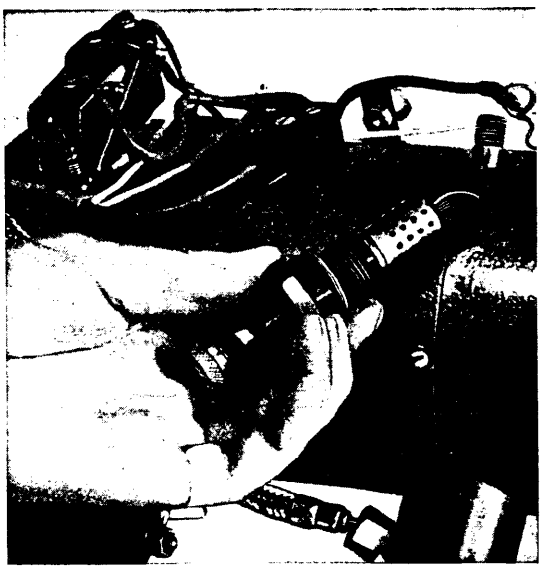

Fig. 5

6 - Removal and disassembly of thermo-switch (Fig. 7).

Disconnect cables from terminals NC, NO and C. Loosen union nut under the switch. Using a turning movement, lift switch out vertically without bending the feeler tube. If tight, use a suitable easing solvent.

Take adjusting screw out of nut in switch mounting.

Take out pressure spring and leaf spring.

Fold adjustment mounting and micro switch over. (Fig. 8).

Slide quartz rod out of feeler tube.

When assembling the switch, ensure that the feeler tube is not bent and that the quartz rod slides easily in the feeler tube.

The adjustment mounting must turn freely in the switch mounting.

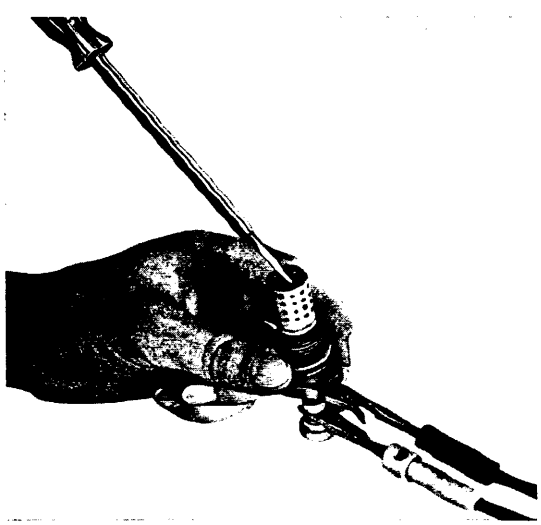

Fig. 6

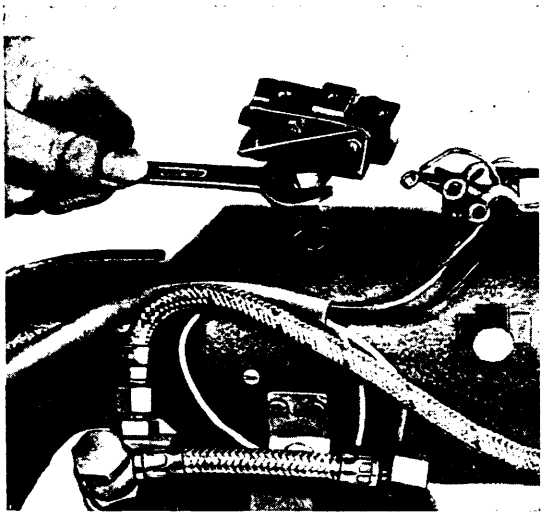

Fig. 7

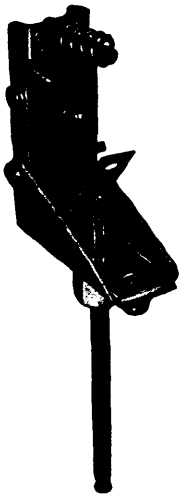

Fig. 8

Fig. 9

Basic adjustment of thermo-switch outside the heater:

Turn the adjusting screw in until switch operates (audible click), turn back to the switching point, then tighten 120° (1/3 of a turn) past the switching point (Fig. 9).

When installing the switch in the heater, ensure that the nut in the switch mounting does not contact the casing as otherwise the switch will not work properly.

The final adjustment is made with the heater at operating temperature.

The run-on time should be 150—210 seconds. If longer, tighten adjusting screw by turning to the right, if too short, loosen slightly by turning to the left.

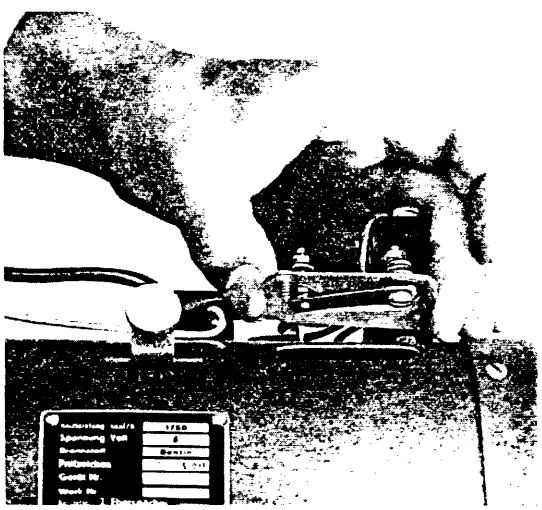

Fig. 10

7 - Removal of overheating switch (Fig. 10)

Disconnect cables.

Remove tapping screws and take switch off.

The switch contacts must be closed when the heater is operating normally and should interrupt the supply of current to the fuel pump at a temperature of 125—180° C.

The switch must not be bent. Replace the switch if it does not work properly.

8 - Removal and installation of resistor switch (Fig. 11).

Screw cap off switch plate.

Disconnect cables.

Take switch plate off tube.

Take switch off plate by loosening nut.

Install in reverse order.

Connect cables as shown in wiring diagram.

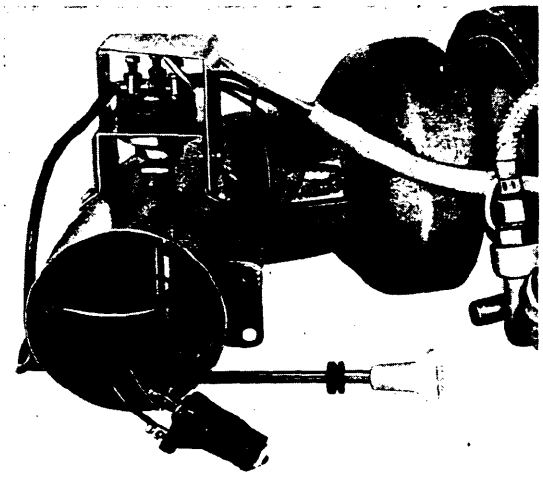

Fig. 11

9 - Removal and installation of operating rod

Screw knob off rod.

Remove cotter pin from rod.

Take rod off lever complete with washer and spring.
Install in reverse order. Do not forget the grommet in the partition.

10 - Removal and installation of warning lamp

Loosen cap nut on warm air outlet.

Remove retaining screw red warning lamp glass from air outlet.

Take outlet off with warning lamp and disconnect two cables.

Install in reverse order.

II. Removal and installation of heater

Take 25 Amp. fuse out of holder (Fig. 12a and 12b).

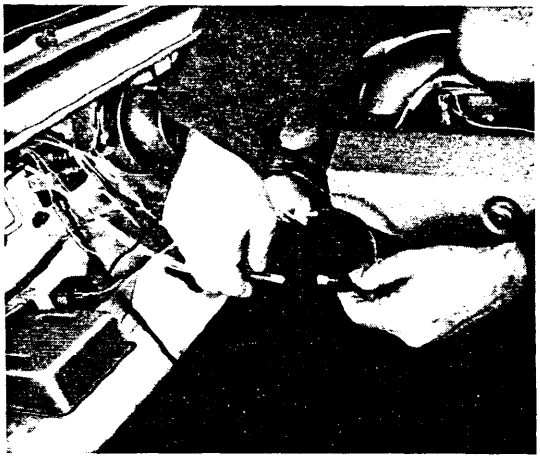

Fig. 12 a

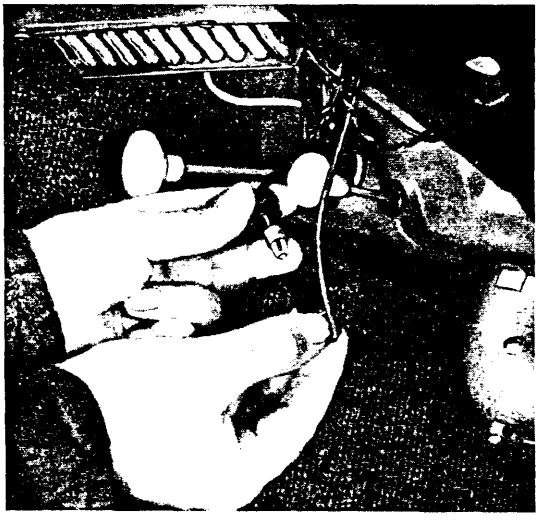

Fig. 12 b

Loosen cap nut on air outlet.

Screw warning lamp out of air outlet.

Take knob off operating rod.

Take cap off heater.

Disconnect fuel suction pipe at filter.

Disconnect return pipe from jet carrier, using a 14 mm wrench to hold union.

Pull return pipe out of cap and take cap off completely.

Loosen two M 6 nuts in bonded rubber mountings.

Take air hose off combustion air pipe and heater.

Loosen screw in exhaust pipe adaptor.

Take heater out of warm air outlet and exhaust pipe seals.

Installation takes place in the reverse order.

Note:

All openings must be fitted with grommets or seals. Pay particular attention to the condition of the exhaust pipe seal and replace if the slightest damage is apparent.

Clean all paint and rust from ground strap securing surfaces to ensure a good electrical contact.

Position fuel suction and return pipes carefully. The return pipe in particular must not be pulled or squeezed and must be routed without bend or sag.

III. Work with heater removed from vehicle

1 - Dismantling heater

Remove heater plug after taking off the resistance.

Remove fuel pressure pipe, holding union with a 14 mm wrench.

Loosen union nut and take jet carrier out heater.

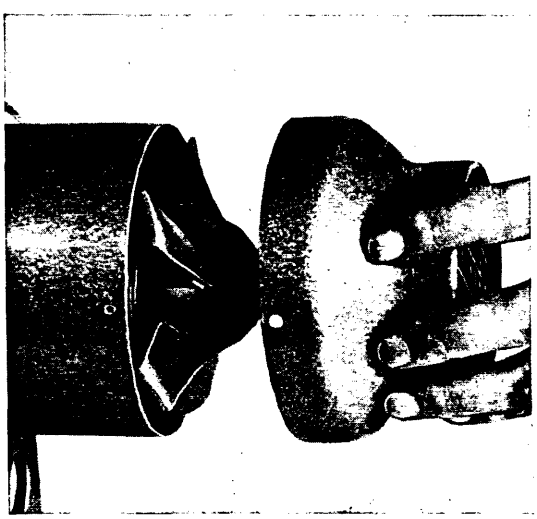

Fig. 13

Disconnect electrical cables.

a - at the cable connector

b - at the thermo-switch

c - at the safety switch

d - at the fuel pump

Remove thermo-switch by loosening the union nut under the switch mounting and pulling the switch out of the heat exchanger with a turning movement. Take care not to bend the feeler tube. If very tight, use easing oil.

Remove safety switch.

Remove fuel pump after loosening clamp.

Remove air inlet cap (Fig. 13).

Remove warm air outlet with control switch.

Remove the three screws at the joint between front and rear parts of casing.

Take front casing half off, withdrawing the blower cable through the grommet in the casing (Fig. 14).

Loosen the three screws in the combustion air blower slightly and take blower out of heat exchanger (Fig. 15).

When installing the blower, seal the joint between blower and heat exchanger with Teroson-Atmosit.

Take the heat exchanger out of the rear casing half taking care not to damage the threaded sleeve for the thermo-switch (Fig. 16).

If the heat exchanger is very dirty, burn it out with a gentle welding flame and blow out with compressed air.

Assembly takes place in the reverse order.

Connect electrical cables according to wiring diagram.

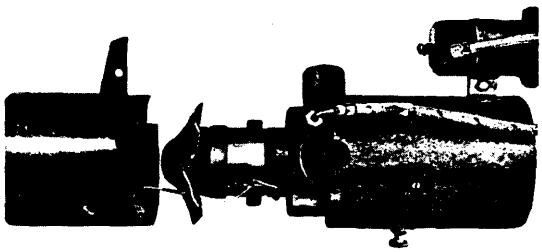

Fig. 14

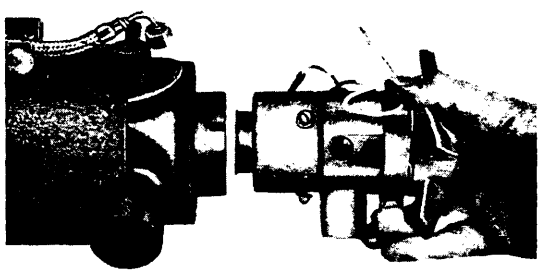

Fig. 15

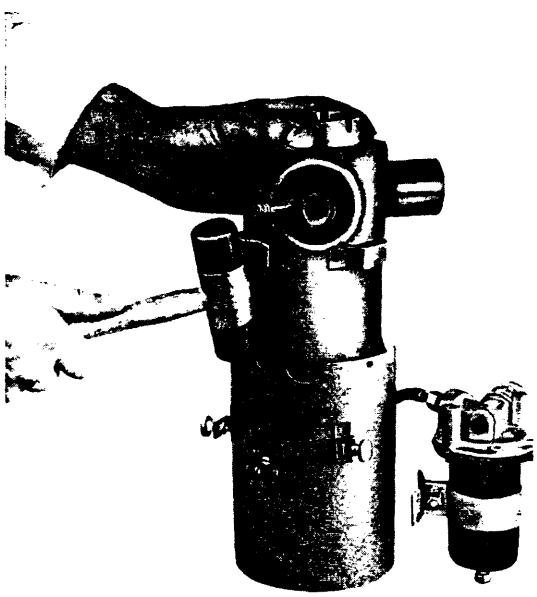

Fig. 16

2 - Dismantling combustion air blower
(Fig. 17)

Take the axial blower off the motor shaft by screwing a screw into the centering hole in the wheel.

Remove guide blade housing after taking out the securing screws and taking ground strap off motor.

Check radial blower for damage and replace if necessary.

Loosen the stud and then lever the radial wheel off the motor shaft with two screwdrivers.

Loosen clamp and take motor housing off motor.

When installing in the reverse order, ensure that the rubber band which seals the motor and motor locating housing does not extend into the combustion air intake adaptor as otherwise the air intake will be restricted. The distance between radial wheel and motor locating housing must be 1.5 mm.

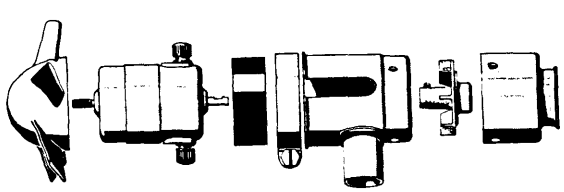

Fig. 17

12/66

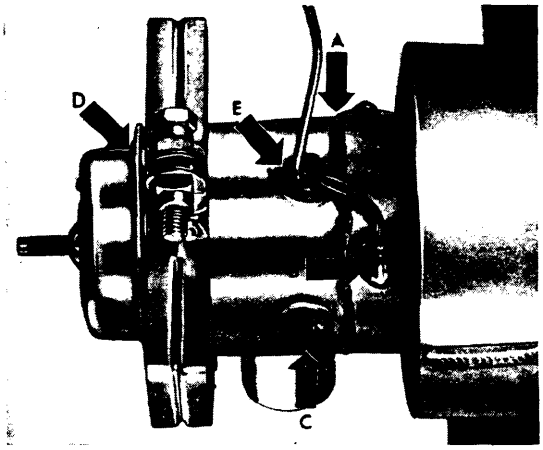

Fig. 17a

Note:

From 1st December 1966, Chassis No. 117 359 570, the connection between combustion air blower and heat exchanger (arrow A) and the securing screws (arrow B) is sealed with VW sealing compound D 2 instead of Torsion-Atmosit.

Furthermore, the caps for the carbon brushes (arrow C), the rubber seal for the motor (arrow D) and the cable grommet (arrow E) are now sealed with this compound. This will prevent warm air from leaking into the combustion chamber at these points and causing poor combustion.

When carrying out repairs to the combustion air blower, even on older heaters, the points shown in the illustration should be sealed carefully with D 2 sealing compound. Before doing this, however, all the existing Teroson-Atmosit must be removed and the areas to be sealed cleaned thoroughly.

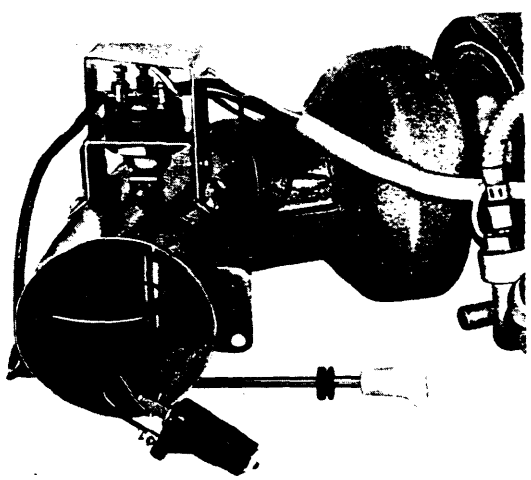

Fig. 18

3 - Removal of warm air outlet with resistor switch (Fig. 18)

Disconnect cables from connector, thermo-switch and safety switch.

Loosen screws and take outlet off rear part of casing.

Take protection cap off switch plate.

Disconnect switch cables.

Take switch plate off elbow.

Take resistor switch off switch plate.

Pull cotter pin out of operating rod and remove rod with washer and spring. When installing, do not forget grommet in hole.

IV. Checking the Heater

Every time the heater has been dismantled or when parts have been replaced, the heater should be given a trial run to check all the adjustments specified by the makers to ensure satisfactory operation as well as heater and vehicle safety.

1 - Checking heater when out of vehicle

Set the heater up horizontally as it is installed in the vehicle.

The exhaust gases must not be obstructed in any way and the exhaust pipe must not be extended. Install the air hose on the combustion air intake adaptor.

Connect a fuel pipe of the same length as the original pipe to the filter.

Connect a return fuel pipe, preferably a hose, to the threaded adaptor of the jet carrier. The cross section of this pipe must under no circumstances be smaller than the proper pipe used in the vehicle. It must be routed perfectly straight, without bends or kinks, to a container which collects the fuel overflow. The end of the pipe must not be immersed in the fuel but must be above the fuel level so that there is no back pressure which would cause an increased delivery of fuel and sooty burning.

Connect electrical cables.

The test voltage is 5.8 Volts or 11.6 Volts.

Switch heater on.

A 100 cc measuring container with suitable markings should be used for the fuel consumption test. The fuel suction pipe should be placed in a suitable container and also the return pipe, noting the above instructions.

When the ignition period is ended (Thermo-switch switches off the current to the heater plug) the test begins.

The consumption should be 0.22—0.27 liters/hour, or 15 cc in 225—200 seconds.

Note soot formation during the consumption test and then for a further 3 minutes.

Check that the pressure pipe of the fuel pump is vertical to the installation surface. Check all cables and screws for security.

Check the operating point of the safety switch (125—180° C) by partially blocking the air inlet (about $^2/_3$ of intake opening).

If the heater smokes badly, check the blower speed. It should be 4550—5400 rpm at 6/12 Volts. The run-on at 6/12 Volts should be 150—200 seconds, otherwise the thermo-switch setting must be rectified.

2 - Checking with heater installed

If the heater is to work properly when installed even though it has been checked thoroughly beforehand it must be installed in accordance with the makers instructions.

Do not alter exhaust pipe and combustion air intake.

Check routing of fuel suction and return pipes.

Prevent poor ground connections (voltage drop) by cleaning paint and rust from ground strap contact surfaces.

Check wiring with diagram.

Check condition of vehicle battery and change if necessary.

The heater will not work properly when the voltage is below 5.5 or 11 Volts.

Switch heater on and check operation of heater plug.

If the battery is discharged, start the engine and put heater into operation again when red charging lamp goes out.

Check heater run-on and rectify thermo-switch setting if necessary.

3 - Technical data for Heater No. 20 1144

Test voltage	5.8 Volt / 11.6 Volt
Fuel consumption	15 cc/225—200 seconds
or	0.22—0.27 liter/hour
Safety switch cut out temperature	125—180° C
Blower speed at 6/12 Volts	4550—5400 rpm
Heater run-on at 6/12 Volts	150—200 seconds

V. Repair Times for the VW 1500 Variant and VW 1200

I. 1 -	Remove and install fuel suction and return pipes	15 min.
2 -	Remove filter	5 min.
3 -	Remove and strip jet carrier	15 min.
4 -	a) Replace fuel pump	15 min.
	b) Adjust pump contacts	20 min.
5 -	Replace or clean heater plug	5 min.
6 -	a) Remove and strip thermo-switch	20 min.
	b) Adjust thermo-switch	10 min.
7 -	Remove safety switch	10 min.
8 -	Remove and install resistor switch	25 min.
9 -	Remove and install operating rod	10 min.
10 -	Replace warning lamp	20 min.
11 -	Replace inlet cowl	10 min.
12 -	Replace air outlet	15 min.
13 -	Replace exhaust pipe	15 min.
14 -	Replace combustion air pipe	10 min.
15 -	Replace axial blower	15 min.
II.	**Remove and install**	16 min.
III. 1 -	a) Replace heat exchanger	80 min. + operation II
	b) Replace front casing	20 min. + operation II
	c) Replace rear casing	45 min. + operation II
	d) Replace complete casing	70 min. + operation II
2 -	a) Replace combustion air blower	30 min. + operation II
	b) Replace radial blower	40 min. + operation II
	c) Replace motor	45 min. + operation II
	d) Replace carbon brushes	35 min. + operation II
3 -	Replace outlet with resistor switch	15 min. + operation II
IV.	**Check heater**	20 min.

Heater No. 20 1144 (6 volt)
20 1188 (12 volt)

for Type 3 (except Model 34) up to October 1964

Heater No. 20 1181 (6 volt)
20 1190 (12 volt)

for Type 1 (except Model 14) up to August 1966

Heater No. 20 1245 (6 volt)
20 1246 (12 volt)

for Type 1 (except Model 14) from August 1966

Trouble	Cause	Remedy
Heater does not ignite.	1 - Fault in electrical circuit: Fuse blown.	Check heater, rectify fault, install new fuse in holder in cable.
	No ground connection.	Clean contact surfaces of ground strap between battery and body (examine battery terminals).
	Feed cable on switch incorrectly connected.	Feed cable must be connected to terminal 56.
	Terminal plate contacts faulty.	Check connections and tighten.
	Thermo-switch incorrectly set or defective.	Adjust thermo-switch (see note) or replace.
	Motor and fuel pump circuit defective.	Check circuit and voltage.
	2 - Voltage drop: Poor ground connection.	Check ground connection from battery to vehicle frame, and between heater and body.
	Battery voltage low so that heater plug does not glow properly.	Start engine to get full generator voltage. If necessary, remove and charge battery.
	3 - Heater plug defective: Heater plug coils bent.	Straighten and clean coils under 4 volt current (2 battery cells).
	Heater plug damaged.	Fit new plug (Beru 194 Grn).
	4 - No fuel: Vacuum in tank.	Check tank breather pipe (iced up in winter).
	Tank empty.	Fill tank.
	Fuel feed interrupted.	Check if fuel flows from jet carrier (by removing return pipe).

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Trouble	Cause	Remedy
Heater does not ignite.	Fuel feed, filter or jets blocked.	Check and clean, fuel pipes, fine filter in jet carrier and jets.
	Fuel pump drawing in air (Pump works unevenly or too fast).	Check pipe from tank to pump for leaks, particularly at the filter and filter glass.
	Fuel pump does not work (Short circuit or burnt contacts).	Check contacts, replace pump if necessary.
	5 - Blower motor defective:	
	Motor does not reach the specified speed of 4550—5400 rpm.	See "Voltage Drop" under 2.
	One of the blowers rubbing on housing.	Straighten.
	Motor defective.	Motor must be replaced.
	6 - Shortage of combustion air: Radial blower loose or damaged.	Secure or replace.
	Screening cap detached.	Fit new radial blower.
	Combustion air pipe dirty or blocked.	Clean pipe.
Heater goes out.	7 - Shortage of fuel:	See "No fuel" under point 4.
	Suction and return pipes badly routed.	Return pipe must not be kinked or hang down.
	8 - Shortage of combustion air.	See "Shortage of combustion air" under point 6.
	9 - Exhaust back pressure too high: Exhaust pipe partially blocked.	Clean exhaust pipe.
	10 - Electrical circuit faulty: Overheating switch has worked and cut off current.	Check for reduced cross section in outlet duct. Check fresh air blower for short blades. Blower must be replaced even if only slightly damaged.
Heater does not switch off.	11 - Thermo-switch incorrect set.	Adjust thermo-switch (see repair instructions).
	12 - Switch defective.	Fit new switch.

Trouble	Cause	Remedy
Heater becomes sooted up and smokes.	13 - Too much fuel: Overflow jet in jet carrier or return pipe blocked.	Check jet and pipe and clear with compressed air.
	Incorrect sized control and feed jets.	Fit new jet (0.325 mm).
	14 - Shortage of air:	See "Blower Motor" under 5. "Shortage of Combustion" Air under 6. "Exhaust back pressure too high" under 9.
	Heater smokes when used with vehicle engine switched off.	Start engine to get full generator current and note if smoke stops. If so, have battery charged up.
Heat output insufficient.	15 - Insufficient fuel: Fuel pipes, filter or jets blocked.	Check and clean fuel pipes, filter, fuel pump filter and fine filter and jets in jet carrier.
	Fuel pump drawing in air or delivering insufficient fuel (pump works unevenly or too fast).	Check pipe from tank to pump for leakage, particularly at the filter and filter glass.
	Fuel hose leaking.	Fit new hose.
	Pump diaphragm damaged.	Fit new pump.
	16 - Poor heat radiation: Combustion deposits inside heat exchanger.	Clean heat exchanger (see repair instructions).
Excessive heater plug wear.	17 - Heater plug coil damaged by excessive current.	Fit new plug (Beru 194). Check if series resistance is fitted. If not, install new series resistance.
	18 - Heater plug remains on longer than necessary to ignite mixture:	
	Thermo-switch incorrectly set or defective.	Adjust switch (see repair instructions) or replace.
	Shortage of fuel.	See "No fuel" under 7.
	Shortage of combustion air.	See "Shortage of combustion air" under 6.

Type BN 2
Heater No. 20 1185 (6 Volt)
20 1205 (12 Volt)
for Volkswagen 1500 and Variant

Trouble	Cause	Remedy
Heater does not ignite.	1 - No current: 25 Amp. fuse blown.	Check heater electrical system (see wiring diagram) or locate short circuit and rectify. Install new fuse in holder in cable.
	Circuit for motor, fuel pump or filter with solenoid valve defective.	Check circuit, voltage and cable connections.
	Thermo-switch defective.	Replace switch.
	2 - Voltage drop: Battery voltage too low.	Start engine to get full generator voltage. If necessary, remove and charge battery.
	3 - Heater plug defective.	Fit new heater plug.
	4 - No fuel: Tank empty.	Fill tank.
	Filter full of water or strainer dirty.	Empty filter and clean it with compressed air. If necessary, replace filter element.
	Filter valve not opening.	Check valve (should click when opening). Replace if necessary.
	Pump drawing in air. (Pump works unevenly or too fast).	Check tipe from tank to pump for leakage.
	Pump does not work. (Short circuit or burnt contacts.)	Check contacts, clean and adjust. If necessary, fit new pump. Check 8 Amp. fuse.
	Fuel jet or pipe blocked.	Check and clean jet and fuel pipe. Remove strainer in pressure regulator inlet and clean with compressed air. Bleed regulator afterwards.
	5 - Blower motor defective.	Replace motor.
	6 - Shortage of combustion air. Combustion air pipe blocked or restricted.	Clean pipe.

