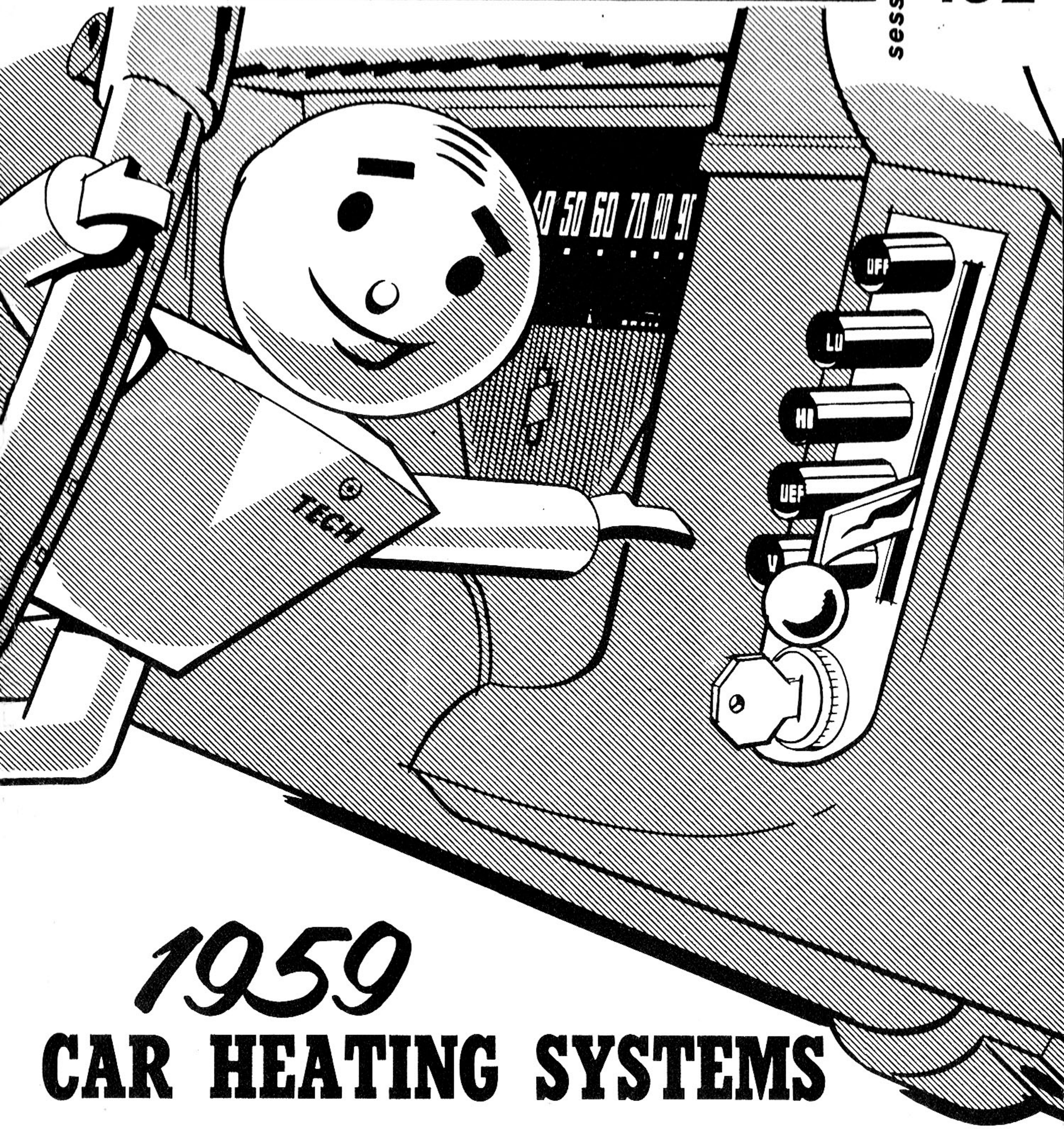
SERVICE REFERENCE BOOK

of the MASTER TECHNICIANS SERVICE CONFERENCE

session no. 132



1959

CAR HEATING SYSTEMS

PREPARED BY CHRYSLER CORPORATION

Plymouth • Dodge • De Soto • Chrysler • Imperial

TECH SEZ:

We are getting into that season of the year when the performance of the car heating system is of vital interest to car owners in practically every section of the country. Does it produce enough heat to keep the driver and passengers comfortable? Does the defrosting part of

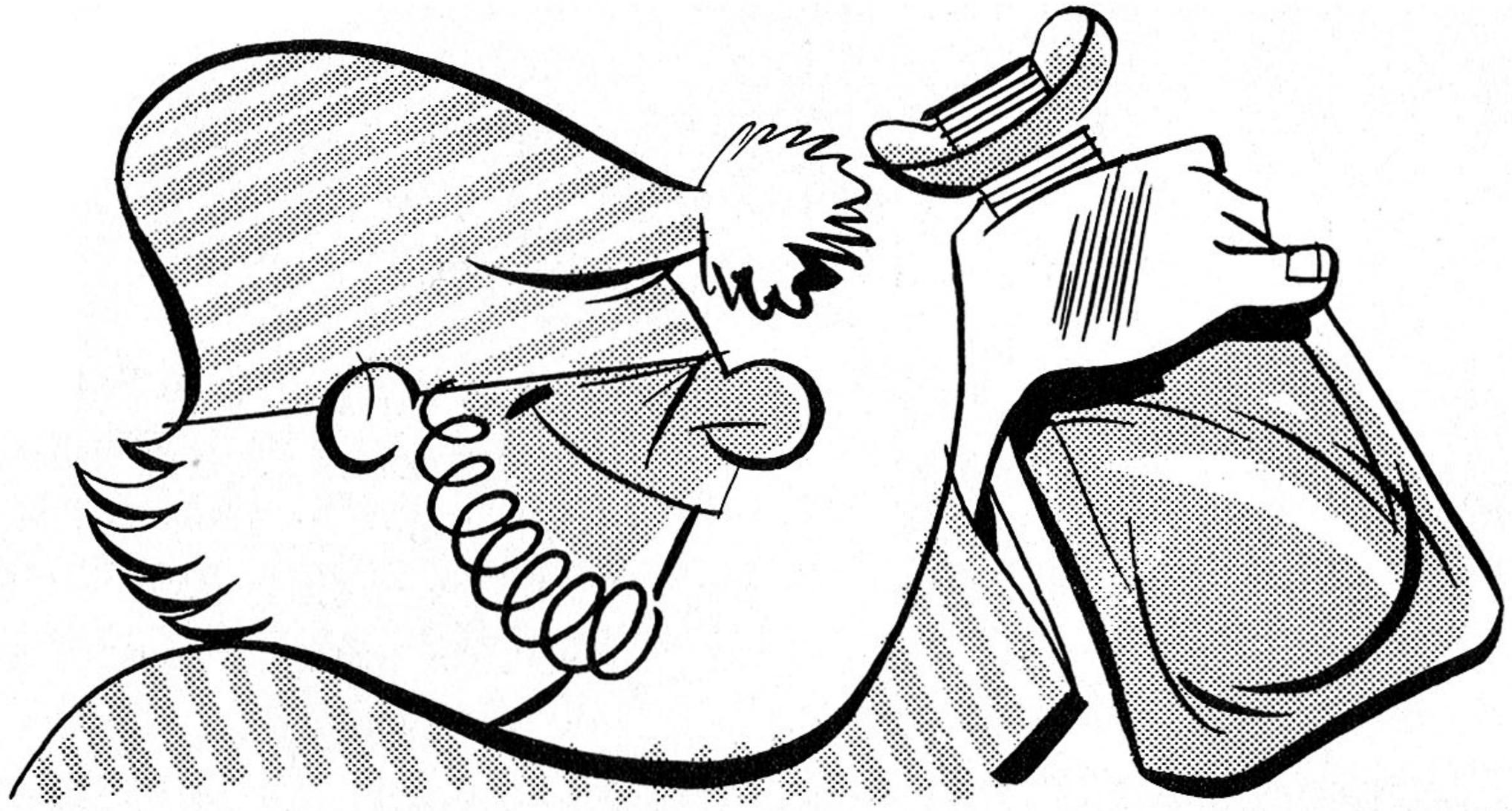
the system work so the windshield and rear window are kept clear? And, what is probably of equal importance, does the owner know how to operate the system to get the desired results? Every service manager is interested in the answers to these questions.

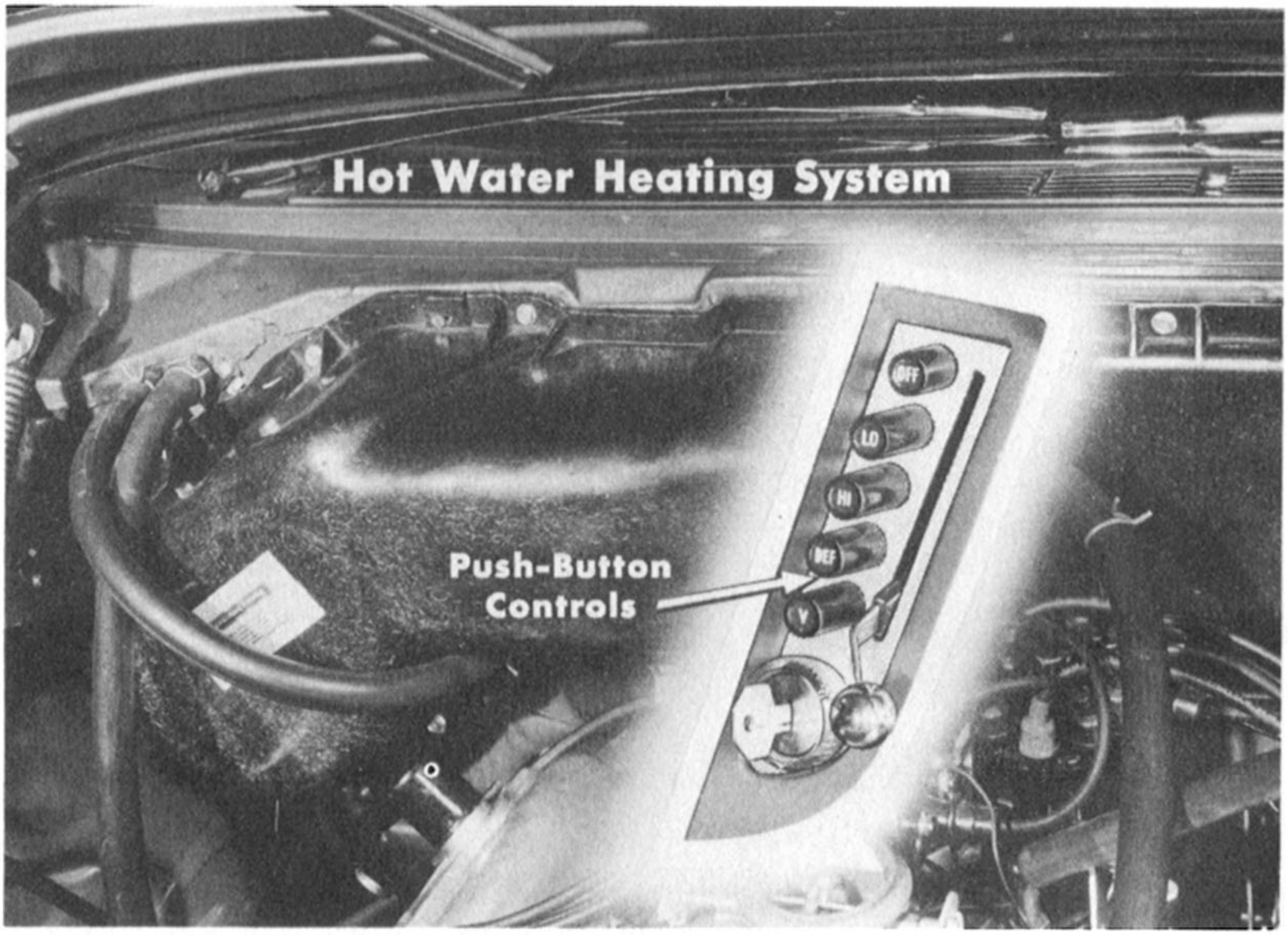
Since the 1959 models have a new heating system, this Reference Book explains how it operates, and gives some trouble-shooting information that will be helpful in your everyday work. The information covers the conventional hot water heating systems, the heating part of the heating and air-conditioning system, and the gasoline heater. Here's how the information is arranged:

HOT WATER HEATING SYSTEM

Description

The hot water heating system for "M" Series cars is designed to heat and circulate fresh air admitted to the system through the fresh-air grille located in the cowl panel. The air is discharged through distribution duct outlets at just above floor level, and through defroster outlets located in the top of the instrument panel. Flexible circular tubes connect the distribution duct with the defroster outlets. The defroster outlet grilles are fixed in position on all domestic cars, but are adjustable in all Canadian cars.



