CONTENTS

SUBJECT	PAGE
COOLING SYSTEM GENERAL DESCRIPTION	95
RADIATOR	97
Construction and Mounting	97
Pressure Cap	97
Radiator Replacement	97
FAN AND SHROUD	97
Fan Belt Adjustment	97
THERMOSTAT	98
WATER TEMPERATURE GAUGE	98
WATER PUMPS	98
Construction	98
Removal	99
Overhaul	99
Installation	101
COOLING SYSTEM PREVENTIVE MAINTENANCE	101
Corrosion Inhibitors	101
Cleaning and Flushing	101
Pressure Flushing	101
ANTI-FREEZE SOLUTIONS	102
SERVICE DIAGNOSIS	103

GENERAL DESCRIPTION

As illustrated in Fig. 153, Kaiser and Frazer engines are cooled by water (or anti-freeze solution) circulated by a belt-driven pump mounted at the front of the cylinder block. The liquid coolant is drawn from the radiator lower tank into the pump and forced through the water jackets, which extend the full length of and clear around every cylinder. After flowing through the cored water space in the cylinder head, the coolant passes through a thermostat valve in the cylinder head water outlet elbow. The radiator inlet hose carries this heated water into the radiator top tank.

Air is circulated through the radiator core air passages by the forward motion of the vehicle, and aided by the fan, cools the water as it flows downward through the water passages in the core. This cooled water or solution is drawn by the pump from the radiator lower tank and circulated again through the engine to carry off more heat.

To permit coolant temperatures higher than the normal boiling point of water, or of the anti-freeze

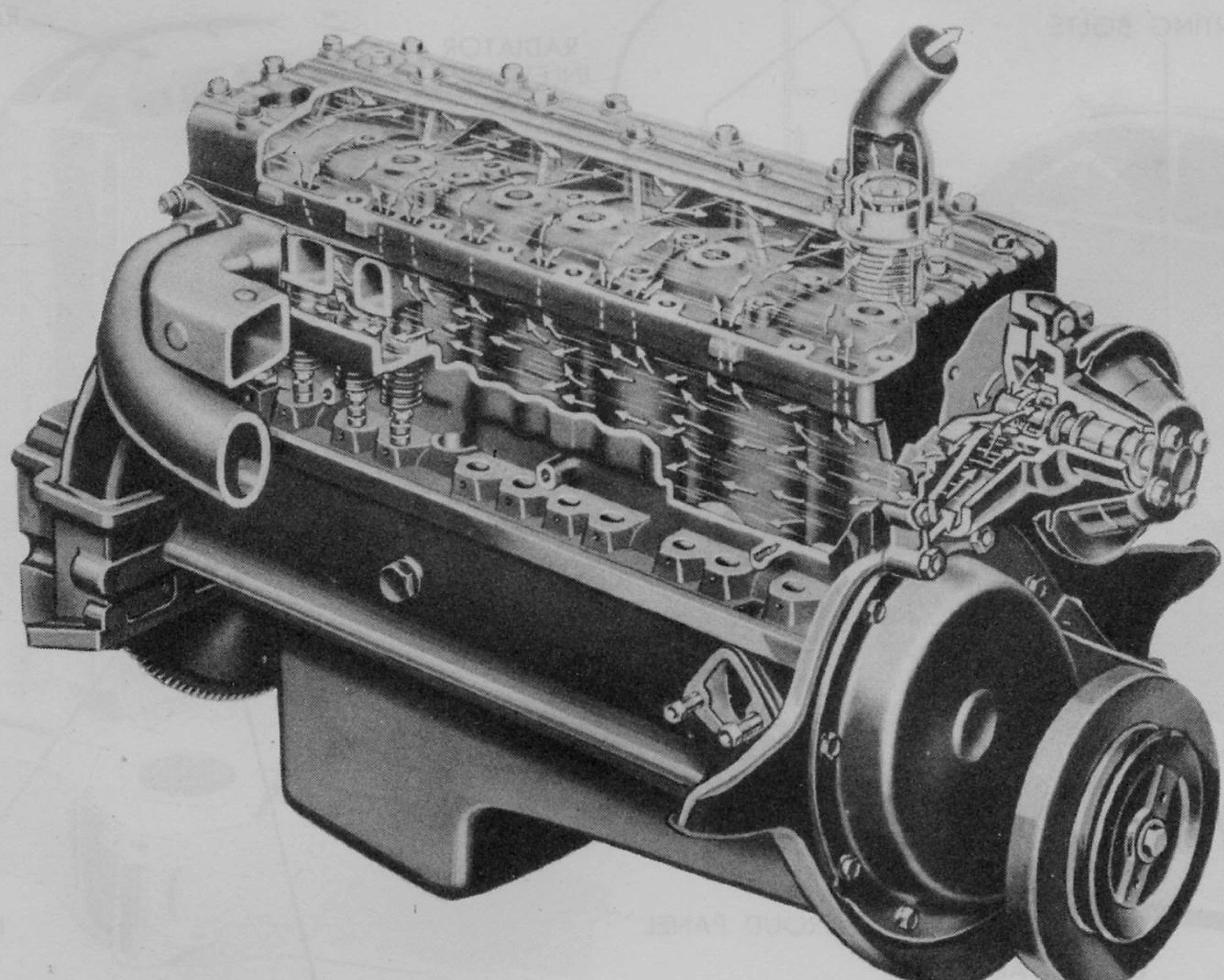

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Fig. 153—Cutaway Engine Showing Cooling

solution, a spring loaded pressure device is built into the cap that closes the radiator filler opening.

Specified cooling system capacity for Kaiser models is 13 quarts without heater and 14 quarts with heater. For Frazer vehicles the figures are 13.5 quarts without, and 14.5 quarts with heater. Actual filling requirements are approximately one pint less, as each gallon of water expands approximately ¼ pint when heated from 40° to 185° F. Anti-freeze solutions have slightly higher thermal expansion rates.