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Trouble	Cause	Remedy
Heater goes out.	7 - Shortage of fuel.	See point 4.
	8 - Combustion air shortage.	See point 6.
	9 - Exhaust back pressure too high. Exhaust pipe blocked.	Clean pipe.
	10 - No current to fuel pump and filter with solenoid valve.	
	Overheating has caused overheating switch to work and cut off current, 8 Amp. fuse is blown.	Check for reduced cross section in inlet and outlet ducts. Fit new 8 Amp. fuse.
Heater does not switch off.	11 - Thermo-switch incorrectly set.	Set thermo-switch properly, turn adjusting screw to right slighly so that run-on is 3 minutes.
Heater becomes sooted up and smokes.	12 - Shortage of air.	See point 5.
	13 - Pressure regulator defective.	Check or replace.
Heat output inadequate.	14 - Insufficient fuel.	See point 4.

Type B N 2
Heater No. 20 1185 (6 Volt)
20 1205 (12 Volt)
for VW 1500 and Variant

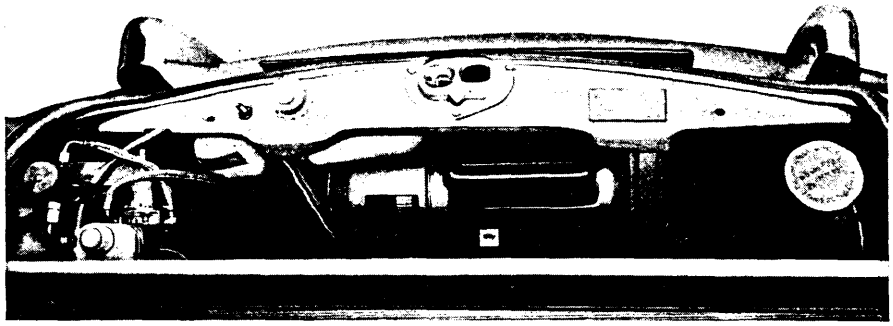

Fig. 1

Contents

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I. Work with heater installed

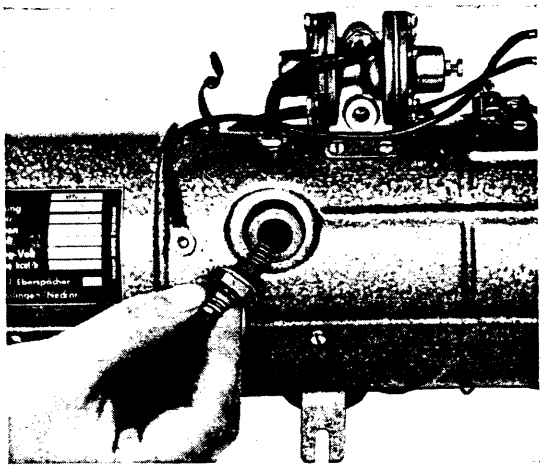

Fig. 2

1 - Heater plug — removal, cleaning, installation (Fig. 2)

Remove plug cable. Unscrew plug with socket 21 mm and clean thoroughly.

If necessary straighten heater coils, using a 4 Volt current because if bent cold the wire will break. If a new plug is fitted, use only the correct type. Install plug again and connect cable.

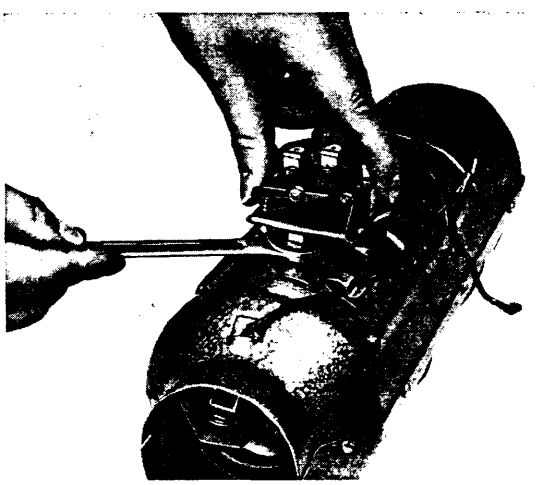

Fig. 3

2 - Thermo-switch — removal, dismantling, adjustment

Disconnect 5 cables from terminals CL, OP and CO on switch. Loosen union nut under switch.

Using a turning movement, pull switch out upwards, taking care not to bend the feeler tube. If tight, use a suitable easing solvent (Fig. 3).

Take adjusting screw out of nut in switch mountings.

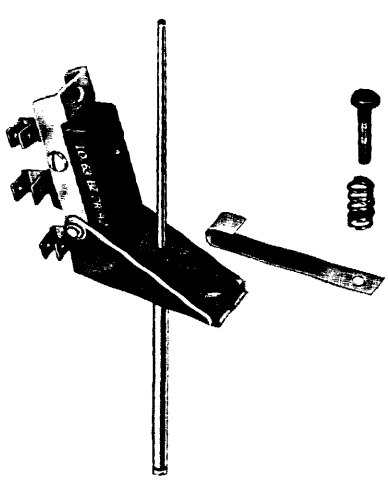

Fig. 4

Take out pressure spring and leaf spring. Fold adjusting mounting and micro switch over.

Slide quartz rod out of feeler tube. When assembling the switch, ensure that the feeler tube is not bent and that the quartz rod slides easily in the tube.

The adjustment mounting must turn freely in the switch mounting.

Connect cables to terminals CL, OP and CO as shown in wiring diagram.

Basic adjustment of thermo-switch outside the heater:

Turn adjusting screw in until the switch operates (audible click), turn back to the switching point, then tighten 120° ($^1/_3$ of turn) past the switching point (Fig. 5).

The final adjustment is made with the heater at operating temperature. The run-on time should be 105—210 seconds. If it is longer, tighten adjusting screw by turning it to the right. If it is shorter, loosen screw by turning it to the left.

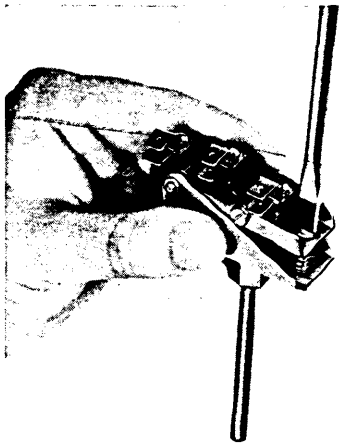

Fig. 5

3 - Overheating switch — replacement (Fig. 6)

Disconnect switch cable from fuse holder on heater.

Loosen hose clip on warm air side of heater and pull hose off.

Remove switch securing screws and take switch out.

Insert new switch and secure with screws.

Connect cables as per wiring diagram.

Slide warm air hose on to outlet end of heater and secure it with a hose clip.

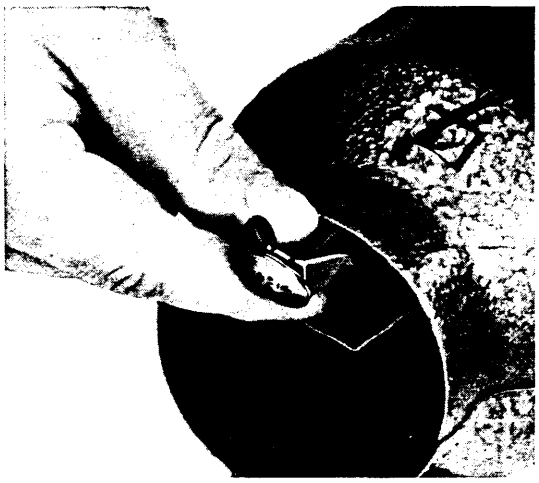

Fig. 6

4 - Warning lamp — removal and installation

The warning lamp is located in the knob of the push/pull switch. It can be removed after unscrewing the red lens in the knob.

5 - Switch — removal and installation

Take 25 Amp. fuse out of the holder under the instrument panel of the vehicle.

Unscrew knob and escutcheon from switch.

Take switch out and disconnect cables.

Checking switch:

At "Off" position (switch pushed in) there should be no circuit from + to terminal 30 a and from terminal 56 h to 57 p.

At the "On" position (switch pulled out) there should be a circuit from + to terminal 30 a and from terminal 56 h to 57 p (see wiring diagram).

Connect cables as shown in wiring diagram.

Insert switch, fit base and secure with escutcheon.

Fit knob.

Install 25 Amp. fuse in holder.

6 - Filter with solenoid valve — removal, dismantling, installation (Fig. 7)

Take 8 Amp. fuse out of holder on heater.

Stop fuel flow at tank outlet with a clip.

Disconnect fuel pump cable and ground connection.

Remove union nut at fuel inlet union while holding union with a 19 mm wrench.

Take fuel filter off bracket and detach short suction pipe.

Loosen wing nut and take filter cup off. Unscrew filter element and clean element and cup.

Remove screw and take solenoid valve cover off. Take coil out.

Remove four screws at the bottom of the solenoid valve housing.

Dismantle housing, guide sleeve, spring, valve and gasket.

Blow filter housing out with compressed air.

Ensure that the gasket is in good condition when assembling the solenoid valve.

Assembly takes place in the reverse order.

When a voltage of 4.5 Volt is applied, the valve should open with a click.

The installation of the filter and solenoid valve also takes place in the reverse order.

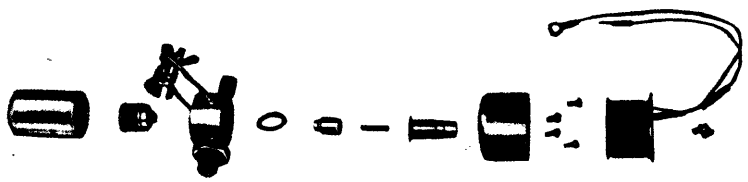

Fig. 7

7 - Fuel pump — removal, dismantling, adjusting, installation (Fig. 8)

Take 8 Amp. fuse out of holder on heater.

Disconnect pump cable and ground connection.

Disconnect suction and pressure fuel pipes.

Loosen screw and take fuel pump out of strap.

Remove four screws on coil body and take pump housing off.

Take diaphragm holder out by turning it to the right. When assembling, screw diaphragm fully home by turning to the left first and then screw it out $3^1/_2$ turns to the right. This ensures that the pump delivers the correct amount of fuel.

Attach coil body to pump housing with four screws.

Remove terminal nut and take bakelite cap off.

Check contacts and oil bearings and springs lightly.

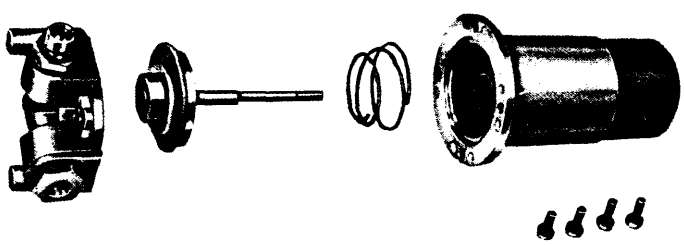

Fig. 8

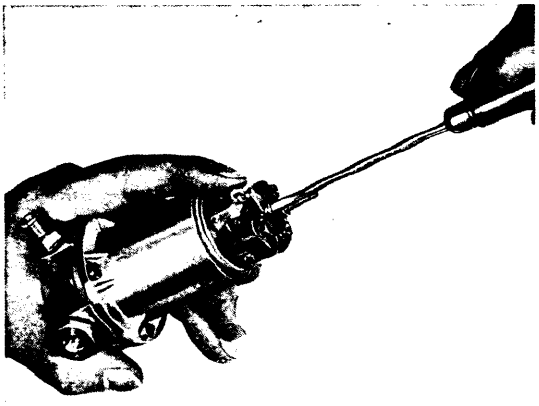

Fig. 9

Adjusting the pump:

The contact breaker gap should be 1 mm.

The points are set with an adjusting screw with the moving point pressed against the coil housing (Fig. 9)

To install the pump, reverse the removal sequence.

The pump must be fitted so that the pressure union is vertical.

The suction and pressure sides of the fuel pump are shown by arrows.

Bleed the fuel system if necessary after installing the pump and moisten the leat of the valve in the pressure union with a few drops of fuel.

8 - Pressure regulator — replacement

Remove pressure pipe at connecting elbow, using a 10 mm wrench to hold the union.

Take fuel hose off at jet holder (Fig. 10).

Remove two screws and take pressure regulator off heater (Fig. 11).

The pressure regulator must not be dismantled nor the adjusting screw setting altered. The screw is set by the manufacturers.

Remove connecting elbow on pressure regulator and take strainer out (Fig. 12).

Clean strainer with compressed air and insert it into the connection.

Install connecting elbow on pressure regulator union.

Secure regulator and ground cable for motor to the casing of the heater and connect fuel hose to jet holder.

Connect pressure pipe to connection elbow (hold union with a 10 mm wrench).

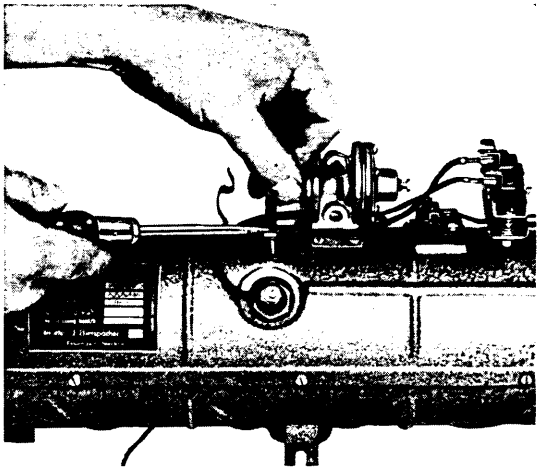

Fig. 10

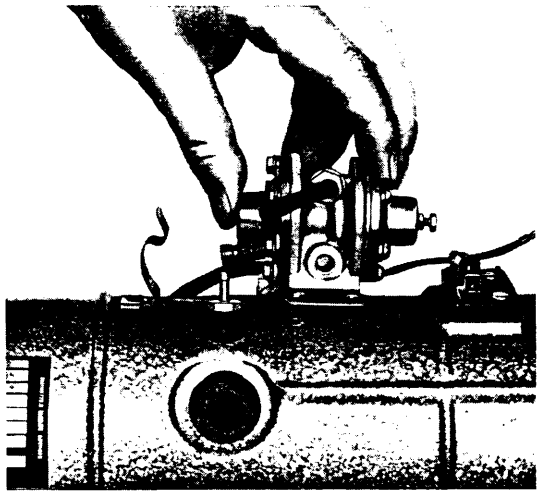

Fig. 11

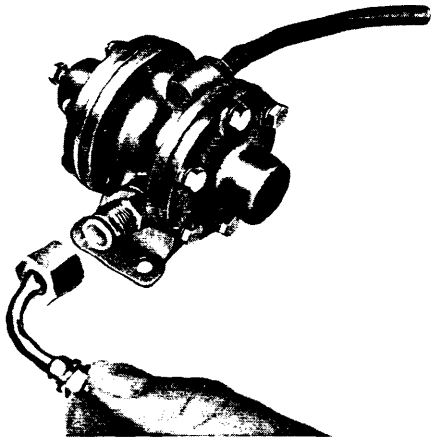

Fig. 12

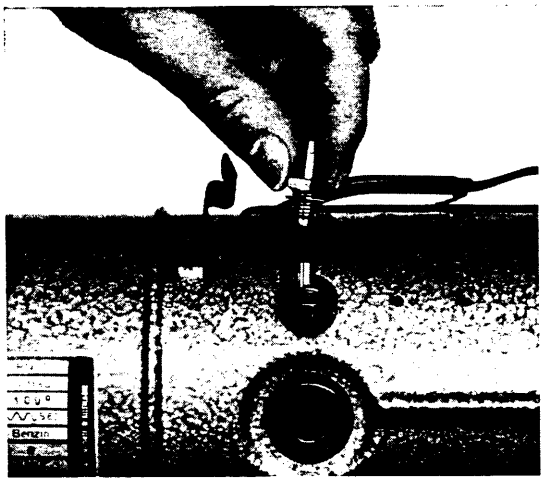

Fig. 13

9 - Fuel jet — replacement

Take fuel hose off jet holder.

Screw jet holder out of union (Fig. 13).

Take distributor adaptor out of union. Screw jet out of holder and clean it with compressed air. (Do not use wire.)

The size of the jet controls the quantity of fuel so use only the correct jet as a replacement (0.30 mm).

Installation takes place in the reverse order.

Ensure that the sealing ring is in good condition.

II. Removal and installation of heater

Take 25 Amp. fuse out of holder (Fig. 14).

Loosen hose clips on heater and pull air hoses off.

Take protective cap off.

Pull cables off thermo-switch and fuse holder.

Remove pressure pipe from pressure regulator.

Hold union with a 10 mm wrench.

Pull combustion air hose off.

Disconnect fuel hose at overflow union.

Disconnect combustion air blower cable.

Remove 3 nuts at mountings and lift heater out of vehicle.

The installation of the heater takes place in the reverse order.

> **Note**
>
> Ensure that exhaust pipe is sealed properly. Replace sealing ring if it shows the slightest sign of damage.

Connect control cables in accordance with wiring diagram.

III. Work with heater removed from vehicle

1 - Dismantling heater

Disconnect heater plug cable and take plug out.

Take fuel hose off jet holder and remove pressure regulator.

Disconnect all cables from thermo-switch and fuse holder.

Remove thermo-switch.

Remove over-heating switch.

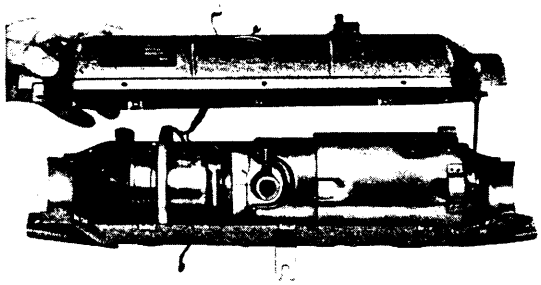

Fig. 14

Remove jet holder with jet and distributor.

Remove 10 screws and take top half of casing off (Fig. 14).

Take heat exchanger and combustion air blower out of lower part of casing.

Loosen clip between heat exchanger and combustion air blower (Fig. 15).

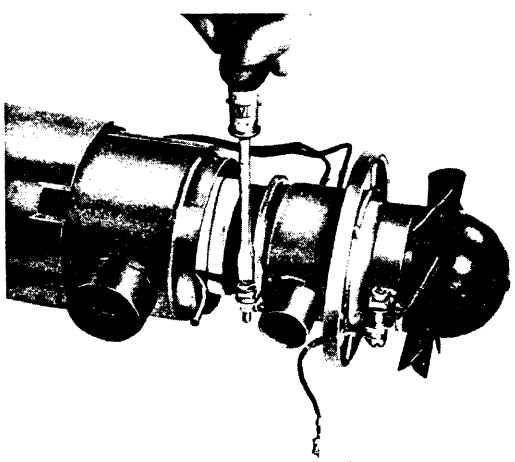

Fig. 15

Separate combustion air blower from heat exchanger. Take clip and sealing ring off. If the heat exchanger is very dirty, burn it off with a gentle welding flame and blow it out with compressed air.

Assembly takes place in the reverse order.

Ensure that the sealing ring between heat exchanger and combustion air blower is in good condition.

Connect cables as per wiring diagram.

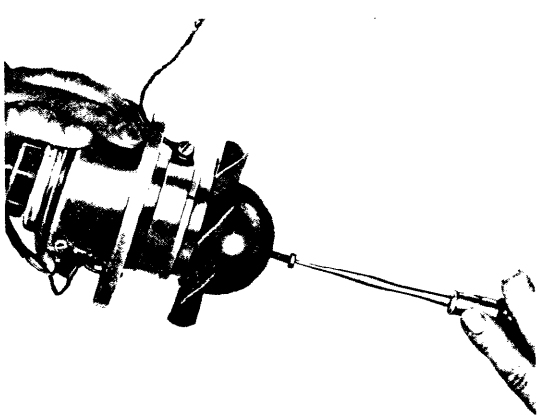

Fig. 16

2 - Dismantling combustion air blower

Take axial blower off motor shaft by inserting a screw into the centering hole of the blower (Fig. 16).

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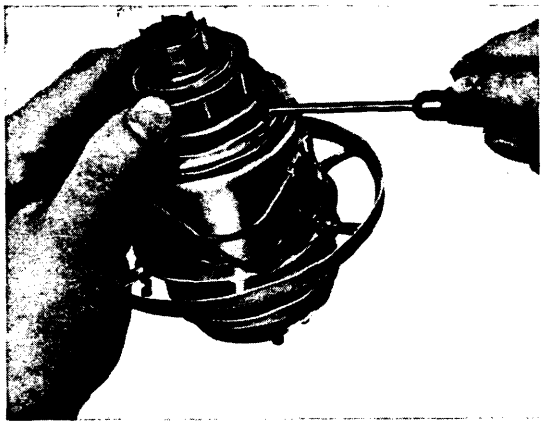

Fig. 17

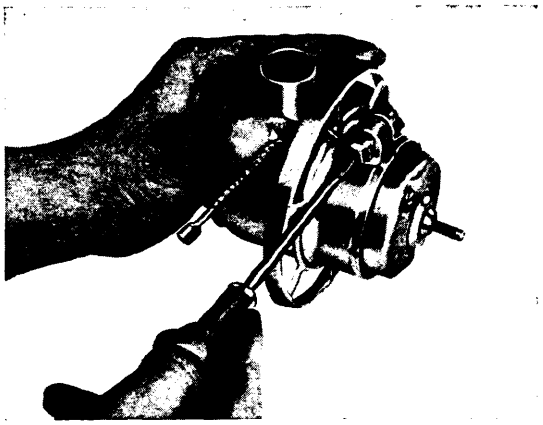

Fig. 18

Loosen the stud and take radial blower off shaft (Fig. 18).

Check radial wheel for damage and replace if necessary.

Loosen clip on motor support (Fig. 18) and pull support off motor.

On assembly, press motor with rubber ring into the support until the rear end of the shaft is in line with the opening for the radial blower.

Tighten clip on motor support. Support shaft end and press axial blower on.

Fit radial wheel on shaft end and secure it with the stud. Ensure that there is 1 mm clearance between motor support bracket and radial wheel.

IV. Checking the heater

When the heater has been dismantled or when parts have been replaced, it must be given a working test and all the adjustments which the manufacturer stipulates for the operation and safety of the heater and vehicle, checked.

1 - Checking heater in vehicle

The heater will only work properly of it has been installed correctly in accordance with the fitting instructions.

Check mountings for tightness.

Check that the ground cable for the combustion air blower, fuel pump and solenoid valve on filter is making good contact. If necessary, remove all traces of paint and rust from cable contact area.

Check all electrical connections with wiring diagram.

Check the connection between heater terminal 30 and vehicle fuse box.

Check vehicle battery and change if necessary.

At a voltage of less than 4.5 or 9 Volts the heater will no longer function properly.

If the battery voltage is low, start the engine and switch heater on again after the red charging lamp has gone out.

Switch heater on and check that it ignites properly and that the heater plug switches off.

Check fuel pipes for leakage.

If the heater smokes badly when burning, check the blower speed after removing the hose on the outlet side. The speed should be 4450—5400 rpm at a voltage of 6 or 12 Volts.

Checking overheating switch

Restrict the grille under the instrument panel, by about $^2/_3$ of its area and measure the temperature at which the overheating switch works. This should be 150—250° C.

Check run-on time at 6 or 12 Volts. This should be 150—210 seconds. If incorrect, rectify thermo-switch setting. If too long, turn adjusting screw to right, if too short, turn screw to left.

Test data

Test voltage	5.8 Volt / 11.6 Volt
Fuel consumption	0.30—0.34 liters per hour
Overheating switch operating temperature	150—250° C
Blower speed with 6 or 12 Volts	4550—5400 rpm
Run-on time with 6 or 12 Volts	150—210 seconds

Type BN 2

Heater No. 20 1215 (6 volt)
20 1216 (12 volt)

for Type 3 (except Model 34) from August 1965

Trouble	Cause	Remedy
Heater does not ignite.	1 - No current: Main fuse blown.	Check heater electrical system (see wiring diagram) or locate short circuit and rectify. Install new fuse.
	Circuit for motor, fuel pump or filter with solenoid valve defective.	Check circuit, voltage and cable connections. Replace fuse on heater if necessary.
	Thermo-switch defective.	Replace switch.
	2 - Voltage drop: Battery voltage too low.	Start engine to get full generator voltage. If necessary, remove and charge battery.
	3 - Heater plug defective.	Fit new heater plug.
	4 - No fuel: Tank empty.	Fill tank.
	Filter full of water or strainer dirty.	Empty filter and clean it with compressed air. If necessary, replace filter element.
	Filter valve not opening.	Check valve (should click when opening). Replace if necessary.
	Pump drawing in air. (Pump works unevenly or too fast.)	Check pipe from tank to pump for leakage.
	Pump does not work. (Short circuit or burnt contacts.)	Check contacts, clean and adjust. If necessary, fit new pump. Check 8 amp. fuse.
	Fuel jet or pipe blocked.	Check and clean jet and fuel pipe. Remove strainer in pressure regulator inlet and clean with compressed air. Bleed regulator afterwards.
	5 - Blower motor defective.	Replace motor.
	6 - Shortage of combustion air: Combustion air pipe blocked or restricted.	Clean pipe.

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Trouble	Cause	Remedy
Heater goes out.	7 - Shortage of fuel.	See point 4.
	8 - Combustion air shortage.	See point 6.
	9 - Exhaust back pressure too high: Exhaust pipe blocked.	Clean pipe.
	10 - No current to fuel pump and filter with solenoid valve: Overheating has caused overheating switch to work and cut off current, 8 amp. fuse is blown.	Check for reduced cross section in inlet and outlet ducts. Fit new 8 amp. fuse.
Heater does not switch off.	11 - Thermo-switch incorrectly set.	Set thermo-switch properly, turn adjusting screw to right slightly so that run-on is 3 minutes.
Heater becomes sooted up and smokes.	12 - Shortage of air.	See point 5.
	13 - Pressure regulator defective.	Check or adjust.
Heat output inadequate.	14 - Insufficient fuel.	See point 4.
Burns irregularly.	15 - Pressure regulator incorrectly set.	Adjust pressure regulator.
Ignition cannot be switched off when time switch knob is partly pulled out.	16 - Diode on time switch defective.	Fit new time switch complete with diode.

Type BN 2

Heater No. 20 1215 (6 volt)
20 1216 (12 volt)

for Type 3 (except Model 34) from August 1965

Trouble	Cause	Remedy
Heater does not ignite.	1 - No current: Main fuse blown.	Check heater electrical system (see wiring diagram) or locate short circuit and rectify. Install new fuse.
	Circuit for motor, fuel pump or filter with solenoid valve defective.	Check circuit, voltage and cable connections. Replace fuse on heater if necessary.
	Thermo-switch defective.	Replace switch.
	2 - Voltage drop: Battery voltage too low.	Start engine to get full generator voltage. If necessary, remove and charge battery.
	3 - Heater plug defective.	Fit new heater plug. (See page C 14/12.)
	4 - No fuel: Tank empty.	Fill tank.
	Filter full of water or strainer dirty.	Empty filter and clean it with compressed air. If necessary, replace filter element.
	Filter valve not opening.	Check valve (should click when opening). Replace if necessary.
	Pump drawing in air. (Pump works unevenly or too fast.)	Check pipe from tank to pump for leakage.
	Pump does not work. (Short circuit or burnt contacts.)	Check contacts, clean and adjust. If necessary, fit new pump. Check 8 amp. fuse.
	Fuel jet or pipe blocked.	Check and clean jet and fuel pipe. Remove strainer in pressure regulator inlet and clean with compressed air. Bleed regulator afterwards.
	5 - Blower motor defective.	Replace motor.
	6 - Shortage of combustion air. Combustion air pipe blocked or restricted.	Clean pipe.