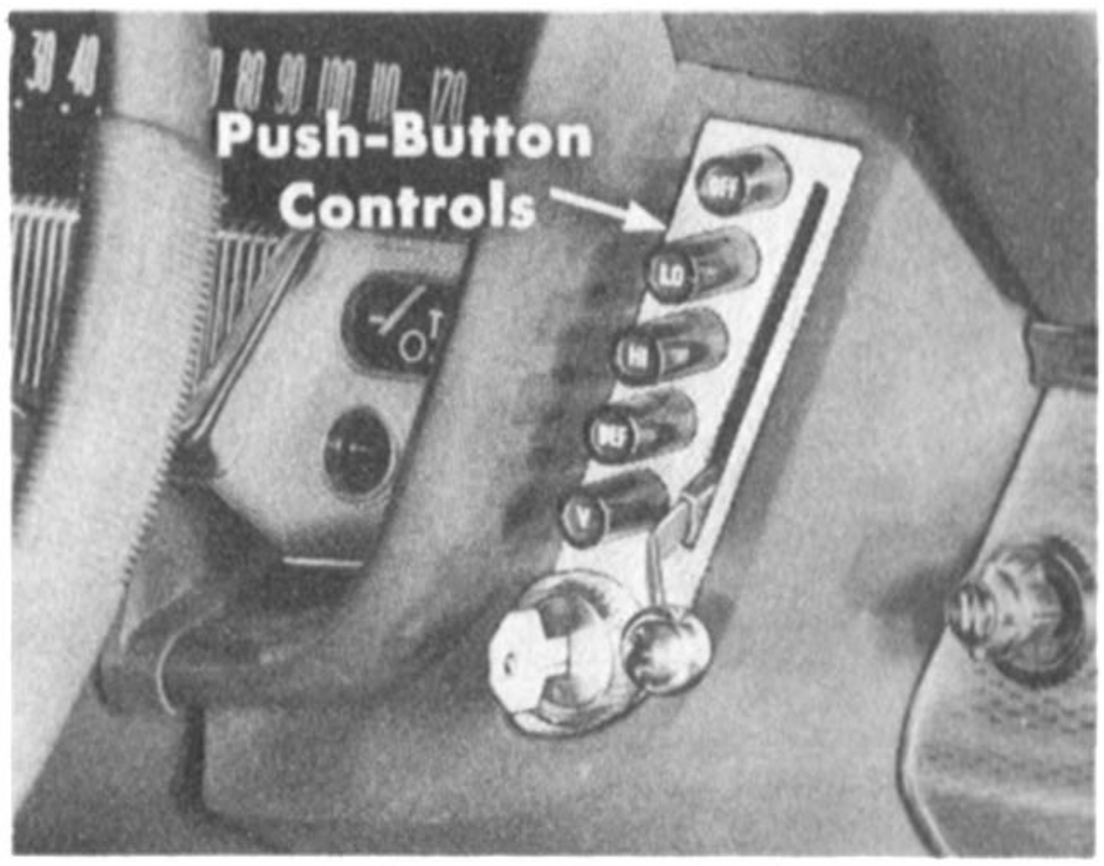


The system consists of a heater core mounted in a molded plastic housing on the engine side of the dash panel. A molded plastic distribution duct is mounted on the passenger side of the dash panel, and contains the single electric motor and the blower fan, as well as the shutoff door and the distribution duct damper. A water flow valve controls the flow of water through the heater core and thus controls

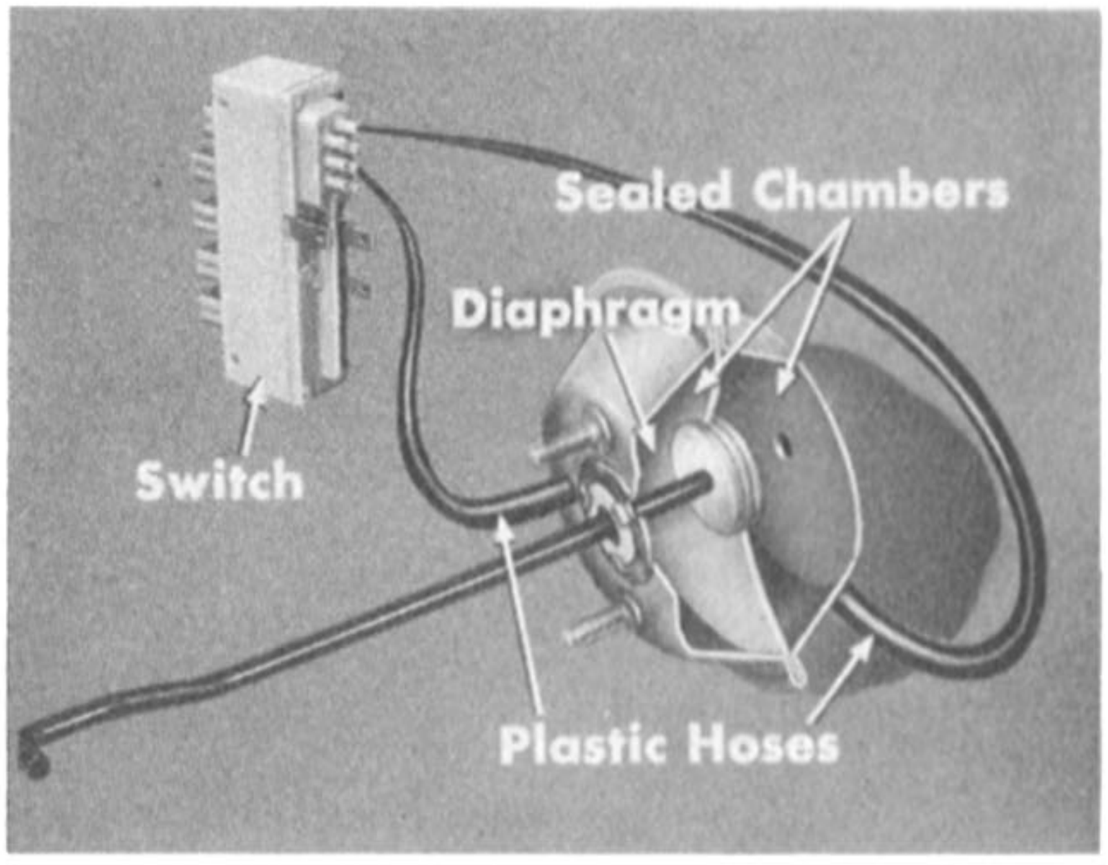
the temperature of the air discharged from the heating system. A fresh-air door is located in the rear of the plenum chamber, and can be opened to admit fresh air directly to the interior of the car.

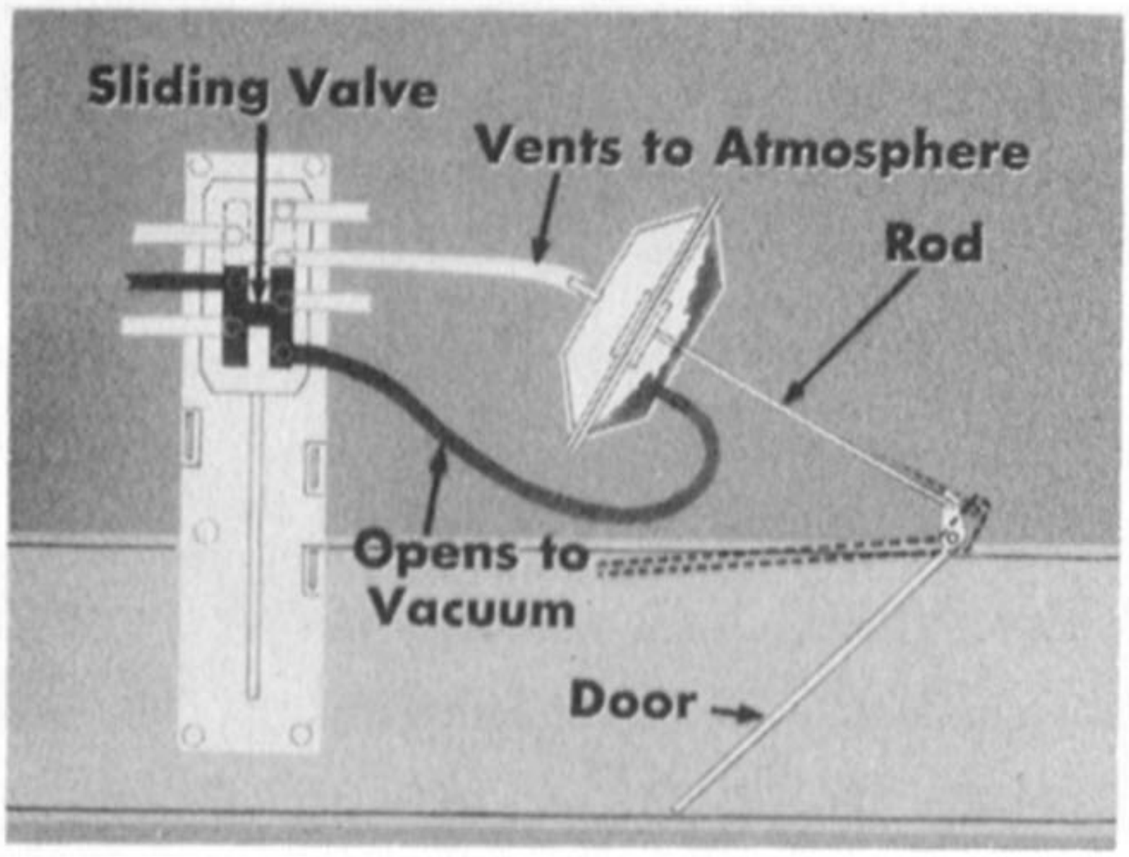
Operation of the doors and the distribution duct damper, as well as the electric circuit to the blower motor is by means of push buttons located on the instrument panel. Operation of the temperature control valve is by means of a cable connected to a sliding lever located in the same panel with the push buttons. The arrangement of the push-button panel is different between models, but the operation of the heating system is the same.

The push buttons are identified "OFF", "LO", "HI", "DEF" (for Defrost), and "V" (for Vent) or "AIR". These push buttons operate a combination vacuum and electrical control switch. The electrical switch completes the circuit to the blower motor, while the vacuum switch controls the vacuum diaphragm units, called vacuum actuators, which operate the fresh-air and shutoff doors, and the distribution duct damper.



The vacuum actuator consists of two sealed chambers, separated by a rubber diaphragm. Each chamber is connected, by means of a plastic tube, to the push-button switch. A rod attached to the center of the diaphragm, connects to the door or damper.

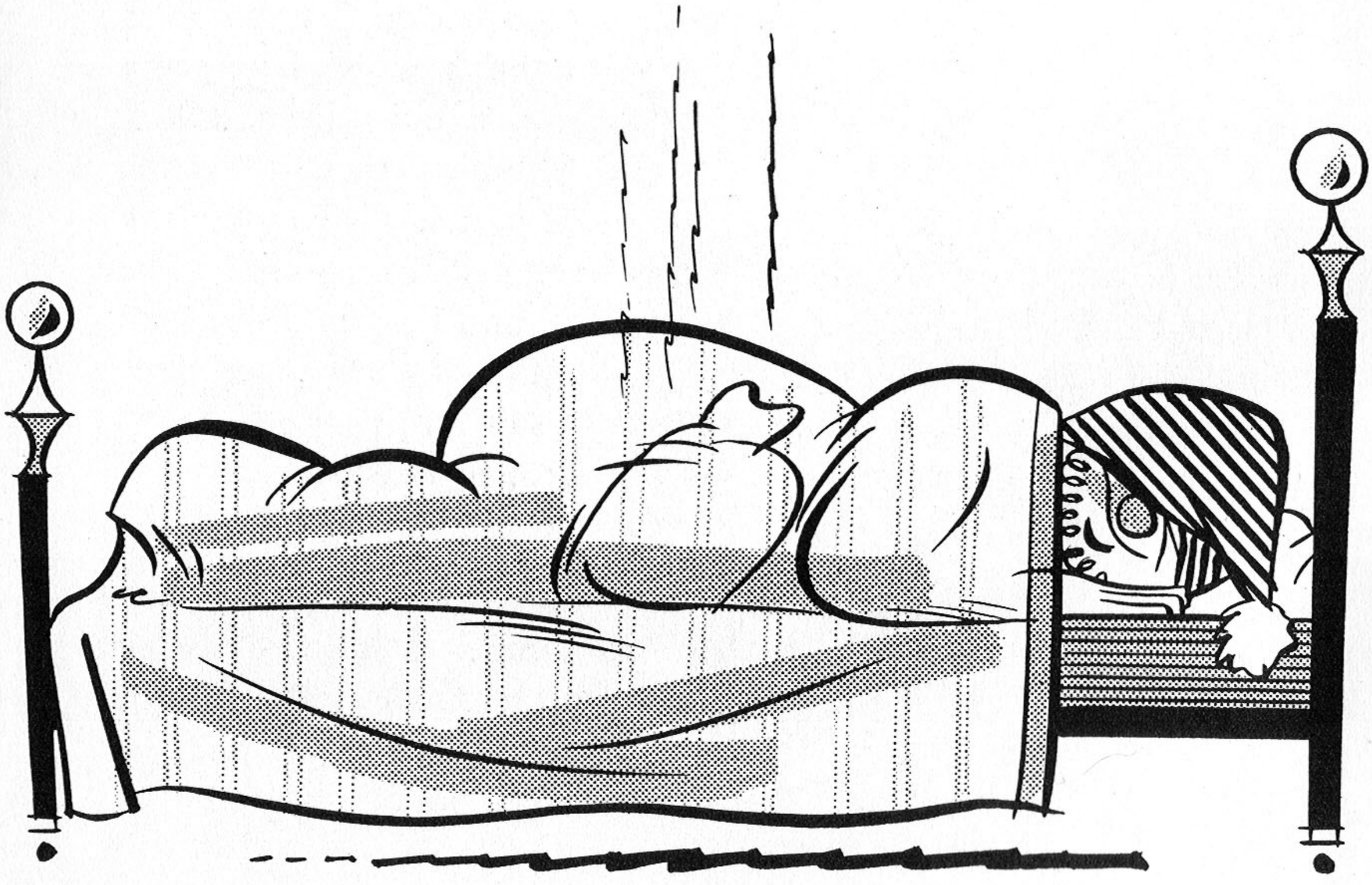


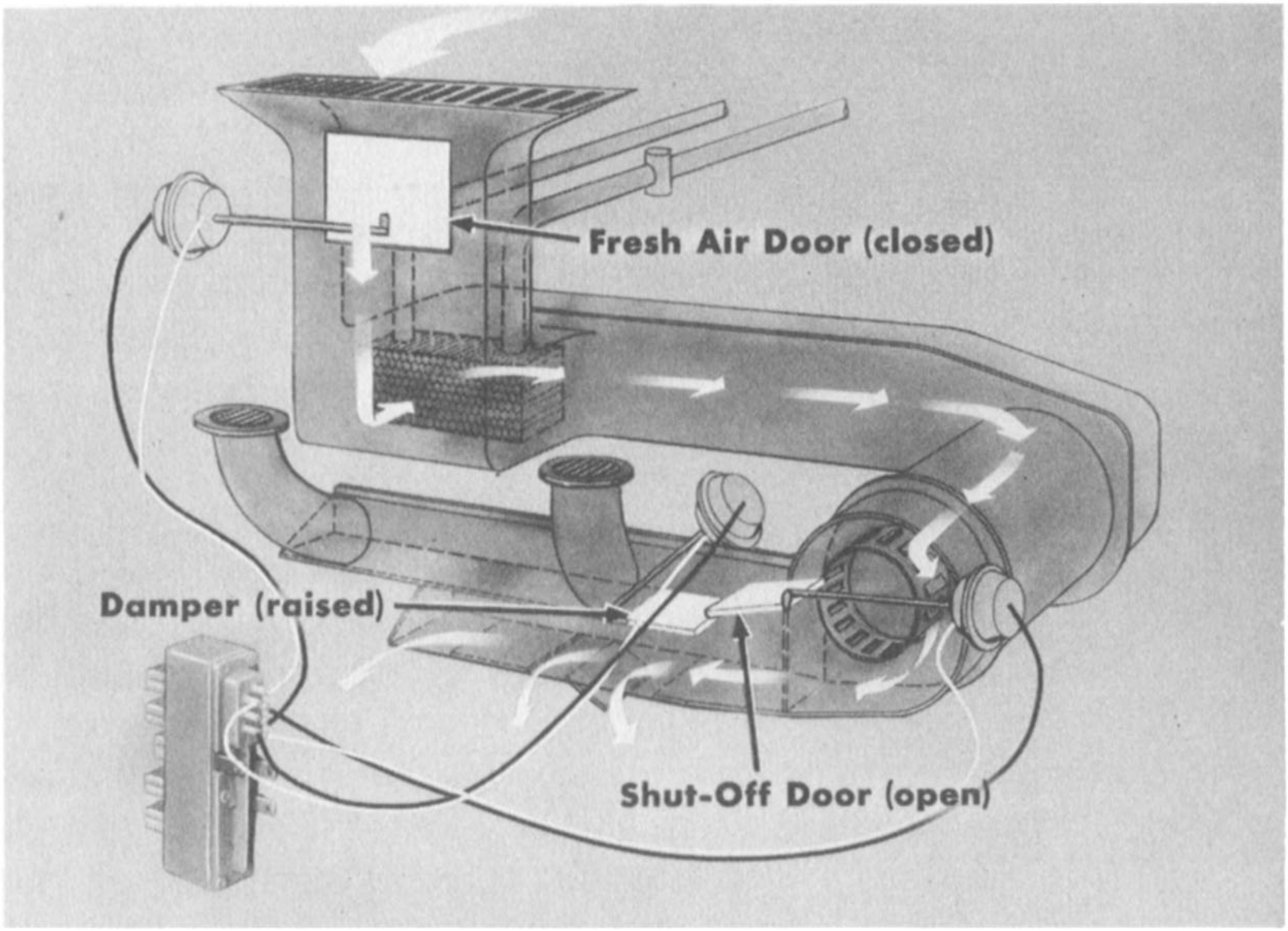


When a push button is pushed, a sliding valve vents one chamber to the atmosphere, and opens the other chamber to vacuum from the engine. As the diaphragm moves to one side of the chamber, the rod opens or closes a door or the damper.