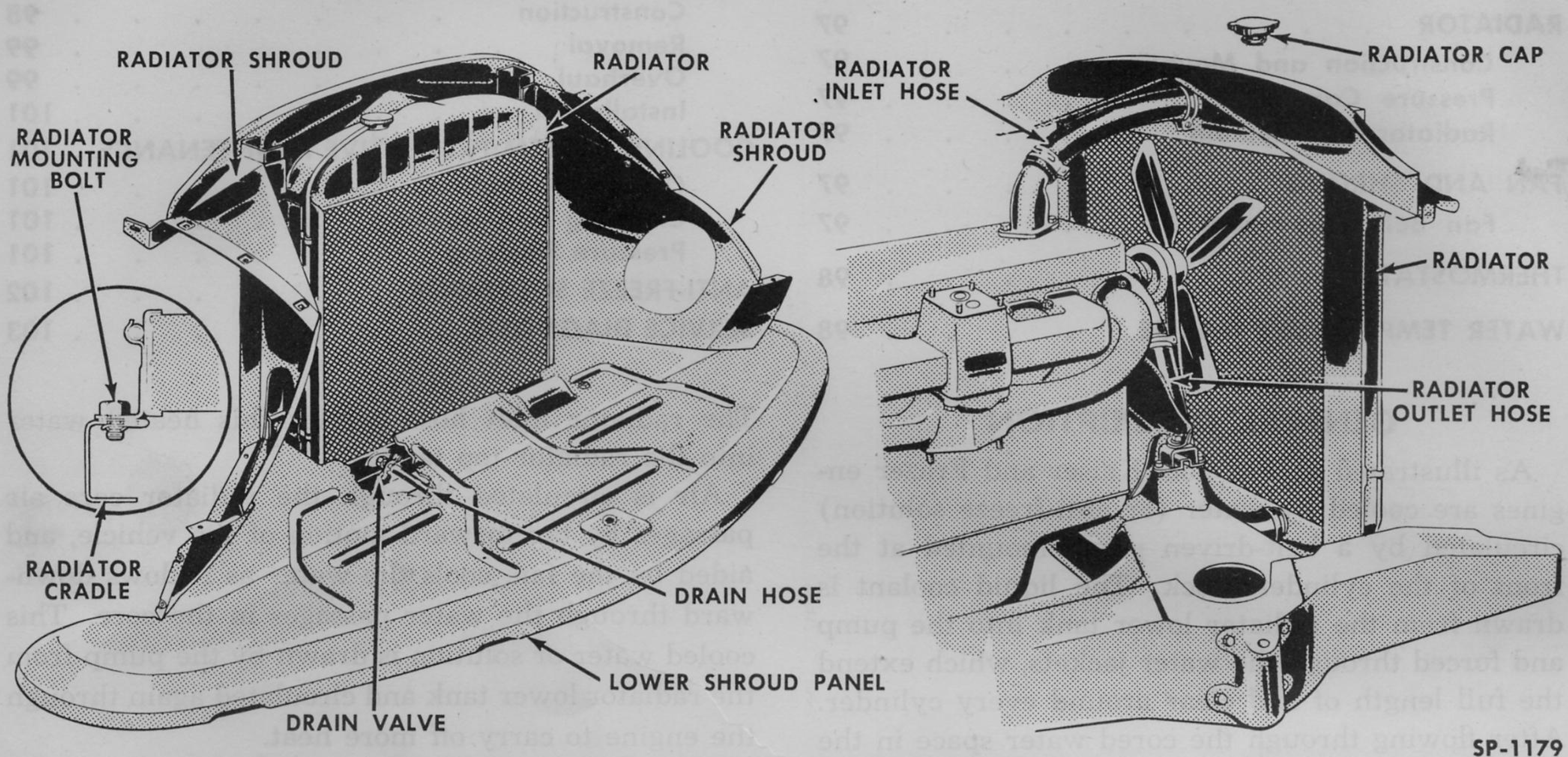

Fig. 154—Kaiser Radiator Mounting

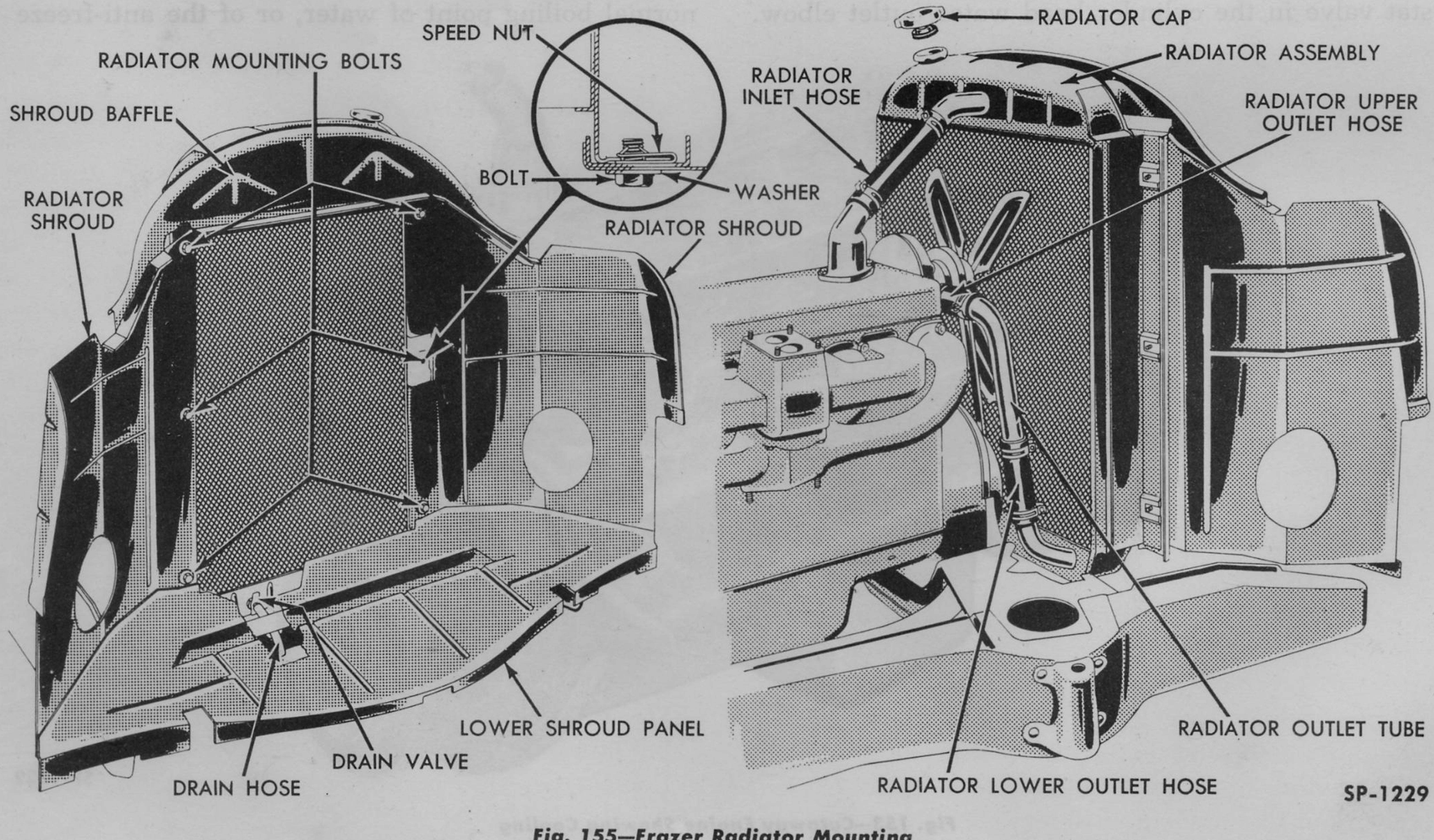

Fig. 155—Frazer Radiator Mounting

RADIATOR

a. CONSTRUCTION AND MOUNTING. Kaiser and Frazer vehicles are equipped with cellular type radiators. Specially treated copper and brass are used for the water tanks, inlet and outlet fittings and the cellular cooling portion. Baffles in the upper tank aid in distributing the coolant to the upper ends of the vertical water passages.

Hose of 1½ inch inside diameter is used at the radiator inlet (upper) and radiator outlet (lower) fittings. An easily accessible radiator drain valve is provided at the bottom of the radiator and a water jacket drain valve is located on the left side of the cylinder block, near the oil dip stick.

Radiator support is by three bolts on each side to fasten flanges or brackets on the radiator side straps to the radiator shroud (Figs. 154 and 155).

b. PRESSURE CAP. The combined radiator filler cap and pressure cap (Fig. 156) permits pressure to build up within the cooling system to the factory setting of 3¼ to 4¼ psi before the pressure seal is lifted to permit steam, expanding liquid or air to escape through the overflow tube.