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Trouble	Cause	Remedy
Heater goes out.	7 - Shortage of fuel.	See point 4.
	8 - Combustion air shortage.	See point 6.
	9 - Exhaust back pressure too high. Exhaust pipe blocked.	Clean pipe.
	10 - No current to fuel pump and filter with solenoid valve.	
	Overheating has caused overheating switch to work and cut off current, 8 amp. fuse is blown.	Check for reduce cross section in inlet and outlet ducts. Fit new 8 amp. fuse.
Heater does not switch off.	11 - Thermo-switch incorrectly set.	Set thermo-switch properly, turn adjusting screw to right slightly so that run-on is 3 minutes.
Heater becomes sooted up and smokes.	12 - Shortage of air.	See point 5.
	13 - Pressure regulator defective.	Check or adjust.
Heat output inadequate.	14 - Insufficient fuel.	See point 4.
Burns irregularly.	15 - Pressure regulator incorrectly set.	Adjust pressure regulator.
Ignition cannot be switched off when time switch knob is partly pulled out.	16 - Diode on time switch defective.	Fit new time switch complete with diode.

Type BN 2

Heater No. 20 1215 (6 volt)
20 1216 (12 volt)

for Type 3 (except Model 34) from August 1965 to August 1966

Heater No. 20 1216

for Type 3 from August 1966

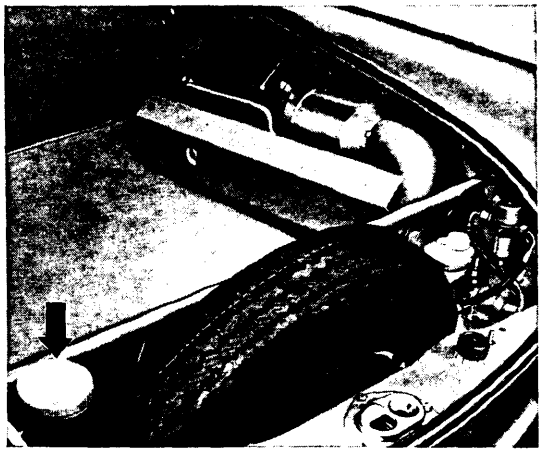

Fig. 1

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I. Work with Heater Installed

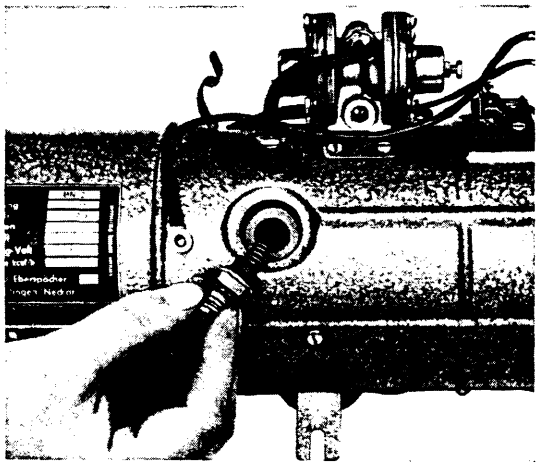

Fig. 2

1 - Heater plug — removal, cleaning, installation (Fig. 2)

Remove plug cable. Unscrew plug with 21 mm socket and clean thoroughly.

If necessary straighten heater coils, using a 4 volt current because if bent cold the wire will break.

If a new plug is fitted, use only the correct type.

Install plug again and connect cable.

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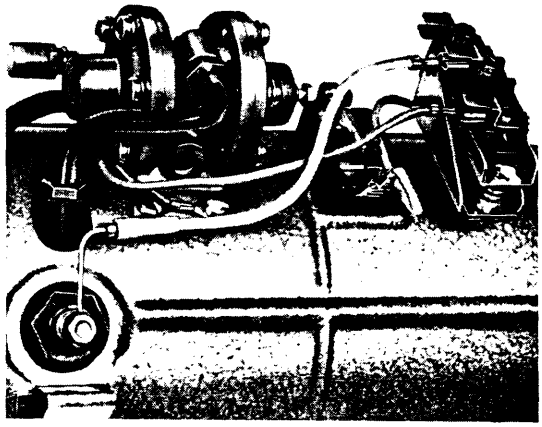


Fig. 2a

Note:

Some heater plugs have been burning out after only a few hours of operation. This was due to the operating voltage at the heater plug being too high.

This complaint can be eliminated by installing a series resistance, Part No. 311 261 555 B, which reduces the supply voltage by about 0.2 volt. The series resistance reduces the voltage which in turn reduces the thermal load on the heater plug without reducing its efficiency. This resistance should only be installed if the heater plug wear is abnormal.

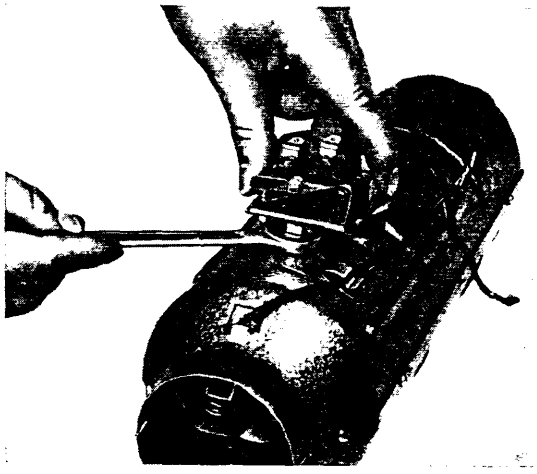


Fig. 3

2 - Thermo-switch — removal, dismantling, adjustment

Disconnect 5 cables from terminals NC, NO and C on switch. Loosen union nut under switch.

Using a turning movement, pull switch out upwards, taking care not bend the feeler tube. If tight, use a suitable easing solvent (Fig. 3). Take adjusting screw out of nut in switch mountings.

Take out pressure spring and leaf spring.

Fold adjusting mounting and micro switch over.

Slide quartz rod out of feeler tube. (Fig. 4)

When assembling the switch, ensure that the feeler tube is not bent and that the quartz rod slides easily in the tube.

The adjustment mounting must turn freely in the switch mounting. Connect cables to terminals NC, NO and C as shown in wiring diagram.

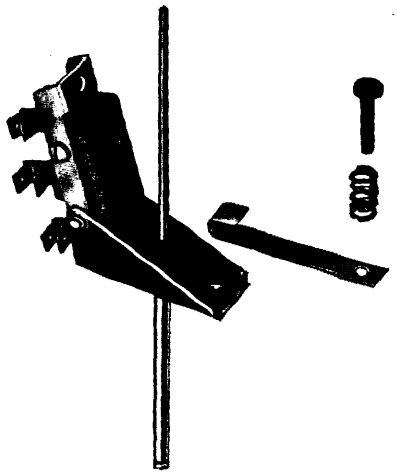


Fig. 4

Basic adjustment of thermo-switch outside the heater:

Turn adjusting screw in until the switch operates (audible click), turn back to the switching point, then tighten 120° (1/3 of turn) past the switching point (Fig. 5).

The final adjustment is made with the heater at operating temperature. The run-on time should be 150—210 seconds. If it is longer, tighten adjusting screw by turning it to the right. If it is shorter, loosen screw by turning it to the left.

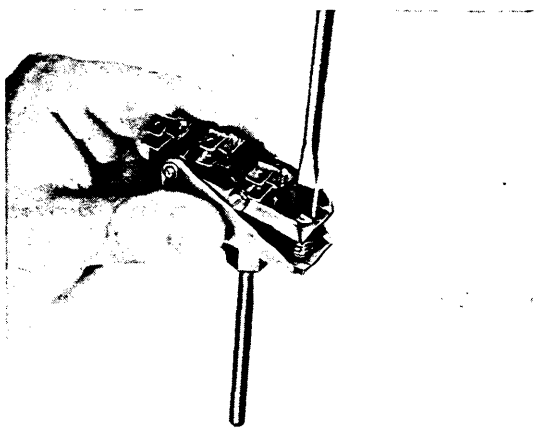


Fig. 5

The thermo-switch terminal designations have been changed as follows:

Old designation on switch (moulded on top)	COMMON	NORMALLY CLOSED	NORMALLY OPEN
Abbreviation	CO	CL	OP
New designation (Printed on side)	C	NC	NO

3 - Warning lamp — removal and installation

The warning lamp is located in the knob of the push/pull switch. It can be removed after removing the lens in the knob.

4 - Switch — removal and installation

Take 25 amp. fuse out of the holder under the instrument panel of the vehicle.

Unscrew knob and escutcheon from switch.

Take switch out and disconnect cables.

Checking push/pull switch:

At "Off" position (switch pushed in) there should be no circuit from + to terminal 30a and from terminal 56h to 57p.

At the "On" position (switch pulled out) there should be a circuit from + to terminal 30a and from terminal 56h to 57p (see wiring diagram).

Connect cables as shown in wiring diagram.

Insert switch, fit base and secure with escutcheon. Fit knob.

Install 25 amp. fuse in holder.

Checking time switch

"Off" position (switch pushed in).

No circuit from terminal B and H to A.

"ON" position (switch pulled out fully).

Circuit from terminal B to A.

"0" position (switch knob pulled in by clockwork mechanism).

Circuit from terminal H to A.

5 - Filter with solenoid valve — removal, dismantling, installation (Fig. 6)

Take 8 amp. fuse out of holder on heater.

Stop fuel flow at tank outlet with a clip.

Disconnect fuel pump cable and ground connection.

Remove union nut at fuel inlet union while holding union with a 19 mm wrench.

Take fuel filter off bracket and detach short suction pipe.

Loosen wing nut and take filter cup off. Unscrew filter element and clean element and cup.

Remove screw and take solenoid valve cover off. Take coil out.

Remove four screws at the bottom of the solenoid valve housing.

Dismantle housing, guide sleeve, spring, valve and gasket.

Blow filter housing out with compressed air.

Ensure that the gasket is in good condition when assembling the solenoid valve.

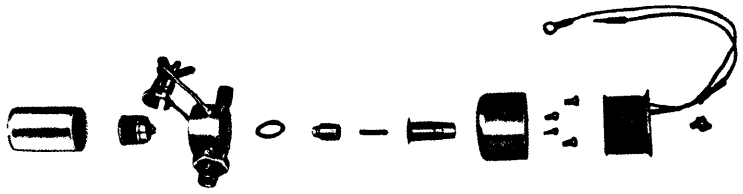
Assembly takes place in the reverse order.

Check solenoid valve:

When a voltage of 4.5 volts/10.5 volts is applied, the valve should open with a click.

The installation of the filter and solenoid valve also takes place in the reverse order.

Fig. 6



6 - Fuel pump — removal, dismantling, adjusting, installation (Fig. 7)

Take 8 amp. fuse out of holder on heater.

Disconnect pump cable and ground connection.

Disconnect suction and pressure fuel pipes.

Loosen screw and take fuel pump out of strap.

Remove four screws on coil body and take pump housing off.

Take diaphragm holder out by turning it to the left.

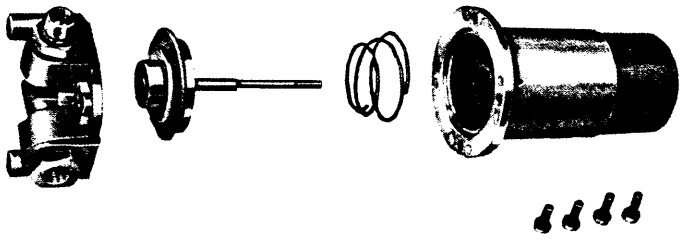
When assembling, screw diaphragm fully home by turning to the right first and then screw it out $2^1/_2$ turns to the left. This ensures that the pump delivers the correct amount of fuel.

Attach coil body to pump housing with four screws.

Remove terminal nut and take bakelite cap off.

Check contacts (gap 1 mm) and oil bearings and springs lightly.

Fig. 7



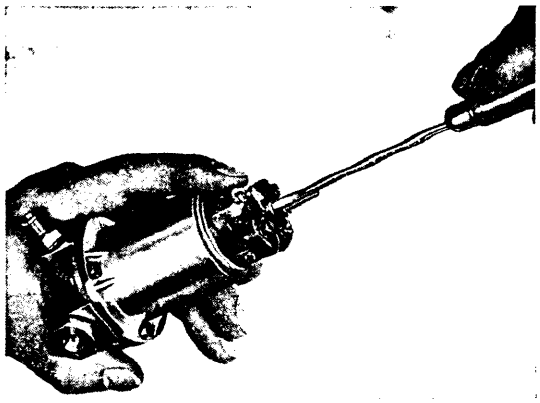


Fig. 8

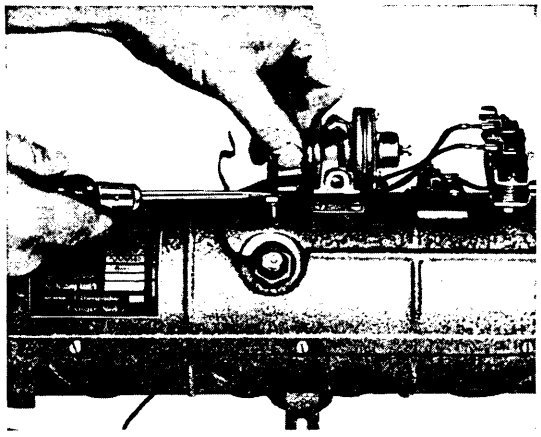


Fig. 9

Adjusting the pump:

The contact breaker gap should be 1 mm.

The points are set with an adjusting screw with the moving point pressed against the coil housing (Fig. 8).

To install the pump, reverse the removal sequence.

The pump must be fitted so that the pressure union is vertical.

The suction and pressure sides of the fuel pump are shown by arrows.

Bleed the fuel system if necessary after installing the pump and moisten the leaf of the valve in the pressure union with a few drops of fuel.

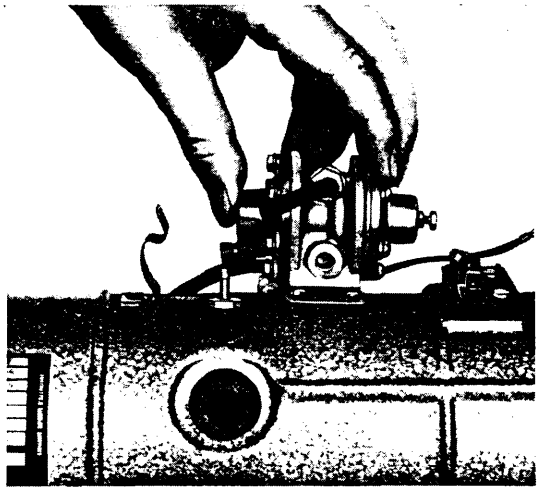


Fig. 10

7 - Pressure regulator — replacement and adjustment

Remove pressure pipe at connecting elbow, using a 10 mm wrench to hold the union.

Take fuel hose off at jet holder (Fig. 9).

Remove two screws and take pressure regulator off heater (Fig. 10).

Remove connecting elbow on pressure regulator and take strainer out (Fig. 11).

Clean strainer with compressed air and insert it into the connection.

Install connecting elbow on pressure regulator union.

Secure regulator and ground cable for motor to the casing of the heater and connect fuel hose to jet holder.

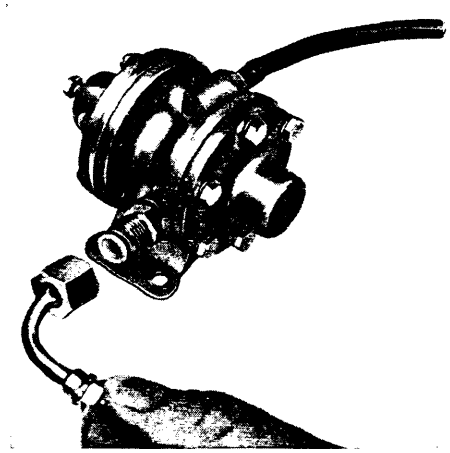


Fig. 11

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Connect pressure pipe to connection elbow (hold union with a 10 mm wrench).

The fuel consumption can be altered by turning the adjusting screw on the pressure regulator.

To increase = Turn screw to right

To reduce = Turn screw to left

To measure fuel consumption, pull hose off jet holder, screw holder out and connect hose again. Place the jet holder in a suitably graduated glass and hold so that jet is at about the same height as when installed in heater. Do not start to time until fuel issues from the jet and do not include the drops which flow after timing period.

Fuel flow cm^3/5 minutes	Fuel consumption liters/hour
26.6	0.32
27.5	0.33
28.3	0.34
29.2	0.35
30.0	0.36

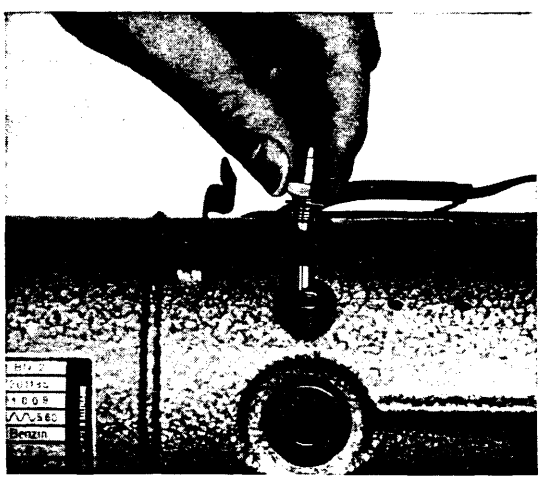

Fig. 12

8 - Fuel jet — replacement

Take fuel hose off jet holder.

Screw jet holder out of union (Fig. 12).

Take distributor adaptor out of union. Screw jet out of holder and clean it with compressed air. (Do not use wire.)

The size of the jet controls the quantity of fuel so use only the correct jet as a replacement (0.30 mm).

Installation takes place in the reverse order.

Ensure that the sealing ring is in good condition.

II. Removal and Installation of Heater

Take 25 Amp. fuse out of holder.

Remove protection plate and cap.

Disconnect electrical cables.

Take fuel pressure line off at connection on pressure regulator, while holding union with a 10 mm wrench.

Take off air circulation pipe.

Remove exhaust elbow in wheel housing and loosen clip for combustion air pipe.

Pull overflow pipe off connection on heater.

Remove three nuts on heater mounting and lift heater out.

The installation of the heater takes place in the reverse order.

III. Work with Heater removed from Vehicle

1 - Overheating switch — replacement (Fig.13)

Disconnect switch cable from fuse holder on heater.

Remove switch securing screws and take switch out.

Insert new switch and secure with screws.

Connect cables as per wiring diagram.

Slide warm air hose on to outlet end of heater and secure it with a hose clip.

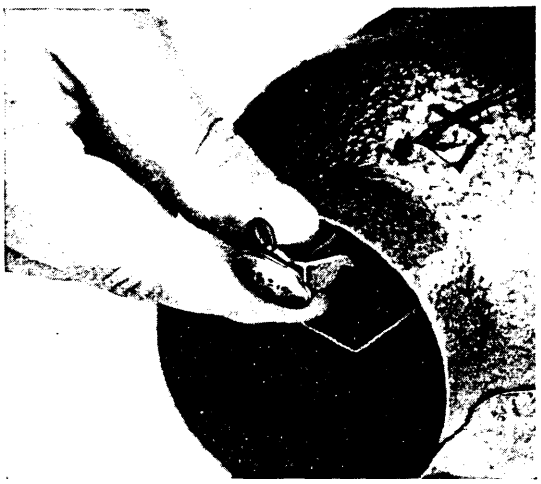

Fig. 13

2 - Dismantling heater

Disconnect heater plug cable and take plug out. Take fuel hose off jet holder and remove pressure regulator.

Disconnect all cables from thermo-switch and fuse holder.

Remove thermo-switch.

Remove jet holder with jet and distributor.

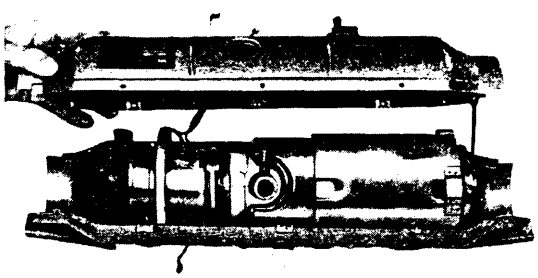

Fig. 14

Remove 10 screws and take top half of casing off (Fig. 14).

Take heat exchanger and combustion air blower out of lower part of casing.

Loosen clip between heat exchanger and combustion air blower (Fig. 15).

Separate combustion air blower from heat exchanger. Take clip and sealing ring off. If the heat exchanger is very dirty, burn it off with a gentle welding flame and blow it out with compressed air.

Assembly takes place in the reverse order.

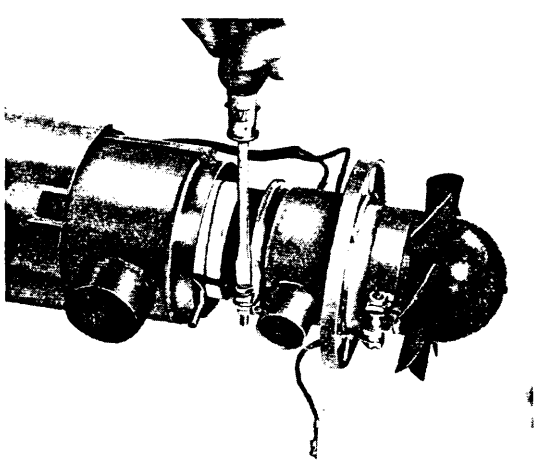

Fig. 15

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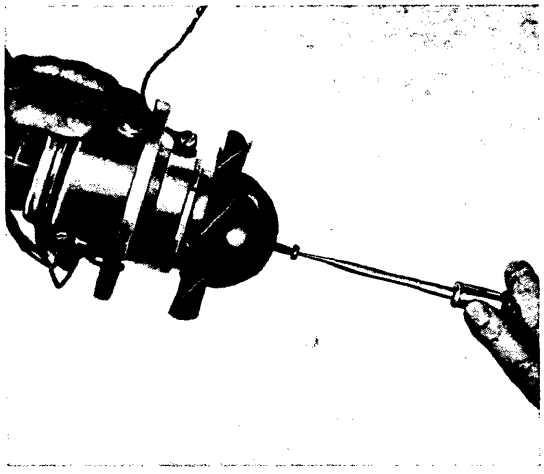

Fig. 16

Ensure that the sealing ring between heat exchanger and combustion air blower is in good condition. Connect cables as per wiring diagram.

3 - Dismantling combustion air blower

Take axial blower off motor shaft by inserting a screw into the centering hole of the blower (Fig.16).

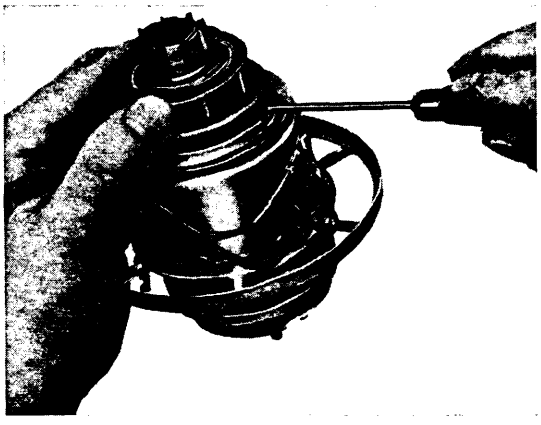

Fig. 17

Loosen the stud and take radial blower off shaft (Fig. 17).

Check radial wheel for damage and replace if necessary.

Loosen clip on motor support (Fig. 18) and pull support off motor.

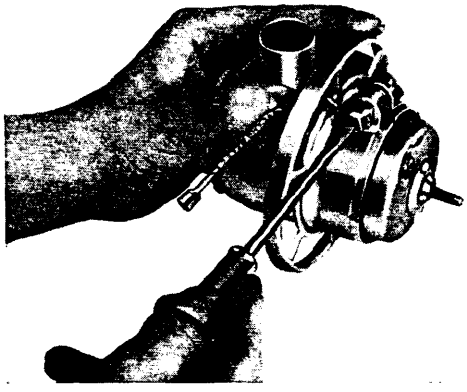

Fig. 18

On assembly, press motor with rubber ring into the support until the rear end of the shaft is in line with the opening for the radial blower.

Tighten clip on motor support. Support shaft end and press axial blower on.

Fit radial wheel on shaft end and secure it with the stud. Ensure that there is 1 mm clearance between motor support bracket and radial wheel.

IV. Checking the Heater

When the heater has been dismantled or when parts have been replaced, it must be given a working test and all the adjustments which the manufacturer stipulates for the operation and safety of the heater and vehicle, checked.

1 - Checking heater in vehicle

The heater will only work properly if it has been installed correctly in accordance with the fitting instructions.

Check mountings for tightness.

Check that the ground cable for the combustion air blower, fuel pump and solenoid valve on filter is making good contact. If necessary, remove all traces of paint and rust from cable contact area.

Check all electrical connections with wiring diagram.

Check that heater is connected to terminal 30 in the vehicle fuse box. (8 amp. fuse)

Check vehicle battery and charge if necessary.

At a voltage of less than 4.5 or 9 volts the heater will no longer function properly.

If the battery voltage is low, start the engine and switch heater on again after the red charging lamp has gone out.

Switch heater on and check that it ignites properly and that the heater plug switches off.

Check fuel pipes for leakage.

If the heater smokes badly when burning, check the blower speed. The speed should be 5460—6040 rpm at a voltage of 6 or 12 volts.

Checking overheating switch

Restrict the intake opening under the instrument panel, by about $^2/_3$ of its area and measure the temperature at which the overheating switch works. This should be 150—250° C.

Check run-on time at 6 or 12 volts. This should be 150—210 seconds. If incorrect, rectify thermo-switch setting. If too long, turn adjusting screw to right, if too short, turn screw to left.

Test data

Test voltage	5.8 volt / 11.6 volt
Fuel consumption	0.30—0.36 liters per hour
Overheating switch operating temperature	150—250° C
Blower speed with 6 or 12 volts	5460—6040 rpm
Run-on time with 6 or 12 volts	150—210 seconds

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Instructions for Repair of Eberspächer Heater BN 2

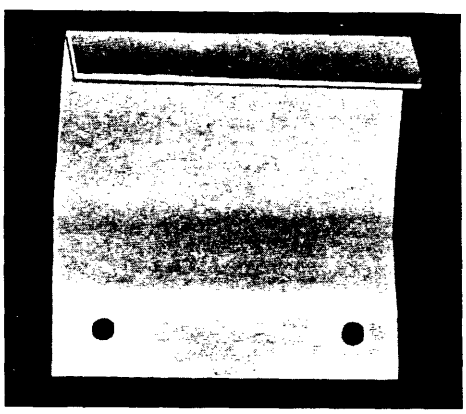
I - Detach heater overflow pipe, .28 in. (7 mm) O.D., from air intake pipe and relocate it. Close the overflow pipe flange by pressing it together with pliers.