Operation

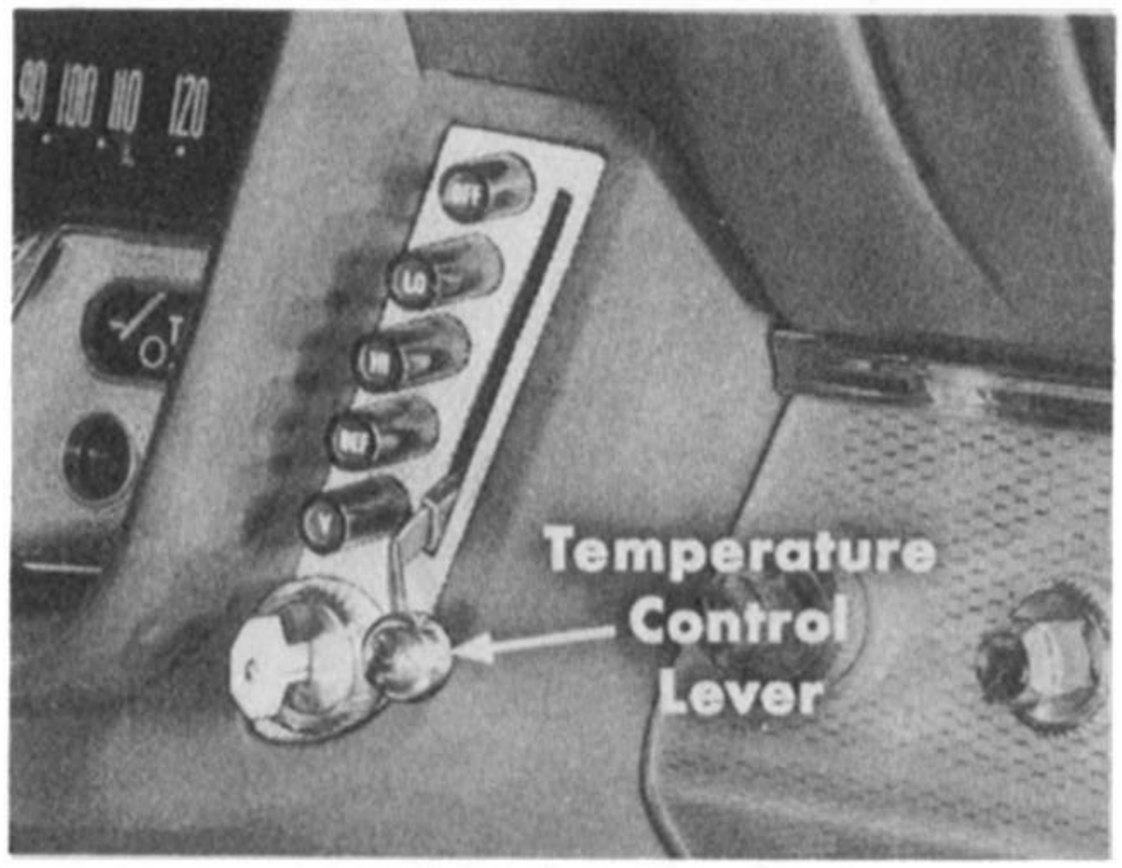
When the "OFF" button is pushed in, the vacuum actuators close the fresh-air door and the shutoff door, and raise the distribution duct damper. Since the "OFF" button does not complete the electric circuit to the blower motor, the blower doesn't run. So, no fresh air circulates through the system.





When either the "LO" or "HI" button is pushed in, the circuit is completed to the blower motor. It runs at either low or high speed, depending upon which button completes the circuit. In addition, pushing either of those buttons causes the fresh-air door to close, the shutoff door to open, and the duct damper to rise. Air enters the intake grille, passes through the heater core, is picked up by the blower and forced into the distribution duct, and then is discharged through the floor-level outlets. The distribution duct damper does not entirely seal off the passage to the defroster outlets, but permits a slight bleed-off of air to be discharged through those outlets.

When the "DEF" (defrost) button is pushed in, the operation of the system is the same except for the position of the distribution duct damper. For "DEFROST" operation the damper is lowered so the main volume of air is directed to the defroster outlets in the top of the instrument panel. Again, there is a slight bleed-off of air to the opposite outlet—in this case, to the floor-level outlets—so some of the air will be used for car heating.



The temperature of the discharged air is controlled by the position of the temperature control lever, which regulates the opening and closing of the temperature control valve. As previously mentioned, this lever is connected to the water flow valve by means of a wire cable.

For summer ventilation of the car, when neither heating nor defrosting is desired, the "V" or "AIR" (vent) button is pushed in. This opens the fresh-air door, and the shutoff door, but does not complete the electrical circuit to the blower. There is a "ram" effect of fresh air being admitted through the cowl panel grille, through the opened fresh-air door, and into the car. Some of this air will find its way into the distribution duct, of course, and will be discharged through the defroster outlets.

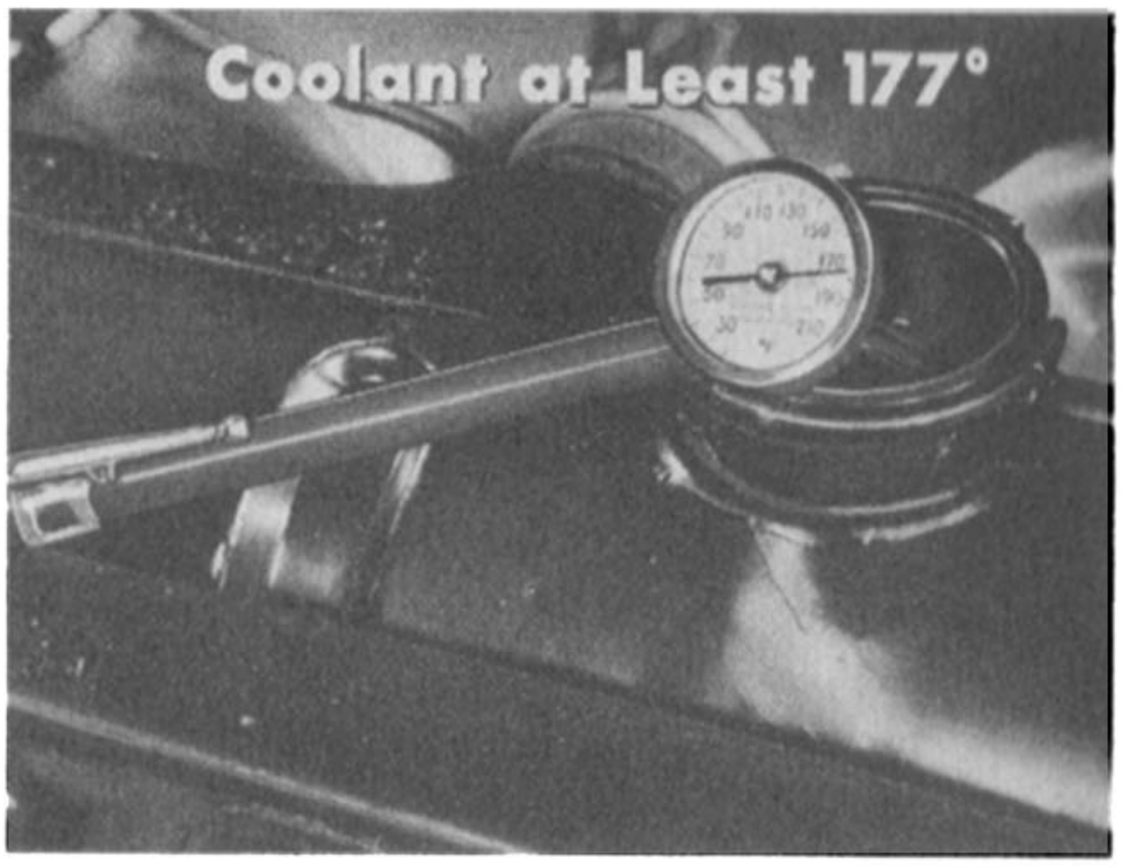
NOTE: Cars not equipped with heaters do, however, have a "V" (or "AIR") button, and an "OFF" button located in the panel otherwise used for the heater control buttons. These two buttons control the vacuum actuator which operates the fresh-air door, so the door can be opened or closed.

Maintenance

When an owner reports lack of heat, or insufficient heat, there are four main conditions to check:

1. Engine coolant temperature
2. Coolant circulation through the heater core
3. Air circulation through heater system ducts
4. Temperature of the discharged air at the outlets

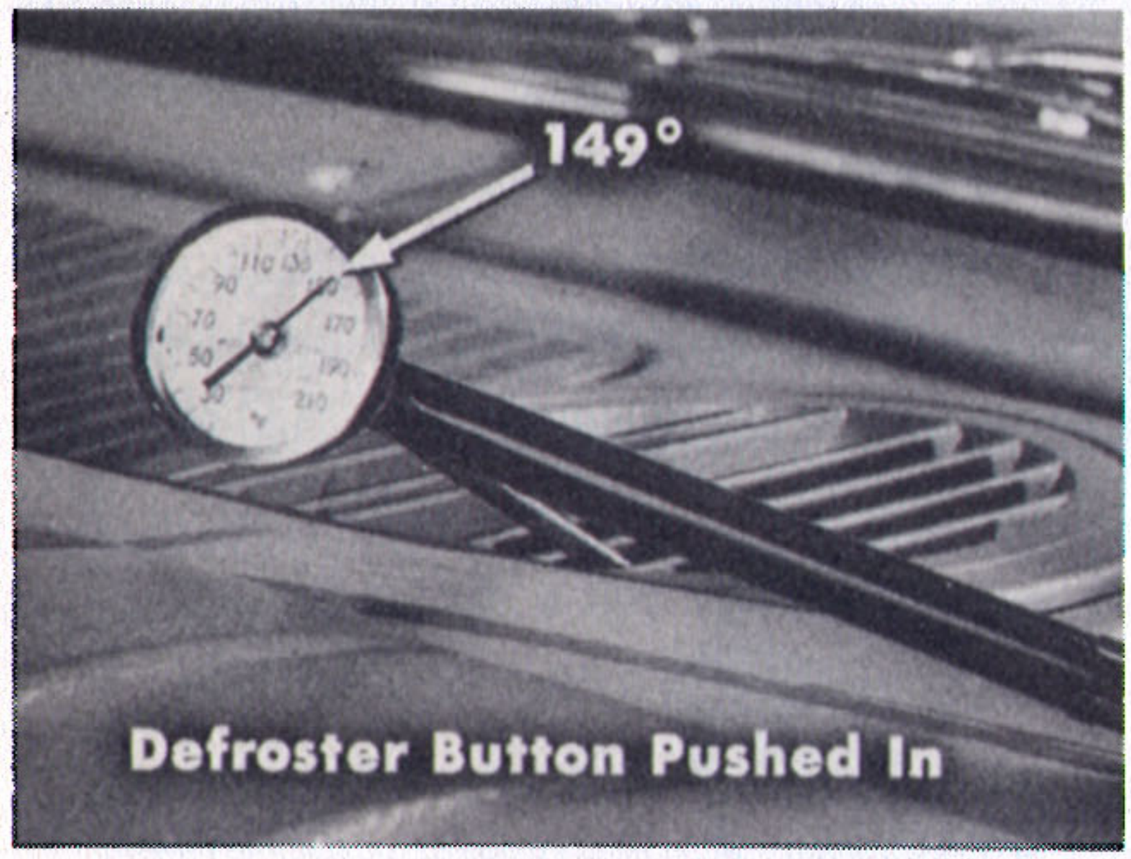
Coolant Temperature. When the water temperature gauge indicates that the engine cooling system is at normal operating temperature, check the actual temperature of the coolant by placing a thermometer in the upper tank of the radiator. All the "M" Series V-8 engines use a 180-degree thermostat, so the water temperature for normal running should be at least 177 degrees. Six-cylinder engines use a 160-degree thermostat, so the coolant temperature in those cars should be least 157 degrees.