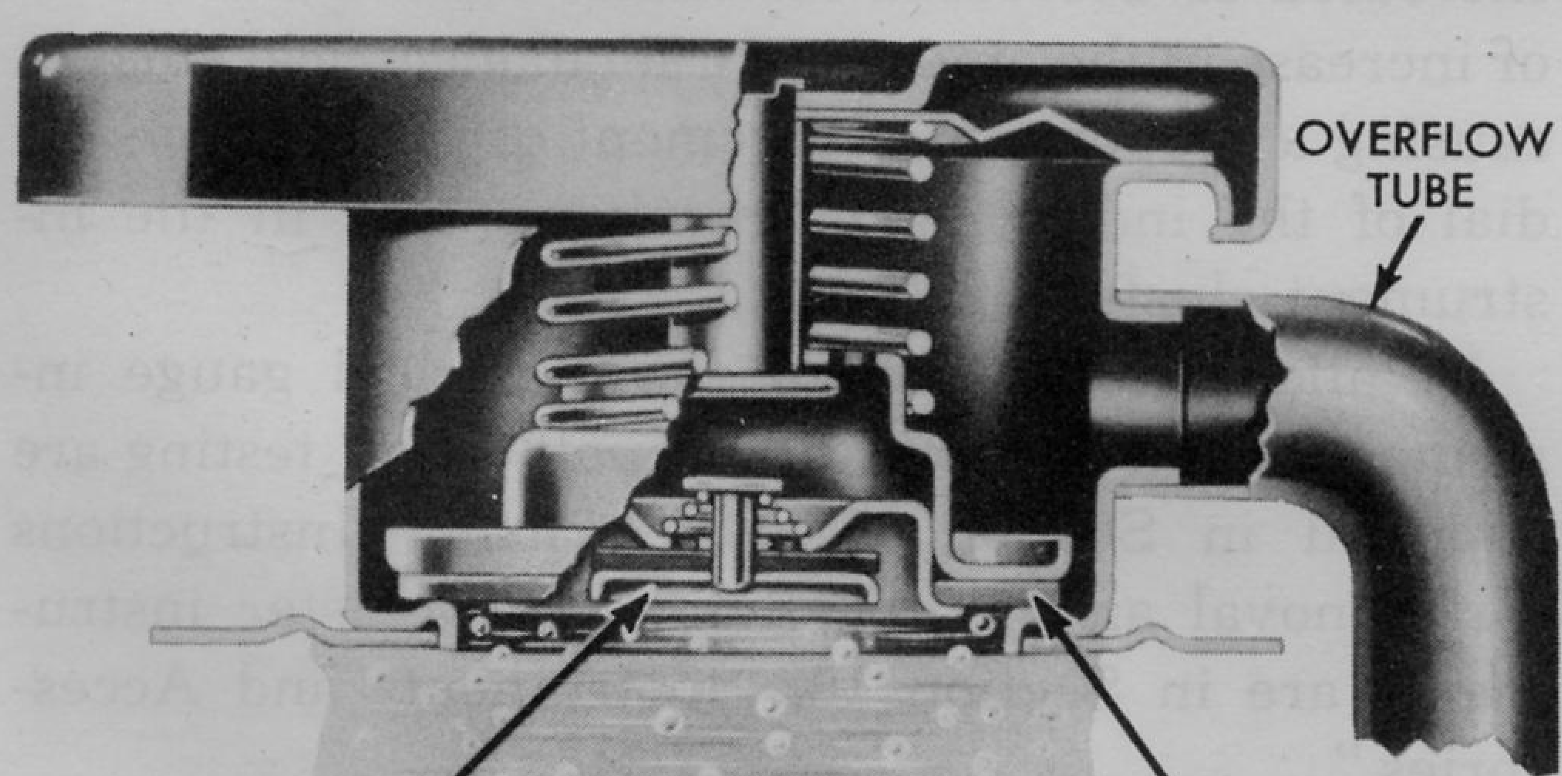

Fig. 156—Radiator Pressure Cap

This pressure increase in the sealed cooling system raises the boiling point of pure water at sea level from 212°F. to approximately 224°F., and raises the boiling points of anti-freeze solutions but in differing amounts.

Greater temperature difference between the coolant in the radiator and the air passing through increases cooling capacity. That is, it provides more reserve cooling capacity for heavy engine loads in hot, dry air, and for operation at high altitudes where the air is thin and the barometric pressure low. For example, at 6000 feet elevation pure water at atmospheric pressure boils at approximately 201°F., but in a sealed cooling system under 4 psi pressure it boils at 212° or 213°F.

A vacuum release valve in the cap (Fig. 156) opens when the cooling of the radiator would otherwise cause a partial vacuum.

c. REMOVAL. Drain cooling system. Open drain cock located in radiator bottom tank to the right. Open cylinder jacket drain cock. Catch anti-freeze solution in clean containers for re-use.

1. Loosen clamps and disconnect the upper and lower radiator hose at the radiator.

2. Remove 6 bolts that fasten radiator flanged side straps to shroud.

3. Lift radiator out carefully.

d. INSPECTION. Clean and inspect before installing. Look for leaks and weak spots and for bent core ribbons and obstructed air passages. Carefully use air hose to blow out dust, leaves, grass or insects. Flush the upper and lower tanks and core.

e. INSTALLATION. Reverse the removal procedure. Replace any radiator hose that shows any swelling or softening of the rubber lining or any cracked, frayed or other bad exterior. Tighten clamps securely.

FAN AND SHROUD

a. DESCRIPTION. To assure adequate air circulation through the radiator when the vehicle is standing or moving slowly, a belt-driven 17½ inch, 4-blade fan is mounted on the front end of the water pump shaft, immediately behind the radiator. The shroud arrangement directs a large volume of cooling air into the radiator while the car is in motion.

Fan belts for both Kaiser and Frazer engines are of the narrow V-type, but are not interchangeable. The included angle of the Kaiser belt and pulleys is approximately 36 degrees, that of the Frazer, 45 degrees.

b. FAN BELT ADJUSTMENT. Loosen 2 generator to bracket mounting bolts and generator adjusting link bolt at generator. Be certain generator rocks freely. With a spring scale exert a 15-pound pull on generator at adjuster bolt and in line with link. While this pull is holding generator, tighten adjusting link bolt. Then tighten generator mounting bolts. For further information, consult Section 15, "Electrical."