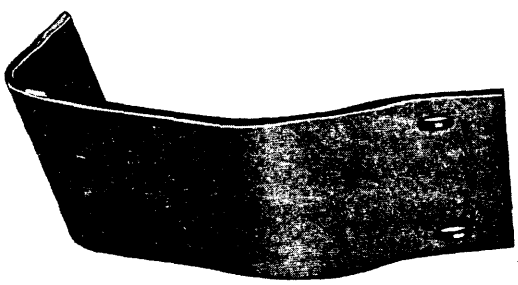
Model 31 and 36

Increase the diameter of the drain hole at the bottom of the front cross panel (311 905 591 E) so that the overflow pipe can be pushed through. The hole must be large enough to enable water which collects in the front cross panel to still drain away.

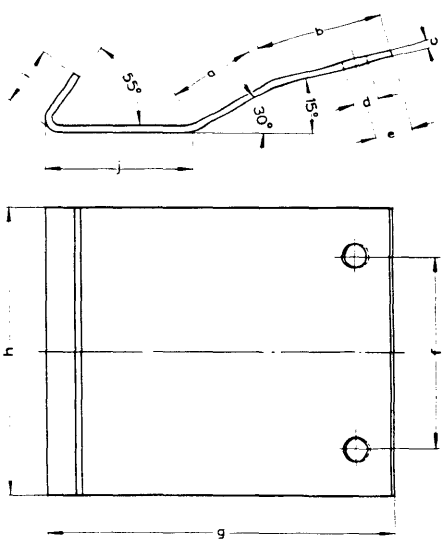
Shorten the overflow pipe to a length of approximately 10.6 in. (270 mm), and cover the end protruding from the front cross panel with a protective plate.

The protective plate can be made according to the illustrations and the drawing reproduced below. The part of the protective plate bent at 55° must bear against the spare wheel well. Use the protective plate as a template when drilling the holes in the front cross panel.



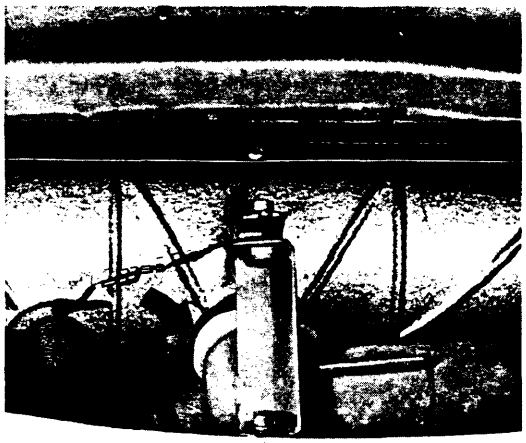


a = .71 in. (18 mm)
b = 1.02 in. (26 mm)
c = .06 in. (1.5 mm)
d = .2 in. (5 mm)
e = .31 in. (8 mm)
f = 1.57 in. (40 mm)
g = 2.8 in. (71 mm)
h = 2.36 in. (60 mm)
i = .47 in. (12 mm)
j = ~~1.18 in. (30 mm)~~
1.85 in (47mm)



p.t.o.

IV - Up to chassis no. 315 095 730 a second gasket (part no. 311 261 187) must be fitted to the exhaust flange on the heater. This is done by loosening the three mountings, lifting the heater and placing the additional sealing ring over the exhaust flange on the heater.



V - At the same time, the silicon sealing ring (part no. 311 261 185 B) should be taken off the exhaust pipe and examined carefully. If the ring is distorted or hard or if there are signs of soot on the ring or heater housing, a new ring should be fitted. Install heater again and check sealing between exhaust flange on heater and exhaust pipe.

VI - Up to chassis no. 315 065 825 a piece of plastic should be stuck inside the front cross panel near the fuel pump to prevent the electrical connections on the pump from coming into contact with the front cross panel.

VII - Check all fuel lines and connections as well as the fuel tank filler cap for leakage. If necessary, the standard cork fuel tank filler cap gasket can be replaced with the rubber one, part no. 111 201 557 E.

VIII - If the front cross panel becomes distorted by external influences, it is essential to check the seal between heater and exhaust pipe for damage.

Important

We should like to point out once again that the heater must always be switched off when the tank is being filled and must not be switched on during the run-on period (see instruction manual).

Type BN 4
for VW Transporter
VW Double Cab Pick-up
VW Ambulance

Trouble — Cause	Remedy
Heater does not ignite	
Battery voltage too low. Normal voltage 5.8.	Start engine to get full generator voltage.
No current.	Clean contact surfaces of ground strap between vehicle — battery and heater — vehicle. Tighten all electrical connections.
Fuse blown.	Check heater, rectify fault, install new 25 Amp. fuse.
Spark plug defective.	Clean plug, check electrode gap. With single pole plug: Check length of spark to ground. Smallest gap electrode/ground, 4 mm. With two pole plug: Check gap (2.5 mm). Fit new plug if defective.
Heater plug as ground electrode for spark plug is dirty (only with single pole plug).	Clean (with wire brush).
Coil defective or cable to plug faulty.	Check if ignition cable connector is making good contact.
Spark too weak.	Replace coil.
Spark too weak at a result of damaged or worn contact breaker.	Replace complete combustion air blower as dismantling is not permitted and contact breaker cannot be adjusted.
Heater plug not working because thermo-switch set incorrectly.	Adjust thermo-switch. Check heater plug electrically.

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Heater does not ignite

Mixture too rich or too weak because pressure regulator set incorrectly.	Adjust pressure regulator.
Fuel not being injected on to the toothed part of radial wheel. (Watch through hole for heater plug or spark plug.)	Clean or replace jet. Align jet carrier.

No fuel

Safety switch has operated after $3^1/_2$ minutes and cut off fuel supply because combustion did not commence.	Press the red safety switch lever to the right briefly to make the fuel pump circuit again.
Loose contacts in overheating switch.	Tighten all connections, if contacts are damaged, replace complete part.
Loose or sticking connections in regulator switch.	Tighten both connections or replace micro-switch.
Solenoid valve on pressure regulator not opening because of short circuit in coil windings.	Detach cover on valve housing and replace coil.
Fuel pump stopped because of dirty points.	Clean and set points. Oil springs and bearings lightly.
Fuel pipes or filter leaking. Pump sucking in air (clicks rapidly).	Check fuel pipe connections and filter glass for leakage.
Dirt or water in filter.	Clean. If filter is inserted so that the arrow does not correspond with the direction of flow, the dirt in the filter will be washed into the pipes and pressure regulator.
Pump not delivering fuel (clicks). Non-return valve on pressure side is dry and sticking.	Take pressure line off pump and put a few drops of fuel into the adaptor.
Fine filter on pressure regulator blocked.	Remove pressure line on regulator and clean filter with compressed air.
Pressure regulator and solenoid valve not working.	Clean and adjust pressure regulator.

No fuel

Solenoid valve does not open because of rust.	Remove pressure regulator with solenoid valve. Dismantle solenoid valve and clean. Replace valve if necessary.
Fuel jet blocked.	Remove pipe and clean jet with compressed air.
Fuel jet damaged.	Fit new jet.

No air

Combustion air blower connections damaged or loose.	Tighten connections at terminal 1.
Combustion air blower motor bearings or windings damaged.	Replace complete blower. Dismantling not permitted because of balancing.
Fresh air blower rubbing on casing.	Remove casing and tighten combustion air blower clip. Shortening of blades not permitted.
Radial wheel is damaged and is jammed in guide blade housing.	Replace complete combustion air blower.
Motor defective	Replace complete combustion air blower.

Shortage of combustion air

Voltage too low, must be at least 5.8 Volts.	Check battery and charge if necessary. Check ground cable.
Combustion air blower not reaching the specified speed of approx. 5000 rpm at correct voltage.	Replace complete combustion air blower.
Fresh air blower rubbing on casing.	Shape casing so that axial wheel has running clearance.
Exhaust back pressure too high because exhaust pipe blocked or extended incorrectly.	Clean, remove extension and use standard parts.
Combustion air intake pipe blocked by road dirt.	If not installed properly (see fitting instructions) the opening of the intake pipe can become blocked. Remove and clean.

No warm air

Bimetal spring flap not opening.	Remove heater and free off flap bearings through warm air duct. If dismantled the flap must be reset. (Should close with snap action when temperature drops below $35 \pm 2°$).
Poor heat transfer due to combustion deposits in heat exchanger.	Clean heat exchanger.

Heat output insufficient

Insufficient fuel due to incorrectly set regulator switch.	Adjust screw for minimum and maximum heat output on regulator switch so that combustion starts again at 42—52° C and stops at 105° C (Correct the setting at room temperature).

Heater smokes and soots up

Excess of fuel due to damaged jet.	Replace jet.
Combustion air shortage.	See under "Shortage of combustion air".
Pressure regulator incorrectly set.	Adjust pressure regulator.

Heater does not switch off

Fuel supply defective. Solenoid valve does not close because of electrical fault.	Winding connection must be on terminal 3 together with fuel pump and regulator switch. The positive connection from generator terminal 51 goes to terminal 2 on heater.
Solenoid valve sticks.	Remove solenoid valve, clean and if rusty, replace. After re-assembling, check adjustment of pressure regulator.
Combustion blower runs continuously. If the thermo-switch is set incorrectly, the blower will run on continuously when heater is switched off.	Adjust thermo-switch. Loosen securing screw slightly. Quarz rod in thermo-switch broken. Remove thermo-switch, fit new quarz rod.

J. EBERSPÄCHER
7300 ESSLINGEN/N., P.O. BOX NO. 289
TEL. 35 65 55 · TELEX. 072 3584

Type BN 4
for VW Transporter
VW Double Cab Pick-up
VW Ambulance

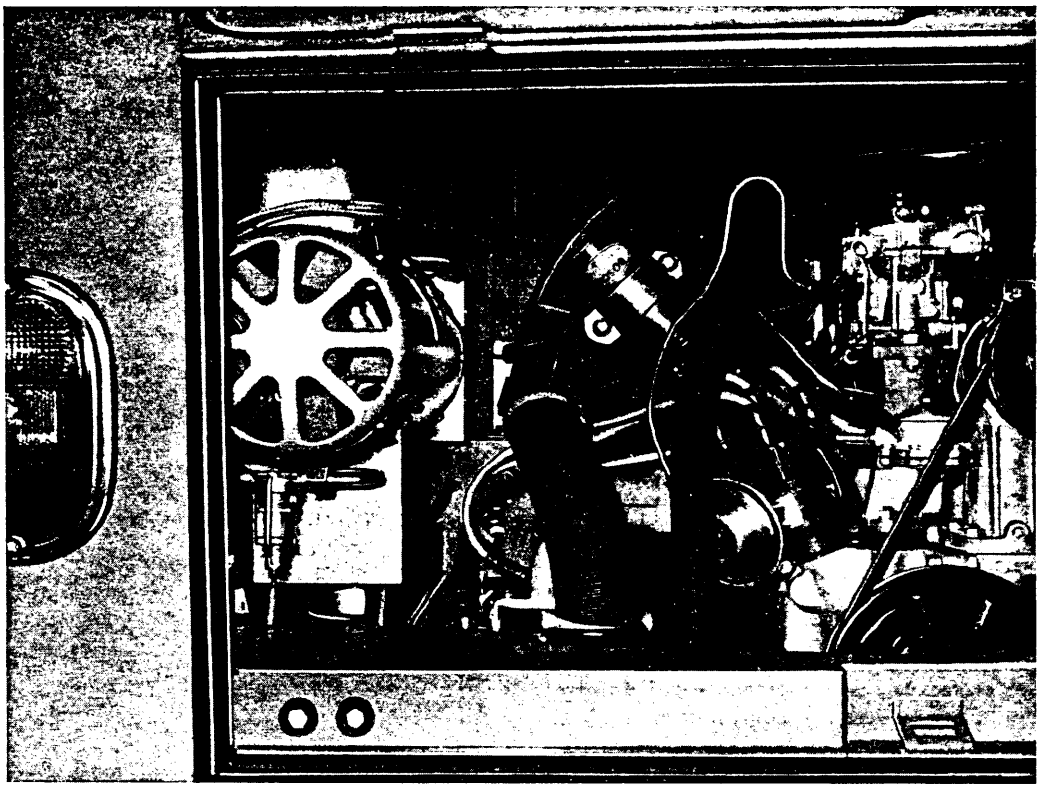

Fig. 1

Contents

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I. Work with heater installed

1 - Replacing push-pull switch and cables

Take 25 Amp. fuse out of holder in engine compartment or (if fitted) out of push-pull switch in sea box.

Remove knob and knurled nut from switch under drivers seat (Fig. 2).

Remove 2 tapping screws from cap in seat box (Fig. 3).

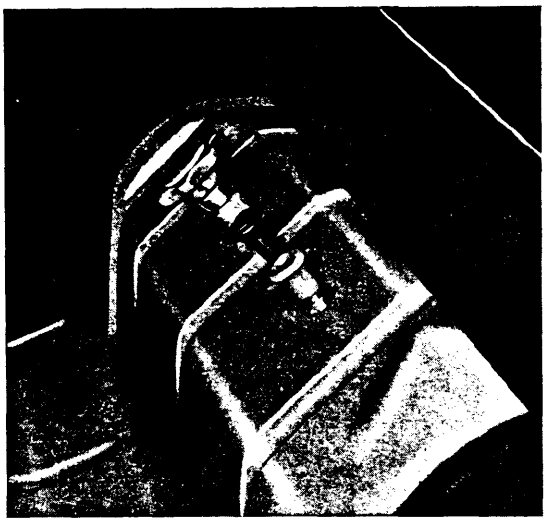

Fig. 2

Take switch and cap out of the hole in seat box and pull rubber sleeve off.

Disconnect cables and check switch.

At "Off" position (switch pushed in): No circuit from + to KL 30 A and from KL 56 H to KL 57 P.

At the "On" position (switch pulled out): there should be a circuit from + to KL 30 A and from KL 56 H to KL 57 P (see wiring diagram in fitting instructions).

Replacing cables: Remove push-on connections at KL 1, 2 and 4 on heater.

Remove protective cover over cable and Bowden cable on load compartment floor, if fitted.

Pull cable out of grommets.

When installing cable ensure that all the grommets are in good condition to avoid the risk of chafing, short circuit and fire.

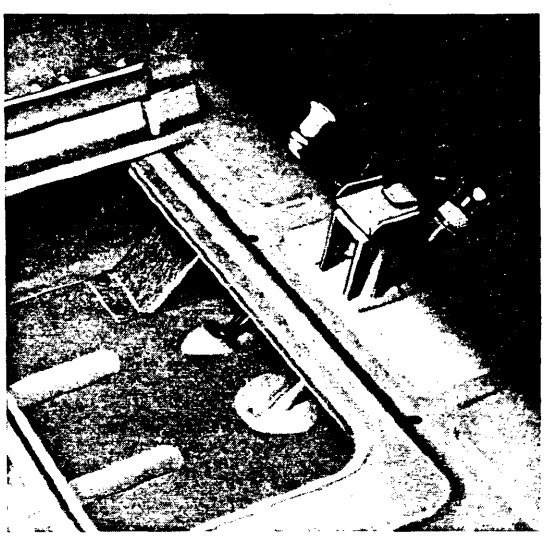

Fig. 3

2 - Replacing Bowden Cable

Detach Bowden cable at regulator switch, using wrenches SW 7 and SW 10 (Fig. 4).

Remove protective cover in vehicle interior, where fitted.

Loosen nut in seat box under driving seat.

Pull Bowden cable out.

When installing, check grommets in holes. Avoid kinks and large curves, rout as straight as possible, shorten if necessary.

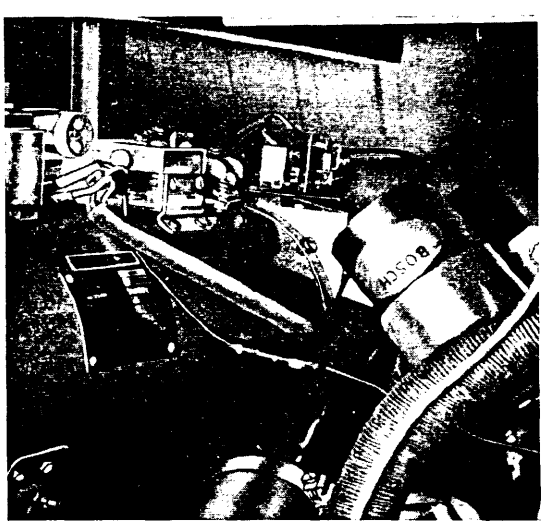

Fig. 4

3 - Removing and cleaning filter

Loosen union nuts at connections.

Take filter off.

Loosen wing nut on bracket.

Bend bracket to side, and take glass bowl off **(not screwed on)**.

Unscrew filter element.

Clean element with compressed air. When installing, note that flow direction corresponds to arrows.

Replace glass bowl even if only slightly damaged.

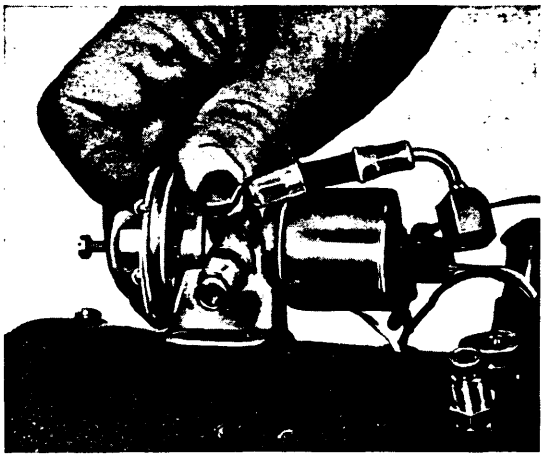

Fig. 5

4 - Removing and disassembling pressure regulator and solenoid valve

Remove pump pressure line from pressure regulator.

Loosen fuel hose at jet, holding jet with SW 14 wrench.

Disconnect solenoid cable at KL 3 on the terminal plate.

Remove 4 screws at bottom of regulator and take regulator off with solenoid (Fig. 5).

Take gland screw out of housing and remove fuel hose. Remove threaded portion, take filter out and clean it (Fig. 7).

Remove 3 screws in cap and take cap off (Fig. 6). Take out adjusting spring and spring plate.

Remove 3 screws in flange, take off flange and diaphragm. Screw valve out of housing. Check valve and clean fine filter.

Clean housing and blow out with compressed air.

Assembly takes place in the reverse order.

Note that the adjusting spring is located properly in the spring plate and that the adjusting screw engages the depression in the upper part.

The small hole in the cap must be downwards.

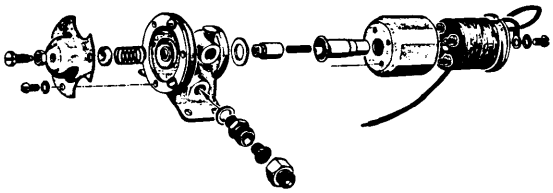

Fig. 6

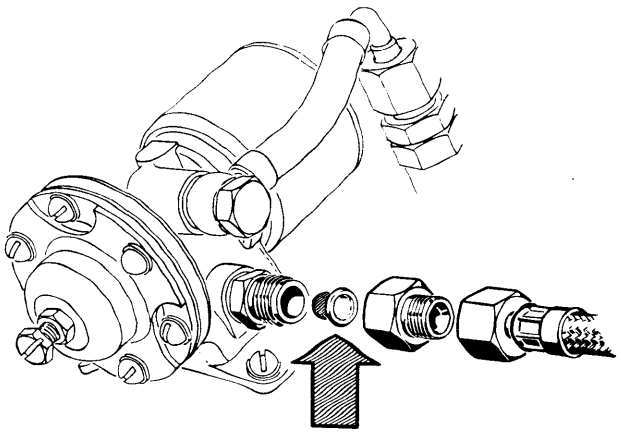

Fig. 7

The pressure regulator controls the fuel flow quantity. It can only be set properly on the heater by means of a **consumption test:**

a - Checking on a test stand in accordance with the test instructions for the heater.

b - On the heater when installed ready for operation, the fuel hose is taken off the jet and the jet screwed out. The jet is then screwed into the fuel hose and held at the same height as it would be when installed. The fuel being pumped out is then caught in a measuring glass for 2 minutes, after which time the quantity should be 20—21 cc. If less than this, the adjusting screw in the cap must be screwed into the right and if the amount is excessive the screw must be screwed out to the left. Note that the safety switch will cut the current to the pump and the solenoid valve after $3^1/_2$ minutes.

5 - Removing fuel pump

Remove pressure and suction lines at the pump.

Disconnect electrical cable.

Loosen two screws in pump bracket and take pump off.

Remove nut on terminal and take cover off (Fig. 8).

a - Check the contact breaker points, oil bearings and springs **lightly** as necessary.

b - The contact breaker gap to the gap (lower contact spring pressed against housing) should be 1 mm. Gap is set with the adjusting spring.

c - The pump must be fitted so that the pressure union is vertical as shown by arrow.

d - It may be necessary to bleed the air from the fuel lines and moisten the pressure valve with a few drops of gasoline after installing the pump.

Note:
On heaters with the pump on the left (newest version) the left rear light assembly should be taken out to facilitate work.

Removing solenoid valve from pressure regulator and disassembling it

Remove screw in solenoid valve cover and take cover off. Take windings out.

Remove 4 screws at bottom of housing and take housing off.

Take out guide tube with valve and spring.

Remove sealing ring in seat and fit new.

Clean valve seat.

Assemble in reverse order.

If the diaphragm valve is working properly, the valve should open with a definite click when current is applied. Otherwise check and replace the windings. If valve is corroded it must be replaced.

Always fit a new seal in the valve seat.

The dimensions of the spring **must not** be altered.

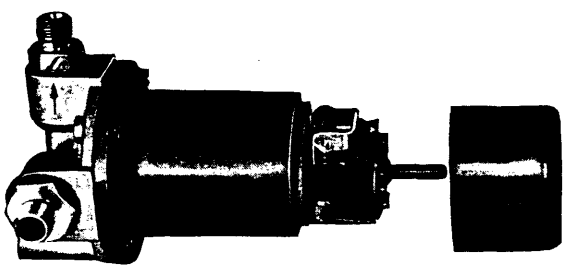

Fig. 8

6 - Removing fuel jet

Take fuel hose off at jet, holding the jet with a SW 14 wrench.

Screw jet out holding jet carrier with SW 14 wrench. The jet carrier is soldered in. Clean filter element and jet with compressed air.

Do not use wire or other objects to clean jets (Fig. 9 and 10).

Install in reverse order. Do not forget the gasket between jet carrier and jet and the filter between jet and fuel hose which also acts as a gasket. When the jet has been removed a few times, fit a new gasket and filter.

Check the fuel spray through the holes for the spark plug and heater plug. The jet of fuel should strike the atomizer wheel about 1 mm off center towards the motor (Fig. 11).

If necessary, align the jet carrier carefully with a brass drift or a 14 mm box wrench.

7 - Removing and checking spark plug

Take plug connector off and screw plug out.

Check electrode gap (Figs. 12 and 13).

If a single pole plug is fitted, the union nut must be undone and the plug pulled out of the adaptor.

When installing the plug, ensure that the guide pin in the adaptor engages in the groove in the insulation on the plug. On the single pole plug the heater plug serves as a ground electrode.

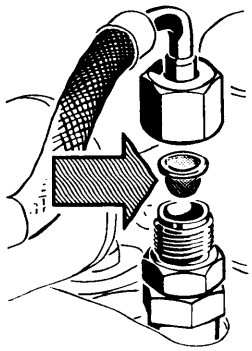

Fig. 9

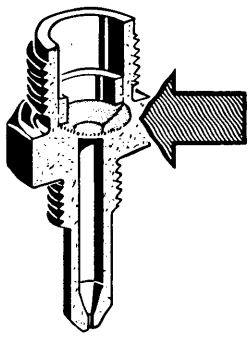

Fig. 10

Conversion to two pole spark plug

Our new type BN 4 heaters are fitted with a two pole spark plug which helps to improve the ignition of the mixture. The electrode gap of the two-pole plug is 2.5 mm (.090").

If a customer with an old type heater with a single pole plug wishes to have it converted to the two pole system, proceed as follows:

a - Remove single pole plug.

b - Remove the lock pin for the single pole plug.

c - Bore the plug hole out to 12.5 mm.

d - Tap an M 14 x 1.25 thread in the hole.

e - Screw in the two pole plug (Order No. 20 1105 10 00 11).

We wish to point out however that this conversion is not covered by our warranty conditions and must be paid for by the customer.

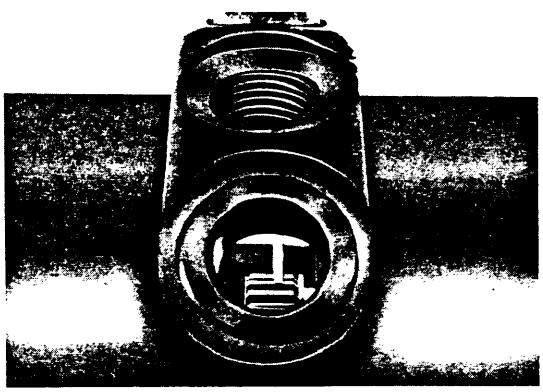

Fig. 11

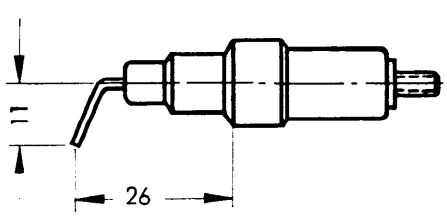

Fig. 12

8 - Removing and checking heater plug

Remove M 5 nut, take cable off and unscrew plug with SW 21 socket.

Check condition of plug and clean with a brass wire brush or a sand blaster if necessary.

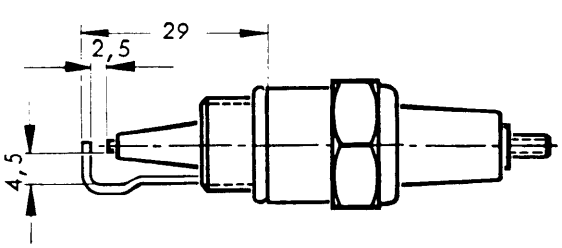

Fig. 13

9 - Replacing ignition coil

Remove plug cable.

Detach cable from contact breaker to coil at the terminal plate.

Detach cable from condenser.

Remove brass screw from stud and take coil off (Fig. 14).

To remove condenser, detach green cable at KL 4 on the terminal plate.

To test the coil use the full voltage. The spark must jump a 6 mm gap and show no signs of misfiring.

When removing the ignition cable plug, loosen the brass stud and pull the high-tension cable out. When installing the cable in the plug, ensure that a good contact is made.

When installing the ignition coil, ensure that the condenser clip is parallel to the longitudinal axis of the heater to avoid the danger of a short circuit on the cover.

The terminal for the connection between coil and contact breaker must be routed so firmly that it cannot get too near to the soldered joint of the high-tension cable on the coil.

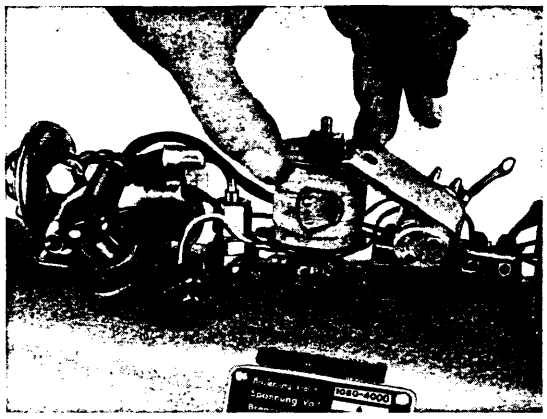

Fig. 14

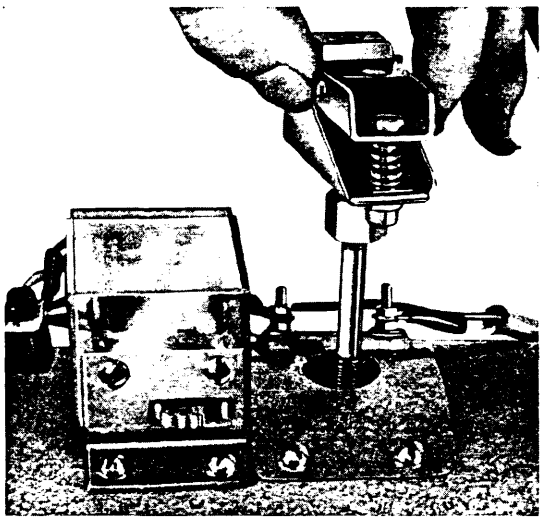

Fig. 15

10 - Removing thermo-switch

Disconnect the 3 switch cables at the terminals CL, OP and CO.