Since the owner's report of heater performance is based on operating the car out-of-doors, your test should be made out-of-doors, too. If the temperature of the coolant in the top tank of the radiator indicates that the thermostat is operating properly, move the car out-of-doors for a test of the discharged air. Run the engine at about 1200 r.p.m. for about ten minutes, being sure that the temperature control lever is moved all the way to the "WARMER" end of the slot, and that the "DEFROST" button is pushed in so the blower

will be running at high speed and air will be discharged through the defroster outlets. Under these conditions, the temperature of the discharged air should be within ten degrees of the temperatures shown in the accompanying table:

OUTSIDE (AMBIENT) TEMPERATURE	OUTLET AIR TEMPERATURE	
	160° Thermostat	180° Thermostat
−10° F	116° F	130° F
0° F	119° F	133° F
+10° F	122° F	136° F
+20° F	125° F	139° F
+30° F	127° F	141° F
+40° F	130° F	149° F

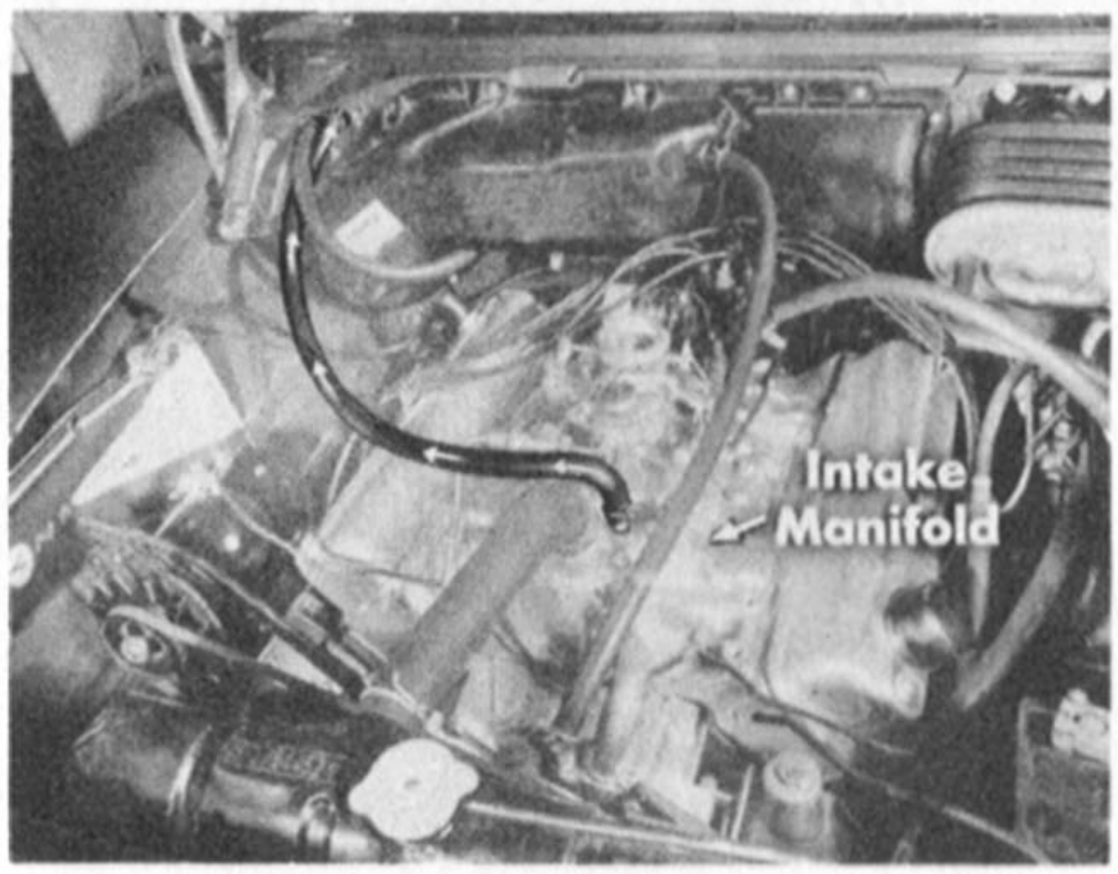


Test the temperature of the discharged air by placing a thermometer at one of the defroster outlets.

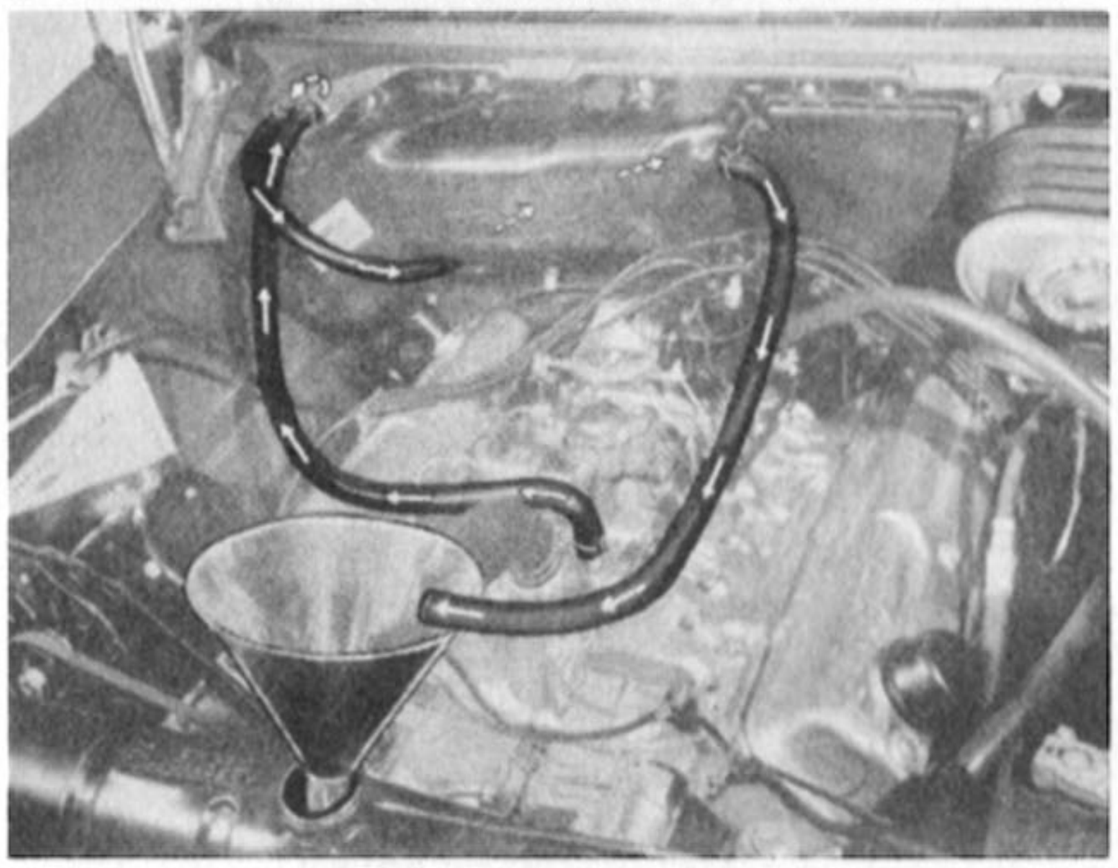
Coolant Circulation. If the temperature registered at the outlet is more than ten degrees lower than those shown in the table, check the water flow through the heater core. First, be sure the temperature control lever cable is properly adjusted so the flow valve is fully open when the lever is at the "WARMER" end of the slot. If it isn't, adjust the cable to fully open the valve.

The next point to check is to be sure that the hose running from the top of the intake manifold (for Plymouth Fury V-800 and Dodge Red

Ram engines) is connected to the INNER (next to the engine) connection of the temperature control valve. On all other V-8 engines, the hose from the upper connection of the water pump housing connects to the inner connection of the valve. On six-cylinder engines it is the hose from the rear of the cylinder head.

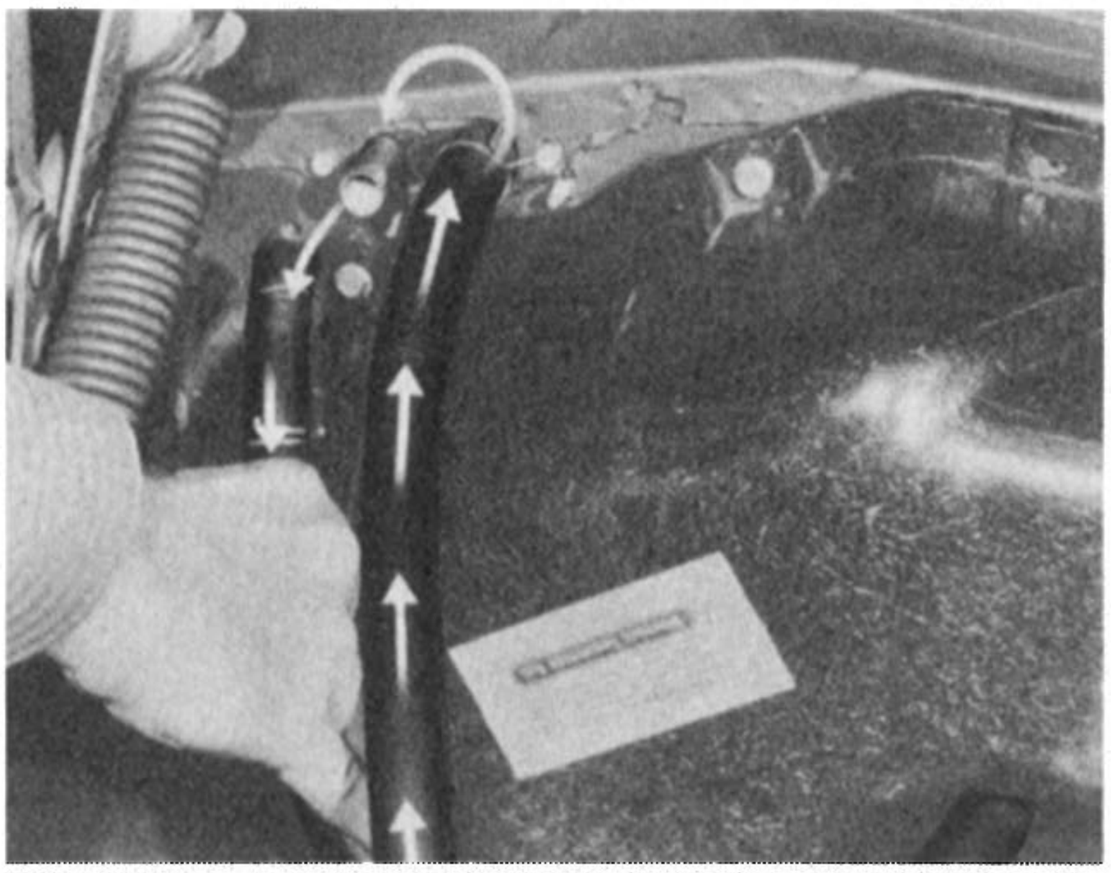


With the valve properly connected, and opening fully (to outward appearance), check water flow through the valve and the heater core. Disconnect the heater return hose from the nipple in the water pump housing, and cap the nipple. Place the end of the hose in a funnel in the radiator filler neck so you can run the water back into the radiator.



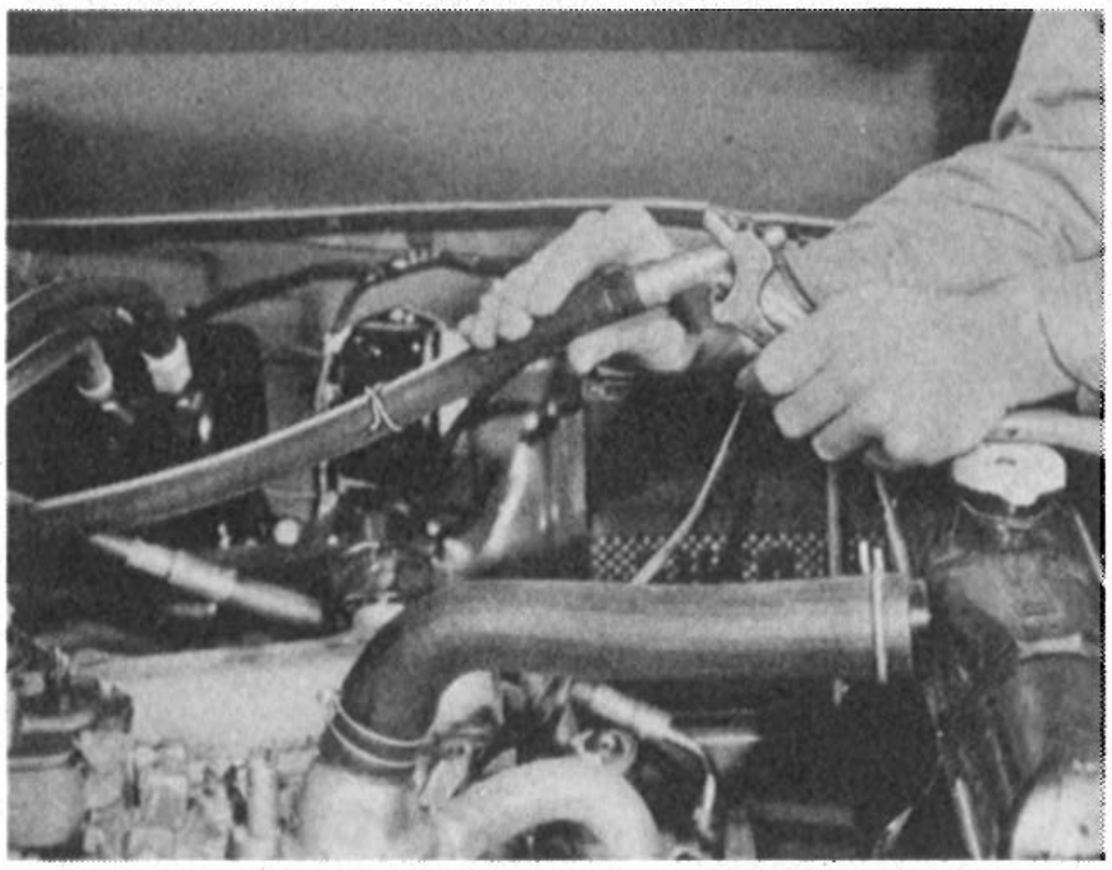
Run the engine at 1200 r.p.m. with the temperature control lever in the "OFF" position. There should be no water flowing from the end of the heater outlet hose. Next, move the temperature control lever to the "WARMER" end of its slot; there should be a full flow of water from the hose.

If water flows from the heater outlet hose when the flow valve is closed it indicates that the valve is leaking. If the cable is properly adjusted, opening the valve fully, and accelerating the engine rapidly, may clear it of foreign matter collected on the valve seat. If it doesn't, you'll have to replace the valve. If there is less than a full flow of water from the heater outlet hose when the valve is fully open (and the cable is properly adjusted), you'll have to test the valve and the heater core separately to see which is obstructing the flow of water.