THERMOSTAT

Because an engine that is too cold fails to deliver a smooth flow of power and maximum fuel economy, a thermostat (Fig. 157) is provided to prevent full flow of coolant from the cylinder head into the radiator until heated to a pre-determined temperature.

a. TEMPERATURE RANGE. The standard thermo-

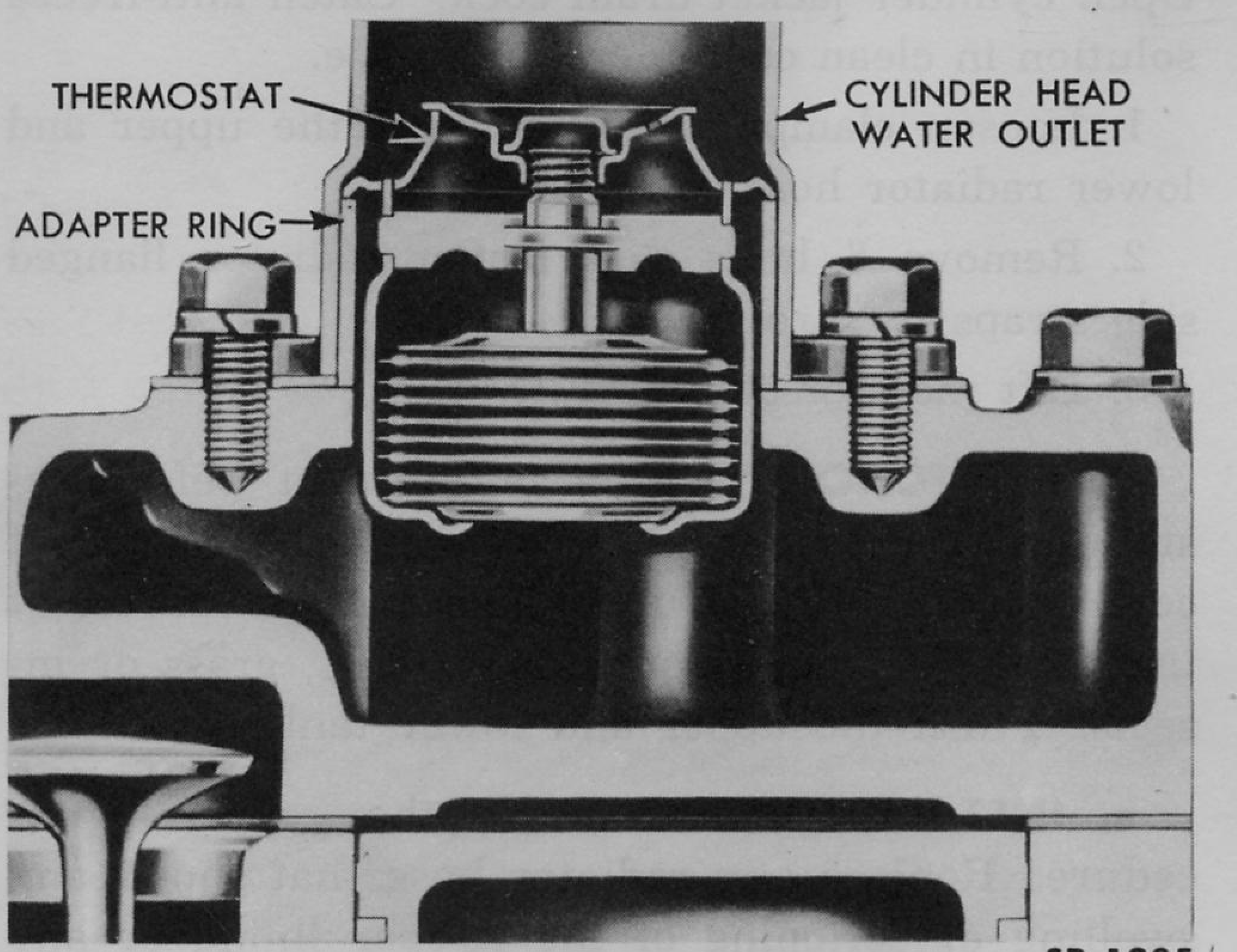

Fig. 157—Thermostat Installation

stat (marked "151" on the valve disc), for use with alcohol anti-freeze solutions, remains closed (except for a small air vent) below 148° to 156°F. At and above 176° it is wide open.

A higher temperature thermostat (stamped "170") is available for use only with water and with ethylene glycol solution anti-freeze. It is particularly desirable when the car is equipped with a heater. Specifications for this higher temperature thermostat call for opening to start at 166° to 174°F. and for full opening at 194°F.

b. THERMOSTAT REMOVAL, TEST, INSTALLATION. Drain cooling system until water level is below cylinder head.

1. Disconnect hose at cylinder head water outlet elbow. Remove two bolts attaching outlet elbow to cylinder head. Remove the elbow and thermostat retaining ring, and lift out thermostat.

2. To check thermostat, suspend in a container of water. Heat the water, measuring temperature with a thermometer. If the valve of the thermostat opens lower than 10°F. below, or does not open at 10°F. above temperature specified on the thermostat, replace it.

3. Place thermostat in position in water outlet elbow, and insert retaining ring.

4. Install outlet elbow, using a new gasket between the elbow and cylinder head.

5. Connect hose to outlet elbow, and refill cooling system.

WATER TEMPERATURE GAUGE

The Kaiser engine coolant temperature indicating gauge equipment is electrically operated. The corresponding Frazer equipment uses a pressure indicating gauge. Both are calibrated to give full scale reading at 224°F, the normal sea level boiling point of water in the Kaiser and Frazer sealed pressure cooling systems. Both are described briefly below.

a. KAISER. The electrical "C V Telegage" equipment has an engine unit or sending unit containing a sealed-in pellet of a special sintered material the electrical resistance of which increases at low temperature and decreases at high temperature. Increased or decreased resistance allows a decrease or increase in the amount of a small electrical current causing a proportional movement of the hand on the dial of the indicating or receiving unit in the instrument cluster.

Detailed explanation of the electrical gauge instruments and circuits and of methods of testing are supplied in Section 15, "Electrical." Instructions for removal and installation of the cluster instruments are in Section 16, "Instruments and Accessories."

b. FRAZER. The vapor pressure system employs a volatile fluid in a sealed metal bulb, comparable to that of a thermometer, surrounded by the engine coolant in the cylinder head, and connected by a capillary metal tube to the temperature indicating instrument on the panel. This indicating instrument is actually a small, sensitive Bourdon-type pressure gauge. Increased pressure in the sealed system caused by coolant temperature increase moves the gauge hand on the dial. Instructions for removal and testing are in Section 16, "Instruments and Accessories."