Loosen union nut under switch.

Using a turning movement, lift switch out of flange vertically without bending the feeler tube. If tight, use a suitable solvent.

Take adjusting screw out of nut in switch mounting.

Take out pressure spring and leaf spring.

Fold adjustment mounting and micro-switch over.

Slide quarz rod out of tube.

When assembling the switch, ensure that the tube is not bent and that the quarz rod slides easily in the feeler tube.

The adjustment mounting must turn freely in the switch mounting.

Basic adjustment of thermo-switch outside the heater:

Turn the adjusting screw in until the switch operates (audible click), turn back to the switching point, then tighten 120° ($^1/_3$ of a turn) past the switching point (Fig. 16).

Fig. 16

When installing the switch in the heater, ensure that the nut in the switch mounting does not touch the casing as otherwise the switch will not work properly.

The final adjustment should be made when heater is warm.

The run-on time should be 150—210 seconds. If too long, turn adjusting screw to the right and if too short, turn to the left.

11 - Removal of overheating switch

At a temperature of 150—200°, this switch breaks the circuit to the fuel pump and solenoid valve and stops combustion. The switch is adjusted at the factory. If it does not operate properly it should be replaced and no attempt made to repair it.

Remove thermo-switch (see point 10).

Detach cables from safety switch and to regulator switch.

Remove four tapping screws and disconnect cables from safety switch.

Take overheating switch out and fit a new part (Fig. 17).

12 - Removal of regulator switch

Detach Bowden cable at switch by loosening with SW 7 wrench and holding with SW 10 wrench.

Pull push-on connections off.

Remove screws from outlet.

Lift regulator switch out of warm air outlet (Fig. 18). A bimetal spring which is influenced by the temperature of the warm air controls the flow of current to the fuel pump and solenoid switch by means of a micro-switch. The operating temperature should be 42—52° C at the minimum heat output and 90—105° C at the maximum heat output.

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Note:

Regulator switch operating temperature

Introduced on **Heater Type**	**from Factory Serial No.**
20 1147	8301
20 1176	1921
20 1177	1963

The basic settings of the bimetal spring and the stop screws of the regulator switch have been altered. This has increased the switch-off temperature from 105 to 135° C (220 to 275° F) and makes the heater more effective.

Note:

If the higher switch-off temperature is desired on older heaters, the rear stop screw on the regulator switch (warm air outlet) should be taken out.

Checking heater when working

If the specified temperatures are not reached, a correction can be made by altering the stop screw for the operating lever.

If the adjustment range of the stop screw is insufficient, the basic setting must be altered by loosening the half-round head screw and moving the lever in relation to the bi-metal spring (slot in lever).

If switch is defective, replace it complete.

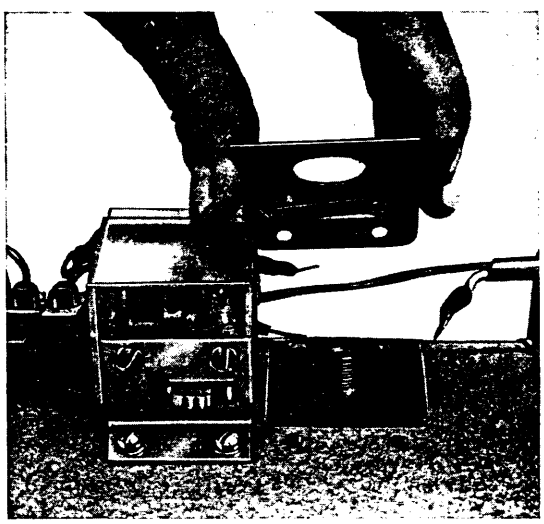

Fig. 17

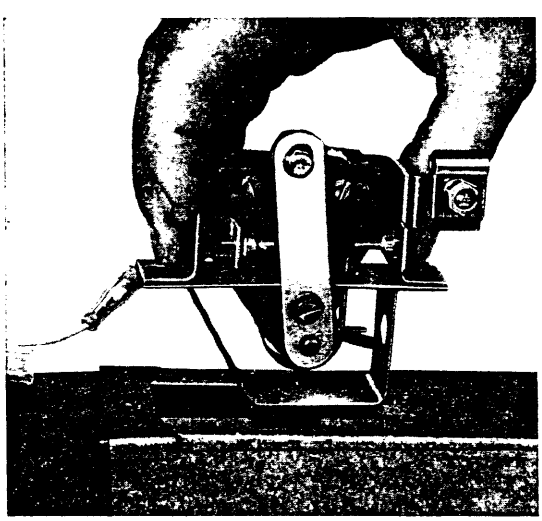

Fig. 18

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II. Removal and Installation of Heater (Fig. 19)

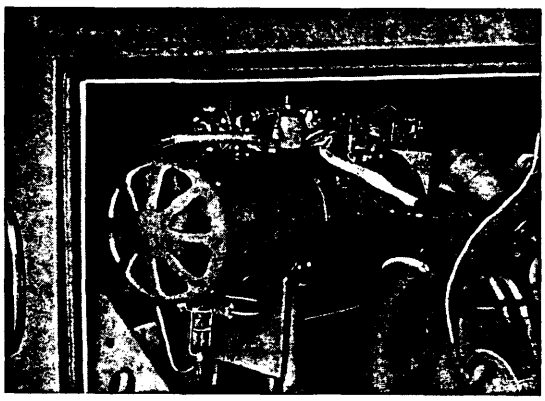

Fig. 19

Take 25 Amp. fuse out of fuse holder in engine compartment. (On earlier models the fuse is in the push-pull switch in the tool box under the driving seat.)

Take cover off heater.

Pull three connections off terminals KL 1, 2 and 4 at the terminal plate.

Unscrew fuel pipe at feed to filter and fit a plug.

Detach Bowden cable at regulator switch with SW 7 wrench, holding with SW 10 wrench.

Pull combustion air hose off heater.

Remove securing screw from exhaust pipe.

Remove two M 6 heater securing nuts under the vehicle.

Lift heater slightly so that the exhaust flange on the heater comes out of the exhaust pipe. Lift heater carefully and withdraw the outlet flange from the warm air duct.

Installation takes place in the reverse order.

III. Work with Heater Removed from Vehicle

1 - Dismantling heater and removing combustion air blower with heat exchanger (Fig. 20 and 21)

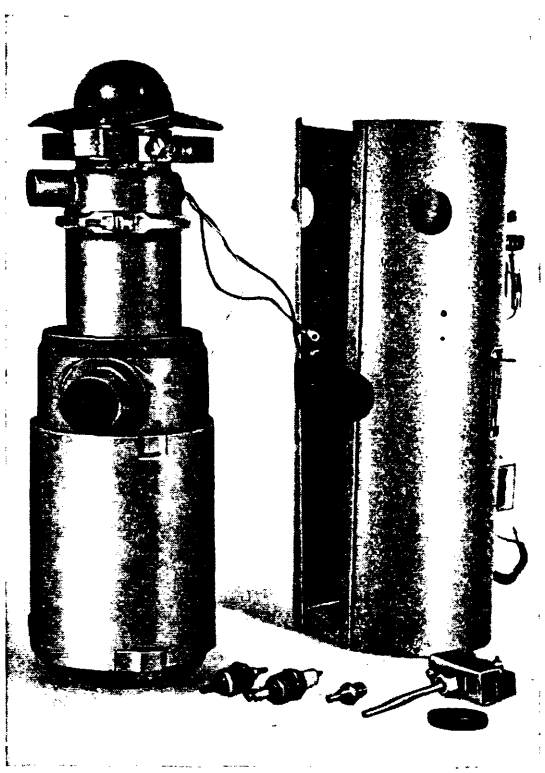

Fig. 20

Detach fuel pump pressure pipe at pressure regulator.

Detach the fuel hose from the pressure regulator, holding the jet with an SW 14 wrench.

Screw fuel jet out, holding jet carrier with an SW 14 wrench.

Remove spark and heater plugs.

Disconnect cables from combustion air blower, fuel solenoid valve and fuel pump.

Remove thermo-switch.

Remove intake cap.

Remove warm air outlet with bimetal spring flap after detaching cable from regulator switch.

Detach cable from fuel pump.

Remove pump and support bracket.

Remove the four screws in the casing and pull casing apart. Pull cables from combustion air blower and fuel pump through the casing. Take rubber plug out of large opening in casing.

Pull combustion air blower and heat exchanger out of the casing, taking care not to damage the threaded adaptors for thermo-switch and jet carrier.

Loosen the clip which connects blower and heat exchanger and pull blower out of heat exchanger carefully.

The combustion air blower should **not** be dismantled further as it is fully balanced and the breaker contacts cannot be adjusted. The gap between radial wheel and motor housing should be 1.4 to 2 mm.

Note: The guide blades in the combustion chamber of the heat exchanger should not be bent or damaged. The three holes in the combustion chamber must be free of combustion deposits.

Assembly takes place in the reverse order.

When installing the combustion air blower, ensure that the ends of the clip are in line with the exhaust pipe adaptor and the slot of the clamp screw in the clip is on the opposite side to the combustion air intake adaptor. After installing the blower and heat exchanger in the casing, center the combustion air adaptor in the opening in the casing and then tighten the clip through the opening and close the opening with the rubber plug.

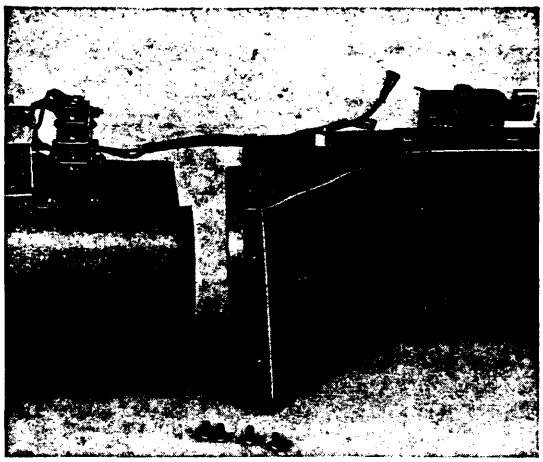

Fig. 21

Note: After installation, check that the blades of the axial blower do not touch the casing. If necessary bend the casing to rectify. The blades must not be shortened.

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Note:

Heater Type	from Factory Serial No.
20 1147	7390
20 1176	2406
20 1177	1963

The toothed ring and the hub of the combustion air blower (radial wheel) are made of corrosion-resistant sheet metal. As the heat conductivity of the new material is much lower than the aluminum used previously, there is considerably less heat transference between combustion chamber and electric motor.

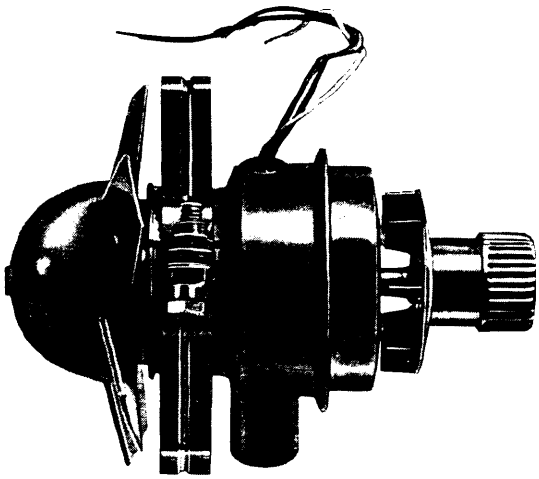

Fig. 21a

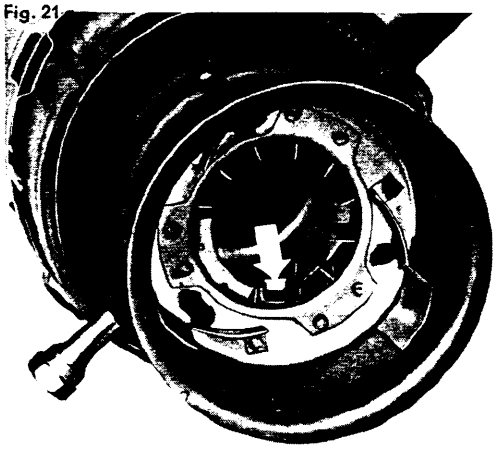

Fig. 21 b

Together with this modification, the deflector plate spot-welded into the guide blade housing has also been altered slightly.

Repair instructions:

The new blowers can be installed in old heat exchangers and the old blowers in new heat exchangers.

However, should the toothed ring of a new blower come into contact with the deflector plate in an old heat exchanger, grind 1 mm off the deflector plate.

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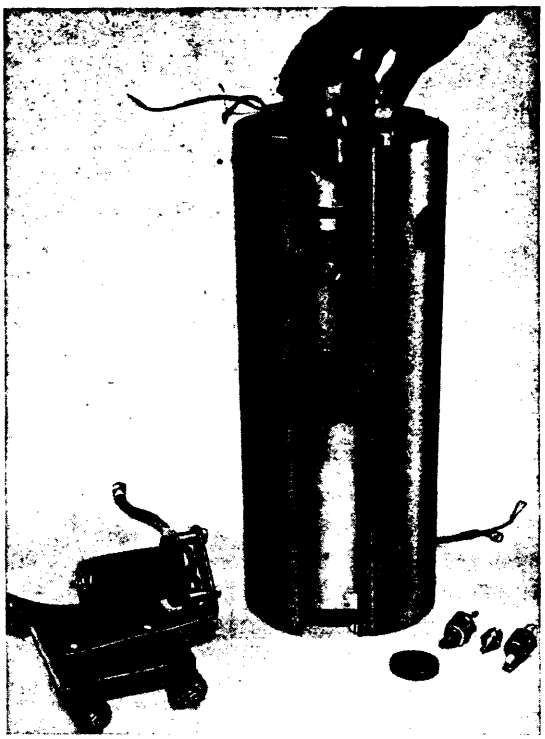

Fig. 22

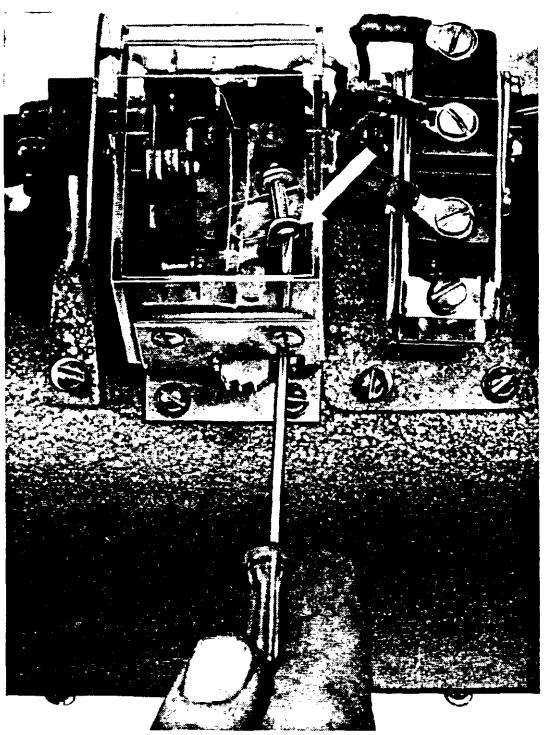

Fig. 23

The marking of the safety switch under the base plate, indicates the voltage:

FC = 6 Volt
FR = 12 Volt
GG = 24 Volt

2 - Removing combustion air blower

Detach fuel pump pressure pipe at pressure regulator.

Detach the fuel hose from the pressure regulator at the jet.

Disconnect fuel pump cable.

Disconnect combustion air blower cable.

Take off push-on connectors at regulator switch.

Remove intake cap.

Remove outlet with thermo spring flap.

Remove pump and bracket.

Remove four screws in casing

Pull casing apart and insert a piece of wood about 1 1/2" wide.

Loosen blower and heat exchanger clip.

Pull blower cable out of grommet in casing.

Pull blower out of heat exchanger and casing to the front (Fig. 22).

Assembly takes place in the reverse order.

The remarks on the combustion air blower in para. 1 are to be noted.

3 - Removing safety switch

Remove two screws in switch bracket.

Take plastic cover off housing.

Pull switch out of housing.

Disconnect cables at terminal plate, at casing and at overheating switch.

Fit new switch if necessary.

Do not bend the spring or the contacts.

The switch must only be checked and adjusted when the plastic housing is closed. At the nominal voltage, the time taken to operate should be 3—4 minutes. If rectification is required, the red sealed adjusting screw on the right side of the base plate must be turned through the slot in the switch lever. If the switch-off time is shorter turn screw to the right, if longer, turn to the left (Fig. 23).

4 - Outlet with bimetal spring flap

Remove two feed cables at regulator switch.

Loosen four screws and take outlet off casing (Fig. 24).

Remove regulator switch (see I. 12).

If faulty, replace complete.

Adjustment is made with heater working. When switching off, the flap must close with a snap at an outlet air temperature of 33—37° C.

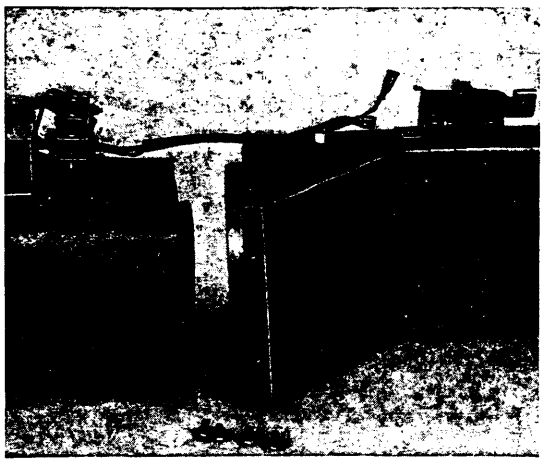

Fig. 24

IV. Checking the Heater

When the heater has been dismantled or when parts have been replaced, it must be given a working test and all the adjustment which the manufacture stipulates for the operation and safety of heater and vehicle, checked. This is the only way to ensure that the heater will continue to work properly.

1 - Checking with heater removed

Note: The following parts are be required for the test:

1 Exhaust pipe
1 Exhaust elbow
1 Fresh air hose
1 Intake pipe
1 Electric cable with push-pull switch

The heater must be set up horizontally. It must only be clamped in a vise at the base and not at the casing.

Place the exhaust pipe on the flange. If the exhaust gas is to be taken further away, use the exhaust elbow as well. Install the fresh air pipe and hose on the combustion air intake flange. Connect the fuel supply to the filter and ensure that the fuel container is in the same position as in the vehicle. Do not exceed the maximum pump delivery head of 1 mm under any circumstances.

Connect positive cable to terminals KL 1, 2 and 4 (it is best to use the push-pull switch with operating cable). Connect the negative cable to heater ground, preferably to the ground strap on the support. (Battery or mains transformer).

Use the correct voltage as shown on the identification plate.

Connect the test lamp to the fuel pump connection and heater ground in order to check the pump, safety switch, overheating switch and regulating switch.

Test voltage 5.8 Volt or 1.6 Volt: measure at feed KL 2 or KL, CL on thermo-switch.

Remove spark and heater plugs and check fuel jet direction. The jet of fuel should strike the atomizer wheel about 1 mm offset towards the motor.

Align jet carrier as necessary.

Start heater up and check that it ignites properly.

Set **regulator switch** stop screw to minimum position.

After one regulating cycle, that is after the heater switches on the second time, check the warm air temperature at the outlet and adjust as necessary, until the specified value is attained.

Specified value:

Regulator maximum setting — Switch off temperature 90—105° C.

Pull the soot check rod out and check if it is covered with soot.

Check fuel consumption and blower speed at 6/12 Volts.

a) Fuel consumption

Bridge the cable at regulator switch. Start the measurement as soon as the heater is fully in operation. The time for the consumption of 25 cc is measured. The time should be 141—153 sec/25 cc which equals .64—.59 liters per hour. If a second check is required, switch heater off and let the run-on cycle cool the heater down.

b) Blower speed

Measured at **6/12 Volts.**
Nominal speed 4875—5375 rpm.

Measure the **run-on time** as follows.

Set the heat output to "Max". and then stop the combustion process by moving the switch to "Off" and operate the stop watch at the same time.

Measure the time which elapes before the blower switches off.

The time should be 150—210 seconds.

Check the bimetal spring flap during the heater run-on period.

The flap should close with a snap action at 35°±2° C.

(Not valid for heater 20 1127, VW Double Cab Pick-up.)

Overheating switch

1. Block the air intake with the proper cover cap.

2. Measure the switch-off temperature.
Should be 150°—200° C.

Check security of all nuts and screws on the heater.

2 - Checking with heater installed

If the heater is to work properly when installed even though it has been checked thoroughly beforehand, it must be installed in accordance with the maker's instructions.

Do not alter the exhaust pipe layout.

The position of the intake pipe for the combustion air must be noted particularly (common fault).

Seen in the direction of travel it be at a right angle to the right and end between exhaust elbow and vehicle floor.

Avoid a poor ground connection (voltage drop) by removing paint or rust from ground strap contact surface.

Check electrical connections with wiring diagram.

Check that Bowden cable works easily, correct routing if necessary.

Check vehicle battery and charge if necessary. At a voltage of less than 5.5/11 Volts, the heater will no longer function properly.

Switch heater on and check ignition and controls.

Ensure that the safety switch is switched on. As the red switch lever does not show the position of the switch, it should be moved back and forth.

If the battery is discharged and the voltage low, start vehicle engine and switch heater on again after the red charging lamp has gone out.

Check heater run-out if necessary.

IV. Checking the heater

When the heater has been dismantled or when parts have been replaced, it must be given a working test and all the adjustment which the manufacturer stipulates for the operation and safety of heater and vehicle, checked. This is the only way to ensure that the heater will continue to work properly.

1 - Checking with heater removed

Note: The following parts are be required for the test:

1 Exhaust pipe
1 Exhaust elbow
1 Fresh air hose
1 Intake pipe
1 Electric cable with push-pull switch

The heater must be set up horizontally. It must only be clamped in a vice at the base and not at the casing.

Place the exhaust pipe on the flange. If the exhaust gas is to be taken further away, use the exhaust elbow as well. Install the fresh air pipe and hose on the combustion air intake flange. Connect the fuel supply to the filter and ensure that the fuel container is in the same position as in the vehicle. Do not exceed the maximum pump delivery head of 1 mm under any circumstances.

Connect positive cable to terminals KL 1, 2 and 4, (it is best to use the push-pull switch with operating cable).

Connect the negative cable to heater ground, preferably to the ground strap on the support. (Battery or mains transformer).

Use the correct voltage as shown on the identification plate.

Connect the test lamp to the fuel pump connection and heater ground in order to check the pump, safety switch, overheating switch and regulating switch.

Test voltage 5.8 Volt or 1.6 Volt: measure at feed KL 2 or KL, CL on thermo-switch.

Remove spark and heater plugs and check fuel jet direction. The jet of fuel should strike the atomizer wheel about 1 mm offset towards the motor.

Align jet carrier as necessary.

Start heater up and check that it ignites properly.

Set **regulator switch** stop screw to minimum position.

After one regulating cycle, that is after the heater switches on the second time, check the warm air temperature at the outlet and adjust as necessary, until the specified value is attained.

Specified value:

Regulator maximum setting = Switch off temperature 90—105° C.

Pull the soot check rod out and check if it is covered with soot.

Check fuel consumption and blower speed at 6/12 Volts.

a) Fuel consumption

Bridge the cable at regulator switch. Start the measurement as soon as the heater is fully in operation. The time for the consumption of 25 cc is measured. The time should be 141—153 sec/25 cc which equals .64—.59 liters per hour. If a second check is required, switch heater off and let the run-on cycle cool the heater down.

b) Blower speed

Measured at 6/12 Volts.
Nominal speed 4875—5375 rpm.

Measure the **run-on time** as follows.

Set the heat output to "Max." and then stop the combustion process by moving the switch to "Off" and operate the stop watch at the same time.

Measure the time which elapes before the blower switches off.

The time should be 150—210 seconds.

Check the bimetal spring flap during the heater run-on period.

The flap should close with a snap action at 35°±2° C.

(Not valid for heater 20 1127, VW Double Cab Pick-up.)

Overheating switch

1. Block the air intake with the proper cover cap.
2. Measure the switch-off temperature.

Should be 150°—200° C.

Check security of all nuts and screws on the heater.

2 - Checking with heater installed

If the heater is to work properly when installed even though is has been checked thoroughly beforehand, it must be installed in accordance with the maker's instructions.

Do not alter the exhaust pipe layout.

The position of the intake pipe for the combustion air must be noted particularly (common fault).

Seen in the direction of travel it be at a right angle to the right and end between exhaust elbow and vehicle floor.

Avoid a poor ground connection (voltage drop) by removing paint or rust from ground strap contact surface.

Check electrical connections with wiring diagram.

Check that Bowden cable works easily, correct routing if necessary.

Check vehicle battery and charge if necessary. At a voltage of less than 5,5/11 Volts, the heater will no longer function properly.

Switch heater on and check ignition and controls.

Ensure that the safety switch is switched on. As the red switch lever does not show the position of the switch, it should be moved back and forth.

If the battery is discharged and the voltage low, start vehicle engine and switch heater on again after the red charging lamp has gone out.

Check heater run-out if necessary.

3 - Technical data for the Type BN 4 heater

Test voltage	5.8 Volts; 11.6 Volts
Safety switch cut-out time	100—180 seconds
Regulator switch operating temperatur — Min. position	42—52° C
Max. position	90—105° C
at a voltage of	6 V ; 12 V
Fuel consumption	25 cc in 141—153 secs.
or	.64—.59 liters/hour
Blower speed	4875—5375 rpm
Heater run-on time	150—210 seconds
Bimetal spring flap closes	35±2° C
Overheating switch operating temperature	150—200° C

V. Repair times for the BN 4 heater

for VW Transporter
VW Double Cab Pick-up
VW Ambulance

I. 1 -	Replace push-pull switch	10 min.
	a) Replace warning lamp	10 min.
	b) Replace cable harness	30 min.
2 -	Replace Bowden cable	30 min.
3 -	Replace fuel filter	10 min.
4 -	Replace pressure regulator complete	20 min.
	a) Adjust pressure regulator	10 min.
	b) Replace coil for solenoid valve	15 min.

3 - Technical data for the Type BN 4 heater

Test voltage	5.8 Volts; 11.6 Volts
Safety switch cut-out time	100—180 seconds
Regulator switch operating temperatur — Min. position	42—52° C
Max. position	90—105° C
at a voltage of	6 V; 12 V
Fuel consumption	25 cc in 141—153 secs.
or	.64—.59 liters/hour
Blower speed	4875—5375 rpm
Heater run-on time	150—210 seconds
Bimetal spring flap closes	35±2° C
Overheating switch operating temperature	150—200° C

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VW Double Cab Pick-up
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3 -	Replace fuel filter	10 min.	
4 -	Replace pressure regulator complete	20 min.	
	a) Adjust pressure regulator	10 min.	
	b) Replace coil for solenoid valve	15 min.	
5 -	a) Replace fuel pump (old type)	15 min.	
	b) Replace fuel pump (new type)	25 min.	
	c) Adjust contacts	10 min.	+ operation
6 -	a) Replace fuel jet	10 min.	[5a or b
	b) Align jet carrier	40 min.	+ operation II
7 -	Replace or clean spark plug	10 min.	
8 -	Replace or clean heater plug	10 min.	
9 -	Replace coil	10 min.	
10 -	a) Replace or adjust thermo-switch	25 min.	
	b) Adjust thermo-switch	10 min.	
11 -	Replace overheating switch	10 min.	+ operation 10a
12 -	Regulator switch	30 min.	
13 -	Replace intake pipe	15 min.	
14 -	Replace exhaust	15 min.	
II.	Remove and install	60 min.	
III.	a) Dismantle heater and remove combustion air blower with heat exchanger	45 min.	+ operation II
	b) Replace combustion air blower	30 min.	+ operation II
	Replace casing	100 min.	+ operation II
	c) Replace safety switch	10 min.	+ operation II
	d) Replace outlet with bimetal switch flap	10 min.	+ operation II
IV.	Check heater	20 min.	