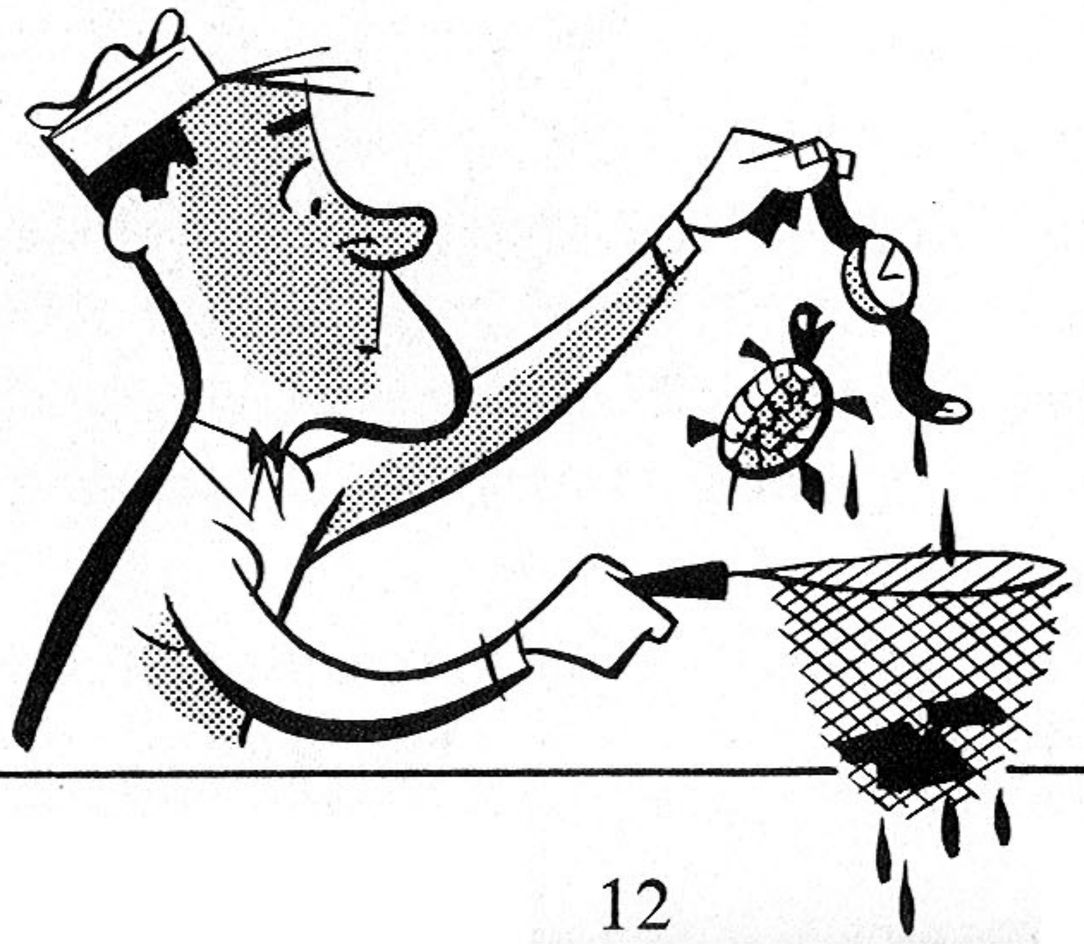
Disconnect the control valve outlet hose at the valve, and run the engine again. If the water flow through the valve is less than full, try to flush it out with the available water pressure. If you get full flow through the valve, test the heater core next.

Disconnect the heater hoses at the engine and at the control valve.

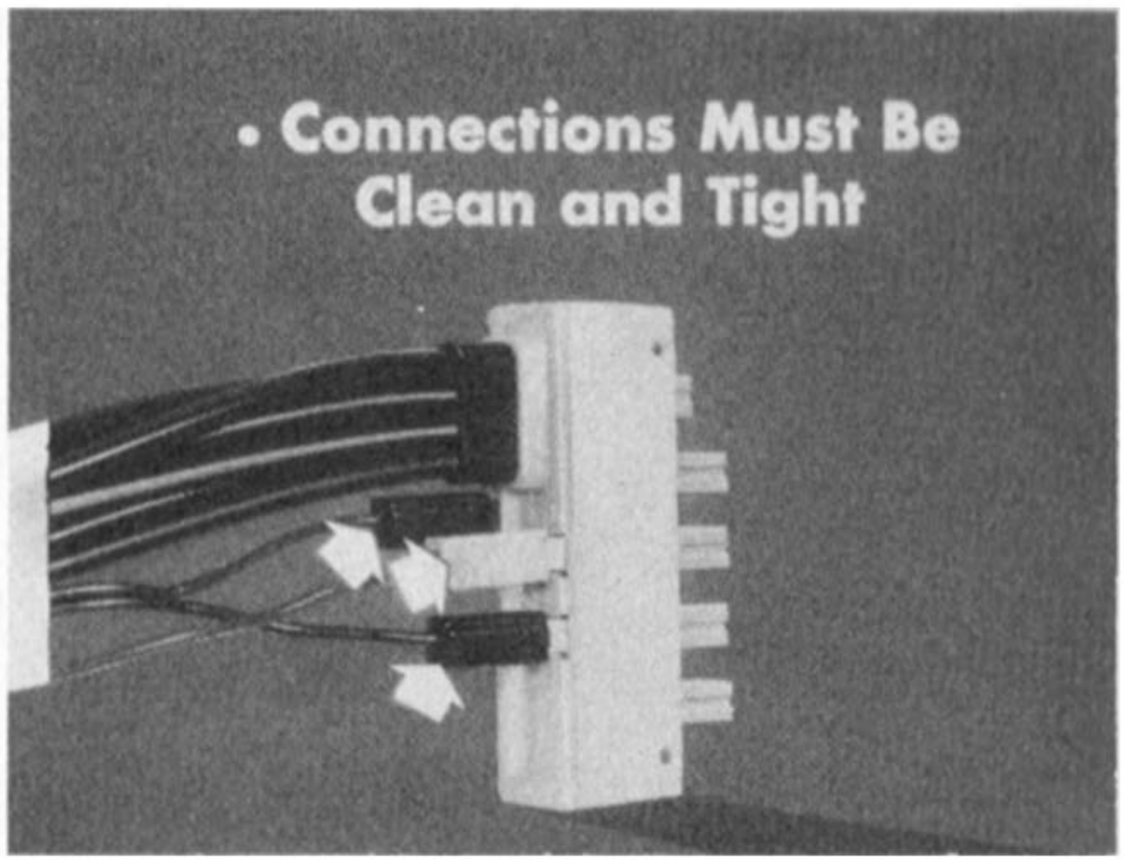


(Save the anti-freeze if it is fresh.) Reverse-flush the core with short bursts of water, for about five minutes. Then flow water through the core at steady pressure for another five minutes. If this fails to improve normal flow, the core should be removed and cleaned as you would clean a plugged radiator core.

NOTE: If you fill the cooling system with the coolant drained from it when you made the heater tests, be sure to strain it to remove foreign matter that may have fallen into the container.



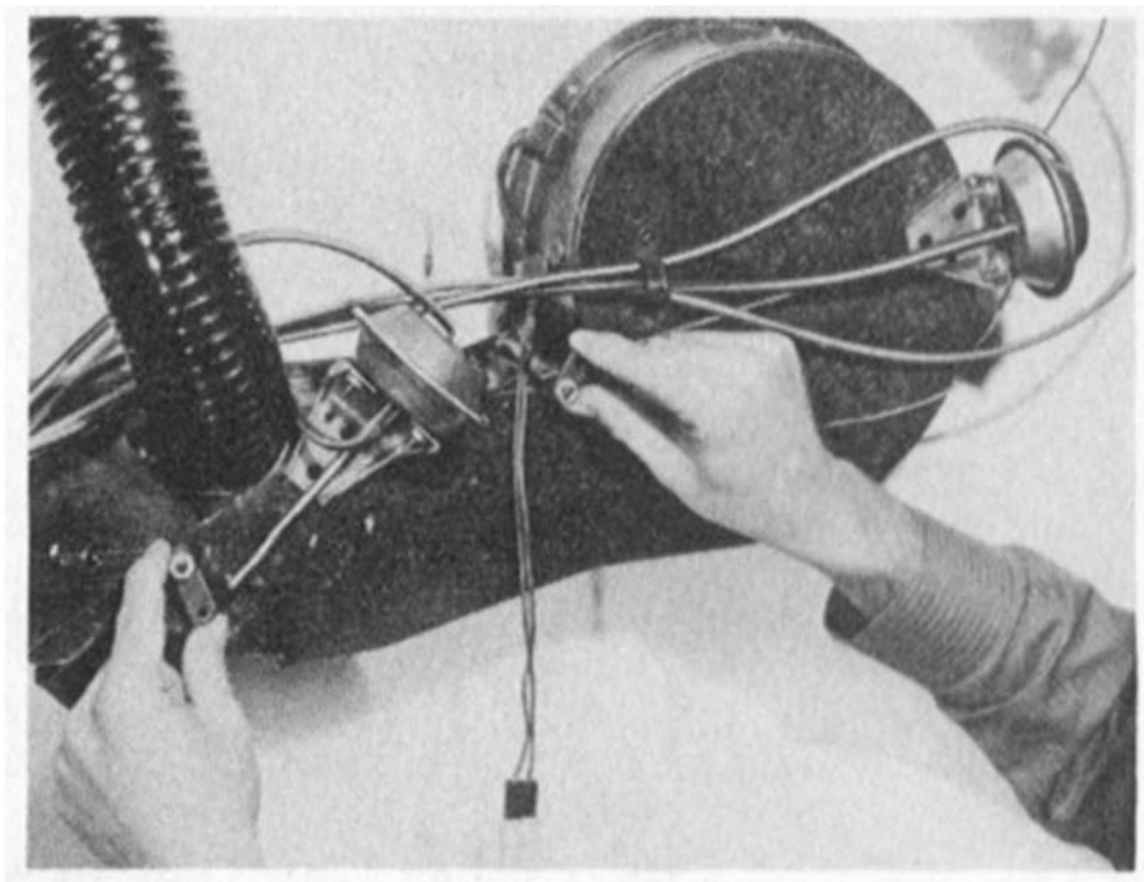
Air Circulation. Having made sure that water flow through the heater core is satisfactory, the next point to check is air flow through the duct system. Check the blower first, to be sure it is running at the proper speed. Be sure all connections at the motor itself, as well as at the push-button switch are clean and tight. Of course, if the motor didn't run at all, you'd check for a blown fuse. Current for the heater blower motor is taken from different points for the different makes.



Plymouth—from the temperature gauge
Dodge —from the junction block on the instrument cluster
De Soto —from the ACC terminal of ignition switch
Chrysler —from fuse block under instrument panel
Imperial —from fuse block under instrument panel

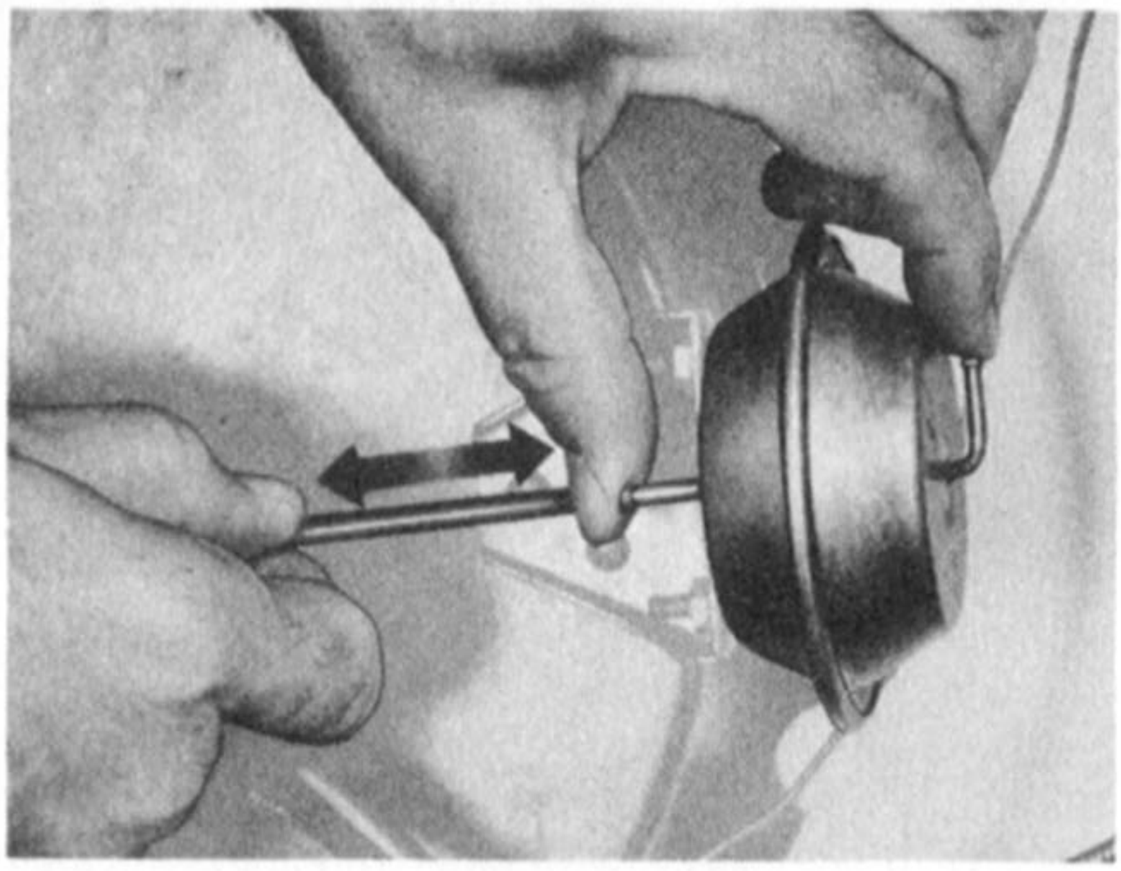
Having determined that the blower is operating up to standard, you'd check the movement of the doors and damper to see if they were operating as they should.