WATER PUMPS

a. CONSTRUCTION. The Kaiser and Frazer water

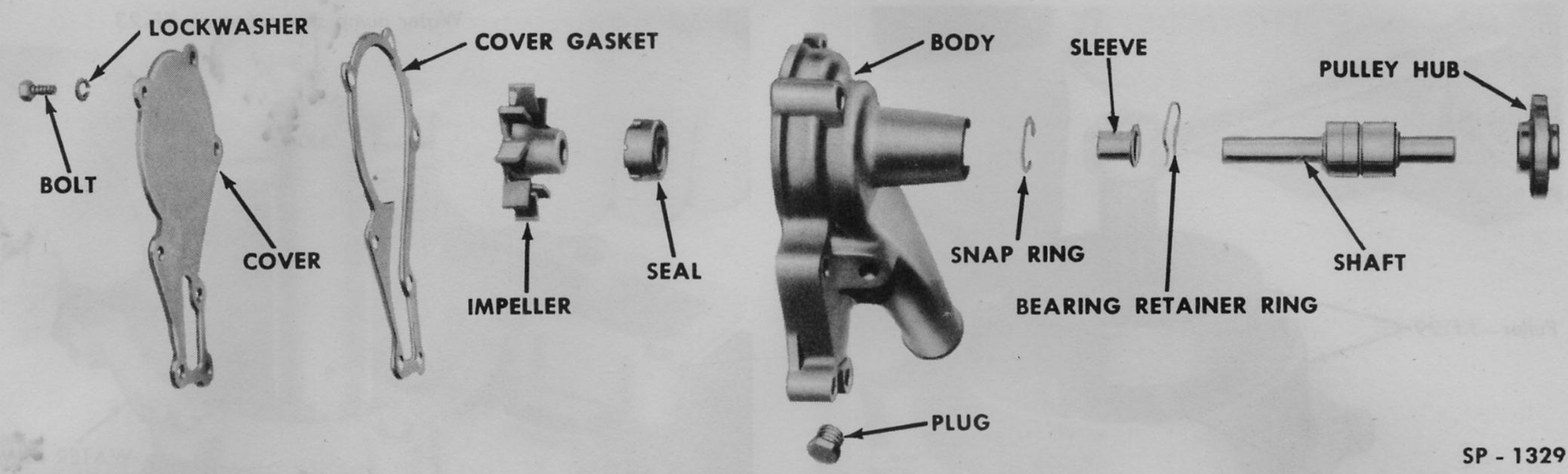

Fig. 158—Kaiser Water Pump—Exploded View

pumps (Figs. 158 and 159) are similar, but not interchangeable. Several features are common to both pumps. Both pump shafts are hardened and ground and supported by sealed, lifetime-lubricated ball bearings. Each shaft has a brass sleeve extending through the seal to protect against corrosion. Both pumps have cast iron impellers, pressed onto the pump shafts. The fan pulley hubs, both pressed onto the shafts, are interchangeable.

The Kaiser pump seal is a self-contained unit pressed into the pump body. Its carbon composition graphite impregnated seal washer is held by the spring in contact with the finished face of the impeller hub. The Frazer seal spring assembly and the composition carbon washer are separate parts, installed loosely in the hub of the impeller and revolving with it. The moving seal washer contacts a stationary finished flat surface machined in the pump housing to assure against coolant leakage.

b. REMOVAL. Drain cooling system.

1. Disconnect hose at pump inlet.
2. Detach generator adjusting link (fan belt tension adjuster) from pump by removing pump bolt.
3. Remove fan belt.
4. Remove remaining pump mounting bolts.
5. Lift pump out.

c. OVERHAUL. Special Kaiser-Frazer water pump tools or an arbor press will simplify water pump disassembly for overhaul or parts replacement. A separate repair or overhaul kit which contains all parts necessary for completely rebuilding is available for the Kaiser and the Frazer water pumps. In addition, individual parts such as seals, impellers and gaskets are required.

Proceed as follows:

1. Remove fan and pulley from pulley hub.
2. Remove pump to block gasket from pump cover.
3. Remove pump cover and gasket from pump body.