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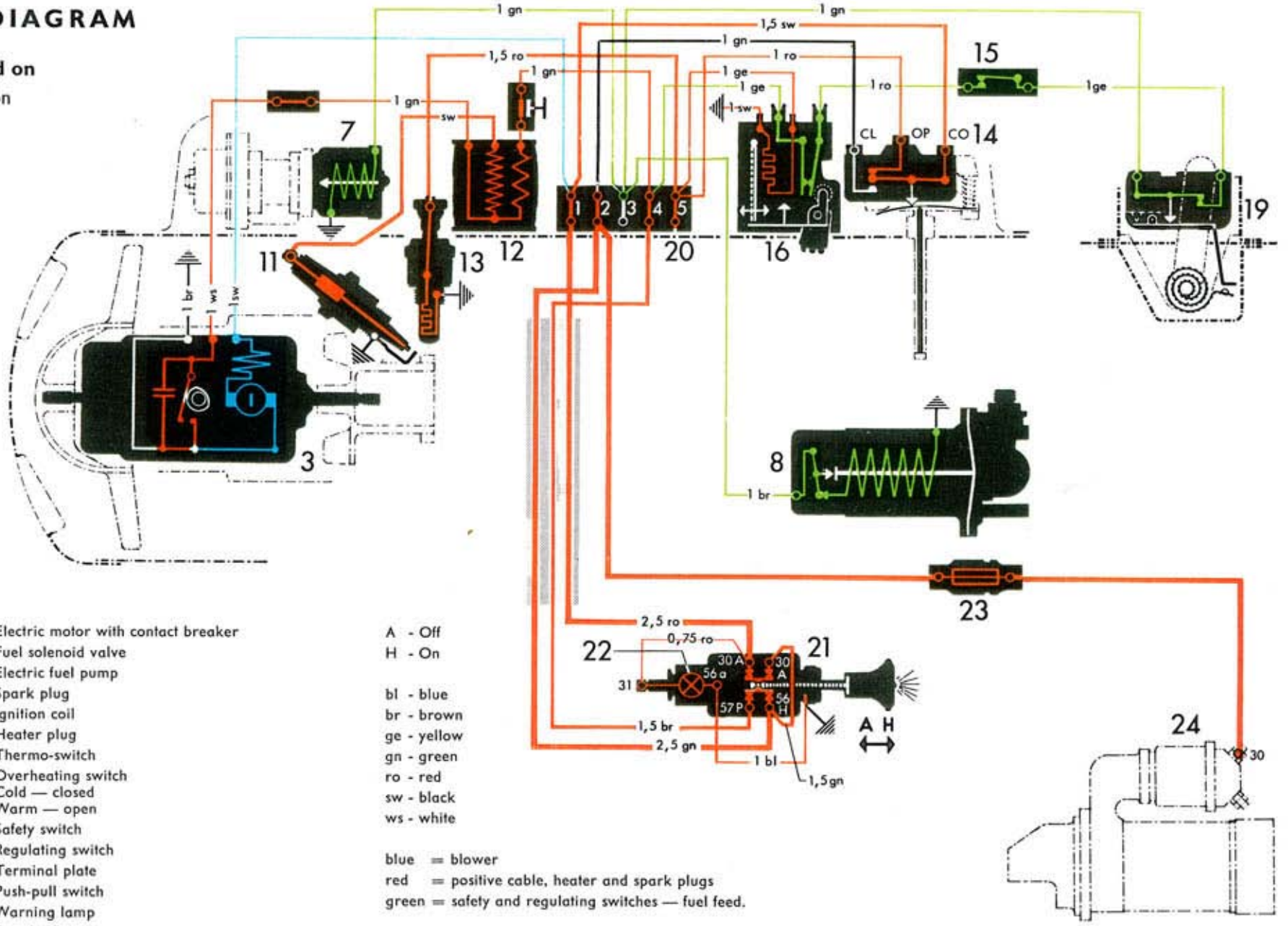
WIRING DIAGRAM

Heater switched on

Start of combustion



3 Electric motor with contact breaker
7 Fuel solenoid valve
8 Electric fuel pump
11 Spark plug
12 Ignition coil
13 Heater plug
14 Thermo-switch
15 Overheating switch
Cold — closed
Warm — open
16 Safety switch
19 Regulating switch
20 Terminal plate
21 Push-pull switch
22 Warning lamp
23 Fuse holder
24 Starter (Terminal 30)

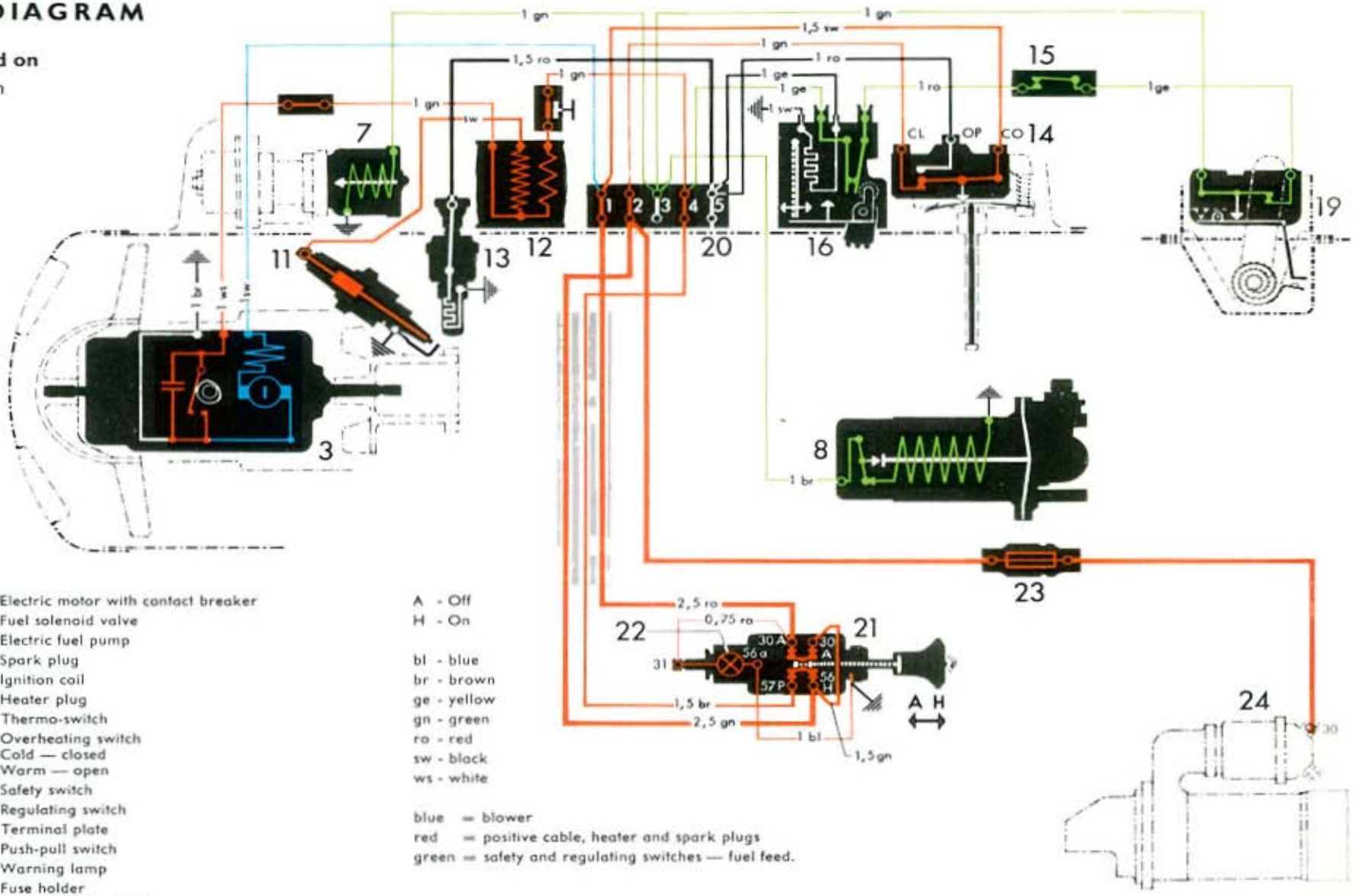
A - Off
H - On

bl - blue
br - brown
ge - yellow
gn - green
ro - red
sw - black
ws - white

blue = blower
red = positive cable, heater and spark plugs
green = safety and regulating switches — fuel feed.

WIRING DIAGRAM

Heater switched on
Normal operation



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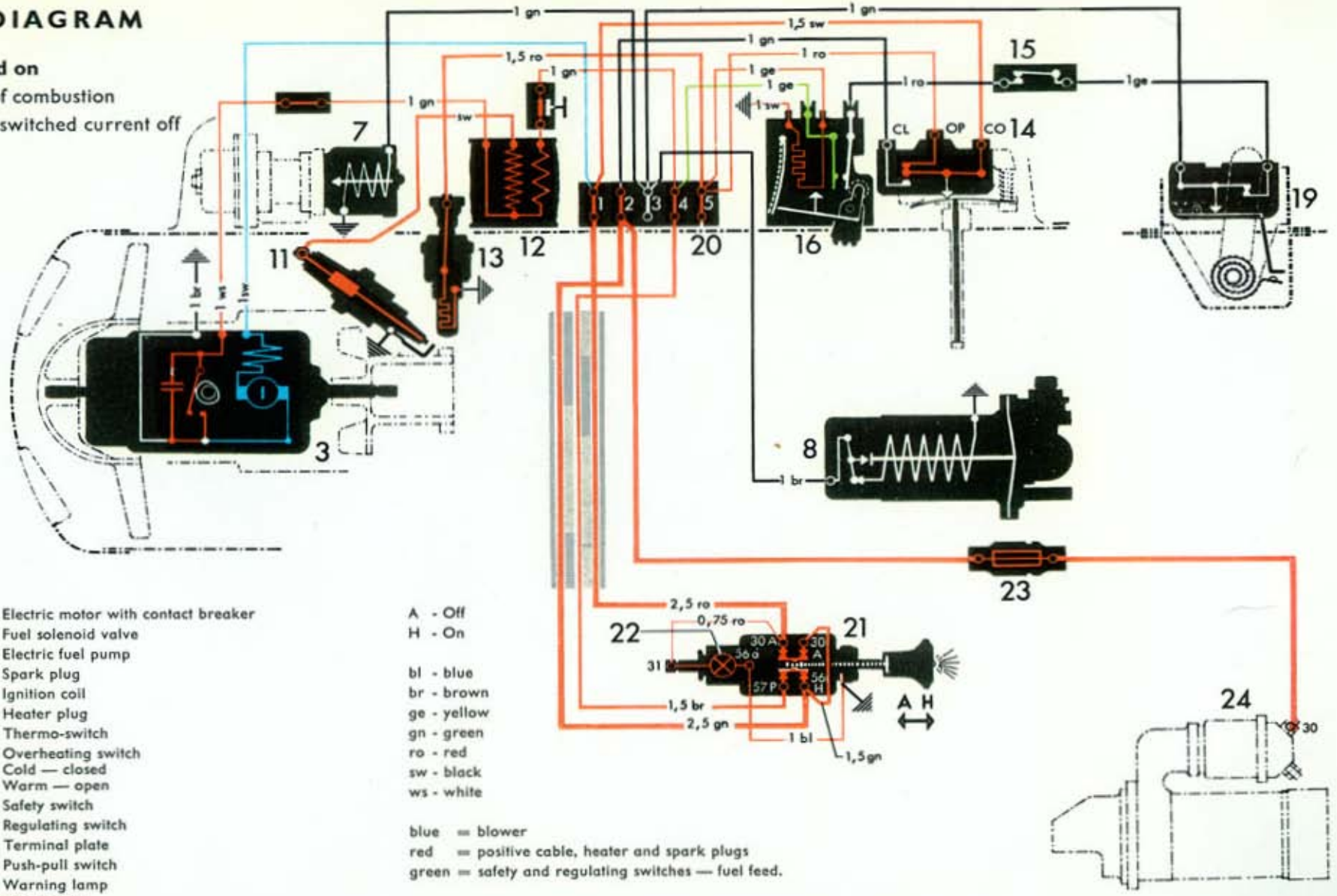
WIRING DIAGRAM

Heater switched on

Trouble at start of combustion

Safety switch has switched current off



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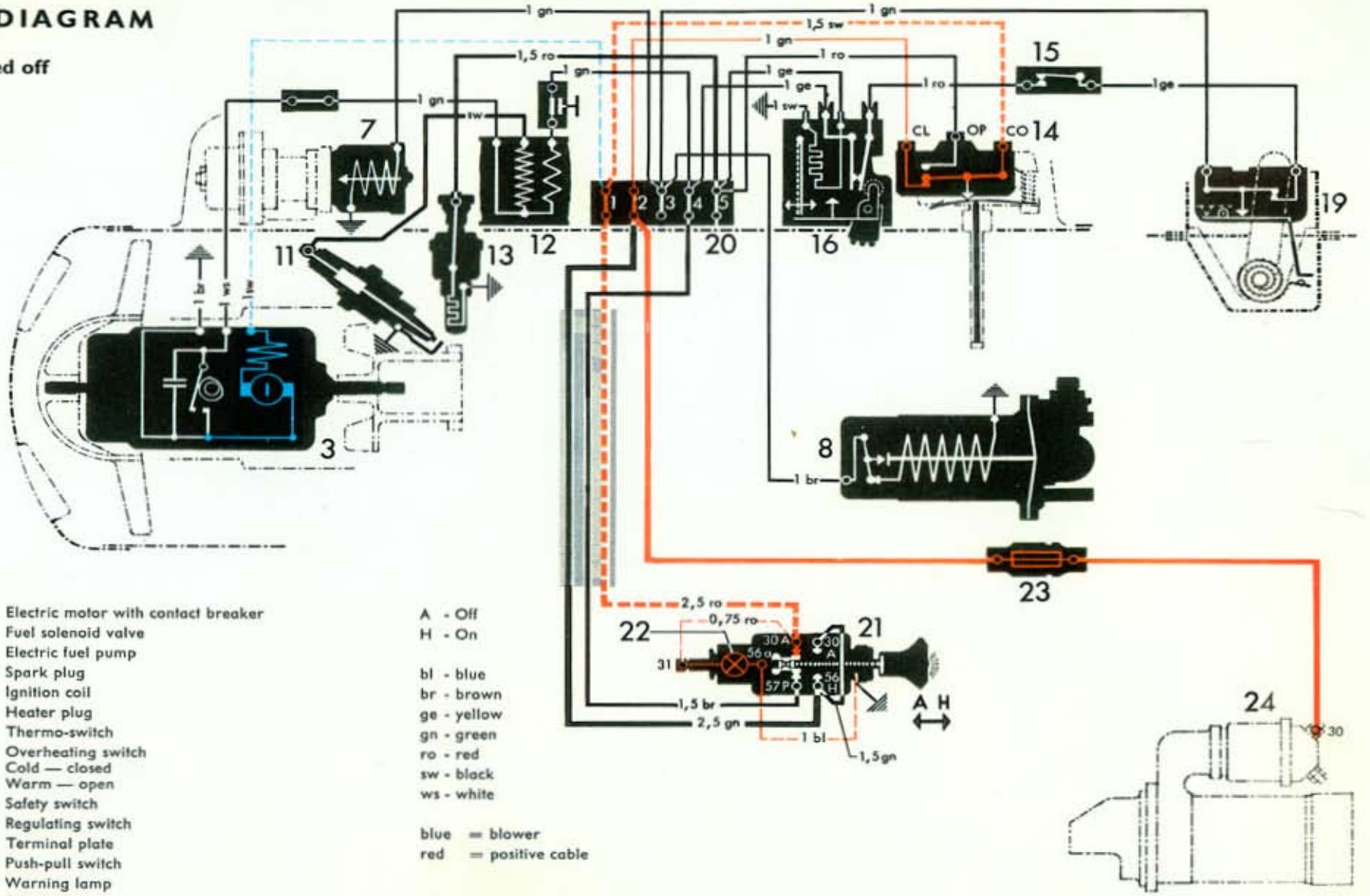
WIRING DIAGRAM

Heater switched off

Run-on



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sw - black
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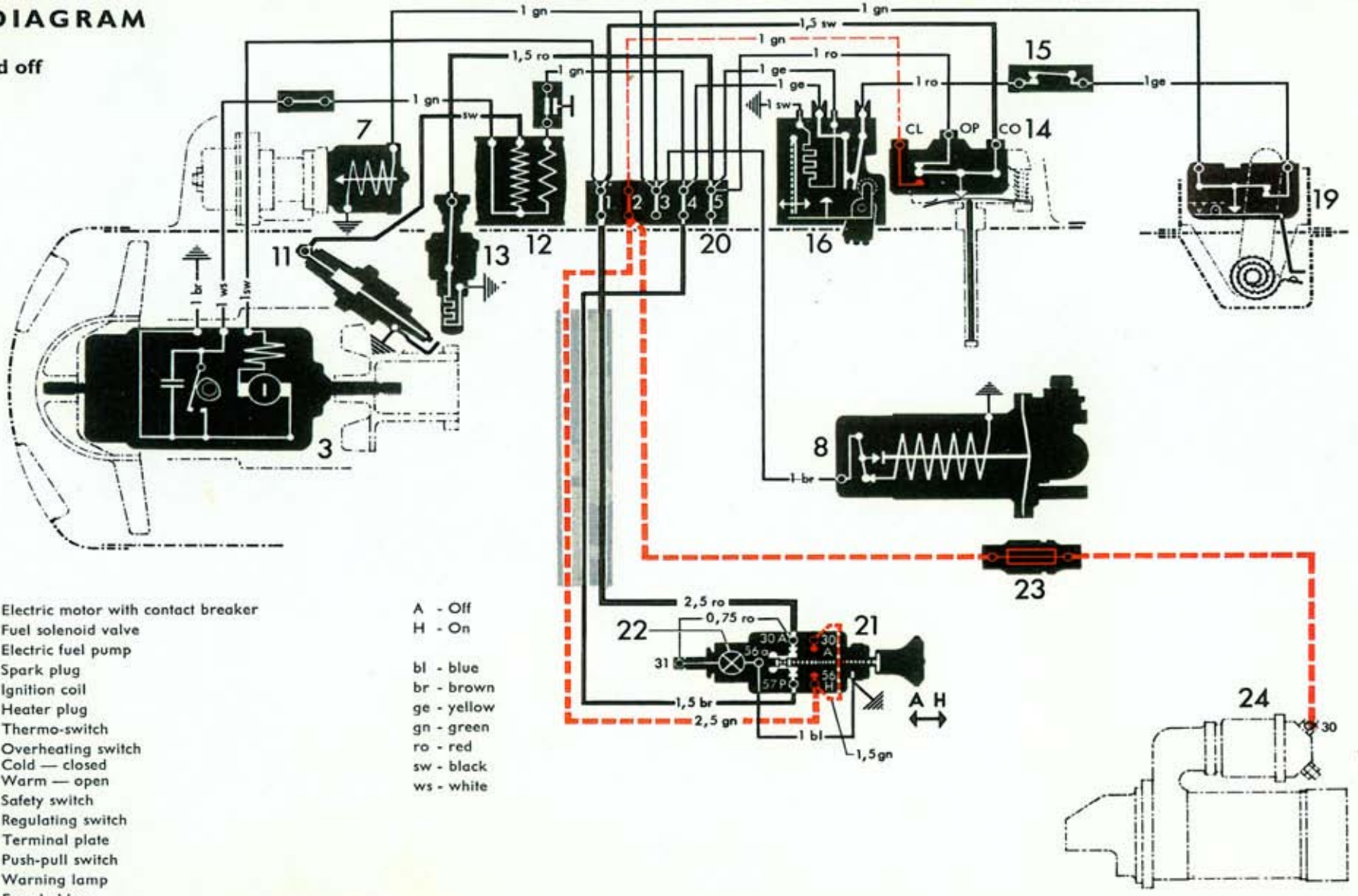
blue = blower
red = positive cable

WIRING DIAGRAM

Heater switched off



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Continuous positive

Heater No. 20 1144
for VW 1500 and Variant

Fig. No.	Qty.	Designation Remarks	Order No.	EB No.
	1	**Casing complete** consisting of:	20 1144 01 00 00 (oZ)	2159
1	1	Front part of casing	20 1144 01 01 00	2215
2	1	Inlet cowl	20 0137 00 00 00	2235
3	1	Rear part of casing	20 1144 01 03 00	2217
	1	Copper ground strap	20 8460 01 00 24	3028
	2	Knurled screw	20 8456 01 00 25	2010
	1	Grommet	20 8456 01 00 26	2011
	2	Bonded rubber buffer	20 8680 01 00 32	2402
	2	Washer	4,3 DIN 125	2012
	2	Cotter pin	1×8 DIN 94	2013
	2	Nut	M 6 DIN 934	2015
	2	Spring washer	B 6 DIN 127	2016
4	1	**Heat exchanger**	20 1144 43 00 00	2218
	1	**Combustion air blower** consisting of:	20 1144 03 00 00	2219
5	1	Guide blade housing	20 8456 03 01 00	2019
6	1	Radial blower, complete	20 8542 03 02 00	2020
7	1	Motor locating housing, complete	20 8542 03 03 00	2022
8	1	Electric motor	20 8542 03 05 00	2023
9	1	Clip	20 8542 03 00 38	8184
	1	Rubber band	20 8542 03 00 27 (oZ)	2025
	2	Cover tabs	20 8542 03 00 28	2026
10	1	Axial blower	20 1144 03 00 10	2220
	1	Grommet	20 8542 03 00 32	4043
	3	Washer	B 4,3 DIN 9021	7982
	3	Screw	M 4×8 DIN 86	2003
	3	Spring washer	B 4 DIN 127	2004
	2	Carbon brush	20 8542 03 05 01	2109

Fig. No.	Qty.	Designation Remarks	Order No.	EB No.
11	1	**Jet carrier with filter** consisting of:	20 8542 04 00 00	2035
	1	Adaptor with filter including:	20 8542 04 01 00	2036
	1	Union	20 8542 04 00 01	2037
12	1	Adaptor	20 8542 04 00 02	2038
13	1	Filter	20 0128 00 00 00	2195
14	1	Jet 0.30 mm	20 8630 06 00 14 (oZ)	2198
	1	Jet carrier	20 8456 04 00 07	2041
	1	Union	20 8456 04 00 10	2042
	1	Sealing washer	20 8450 09 00 10	2043
	1	Union nut	2/3 M 10×1 DIN 7606	4041
15	1	Jet 0.325 mm	20 8456 04 00 15 (oZ)	2040
16	1	Jet 0.70 mm	20 8456 04 00 16 (oZ)	2047
	1	Jet 0.75 mm	20 0095 00 00 04 (oZ)	2199
	1	Sealing ring	A 8×12 DIN 7603	2045
	1	Sealing ring	A 10×14 DIN 7603	2046
17	1	**Electric fuel pump, complete** consisting of:	20 8542 06 00 00 (oZ)	2051
	1	Electric pump consisting of:	20 8542 06 01 00	2048
	1	Adaptor (M 10×1)	20 8541 16 02 01 (oZ)	5666
	1	Bakelite cap for normal pump	20 8541 16 02 04 (oZ)	5651
	1	Gland screw	A 8 DIN 7623	2054
	2	Sealing ring	A 14×18 DIN 7603	2055
	1	Clip	SP 44/12 Skz	2050 A
	1	Screw	M 6×8 DIN 86	2028
	1	Lock washer	J 6,4 DIN 6797	2029
18	1	**Outlet with control switch** consisting of:	20 1144 07 00 00	2162
	1	Elbow	20 1144 07 02 00	2163
	1	Control flap, complete	20 1144 07 04 00	2221
	1	Link	20 8456 07 03 00	2059

Fig. No.	Qty.	Designation Remarks	Order No.	EB No.
	1	Lever	20 8456 07 06 00	2062
	1	Operating rod, complete	20 1144 07 07 00	2222
	1	Switch plate	20 8456 07 00 51	2068
	1	Spring	20 8460 06 00 45	2069
19	1	Control switch	20 8460 06 00 43	2070
	1	Cap	20 1144 07 00 04	2223
	2	Grommet	20 8362 02 00 34	2072
	1	Knob	20 0117 00 00 00	2224
	1	Pin	2×12 DIN 1481	2044
	1	Cotter pin	1,5×10 DIN 94	2064
	9	Tapping screw	BZ 3,5×6,5 DIN 7971	2006
	1	Spring	20 8456 07 00 60	2205
	1	Washer	5,3 DIN 433	2067
	1	Cap nut, self-locking	M 6 DIN 986	2009
	1	Grommet	20 1144 07 00 07	2225
	1	Screw	M 3×10 DIN 84	2060
	1	Spring washer	B 3 DIN 127	2061
	1	Insulating sleeve	20 1144 07 00 10	2226
20	1	**Outlet, complete**	20 1144 08 00 00	2165
	—	**Operating parts** consisting of:	20 1143 09 00 00 (oZ)	2227
21	1	Heater plug	20 00 92 00 00 00	2076
22	1	Warning lamp with bulb	20 8456 09 04 00	2077
	1	Bulb	20 8516 17 04 01 (oZ)	2202
	1	Grommet	20 8456 09 00 58	2079
	1	Cap	20 1143 09 00 04	2228
	1	Cable connector, 2 pole	20 8542 09 00 05 (oZ)	2080
	1	Screw	CM 4×20 DIN 85	2081
	1	Spring washer	B 4 DIN 127	2004
	—	**Combustion air pipe** consisting of:	20 1140 10 00 00 (oZ)	2166
23	1	Pipe	20 1140 10 01 00	2167
24	1	Air hose	20 8680 10 00 09 (oZ)	2428

Fig. No.	Qty.	Designation Remarks	Order No.	EB No.
	1	**Exhaust pipe, complete** consisting of:	20 1144 11 00 00 (oZ)	2168
25	1	Exhaust pipe	20 1144 11 01 00	2169
	1	Sealing ring	20 8542 11 00 02	2087
26	1	Fuse holder with 25 Amp. fuse	20 8542 12 00 03	2434
	1	Fuse	25 DIN 72 581	4056
27	1	Cable adaptor	20 0023 00 00 00	8073
	1	Resistance for heater plug	20 8456 12 00 62	2089
28	1	Pump pressure line	20 8542 13 01 00	2090
29	1	Suction and return line with tank connection	20 1144 13 01 00	2230
30	1	Filter holder	20 1144 13 00 01	2229
31	1	Suction line from filter to pump	20 8542 13 00 24	2093
32	1	**Filter** consisting of:	20 8478 07 07 00	2092
	1	Housing with clip	20 8478 07 07 01 (oZ)	2153
	1	Gasket	20 8478 07 07 02 (oZ)	2154
	1	Strainer	20 8478 07 07 03 (oZ)	2155
	1	Glass bowl	20 8478 07 07 04 (oZ)	2156
	1	Clamp sleeve	20 8478 07 07 05 (oZ)	2157
	1	Wing nut	M 5 DIN 315 g	2158
33	1	**Thermo-switch** consisting of:	20 8470 21 00 00	2094
	1	Switch mounting	20 8470 20 01 00	2095
34	1	Micro switch	20 8470 21 00 02 (oZ)	2096
	1	Adjusting mounting	20 8470 20 00 07	2097
	1	Leaf spring	20 8470 20 00 08	2098
	1	Spring	20 8470 16 00 12	2099
	1	Quarz rod, 3.4 mm dia.	20 8456 09 00 25	2100
	1	Seal	20 8450 09 00 10	2043
	1	Union nut	2/3 M 10×1 DIN 7606	4041
	1	Screw	CM 3,5×25 DIN 85	2102
	1	Screw	CM 4×22 DIN 85	2106
	1	Washer	4,3 DIN 433	2107
	2	Washer	3,7 DIN 433	2103