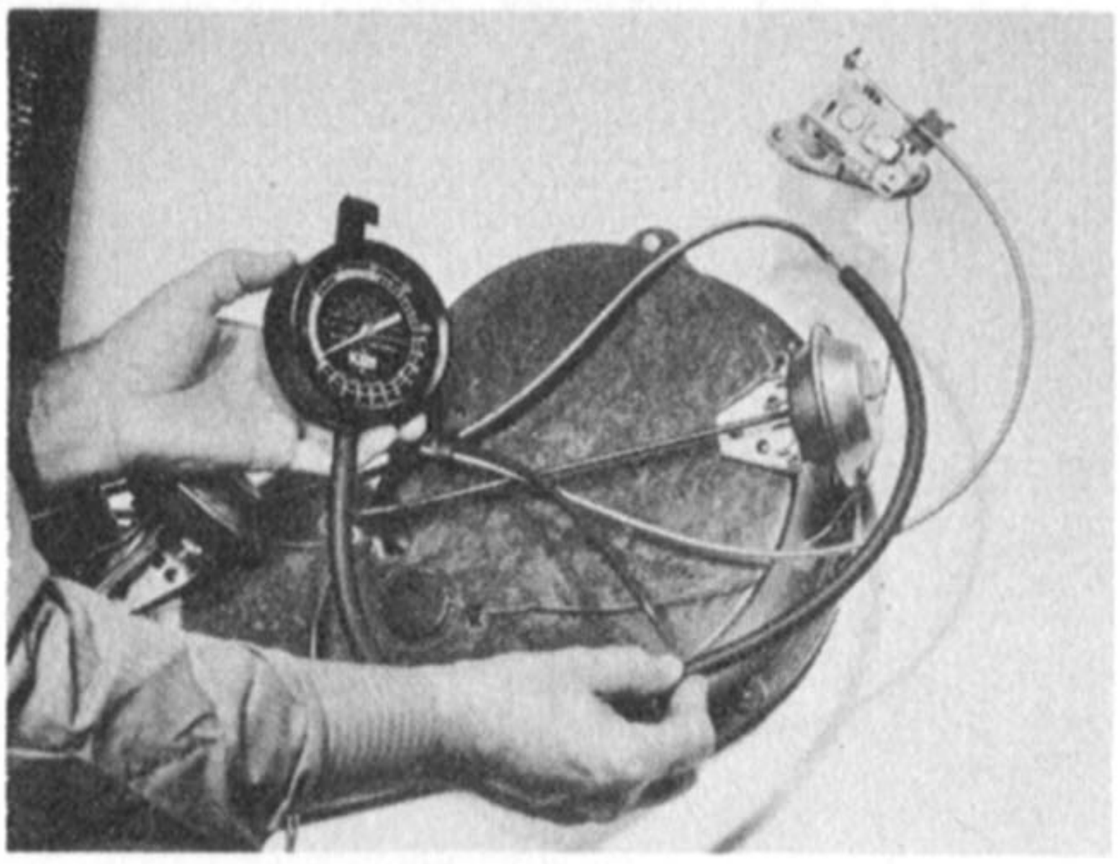
Disconnect the vacuum actuator rods at the doors and at the damper. Try to move the doors and the damper by hand. They should move freely, and should have enough travel to fully open and close.



Next, test to see that each vacuum actuator operates properly. Remove both hoses from the actuator. One hose is vented to atmos-

phere, but the other should show vacuum pull. Make an adapter so you can connect your vacuum gauge to one of the hoses—it should register normal manifold vacuum. If it does, connect the hose to the actuator and see if it operates the diaphragm. If it doesn't, the diaphragm is probably ruptured, and the actuator will have to be replaced. To test the diaphragm, hold a finger over the end of each tube connection, and see if you can move the diaphragm back and forth with the rod. If you can, the diaphragm is ruptured.





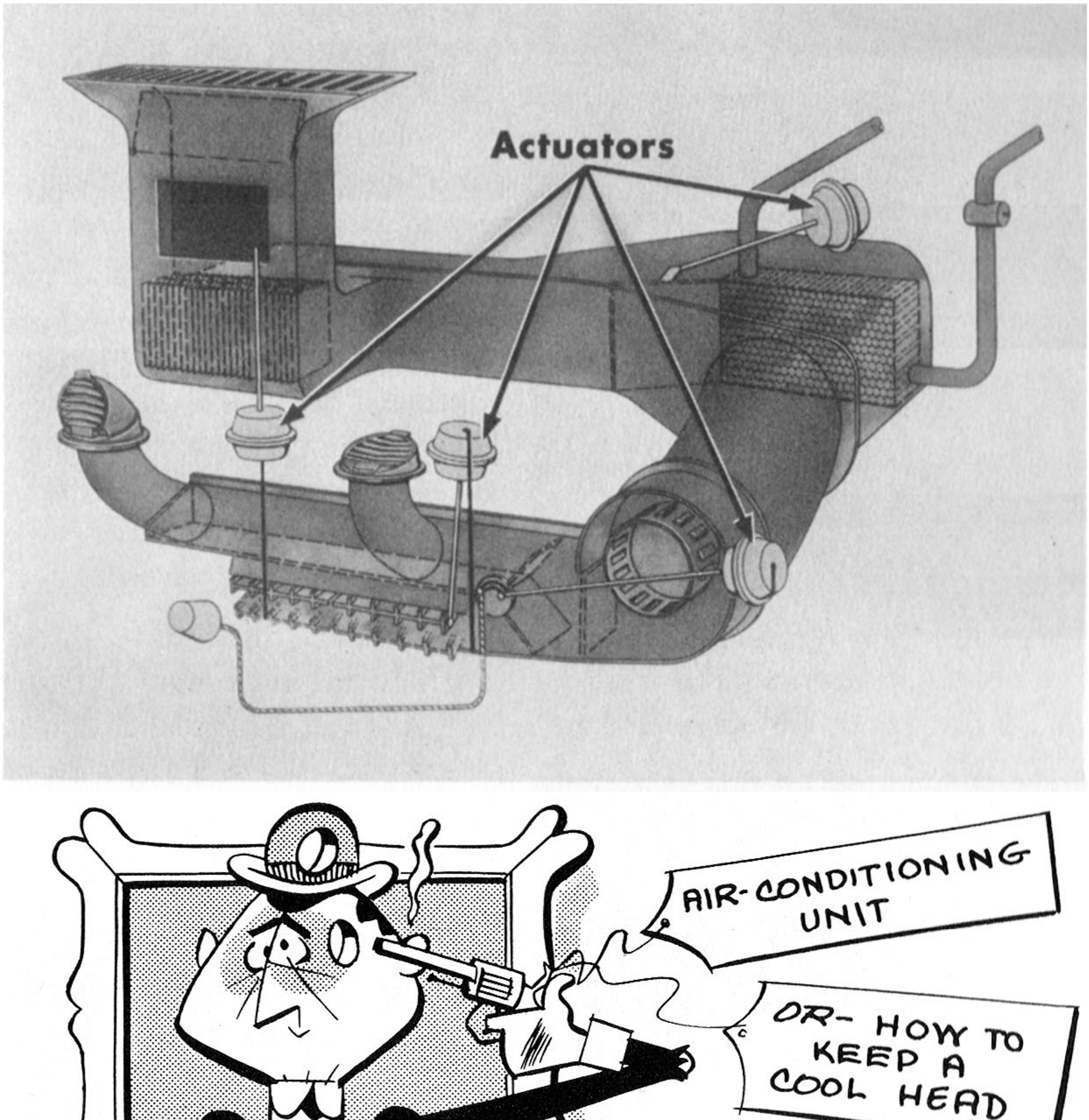
If the vacuum gauge registers no vacuum, the hose is ruptured. In that case you'll have to replace the complete vacuum hose assembly, since it is made with a manifold connection at the push-button switch end. When you install it, be sure each separate hose is pushed firmly on the connection at each actuator, and that the manifold connection is firmly installed on the switch.

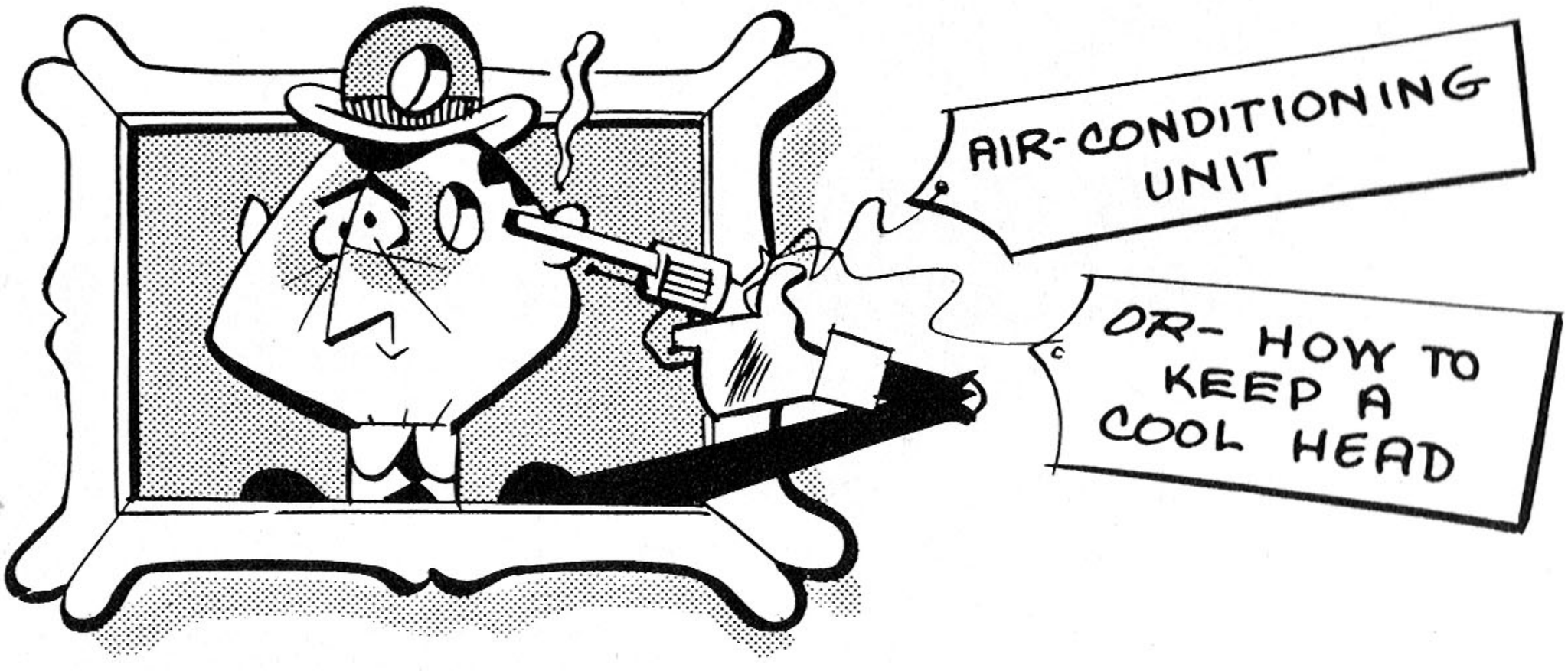
HEATING CIRCUIT OF HEATING AND AIR-CONDITIONING SYSTEM

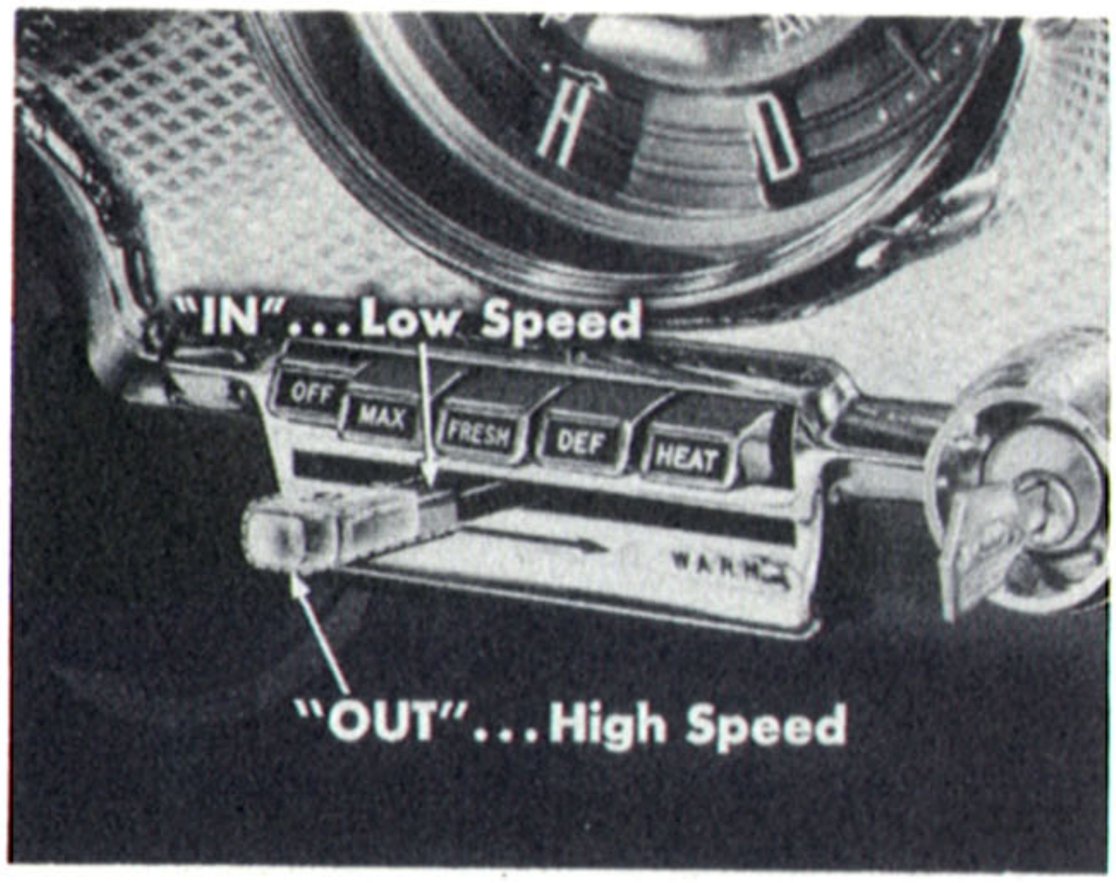
Description

The heating circuit of the combined heating and air-conditioning system is very similar to the hot water heating system previously described. There are some differences, however.

Push Buttons. Push buttons are identified as "OFF", "MC" or "MAX" (meaning Maximum Cooling), "FC" or "FRESH" (meaning Fresh-Air Cooling), "DEF" (Defroster), and "HEAT" (Heating). There is no "V" (Ventilation) button, but fresh-air ventilation through the distribution duct can be obtained by pushing in either the "DEF" or the "HEAT" button, and placing the temperature control lever in the "OFF" end of the slot. The "DEF" and "HEAT" buttons complete the electric circuit to the blower.