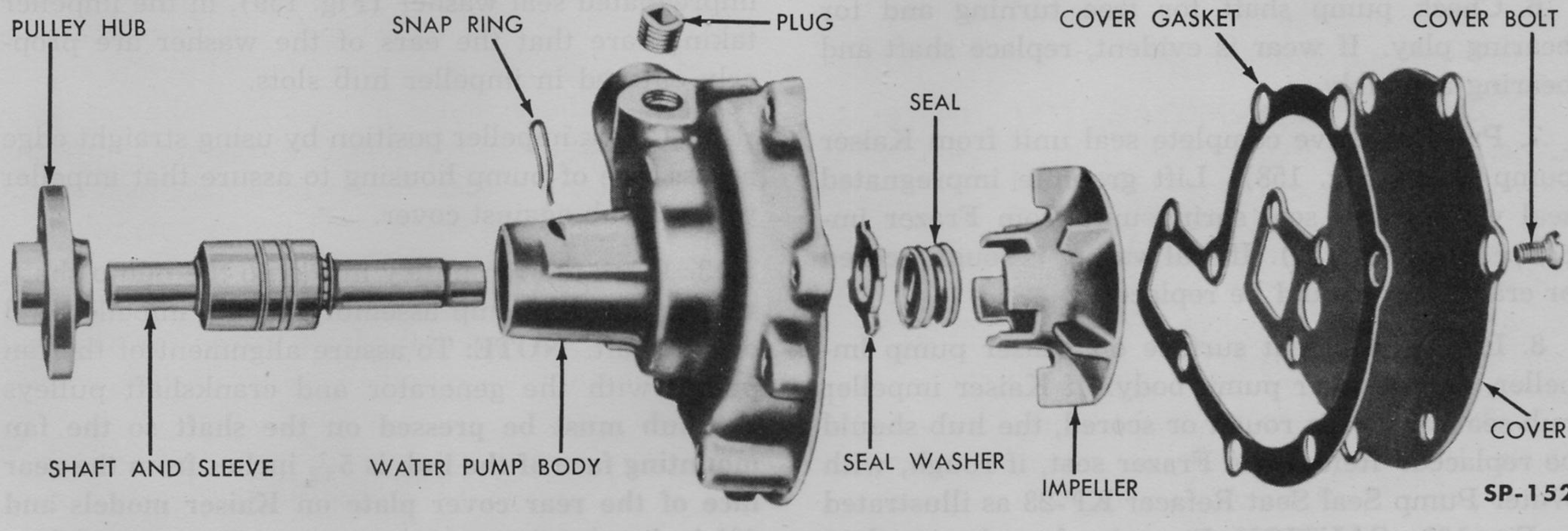

Fig. 159—Frazer Water Pump—Exploded View

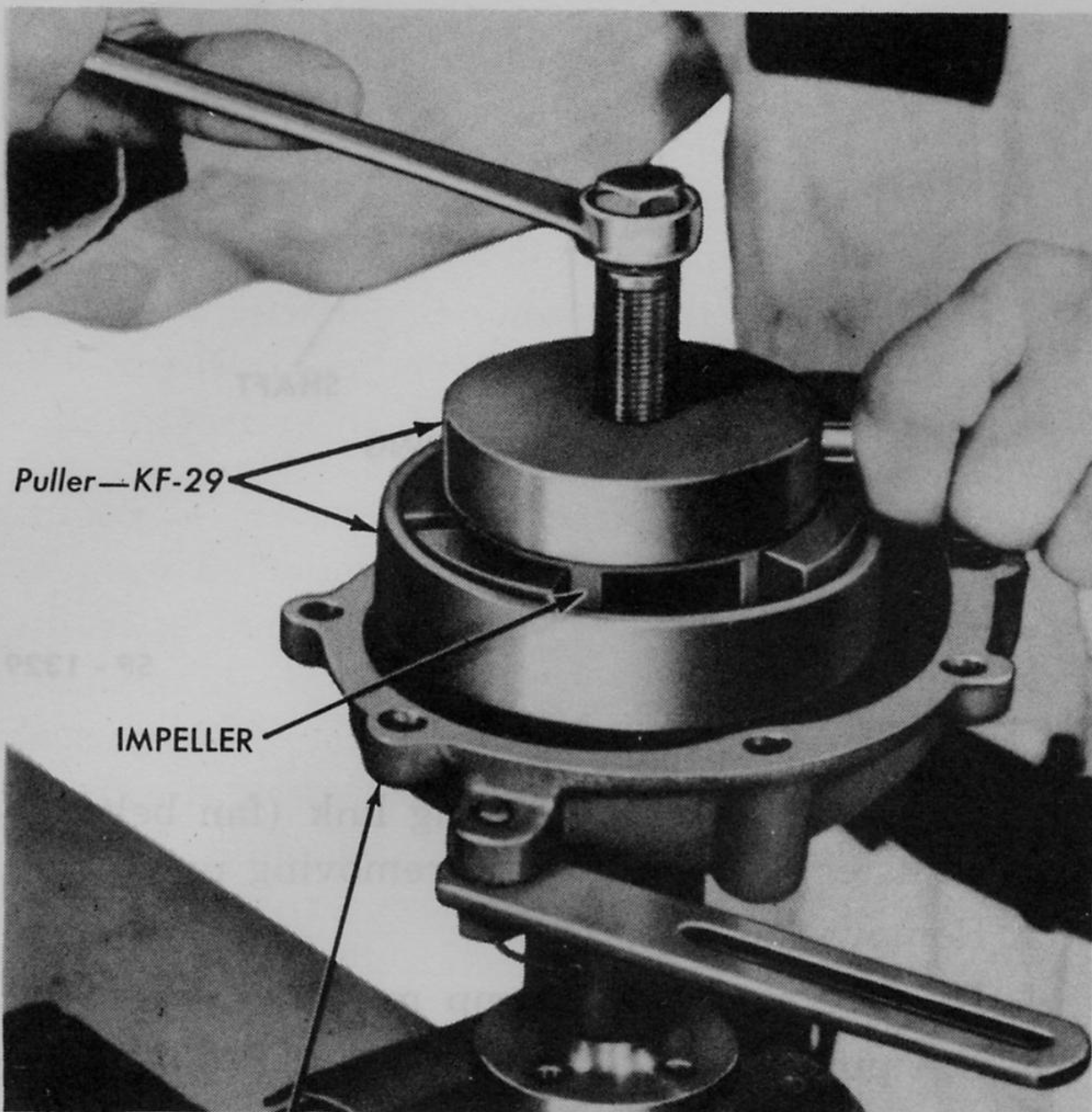

Fig. 160—Removing Water Pump Impeller—Frazer

4. Remove pump impeller from pump shaft. Fig. 160 illustrates use of special tool, Puller KF-29. For use on 1951 Kaiser water pump, Puller KF-29 requires a special screw and jaws, available as Adapter Kit KF-113. If the pump body is properly supported an arbor press can be used effectively to push the pump shaft out of both impeller and housing—after the pump shaft bearing retaining ring (Fig. 158 or 159) has been removed.

5. If impeller puller has been used and pump shaft is still in housing, remove retaining ring (Fig. 158 or 159) and drive or press shaft from housing.

6. Check pump shaft for free turning and for bearing play. If wear is evident, replace shaft and bearing assembly.

7. Press or drive complete seal unit from Kaiser pump body (Fig. 158). Lift graphite impregnated seal washer and seal spring unit from Frazer impeller hub (Fig. 159). If seal washer is rough, scored or cracked, it should be replaced.

8. Inspect seal seat surface on Kaiser pump impeller, or in Frazer pump body. If Kaiser impeller hub seat surface is rough or scored, the hub should be replaced. Reface the Frazer seat, if rough, with Water Pump Seal Seat Refacer KF-23 as illustrated in Fig. 161. **CAUTION: Do not reface deeper than**

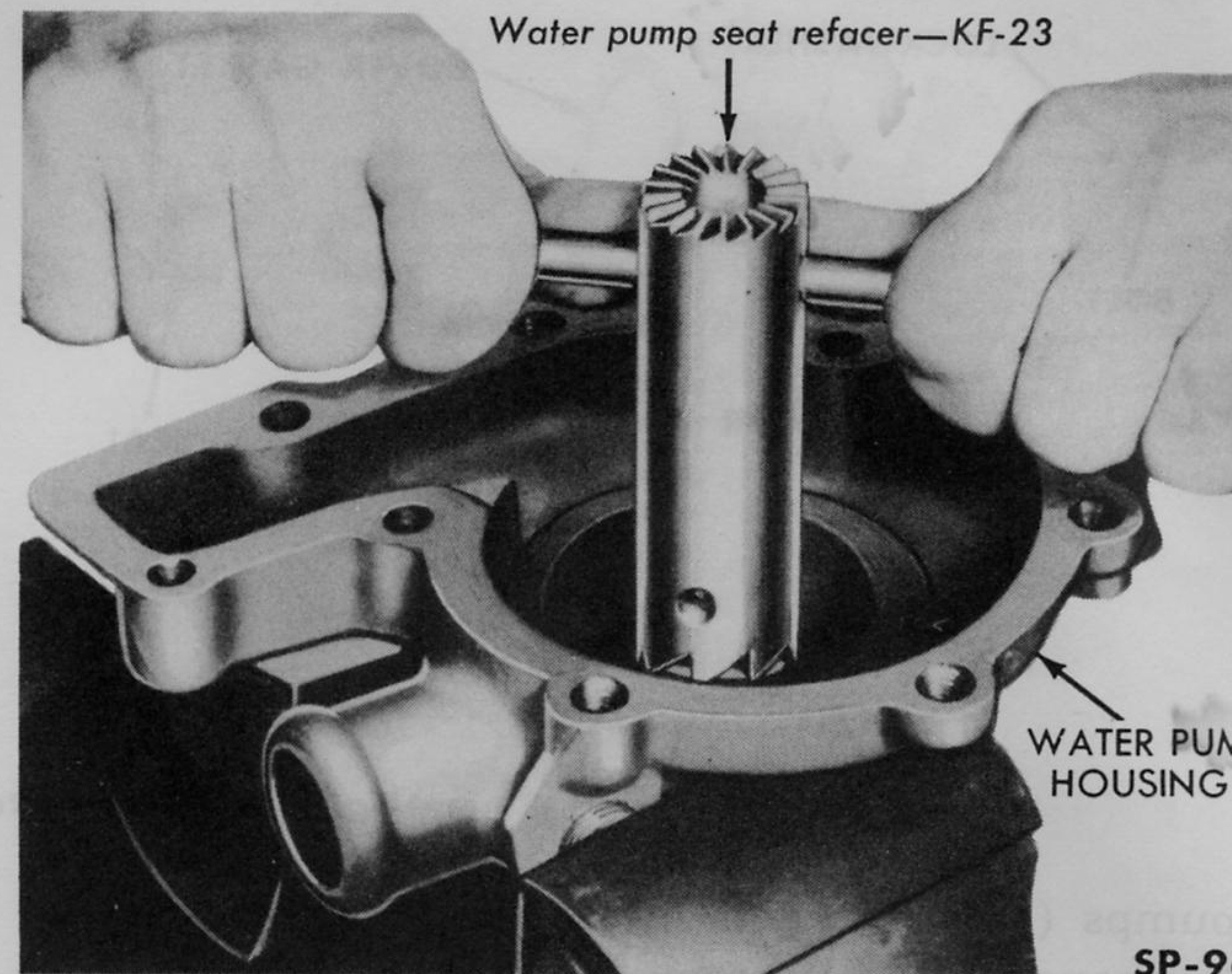

Fig. 161—Refacing Water Pump Seal Seat in Housing—Frazer

$\frac{19}{32}$ of an inch below pump cover face.

Apply a small amount of fine graphite or oil to the seat before assembling the pump. Always install a new seal or new seal washer.

9. Press Kaiser pump seal assembly carefully into bore in pump housing. Apply oil or graphite to face of carbon impregnated seal washer. Use suitable seal driver against seal to prevent distortion when driving.

10. Press pump shaft and bearing assembly into pump housing, carefully, just far enough for insertion of retaining ring. Insert ring (Figs. 158 and 159).

11. Press impeller onto pump shaft until flush with shaft end. Before pressing Frazer impeller onto shaft insert seal spring assembly and graphite impregnated seal washer (Fig. 159), in the impeller taking care that the ears of the washer are properly entered in impeller hub slots.