Fig. No.	Qty.	Designation Remarks	Order No.	EB No.
	4	Lock washer	J 3,7 DIN 6797	2104
	1	Nut	M 3,5 DIN 934	2105
	1	Pivot pin	20 8470 21 00 28	8195
	2	Lock washer	2,3 DIN 6799	8196
35	1	**Overheating switch** including:	20 8542 16 00 00	2123
	2	Tapping screw	BZ 3,5 x 6,5 DIN 7971	2006
	2	Lock washer	J 3,7 DIN 6797	2104
	1	**Cover plate, complete** consisting of:	20 1144 26 00 00	2210
	1	Bracket, front	20 1144 26 01 00	2211
	1	Bracket, rear	20 1144 26 02 00	2212
	1	Plate with brackets	20 1144 26 03 00	2213
	2	Knurled screw	20 1144 26 00 03	2246

Exchange and expendable parts

The following parts are also available on an **Exchange basis**:

1 - Electric fuel pump 20 8542 06 01 00

2 - Combustion air blower 20 1144 03 00 00

3 - Thermo-switch 20 8470 21 00 00

4 - Electric motor 20 8542 03 05 00

Expendable parts which are not covered by the warranty:

1 - Heater plug 20 0092 00 00 00

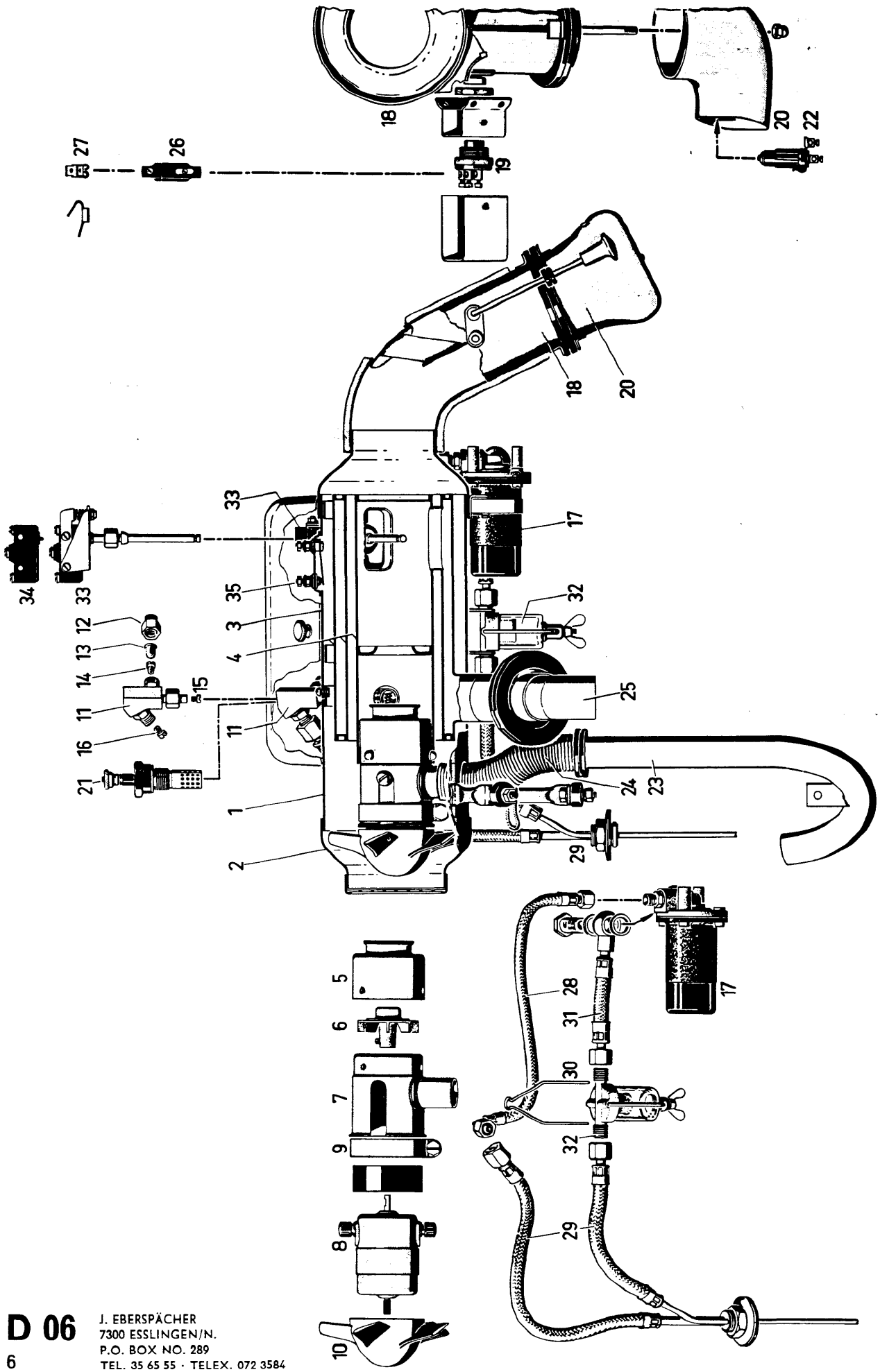
2 - Glass bowl for filter ..... 20 8478 07 07 04 (oZ)

3 - Gaskets and seals .....

4 - Grommets .....

5 - Bulbs ..... 20 8516 17 04 01 (oZ)

6 - Fuses ..... 25 DIN 72 581



D 06
J. EBERSPÄCHER
7300 ESSLINGEN/N.
P.O. BOX NO. 289
TEL. 35 65 55 · TELEX. 072 3584

Type BN 4
Heater No. 20 1104 (6 Volt)
20 1147 (12 Volt)
for VW Transporter

Fig. No.	Qty.	Designation Remarks	Order No.	EB-No.
1	1	**Casing with component parts** consisting of:		
	1	Casing complete	20 1101 01 01 00	8001
2	1	Bracket	20 1101 01 00 01	8002
3	1	Stud	20 1101 01 00 02	8003
	1	Grommet	20 1101 01 00 05	8004
	1	Grommet	20 8456 01 00 26	2011
	1	Grommet	20 8362 02 00 34	2072
	7	Half round head screw	M 4 x 8 DIN 86	2003
	2	Countersunk screw	AM 4 x 6 DIN 91	7995
	7	Lock washer	J 4,3 DIN 6797	3014
4	1	**Heat exchanger**	20 1101 32 00 00	8214
5	1	**Combustion air blower 6 Volt** **12 Volt** consisting of:	20 1101 03 00 00 20 1102 03 00 00	8012 8097
6	1	Sealing ring	20 1101 03 00 04	8013
7	1	Clip	20 1101 03 00 07	8014
8	1	Support clip	20 1101 03 00 08	8159
9	1	**Intake cap, complete** consisting of:	20 1101 04 00 00	8015
	1	Intake cap	20 1101 04 00 01	8016
	4	Screw	AM 5 x 8 DIN 85	8017
	4	Lock washer	J 5,3 DIN 6797	3011
		Connecting parts consisting of:		
10	1	Fuel jet	20 1101 07 02 00	8019
11	1	Strainer	20 0128 00 00 00	2195
12	1	Fuel hose	20 1101 07 00 05	8021
	1	Sealing ring	A 8 x 12 DIN 7603	2045

SUBJECT TO ALTERATION
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Fig. No.	Qty.	Designation Remarks	Order No.	EB-No.
		Electrical parts (6 Volt) **(12 Volt)** consisting of:		
13	1	Safety switch, complete (6 Volt)	20 1101 30 01 00	7951
		(12 Volt) consisting of:	20 1102 30 01 00	8252
	1	Cap, front	20 1101 10 01 06	7986
	1	Cap, rear	20 1101 10 01 07	7984
14	1	Coil (6 Volt)	20 1101 10 00 02	8207
		(12 Volt)	20 1102 10 00 02	8208
	1	Ignition cable connector	20 1101 10 00 18	8032
	1	Terminal plate, 5 pole	20 1101 30 03 00	7993
	1	Terminal plate, 1 pole	20 1101 10 00 04	8026
	3	Connecting tabs	20 1101 10 00 05	8027
	1	Clip	20 1101 10 00 06	8028
15	1	Condenser	20 1101 10 00 08	8029
16	1	Heater plug (6 Volt)	20 1101 10 00 10	8030
		(12 Volt)	20 1102 10 00 10	8140
17	1	Spark plug (2 pole)	20 1105 10 00 11	8130
	1	Rubber cap	20 1101 10 00 19	8033
	2	Cheese head tapping screw	BZ 2,9×13 DIN 7971	8222
	1	Hexagon nut	M 5 DIN 934	2032
	3	Lock washer	J 5,3 DIN 6797	3011
	2	Lock washer	J 4,3 DIN 6797	3014
18	1	**Cap**	20 1101 22 00 00	8253
	1	Knurled nut	M 5 DIN 467	8008
	1	Washer	5,3 DIN 9021	8009
19	1	**Overheating switch** including:	20 1101 33 00 00	8225
	4	Round head screw	AM 4×6 DIN 86	3086
	4	Lock washer	J 4,3 DIN 6797	3014
20	1	**Regulator switch** including:	20 1101 14 00 00	8045
	2	Cheese head screw	M 4×6 DIN 84	8052
	2	Spring washer	A 4 DIN 137	8228
21	1	**Pressure regulator with solenoid valve** consisting of:	20 1101 35 00 00	8254
22	1	Coil, complete (6 Volt)	20 1101 06 03 00	8059
		(12 Volt)	20 1102 06 03 00	8111
	1	Union	20 8515 05 00 29	3061 A
	1	Adaptor	20 8542 04 00 02	2038

Fig. No.	Qty.	Designation Remarks	Order No.	EB-No.
	1	Strainer	20 0128 00 00 00	2195
	1	Hollow screw	A 2/3 DIN 7623	8005
	3	Sealing ring	A 8×12 DIN 7603	2045
	4	Round head screw	4×8 DIN 86	2003
	4	Lock washer	J 4,3 DIN 6797	3014
	1	Housing	20 1101 35 05 01	8241
	1	Cap, complete	20 1101 15 04 00	8242
	1	Adjusting screw	20 1101 15 00 04	8243
	1	Adjusting spring	20 1101 15 00 02	7963
	1	Spring cover	20 1101 15 00 03	8244
	1	Flange	20 1101 15 00 01	8245
	1	Diaphragm, complete	20 1101 25 03 00	8246
	1	Valve, complete	20 1101 25 02 00	8247
	1	Housing	25 1101 04 00 01	8248
	1	Guide sleeve	25 1101 04 01 00	7961
	1	Valve, complete	20 1101 06 01 00	7964
	1	Spring	20 1101 06 00 04	8249
	1		25 1101 04 00 03	8250
	1	Gasket	25 1101 04 00 02	8251
	6	Round head screw	AM 4×8 DIN 86	2003
	6	Lock washer	J 4,3 DIN 6797	3014
23	1	**Thermo-switch** consisting of:	20 8470 21 00 00	2094
	1	Switch mounting, complete	20 8470 20 01 00	2095
	1	Micro-switch	20 8470 21 00 02	2096
	1	Adjusting mounting	20 8470 20 00 07	2097
	1	Leaf spring	20 8470 20 00 08	2098
	1	Spring	20 8470 16 00 12	2099
	1	Quarz rod	20 8456 09 00 25	2100
	1	Seal	20 8450 09 00 10	2043
	1	Locating pin	20 8470 21 00 28	8195
	1	Union nut	2/3 M 10×1 DIN 7606	4041
	2	Lock washer	2,3 DIN 6799	8196
	1	Screw	CM 3,5×25 DIN 85	2102
	2	Washer	3,7 DIN 433	2103
	4	Lock washer	J 3,7 DIN 6797	2104
	1	Hexagon	M 3,5 DIN 934	2105
	1	Screw	CM 4×22 DIN 85	2106
	1	Washer	4,3 DIN 433	2107

Fig. No.	Qty.	Designation Remarks	Order No.	EB-No.
24	1	**Outlet with bimetal spring flap** including:	20 1104 01 00 00	8006
	4	Screw	AM 5 x 8 DIN 85	8017
	4	Lock washer	J 5,3 DIN 6797	3011
25	1	**Heater mounting** consisting of:	20 1104 22 00 00	7954
	1	Support, complete	20 1104 22 01 00	7952
26	2	Bonded rubber mounting with thread	20 8460 01 00 15	3027
	1	Copper ground strap	20 8460 01 00 24	3028
	4	Hexagon nut	M 6 DIN 934	2015
	4	Spring washer	B 6 DIN 127	2016
	4	Round head screw	M 4 x 8 DIN 86	2003
	4	Lock washer	J 4,3 DIN 6797	3014
		Fuel pump with suction pipe consisting of:		
27	1	Electric pump (6 Volt)	20 8541 16 02 00	4047
		(12 Volt)	20 1122 04 01 00	8237
	1	Bakelite cap for normal pump	20 8541 16 02 04	5651
28	1	Pressure line	20 1104 24 00 06	8239
	2	Hexagon head screw	M 6 x 15 DIN 931	3053
	2	Spring washer	B 6 DIN 127	2016
	1	Ground cable	20 0012 10 01 10	7997
29	1	T piece	20 8478 07 02 00	3047
30	1	Pipe, long	20 1104 24 02 00	7957
31	1	Pipe, short	20 1104 24 01 00	7958
32	1	**Fuel filter** consisting of:	20 8478 07 07 00	2092
	1	Housing with clip	20 8478 07 07 01	2153
	1	Gasket	20 8478 07 07 02	2154
	1	Strainer	20 8478 07 07 03	2155
	1	Glass bowl	20 8478 07 07 04	2156
	1	Clamp sleeve	20 8478 07 07 05	2157
	1	Wing nut	M 5 DIN 315 g	2158
	1	**Controls** consisting of:	20 1104 15 00 00	8240
33	1	Bowden cable	20 1104 26 00 01	7960

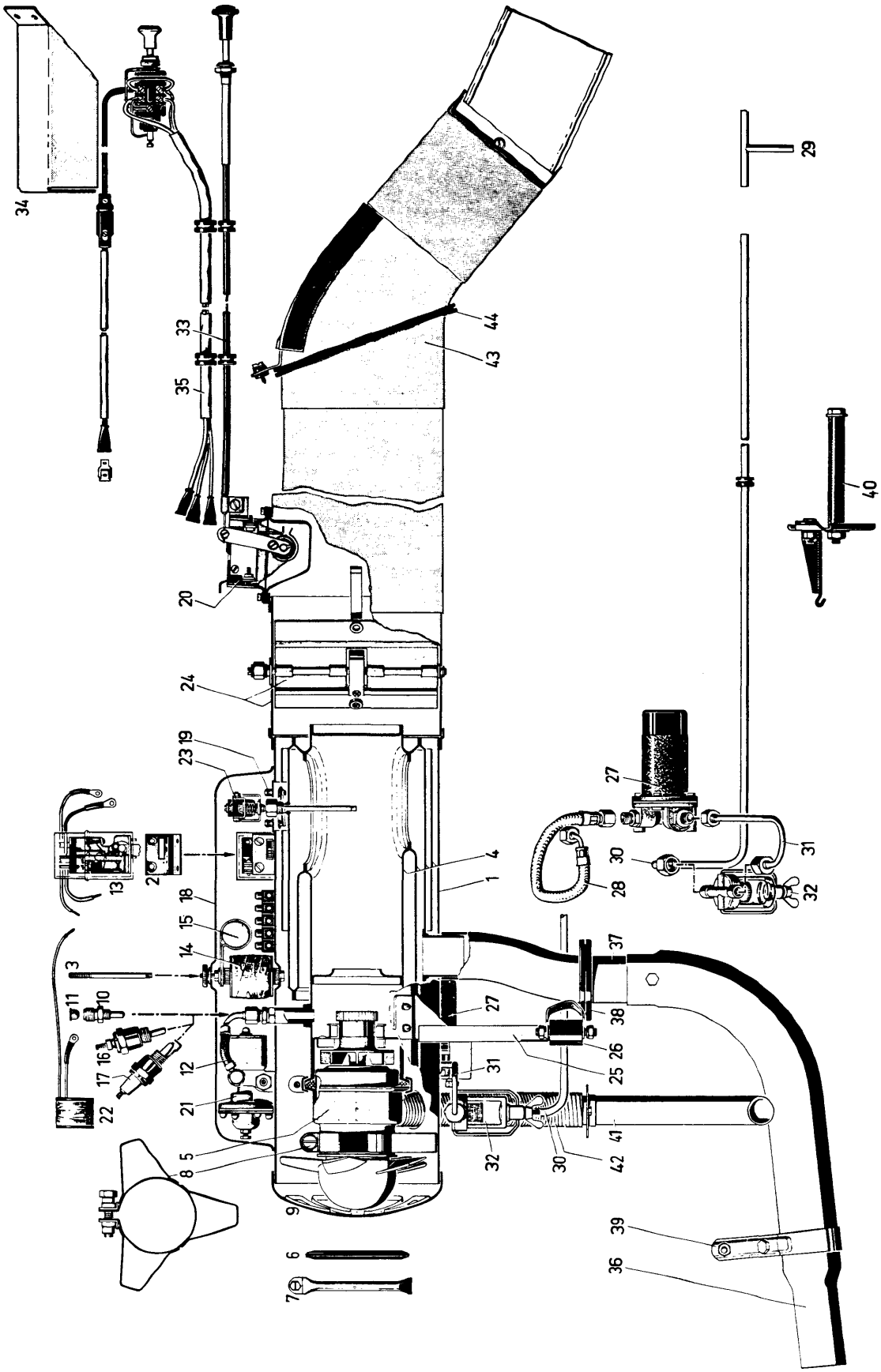
Fig. No.	Qty.	Designation Remarks	Order No.	EB-No.
34	1	Cover plate	20 1104 05 00 06	7992
	2	Grommet	20 8362 02 00 34	2072
35	1	**Cable for control**	20 1104 15 02 00	8255
	1	Push-pull switch (6 Volt)	20 8529 17 04 00	4038
		(12 Volt)	20 8530 17 04 00	8256
	1	Fuse holder with 25 Amp. fuse	20 8542 12 03 00	8158
	1	Fuse, 25 Amp.	25 DIN 72 581	4056
	1	Cable adaptor	20 0023 00 00 00	8073
	2	Grommet	20 8593 17 00 51	8074
	1	Bulb (6 Volt)	20 8515 17 04 02	8257
		(12 Volt)	20 8516 17 04 01	2202
	1	**Exhaust system** consisting of:	20 1104 06 00 00	8075
36	1	Elbow	20 8478 09 00 01	3125
37	1	Exhaust pipe	20 1104 06 00 03	8076
38	1	Sealing ring for exhaust pipe	20 8542 11 00 02	2087
39	1	Bracket	20 8478 09 00 04	3116
	2	Hexagon head screw	M 5 x 50 DIN 931	2088
	2	Hexagon nut	M 5 DIN 934	2032
	2	Spring washer	B 5 DIN 127	2033
	2	Hexagon head screw	M 6 x 18 DIN 931	8178
	2	Hexagon nut	M 6 DIN 934	2015
	2	Spring washer	B 6 DIN 127	2016
40	1	**Filter bracket, complete**	20 1104 21 00 00	7990
	1	Warm air hose	20 1104 11 00 01	8079
	1	**Intake system** consisting of:	20 1104 07 00 00	8081
41	1	Intake pipe, complete	20 1104 07 01 00	8082
42	1	Fresh air hose	20 1104 07 01 01	8083
	3	Hexagon head screw	M 4 x 10 DIN 933	1136
	3	Washer	B 4,3 DIN 125	2012
	3	Spring washer	B 4 DIN 127	2004
	1	**Air outlet, complete** consisting of:	20 1104 08 00 00	8084
43	1	Air outlet	20 1104 08 03 00	8085
44	1	Seal	20 1104 08 00 04	8086
	2	Grommet	20 8515 12 00 33	3074
	2	Cheese head tapping screw	BZ 4,8 x 13 DIN 7971	4052
	2	Washer	5,3 DIN 125	3042

Exchange and expendable parts

The following parts are also available on an **Exchange** basis:	Order No.	EB-No.
1 - Electric pump (6 Volt)	20 8541 16 02 00	4047
Electric pump (12 Volt)	20 1122 04 01 00	8237
2 - Combustion air blower (6 Volt)	20 1101 03 00 00	8012
Combustion air blower (12 Volt)	20 1102 03 00 00	8097
3 - Thermo-switch	20 8470 21 00 00	2094

Expendable parts which are not covered by the warranty:

1 - Heater plug (6 Volt)	20 1101 10 00 10	8030
Heater plug (12 Volt)	20 1102 10 00 10	8140
2 - Spark plug	20 1105 10 00 11	8130
3 - Glass bowl for filter	20 8478 07 07 04	2156
4 - Fuse 25 Amp.	25 DIN 72 581	4056
5 - Bulb (6 Volt)	20 8515 17 04 02	8257
Bulb (12 Volt)	20 8516 17 04 01	2202
6 - Gaskets and seals		
7 - Grommets		



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Type BN 4
for VW Transporter
VW Double Cab Pick-up
VW Ambulance

Supplement to Part List for older BN 4 heaters

for heaters with single pole spark plug:

Qty.	Designation	Order No.	EB-No.
1	Spark plug, single pole	20 1101 10 00 11	8031
1	Union nut	20 1101 10 00 21	8034
1	Gasket	20 1101 10 00 13	8258

for heaters with horizontal fuel pump in front of mounting

Qty.	Designation	Order No.	EB-No.
1	Heater mounting, complete consisting of:	20 1104 02 00 00	8065
1	Mounting	20 1104 02 01 00	8066
1	Fuel hose (pressure line from fuel pump)	20 1104 04 00 06	8039
1	Fuel pipe, long	20 8478 07 04 00	3048
1	Fuel pipe, short	20 8478 07 06 00	3050 A

Up to Vehicle Chassis No. 970 650

1	Filter bracket	20 1104 11 00 00	8077

from Vehicle Chassis No. 970 651

1	Filter bracket	20 1104 21 00 00	7990

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Type BN 4
for VW Double Cab Pick-up
VW Ambulance

in conjunction with
Parts List D 22

General

The above versions of the BN 4 Eberspächer heater differ from the heater for the VW Transporter in the following parts.

I. Heater Type BN 4

Heater No. 20 1127 (6 Volt)
20 1176 (12 Volt)
for Double Cab Pick-up

Fig. No.	Qty.	Designation Remarks	Order No.	EB-No.
1	1	**Outlet with bimetal spring flap** consisting of:	20 1127 01 00 00	8168
	4	Screw	AM 5 x 8 DIN 85	8017
	4	Lock washer	J 5,3 DIN 6797	3011
(25)*	1	**Heater mounting** consisting of:	20 1127 22 00 00	8236
	1	Support, complete	20 1104 22 01 00	7952
(26)	2	Bonded rubber mounting with thread	20 8680 01 00 32	2402
	1	Copper ground strap	20 8460 01 00 24	3028
	4	Hexagon nut	M 6 DIN 934	2015
	4	Spring washer	B 6 DIN 127	2016
	4	Round head screw	M 4 x 8 DIN 86	2003
	4	Lock washer	J 4,3 DIN 6797	3014

* See Parts illustration D 22 for Fig. Nos. in brackets.

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Fig. No.	Qty.	Designation Remarks	Order No.	EB-No.
	1	**Exhaust system** consisting of:	20 1127 06 00 00	8175
(36)	1	Elbow	20 8478 09 00 01	3125
(37)	1	Exhaust pipe	20 1127 06 00 03	8176
(38)	1	Sealing ring for exhaust pipe	20 8542 11 00 02	2087
(39)	1	Bracket	20 8478 09 00 04	3116
	2	Screw	M 5 x 50 DIN 931	2088
	2	Nut	M 5 DIN 934	2032
	2	Spring washer	B 5 DIN 127	2033
	2	Screw	M 6 x 18 DIN 931	8178
	2	Nut	M 6 DIN 934	2015
	2	Spring washer	B 6 DIN 127	2016
2	1	**Outlet, complete** consisting of:	20 8617 11 00 00	4103
3	1	Outlet	20 8617 11 01 00	4104
4	1	Hose support	20 8617 11 02 00	4105
5	1	Sleeve	20 8617 11 03 00	4106
6	1	Tube, complete	20 8617 11 04 00	4126
7	1	Warm air hose, long	20 8617 11 00 02	4127
8	1	Warm air hose, short	20 8617 11 00 03	4128
9	1	Bracket	20 8617 11 00 05	4129
	2	Screw	M 8 x 15 DIN 933	8179
	2	Nut	M 8 DIN 934	3114
	2	Washer	8,4 DIN 126	8180
	2	Spring washer	B 8 DIN 127	3124
10	4	Beru strip hose clip	20 8617 11 00 04	4130
	4	Tensioner	20 8617 11 00 07	5017
	3	Screw	AM 4 x 12 DIN 86	4112
	3	Nut	M 4 DIN 934	3013
	3	Spring washer	B 4 DIN 127	2004
	3	Screw	AM 5 x 12 DIN 86	8181
	3	Spring washer	B 5 DIN 127	2033

II. Heater Type BN 4

Heater No. 20 1128 (6 Volt)
20 1177 (12 Volt)
for VW Ambulance

Fig. No.	Qty.	Designation Remarks	Order No.	EB-No.
	1	**Outlet** consisting of:	20 1128 11 00 00	8090
11	1	Outlet elbow, complete	20 1128 11 01 00	8091
	1	Seal	20 1104 08 00 04	8086
12	1	Outlet	20 8514 11 04 00	6006
13	1	Warm air hose	20 8514 11 00 29	6008
	1	Outlet grille	20 8514 11 05 00	6007
	2	Grommet	20 8515 12 00 33	3074
	2	Tapping screw	BZ 4,8×13 DIN 7971	4052
	2	Washer	5,3 DIN 125	3042

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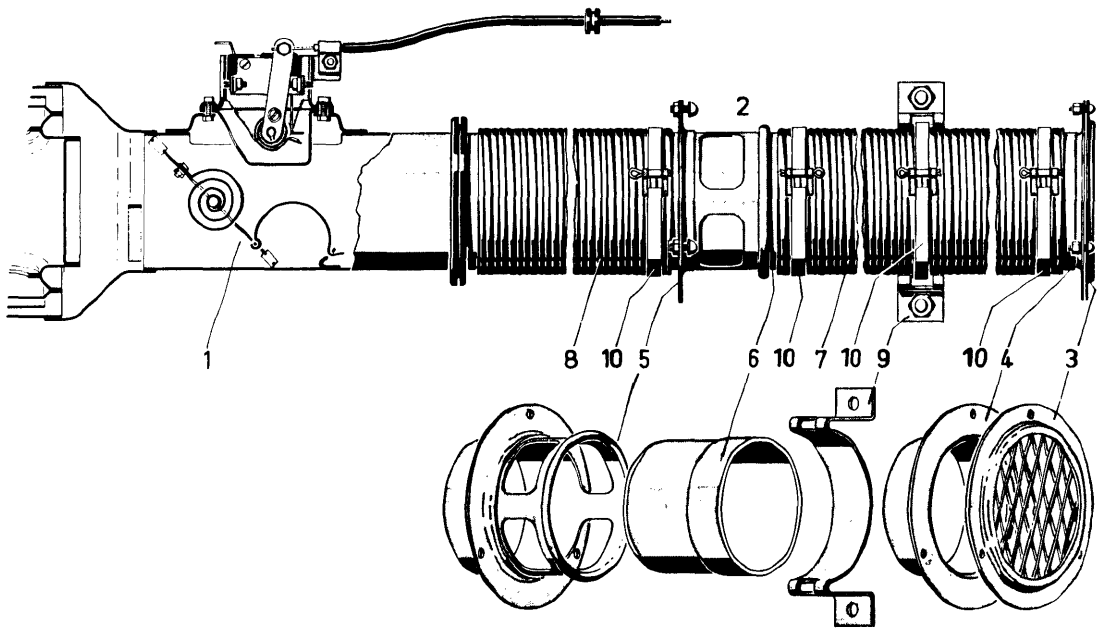

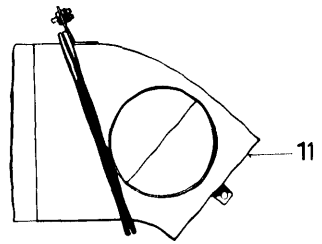

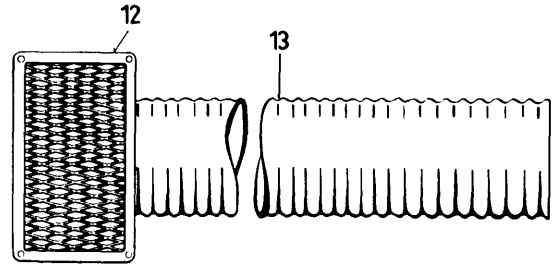

Instructions for warranty work in VW Workshops

The following instructions only apply to Eberspächer heaters which are sold direct to workshops in the VW Organization by Messrs. Eberspächer without bringing in the Volkswagenwerk AG.