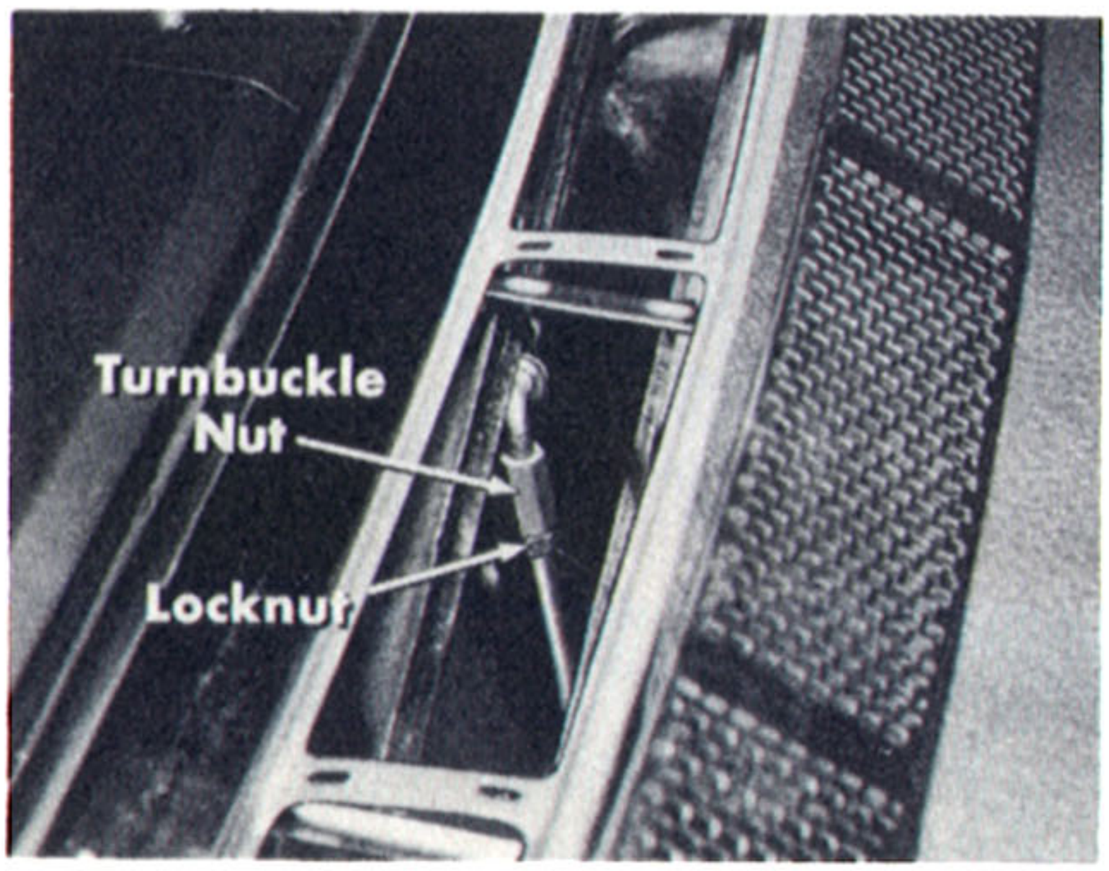


The temperature control lever operates the blower switch. There are two types of switches used—two-speed and three-speed. The two-speed switch provides low speed when the lever's pushed in, high speed when the lever's pulled out.

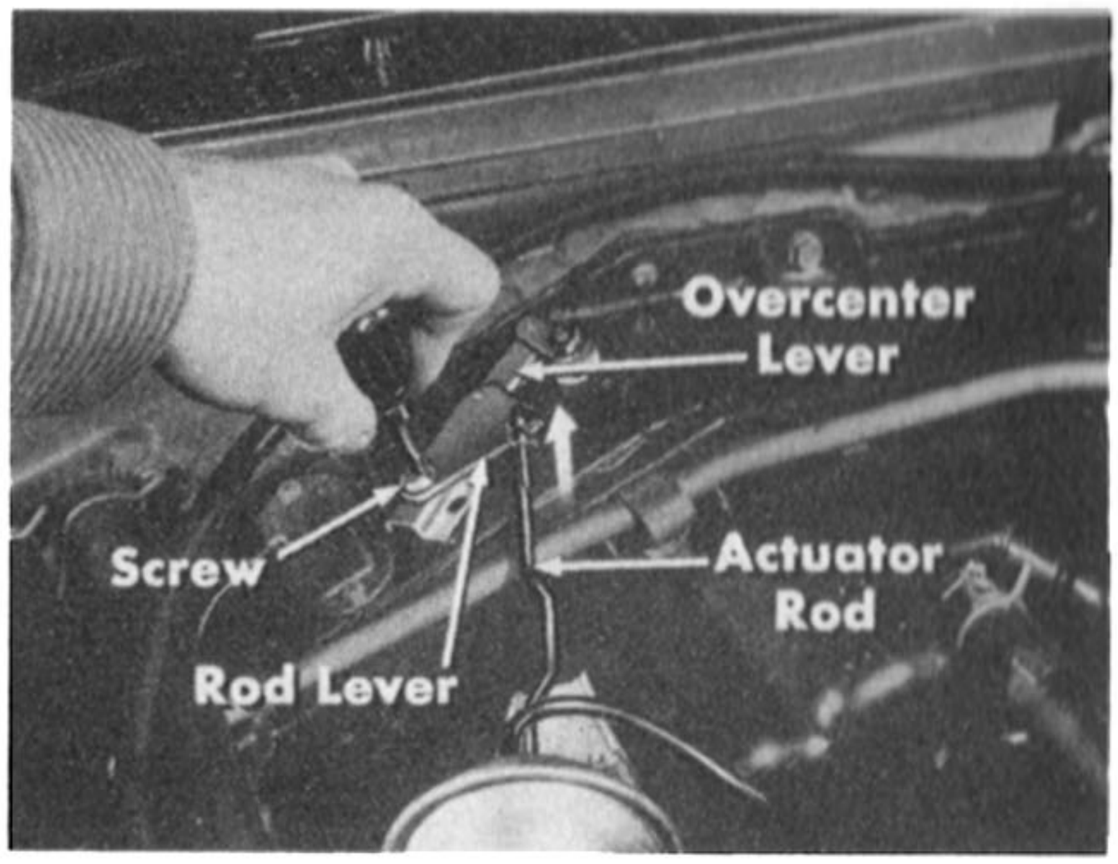
The three-speed switch provides low speed when the lever's pushed in; pulled out to the first notch is medium speed. All the way out is high speed.

Maintenance

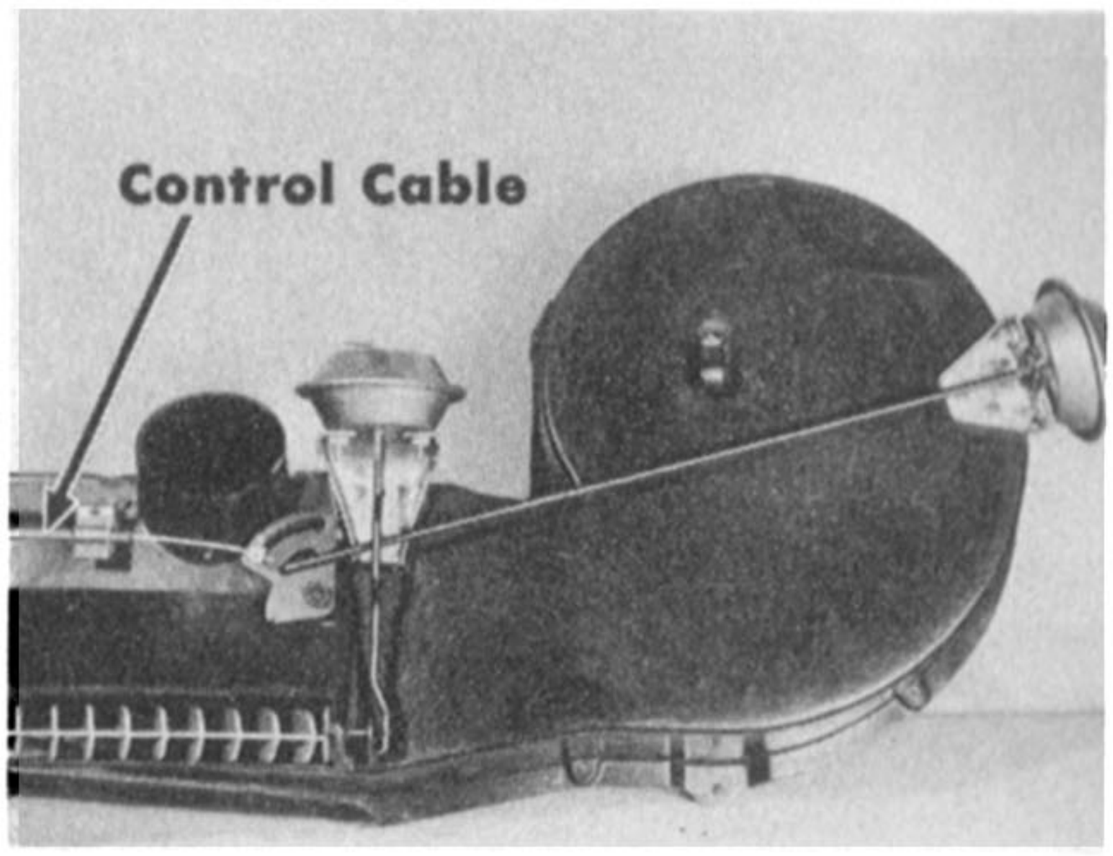
There are four vacuum actuators in this system, instead of three. One actuator operates the fresh-air door and the recirculating door. These two doors are connected by an adjustable linkage, so that one door is closed when the other door is open. The linkage is adjustable by means of a turnbuckle nut, and is held by a lock nut. To adjust this linkage, remove the fresh-air grille from the cowl panel. Reach through the cowl opening with two long $\frac{7}{16}$-inch wrenches.



To adjust the by-pass door, loosen the adjusting screw on the top face of the heater housing, in the engine compartment. Push the actuator rod toward the rear of the car until the overcenter lever is straight or in line with the back edge of the rod lever. Tighten the adjusting screw.



The distribution duct damper is operated by a vacuum actuator, but the position of the damper can be changed in most cars by a cable operated by a control knob on the instrument panel. Some owners may desire a different distribution of heated air between the defroster outlets and the floor level outlets than that provided by the automatic positioning of the damper by the actuator.



The distribution duct deflectors also can be adjusted by hand, to change the position in which they are placed by the vacuum actuator.

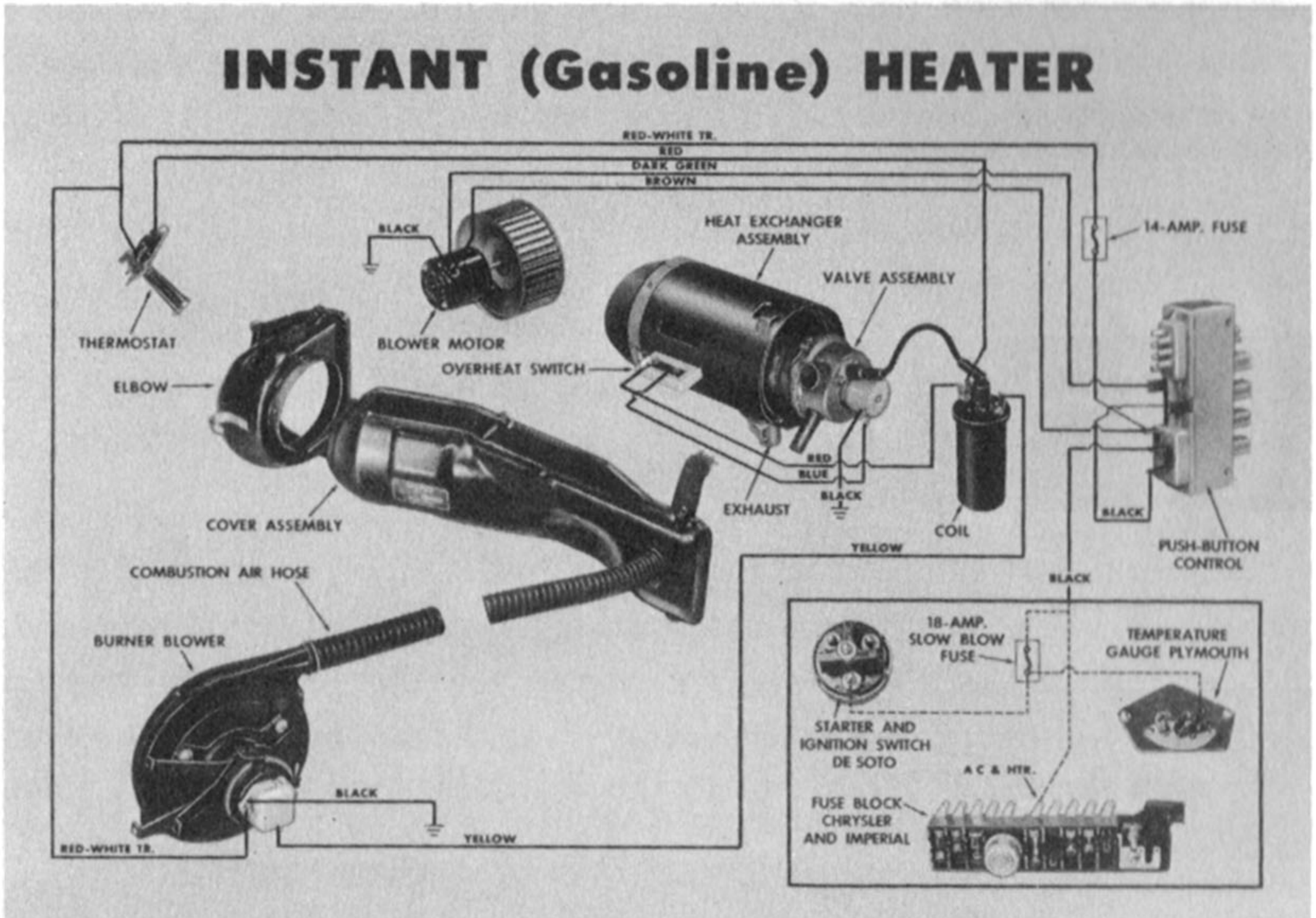
INSTANT (Gasoline) HEATER SYSTEM

Description

The Instant Heater is a gasoline burning heater that supplies heated air within a few seconds after the engine is started. The unit obtains its fuel supply from the main fuel system. Fuel is ignited by a spark plug which obtains its current from its own ignition system. This system is perfectly safe to operate, since gasoline can be pumped