12. Check impeller position by using straight edge across face of pump housing to assure that impeller will not rub against cover.

13. Press the fan pulley hub onto the pump shaft, supporting the pump assembly on the impeller end of the shaft. **NOTE:** To assure alignment of the fan pulley with the generator and crankshaft pulleys **the hub must be pressed on the shaft so the fan mounting face of the hub is $5\frac{7}{32}$ inches from the rear face of the rear cover plate on Kaiser models and $4\frac{25}{32}$ inches for the measurement on Frazer models.**

14. Install cover gasket and cover. Use new cover gasket.

d. INSTALLATION. Install the pump assembly on the engine as follows:

1. Place pump in position on engine using a new pump to cylinder block gasket. Install pump mounting bolts.

2. Install fan pulley and fan on pump.

3. Install fan belt and adjust as described under FAN BELT ADJUSTMENT.

4. Install hose at water pump inlet and fill the cooling system.

COOLING SYSTEM PREVENTIVE MAINTENANCE

During long periods of normal operation rust from corrosion in the water jackets and small amounts of lime or other solid matter contained in water may accumulate in the cooling system.

If allowed to remain in the system and form deposits such solid matter may retard or even prevent proper flow of the coolant. Also, it may retard flow of heat from the cylinders and cylinder head to the coolant and from the coolant to the air passing through the core. Therefore, efforts should be made to prevent corrosion and to remove such solid matter as may accumulate in the cooling system.

a. CORROSION INHIBITORS. Suitable inhibitors, such as "KF Radiator Rust Resistor" if used according to directions are capable of reducing rusting up to 95 percent. As safe inhibitors (using soluble oil) do not remove deposits, an approved radiator flushing compound should be used to loosen and remove such deposits from a cooling system that has suffered from lack of protection against corrosion.

b. CLEANING AND FLUSHING. The coolant should be examined at the time of each 2,000 mile lubrication and inspection for color and freedom from sediment. Rusty color indicates corrosion and need of flushing and adding inhibitor.

Use only an approved cooling system cleaner, such as "KF Radiator Flush," and follow the directions on the container. A cleaner may be effective in loosening and dissolving and aiding in flushing out iron rust. In districts where water contains much lime (which deposits in the cooling system in the form of calcium carbonate, which is like limestone or marble) the cleaner may have to dissolve such lime deposits. However, the cleaner should have no corrosive action on any parts of the cooling system. The stronger and more effective the preparation the more important it is to follow exactly the instructions on the container. Particularly important is the use of the approved neutralizing solution and flushing after strong cleanser treatment.

c. PRESSURE FLUSHING. Whenever a cooling system is badly rust-clogged, as indicated by overflow loss of coolant or abnormally high operating temperature of the system, pressure flushing should be used in the cleaning procedure, to remove scale and loosened deposits of rust. Pressure flushing is accomplished by means of air-and-water Pressure Flushing Gun C-311 manufactured expressly for this purpose available as a special service tool (Figs. 162 and 163).

For effective removal of loosened material flush

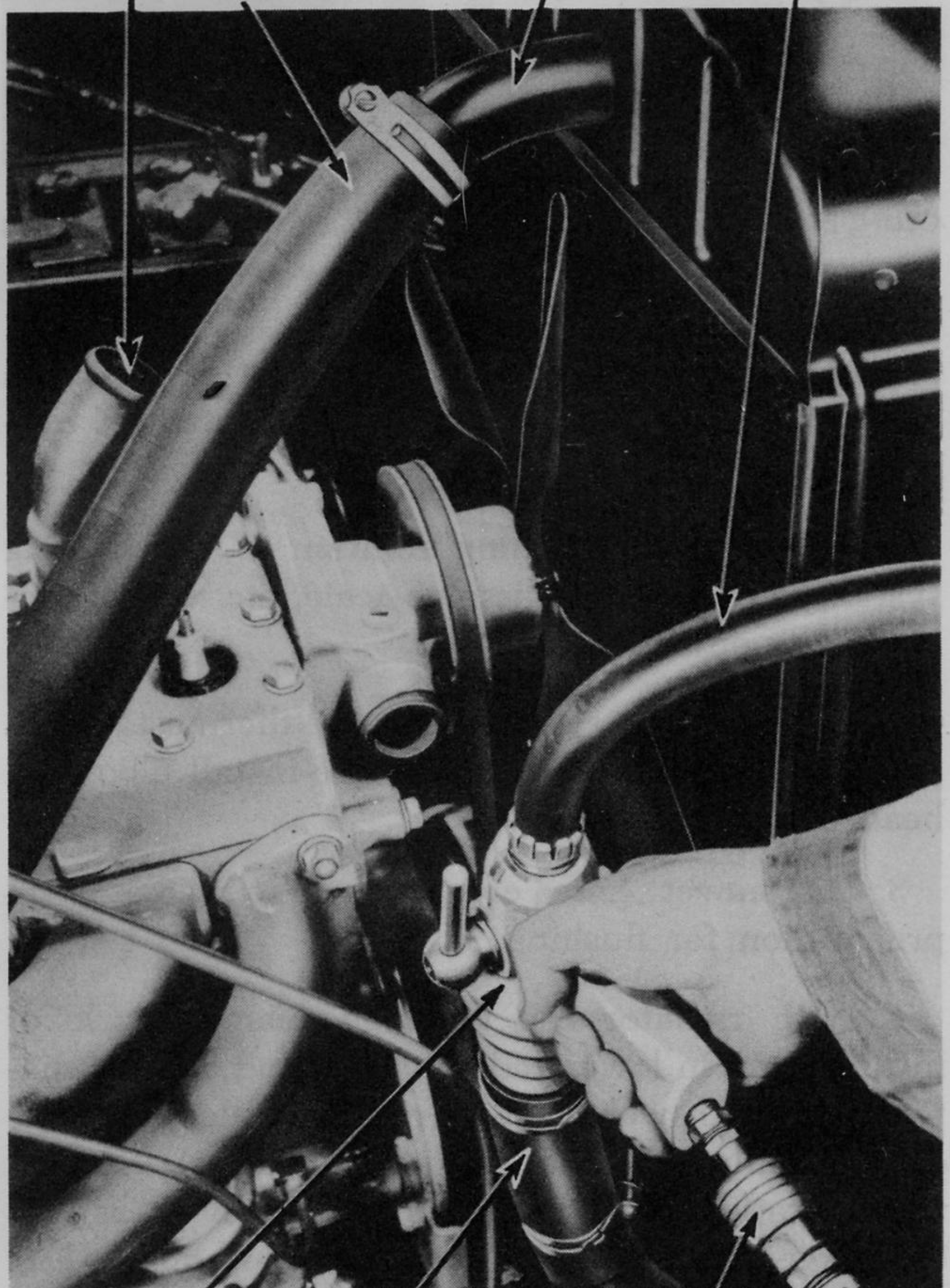

Fig. 162—Reverse Flushing Radiator

Fig. 163—Reverse Flushing Engine Water Jackets

radiator and engine individually, first in direction opposite coolant flow and then in direction of normal flow.

1. Add a good cleaning solution to the cooling system to loosen and dissolve scale, etc. Follow instructions on container.