Warranty work on Eberspächer heaters which are supplied by the Volkswagenwerk AG (e. g. as M-equipment) is carried out in accordance with the instructions from the Volkswagenwerk AG.

1 - In accordance with our Warranty Conditions for Vehicle Heaters which are included with every "Eberspächer Stationary Heater for Volkswagen" leaflet, our warranty covers all heaters which are installed in an **authorized workshop** (VW Workshop with mechanics who have had a heater course) as laid down in our fitting instructions.

If **incorrectly installed,** we do not accept warranty claims for the heater when removed.

2 - The warranty period for all heaters fitted as **"M" equipment** begins on the date when the vehicle is registered.

For all heaters **installed subsequently,** the warranty period begins on the date of installation.*

3 - The **warranty claims** must bear the Type designation and the **Factory No.,** give **exact** information on the type of defect which has occurred and also describe the work carried out in the workshop. The claims must be submitted not later than 4 weeks after workshop process.

The **spare parts** used must be listed separately. The defective parts should be sent in or kept until the warranty claim has been checked. The parts used when carrying out warranty repairs will be credited at net price or we shall supply free-of-charge replacement parts.

4 - If **badly** damaged heaters cannot be repaired in the VW Workshop, the matter must be referred to the nearest JE Service Station or to the manufacturer. When necessary, an exchange appliance can be made available from there. Heaters which still do not function properly after having been examined twice in the workshop must also be returned for exchange.

Overseas such appliances should be sent to the Importers central workshop.

5 - Damage caused by **negligence** in the workshop will be charged to the workshop and is excluded from warranty procedure. Our repair times are valid for repair work and also for removal and installation costs.

6 - Cleaning, adjusting and checking operations which are connected with **normal** maintenance and cannot be attributed to malfunctioning of our heater cannot be claimed under warranty.

7 - **Expendable parts** such as spark plugs, heater plugs, glass filter bowls, etc. are not covered by the warranty. Mechanical **damage,** excessive **dirt** or heavy **corrosion** are not covered by the warranty, nor can costs incured when it is necessary to send a heater away for warranty repairs be accepted.

8 - On the question of **"Consequential Damage",** see our Warranty Conditions, point 5.

* **This is covered by point 3 in our Warranty Conditions, Printing No. 2217.**

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F

Type BN 4
for VW Transporter
VW Double Cab Pick-up
VW Ambulance

Instructions for trouble shooting on the BN 4 heater.

During the last winter we received numerous complaints about the BN 4 heater which revealed a lack of knowledge of the basic principles. The following instructions supplement the trouble shooting chart for the BN 4:

1 - Ensure that voltage at terminal 2 is at **least** 5.6 Volts when **the heater is working** without the vehicle engine running.

If the voltage is below this **minimum,** the result will be shooting up, ignition difficulty and even an occasional banging.

2 - Note the **wiring diagram** when installing. After installation, check that there is current at terminal 2 — even when the heater is switched off.

3 - Check that the **thermo-switch** is working properly:

a) during the starting procedure, there must be current at all 3 terminals.

b) about 15 seconds after combustion has commenced, the thermo-switch must switch the heater plug off. There should not be current at the OP terminal (center connection).

c) The run-on period should be 150—180 seconds. If too long the red-marked adjusting screw must be turned to the right. If too short, turn to the left.

d) When the heater is switched off and the run-on finished there should only be current at terminal CL.

4 - If **ignition** does not take place, the fault may lie in:

a) The ignition system or

b) Shortage of **fuel**.

To a) There should be current a terminal 4; and at the contact screw in the spark plug connector. Loosen this screw and check that the conical part is really making good contact with the cable. With the single pole spark plug, ensure that the plug and the heater plug which acts as the ground electrode are clean in order to prevent tracking. With the two pole plug, ensure that the gap is correct (2.5 mm) and that the condenser is not shorting on the cover.

Consider conversion to 2 pole plug: see Repair Instructions BN 4.

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To b) There should be current at terminal 3. If not, operate the red lever on the safety switch (Item 16 in wiring diagram) and check the terminal 3 again. If there is still no current here, check the circuit from terminal 4 via. the safety switch — overheating switch (Item 15) to the regulator switch (Item 19) with the aid of the wiring diagram and find out where the break is.

Take the jet out of the adaptor (holding with the second SW 14 wrench) after removing the union nut. Clean the jet by blowing with compressed air in direction of flow. Then connect the fuel hose to the jet and switch the heater on. The fuel should flow in a steady stream.

If the jet of fuel is being diverted by dirt between fine filter and jet hole, remove the filter with a small hook and clean the jet.

If no fuel is delivered, check if there is current at the pump. If there is, check the suction pipes and filter gasket for leakage.

Finally check if the fuel solenoid valve is clear and not sticking. The solenoid valve should give an audible click if current is applied to terminal 3 (current can be taken from terminal 2) when the heater is switched off. This is subject to the pressure regulator setting being roughly right.

5 - We have also frequently noted the following **fitting errors:**

a) Deficient or incorrectly installed combustion air pipes. The bent **combustion air pipe** (snow protection pipe) must be at a right angle to the right when seen in direction of motion and end between exhaust pipe and vehicle floor.

b) Flexible combustion air hoses not fitted on the heater flange.

c) Poor ground connections due to paint left on ground strap contact surfaces.

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This service manual for the

Eberspächer Heaters

has been made up to meet the requirements of the workshop.

The contents are divided into main sections and then sub-divided into the individual heater types.

The information given here is continually being amended and supplemented.

Supplements to this manual should be inserted in the same way as the supplements to the vehicle workshop manuals.

From August 1964, all spare parts for Eberspächer heaters will be supplied by the Parts Department of the Volkswagen factory and will be listed in the Parts Lists.

List of Heaters

VW Passenger Cars

Code No.	Heater for	Heater Type	Remarks	Heater No.
01				
02				
03				
04				
05				
06	VW 1500 / VW Variant		6 V	20 1144 00 00 00
			12 V	20 1188 00 00 00
07				
08				
09				
10				
11	VW 1200		6 V	20 1181 00 00 00
			12 V	20 1190 00 00 00
12	VW 1500 / VW Variant	BN 2	6 V	20 1185 00 00 00
			12 V	20 1205 00 00 00

VW Commercial Vehicles

21				
22	VW Transporter	BN 4	6 V	20 1104 00 00 00
			12 V	20 1147 00 00 00
23				
24				
25	VW Double Cab Pick-Up	BN 4	6 V	20 1127 00 00 00
			12 V	20 1176 00 00 00
26				
27	VW Ambulance	BN 4	6 V	20 1128 00 00 00
			12 V	20 1177 00 00 00
28	VW Transporter (reinforced floor plates)	BN 4	6 V	20 1171 00 00 00
			12 V	20 1178 00 00 00
29				
30				

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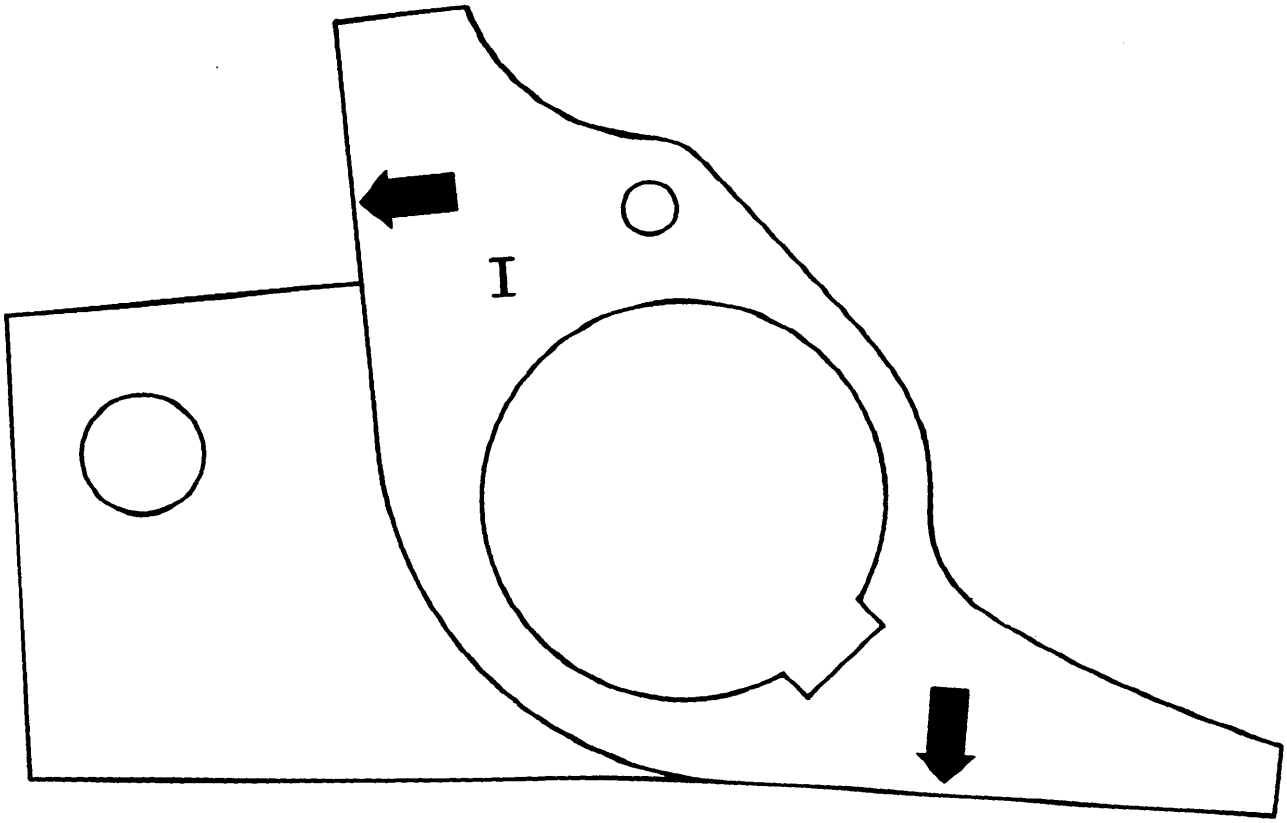
Example:

The heater for the VW 1500, heater number 20 1144 00 00 00 has the code number 06.

This means that you will find the operating instructions for this heater under A 06, the spare parts list under D 06 and the workshop bulletins under F 06.

Fitting instructions are supplied with the heaters for service installation in all Volkswagen vehicles.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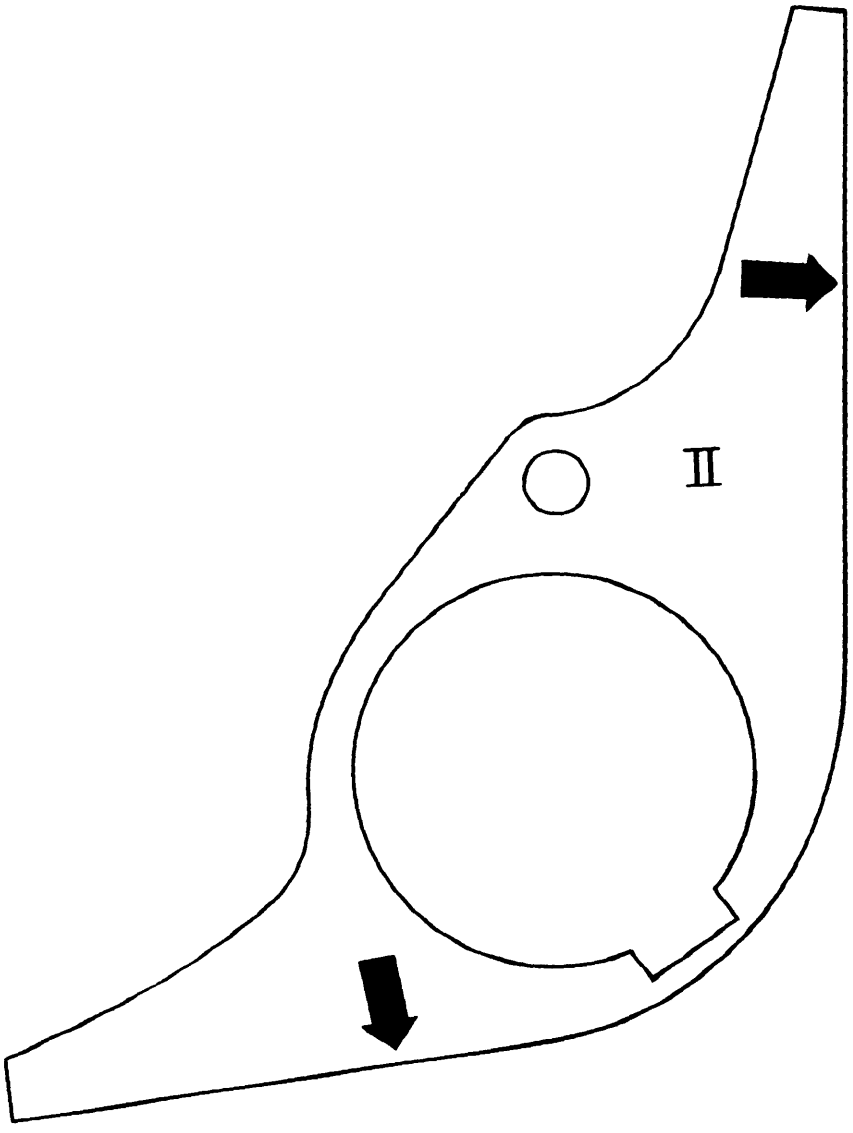
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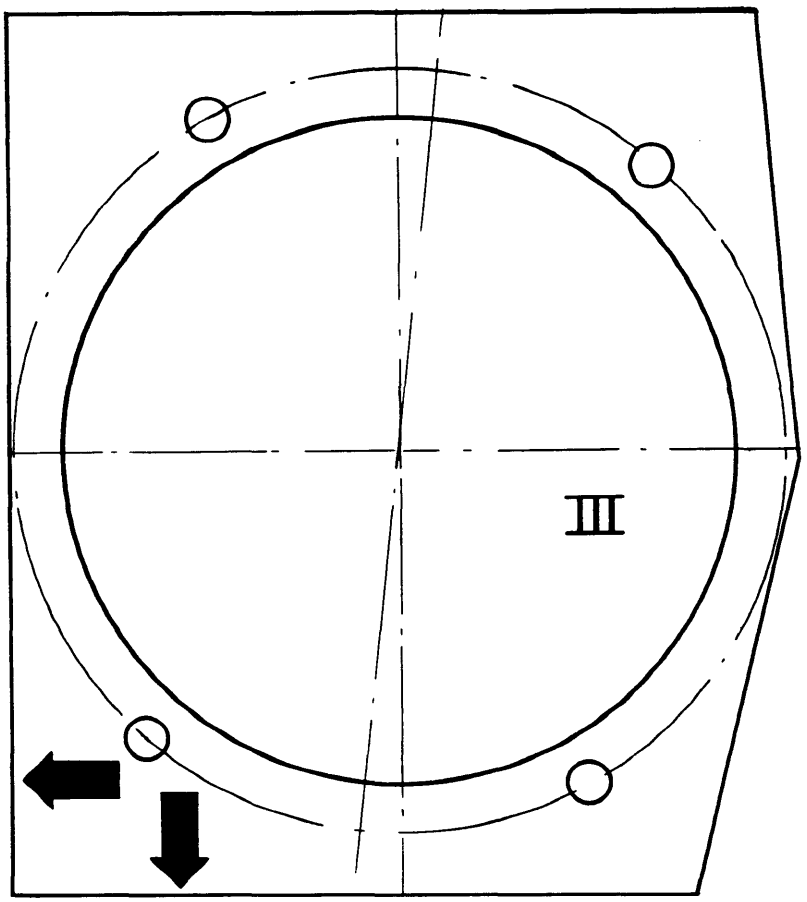
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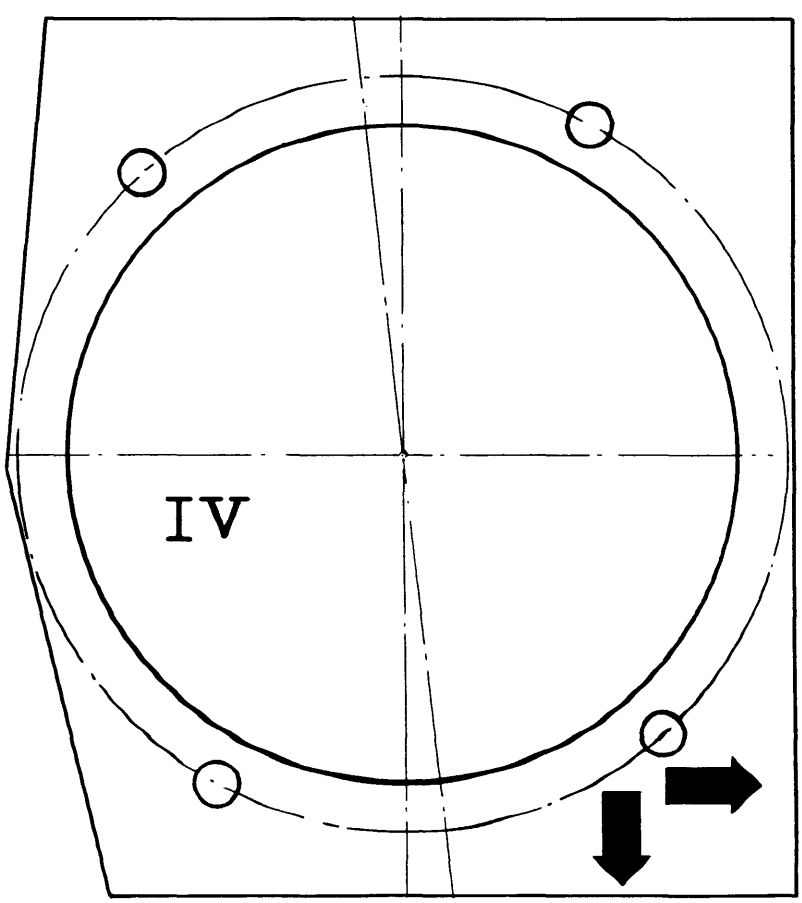
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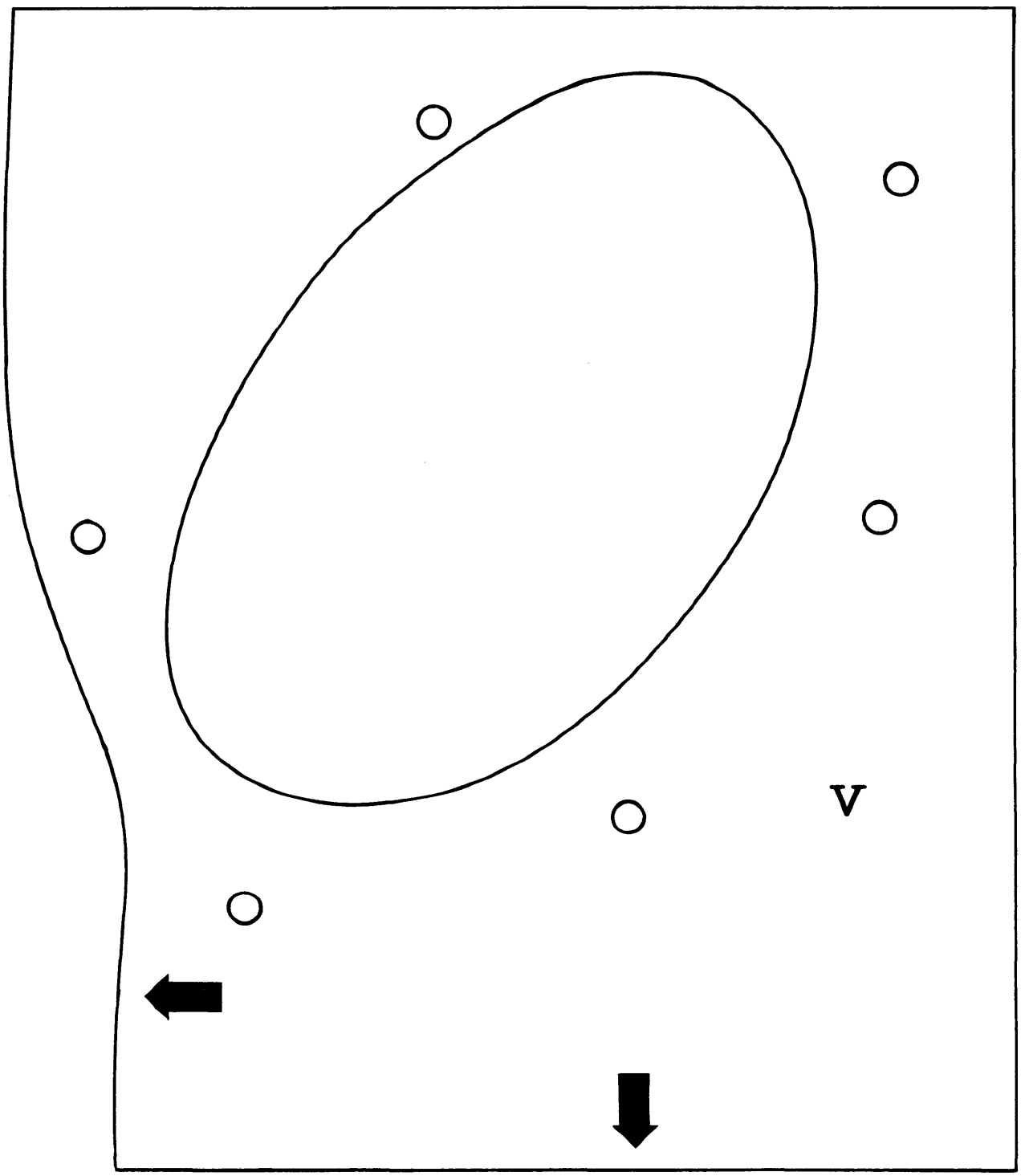
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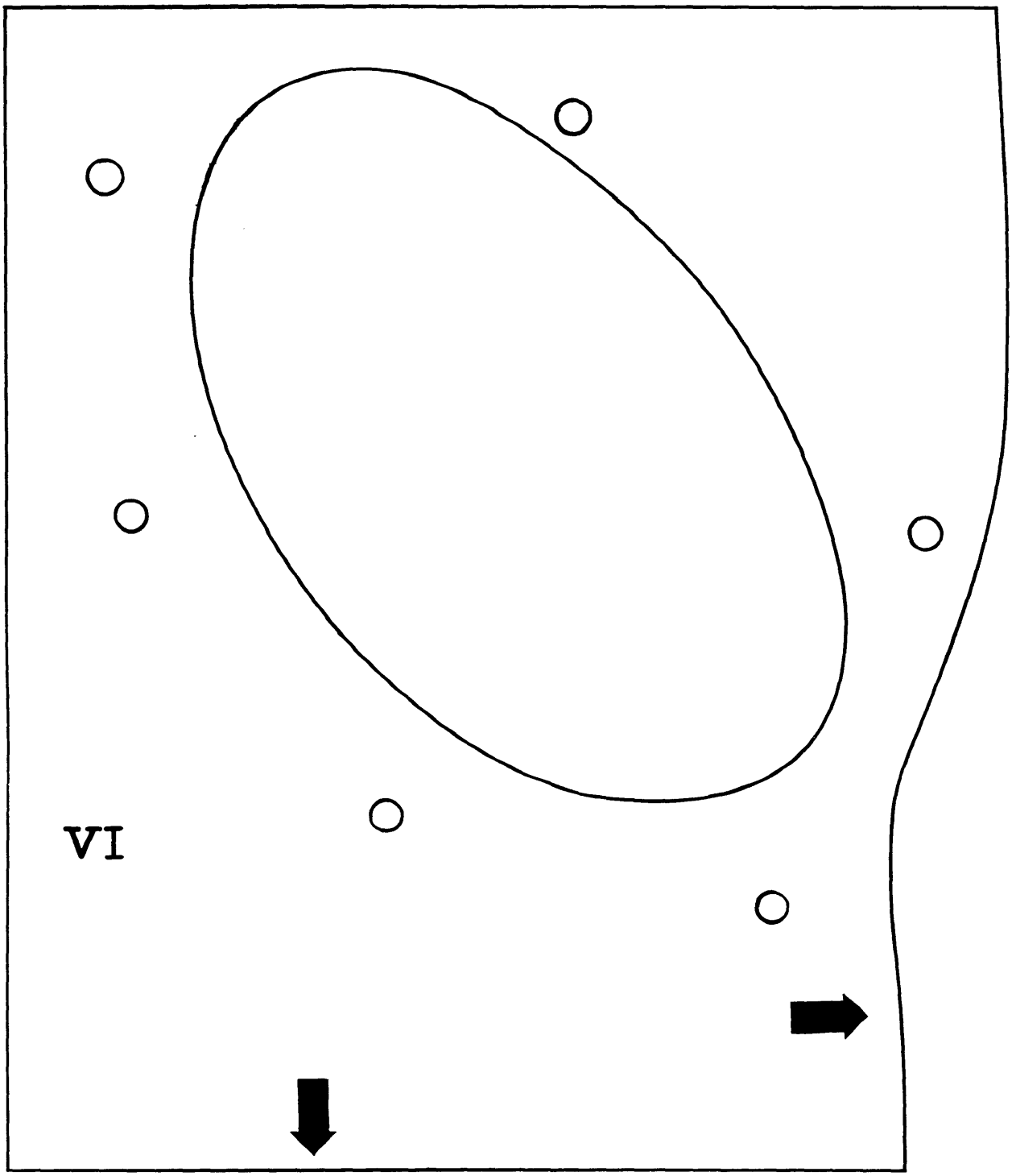
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