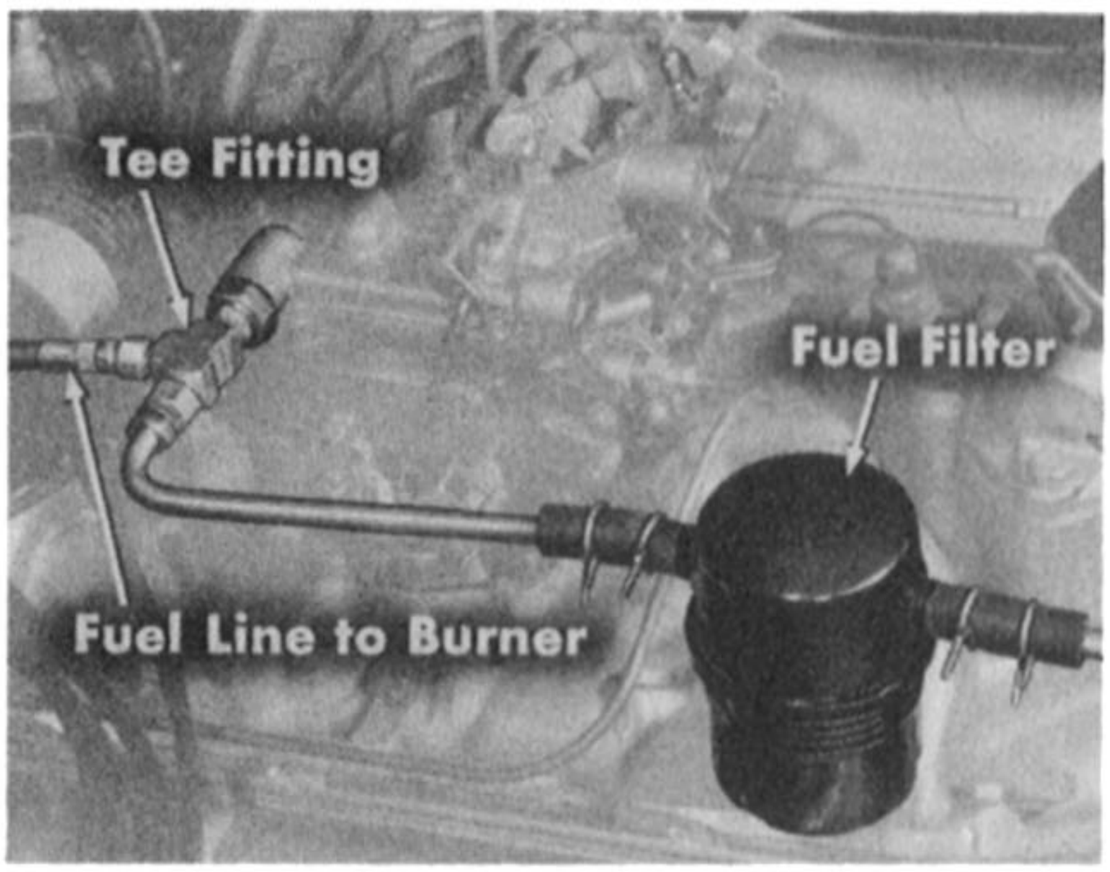
into the burner *only* when the engine is running. Exhaust gases are expelled through a pipe having an outlet below the floor level of the car. A thermostat is provided in the system to control the heater outlet temperature.

Push-button controls for the Instant Heater system are identical to those of the hot water heater system. The duct system for air circulation, and the distribution of discharged air between the defroster outlets and the floor level outlets is also the same.



Operation

When the "LO", "HI", or "DEF" button is pushed in, the circuit through the thermostat is closed. This causes the solenoid to be energized, completes the ignition circuit, and starts the combustion blower. The solenoid operates the fuel valve. Fuel is taken from the discharge side of the engine fuel pump through a "T" fitting located at the carburetor.



Fuel flows through the valve, and out the fuel nozzle in a cone-shaped spray. Ignition is accomplished by a spark plug, supplied by

the system ignition coil. In the event the fuel fails to ignite but is still entering the burner, it will drain out through the exhaust tube, preventing an accumulation of raw fuel in the burner.

A combination heat exchanger is substituted for the hot water heater core. Fresh air is drawn across this heat exchanger by the heating system blower, heated, and discharged into the distribution duct. There is no opportunity for the fresh air to become mixed with the combustion air, since each is in a separate compartment or chamber.

A thermostat, located in the heater outlet duct, cycles the heater ON and OFF to maintain the desired temperature. If for some reason the thermostat fails to cycle the heater, or there is an insufficient amount of system fresh air, a safety device known as a limit switch will open the electrical circuit to the solenoid, closing the fuel valve.

Maintenance

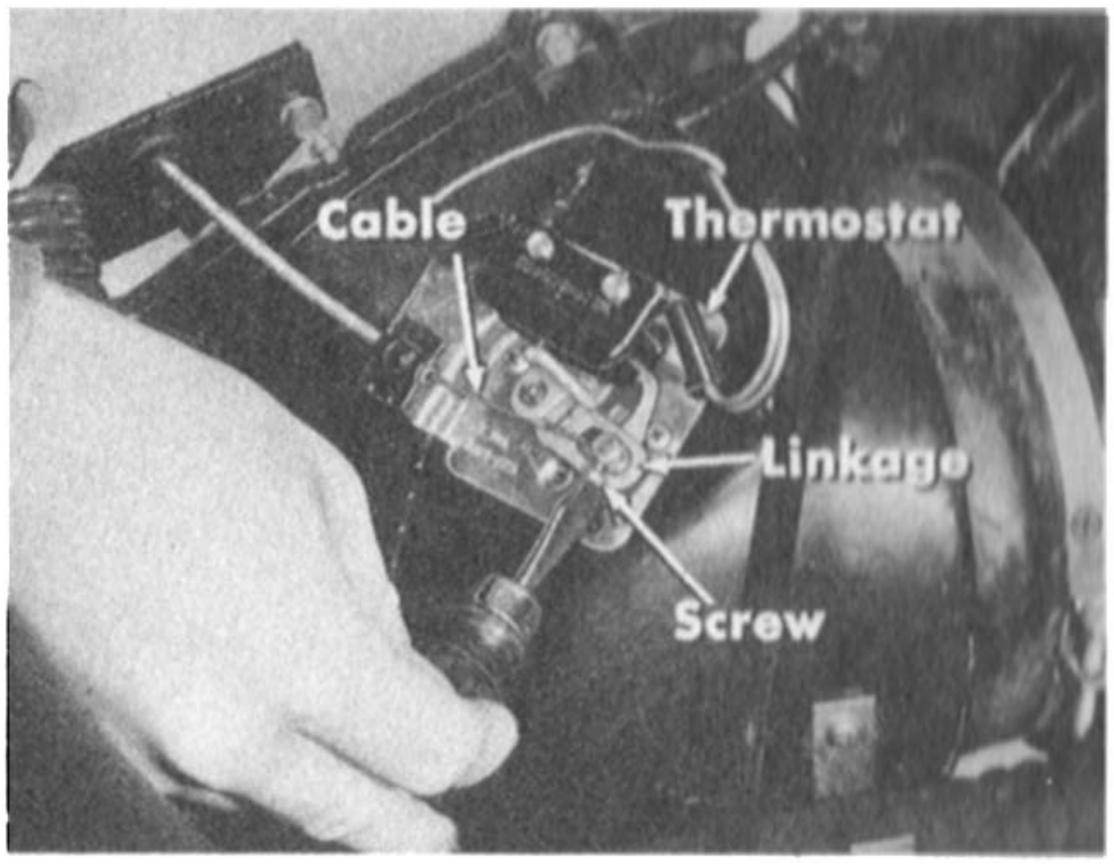
Owner's reports of heater operation may range from no heat, improper heat control, to miscellaneous conditions such as noise, odor, etc.

No Heat. If the heater fails to start and the burner blower does not run, the cause could be a blown fuse, loose electrical connection, faulty switch or difficulty in the burner blower.

If the burner blower operates but the heater fails to start, you'd check the fuel supply. There could be a clogged fuel nozzle, faulty solenoid valve, fouled spark plug, failure of the ignition coil or breaker points, or a faulty limit switch. In order to check these units it is necessary to remove the heater from the car and partially disassemble it to gain access to the units.

Improper Heat Control. Intermittent operation, with too low or too high heat output, could be caused by an improperly adjusted thermostat or an air lock in the fuel supply.

Check the thermostat adjustment to see that the wire cable is at its maximum length. The thermostat linkage should then be rotated to its maximum counterclockwise (looking down at the top of the thermostat), and then the cable secured to the linkage.



An air lock in the fuel line can be relieved by momentarily disconnecting the fuel line, and then connecting it. Check carefully for loose connections that could permit leaks, or admit air to the line.

There may be a report of low heat output, even though the heater appears to be running continuously. This is probably due to a faulty fuel nozzle, and the nozzle should be replaced rather than repaired. Replacing the nozzle requires removal and disassembly of the valve and burner assembly.

Miscellaneous Conditions. The odor of raw gasoline is generally due to a loose fuel line at the burner casting. Check and tighten.

The odor of burned gasoline may be corrected by tightening or replacing a loose or broken burner clamp, or by replacing the exhaust ferrule.

The presence of excessive smoke from the heater is an indication that the fuel valve is leaking, or the burner blower is not supplying sufficient air to the combustion chamber. Look for leaks in the burner air hose or connections, and check the operation of the blower. Also, be sure the exhaust pipe is clear—it may become partially plugged with carbon.

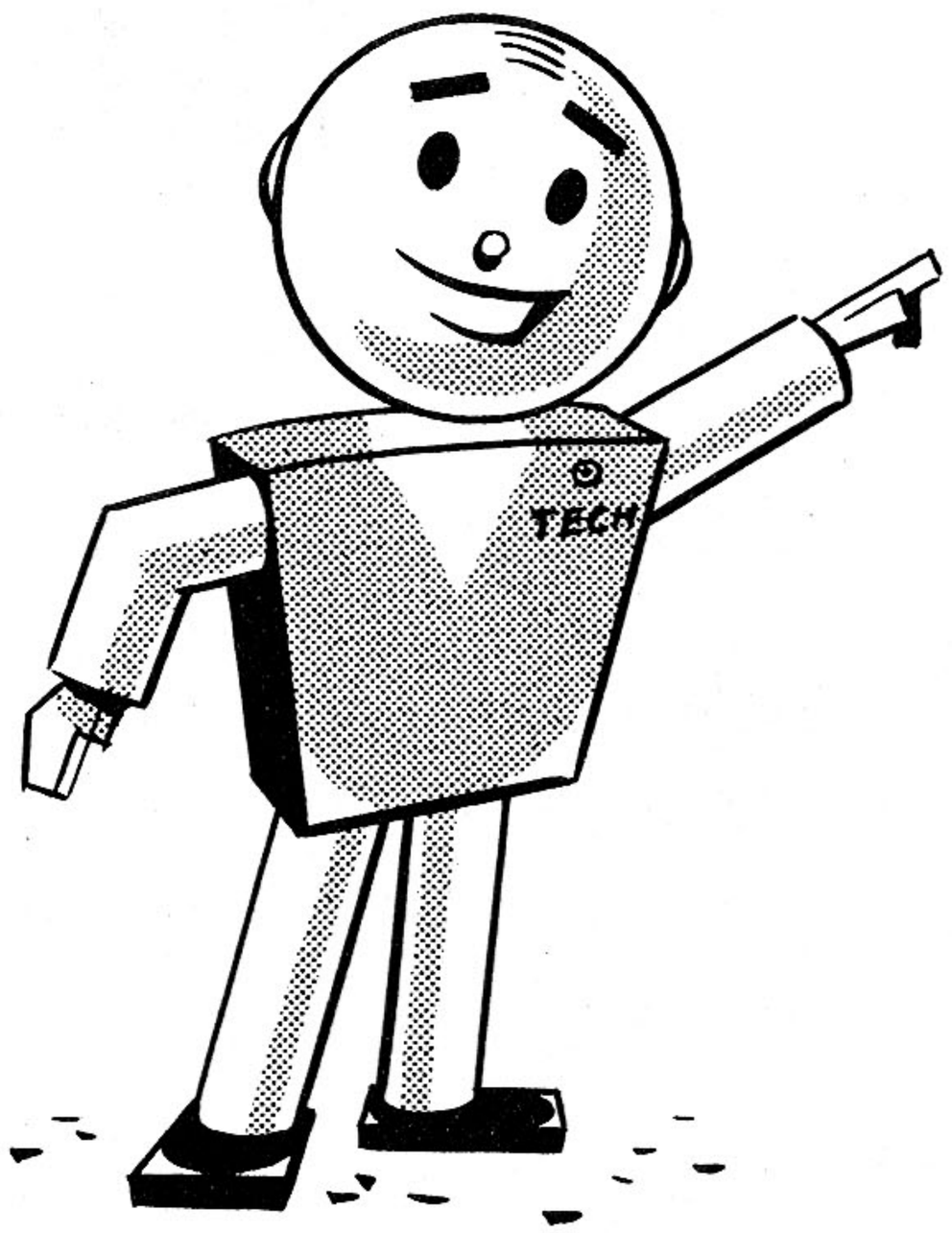
If a popping noise is heard when the heater starts, or cycles ON, look for a nozzle that is loose in the mixer, or one that has a poor spray pattern.

CAUTION: Have a fire extinguisher handy before attempting to check spray pattern. Connect a jumper wire from the red wire terminal of the heater ignition coil to the white or blue wire terminal of the solenoid. Disconnect the ignition cable from the spark plug. Start the engine and turn the heater switch to high position. The fuel valve will open, and you can observe the spray pattern. If the pattern is faulty, the nozzle should be replaced.

A fouled or improperly spaced spark plug could also cause a popping noise when the heater starts. Clean the plug, and space the gap to .085 inch.

SUMMARY

Satisfactory heater performance is uppermost in the owner's mind during this season of the year. Be sure you are prepared to service the heater system so your owners will enjoy comfortable transportation. Now is the time to ask your owners to bring their cars in so you can check the heater system to be sure it will give maximum performance during the winter months.



to our customers -

YOU'RE INVITED

TO A SPECIAL

car
~~HOUSE~~ WARMING

THIS MONTH !

RECORD YOUR ANSWERS TO THESE QUESTIONS ON QUESTIONNAIRE NO. 132

The temperature control valve of the hot water heater system is controlled by a wire cable attached to a sliding lever in the push-button panel.

RIGHT 1 WRONG

The vacuum actuators are operated by engine vacuum taken from the intake manifold.

RIGHT 2 WRONG

Pushing the "LO" or "HI" button of the hot water heater system also completes the electrical circuit to the blower motor.

RIGHT 3 WRONG

When the "V" (or "AIR") button of the hot water system is pushed in, the heater blower operates to blow the fresh air into the car.

RIGHT 4 WRONG

The V-8 engines of the "M" Series cars use a 160-degree thermostat as standard equipment in the engine cooling system.

RIGHT 5 WRONG

The hot water heater hose from the top of the engine or water pump housing should be connected to the inner (next to the engine) connection of the temperature control valve.

RIGHT 6 WRONG

Running the engine with the heater return hose disconnected at the water pump housing tests water circulation through the temperature control valve and heater core.

RIGHT 7 WRONG

When reverse-flushing the heater core, use short bursts of water for about five minutes, then a flow at a steady pressure for another five minutes.

RIGHT 8 WRONG

Test for leaks in the vacuum actuator hoses with a vacuum gauge.

RIGHT 9 WRONG

The blower motor of the combined heating and air-conditioning system may have a two-speed switch or a three-speed switch.

RIGHT 10 WRONG

Litho in U.S.A.