2. Drain cooling system. Remove thermostat from cylinder head outlet elbow and re-install elbow on head.

3. Disconnect hose connections to radiator in preparation for flushing.

4. With radiator cap installed, clamp nozzle of flushing gun in lower radiator hose and allow radiator to fill with water. With radiator filled, turn air on gradually (to avoid radiator damage). Repeat this operation until flushing stream is clean as it is discharged from upper radiator inlet hose (Fig. 162). **NOTE: Use a lead-away hose to direct the flushing stream away from the engine.**

5. To flush in opposite direction, repeat flushing operation with flushing gun installed in upper, or inlet, radiator hose.

6. To flush engine water jackets, clamp flushing gun in cylinder head outlet hose and fill system with water.

7. With jackets filled with water, apply full short blasts of air from the gun. Repeat this operation until flushing stream is clean as it leaves inlet connection at water pump (Fig. 163).

8. To provide flushing in opposite direction, repeat flushing operation with flushing gun installed in water pump inlet hose connection.

9. If a heater is installed, flush in both directions in same manner as the radiator.

10. Inspect hose and check thermostat, and install or replace. Check pressure cap, refill cooling system and check for coolant leaks.

ANTI-FREEZE SOLUTIONS

Water freezing expands approximately 9 percent in volume and, if confined, exerts tremendous pressure. Water freezing inside the cooling system, causes serious damage. Therefore, another liquid is added to the coolant to prevent freezing. Water containing a suitable anti-freeze ingredient in proper proportion will not freeze in the cooling system even at very low temperatures.

Ethylene glycol, methanol (synthetic methyl alcohol), and denatured ethyl alcohol are most commonly used in anti-freeze solutions. **CAUTION: Do not use kerosene, oils, honey glucose, salt, or any petroleum or salt base anti-freeze solutions.**

The freezing point of anti-freeze solutions can be determined by the use of a universal hydrometer, according to instructions furnished with the hydrometer. Standard anti-freeze products usually contain rust inhibitors and require no additives.

The freezing point of water is lowered in proportion to the amount of anti-freeze used. Methyl alcohol gives the greatest protection per gallon, ethylene glycol ranks second, and ethyl alcohol is slightly less effective. The following tables indicate the amount of water that must be replaced with anti-freeze to provide protection down to the indicated temperatures.

KAISER ANTI-FREEZE REQUIREMENTS—QUARTS

Protection to °F	Methyl Alcohol		Ethylene Glycol		Ethyl Alcohol	
	Without Heater	With Heater	Without Heater	With Heater	Without Heater	With Heater
+20	2.	2.	2.	2.	2.5	2.5
+10	2.5	3.	3.5	4.	3.5	4.
0	3.5	4.	4.5	5.	4.5	5.
—10	4.5	4.5	5.	5.5	5.5	6.
—20	5.5	5.5	6.	6.5	6.5	7.
—30	6.	6.	6.5	7.	7.5	8.
—40	6.5	6.5	7.	7.5	8.5	9.
—50	7.	7.	7.5	8.	—	—
—60		7.5	8.	8.5	—	—

FRAZER ANTI-FREEZE REQUIREMENTS—QUARTS

Protection to °F	Methyl Alcohol		Ethylene Glycol		Ethyl Alcohol	
	Without Heater	With Heater	Without Heater	With Heater	Without Heater	With Heater
+20	2.	2.	2.	2.	2.5	3.
+10	3.	3.	3.5	4.	4.	4.
0	4.	4.	4.5	5.	5.	5.5
—10	4.5	5.	5.5	6.	6.	6.5
—20	5.	5.5	6.	6.5	6.5	7.
—30	6.	6.5	6.5	7.	7.5	8.
—40	6.5	7.	7.	8.	9.	9.5
—50	7.	7.5	7.5	8.5	—	—
—60	7.5	8.	8.	9.	—	—

EFFECT OF PRESSURIZED COOLING SYSTEM

If the pressure in the coolant is raised above atmospheric pressure, the coolant will not boil until a higher temperature is reached. For each pound of additional pressure in the system, the boiling point of the coolant will rise about 3°F. In the Kaiser-Frazer cooling system, the radiator cap is set to allow between 3¼ and 4¼ pounds per square inch pressure (above atmospheric) in the cooling system. The following table gives the effect of the pressurized cooling system on boiling points of water and various anti-freeze solutions, protecting to —20°F.

BOILING POINT OF WATER AND SOLUTIONS PROTECTING TO —20°F IN °F

Pounds Gauge Pressure	Methyl Alcohol	Ethyl Alcohol	Water	Ethylene Glycol
0	179°	180°	212°	223°
4	189.5°	191°	222.5°	235°

NOTE: The cooling system is **not** designed to operate at a higher pressure than that allowed by the radiator cap (approximately 4¼ psi maximum). Higher pressure may damage the radiator.

COOLING SYSTEM SERVICE DIAGNOSIS

During the diagnosis of improper engine function, the importance of proper cooling system operation is often overlooked as an important contributing factor. The cooling system should be periodically serviced to assure continued effectiveness.

Neglect of the cooling system may cause serious damage necessitating expensive repairs. Since cooling system failure may have considerable effect on the vehicle operation and on the engine, its condition must not be overlooked in any diagnosis of operation and engine troubles. Cooling system diagnosis should include the following:

a. ENGINE OVERHEATING. Overheating may be caused by several factors or combination of factors that may not necessarily originate in the cooling system such as: Improper ignition timing, improper carburetion, dragging brakes, etc., therefore, engine overheating diagnosis should not be confined to the cooling system alone. Check the cooling system for:

1. Low coolant level due to overflow loss.
2. Low coolant level due to leakage.
3. Obstructed coolant flow.
4. Improper engine thermostat operation.
5. Deteriorated or collapsed hose.
6. Air passages through radiator core clogged with insects, dirt, or leaves.
7. Loose, slipping fan belt.
8. Water pump impeller loose on shaft.
9. Siezed or binding water pump shaft.
10. Improper ignition timing.
11. Dragging brakes.
12. Tight wheel bearings.
13. Spark advance mechanism out of adjustment.
14. Frictional resistance in the engine due to improper clearance of working parts, misalignment or improper lubrication.
15. Internal leak allowing engine lube oil to enter cooling system (see Engine section).
16. Improper carburetion (too lean).

b. LOSS OF COOLANT. Check the following:

1. Radiator, hose, or water pump leaks.

2. Core plug leaks in the engine block.

3. Engine block or cylinder head cracks.

4. Cylinder head gasket leaks.

5. Cooling system gasket leaks.

6. Engine thermostat failure.

7. Air leaks at the water pump.

8. Coolant boiling and loss through the overflow pipe.

9. Internal coolant leakage into crankcase.

c. WATER PUMP AND FAN NOISE. The various evidences of water pump and fan noises are often misleading but usually can be located when the engine is idling. Intermittent or constant squeaks, squeals, or scraping noises usually originate at the water pump or fan assemblies and are caused by:

1. Loose fan pulley or fan blades.

2. Loose pump impeller.

3. Broken impeller.

4. Excessive end-play in pump shaft.

5. Impeller interference with pump body.

6. Bent fan blades.

7. Fan and pulley out of balance.

8. Misalignment of pulleys.

9. Worn fan belt.

10. Fan belt too tight or too loose.

11. Dirt or foreign matter on belt or pulley.

12. Worn or binding water pump shaft bearing.

13. Pump drive shaft sealing washer worn or pump seal seat rough.

SERVICE BULLETIN REFERENCE