

S E C T I O N 2

C O O L I N G S Y S T E M

C O N T E N T S

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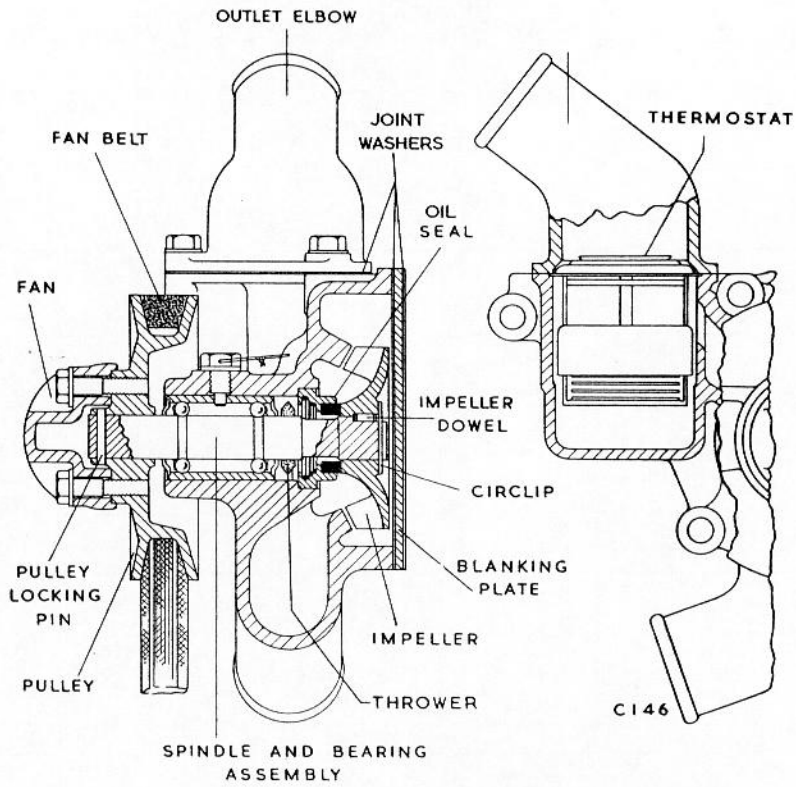


Fig.1 Section view of pump.

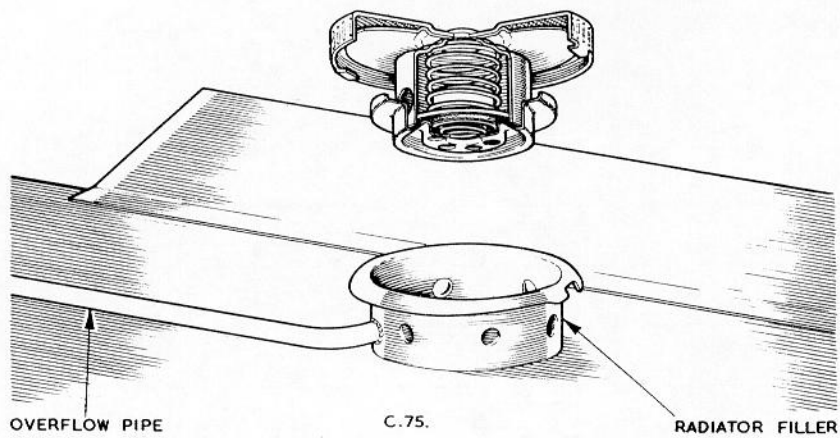


Fig.2 Steam pressure relief valve.

C O O L I N G S Y S T E M

DESCRIPTION

Water drawn from the radiator by the centrifugal pump mounted on the front of the cylinder head is impelled around the inlet valve seats into the cylinder block jacket. The return flow passes around the exhaust valve seats to the pump and finally to the radiator via a thermostat valve incorporated in the pump.

The radiator is of the cellular matrix type, the system being sealed; a steam pressure relief valve is incorporated in the filler cap. The thermometer bulb of the water temperature gauge is located on the right-hand side of the cylinder block.

Fig.1 shows the construction of the water pump. The rear portion of the light alloy body forms the impeller chamber which is closed by a blanking plate, a joint washer being fitted to each side of the plate. Incorporated in the plate is the outlet port from impeller chamber to the cylinder head water jacket and the port from the jacket to the thermostat valve housing. The thermostat valve housing also mounts the connection elbow for the return hose to the radiator.

The cast iron impeller is located on the pump spindle by a dowel, a circlip retaining the impeller in position. Its front face is in contact with the carbon face of the seal fitted to the spindle bearing housing; a rubber thrower fitted between the seal and bearing assembly collects any water that may

penetrate the seal and ejects it through a drain orifice in the underside of the pump body. A grooved pin secures the driving pulley to the front end of the pump spindle and attached to the pulley is the cooling fan.

The thermostat valve is of the bellows-operated poppet type and operates in the following manner. Upon starting the engine from cold, the valve is in the closed position thus closing the outlet to the radiator. Water is then circulated by the pump through the cylinder block and head, enters the valve housing and passes through a passage to the impeller to be re-circulated. A small bleed hole in the valve head into the outlet elbow prevents excessive build-up of water pressure. As the water temperature reaches 75°C. (167°F.), the bellows expand sufficiently to lift the valve from its seat thus permitting a restricted flow via the outlet elbow to the radiator header tank, until at normal running temperature, the valve is fully open and the normal sequence of water circulation is obtained. This system promotes rapid warming of the engine in cold weather.

GENERAL DATA

Water system capacity	17 pints. (2½ U.S.A. gallons - 9.7 litres)
Water pump drive... ..	Pump in tandem with cooling fan; belt-driven from crankshaft.
Radiator	
Frontal area	256 sq. ins. (1651.6 cm.2)
Thickness	2.375 in. (60.32 m.m.)
Thermostat setting.	Commences to open at 75°C. (167°F).

MAINTENANCE

General

Inspect the water pump at regular intervals for leakage at the attachment face and hose connections, and check the retaining bolts and hose clips for tightness. Make sure that the relief valve in the radiator cap is free by pressing upwards through the small centre hole. When anti-freezing compounds are in use in the system, it is advisable occasionally to examine the condition of the hoses. Replace any unsound hoses immediately to prevent leakage of the coolant.

Fan belt tension

Check this every 1,500 miles. The belt is tensioned correctly if it can be deflected inwards by hand approximately 1in. on its upward run. To adjust the tension, release the dynamo adjusting and mounting bolts shown at "A", "B" and "C" in Fig. 3 together with the mounting bolt located at the rear of the dynamo, and move the dynamo away from the cylinder block until the correct deflection is obtained.

Draining the system

Drain the system while the engine is hot as this will cause any moisture left in the system to evaporate. First remove the radiator filler cap.

Warning :- Never remove the radiator cap while the engine is running since water may be ejected through the filler neck under pump pressure. After stopping a hot engine, remove the cap slowly (as warned on the cap) to release any steam pressure within the cooling system.

Drain the radiator by means of the tap at the bottom right-hand side of the

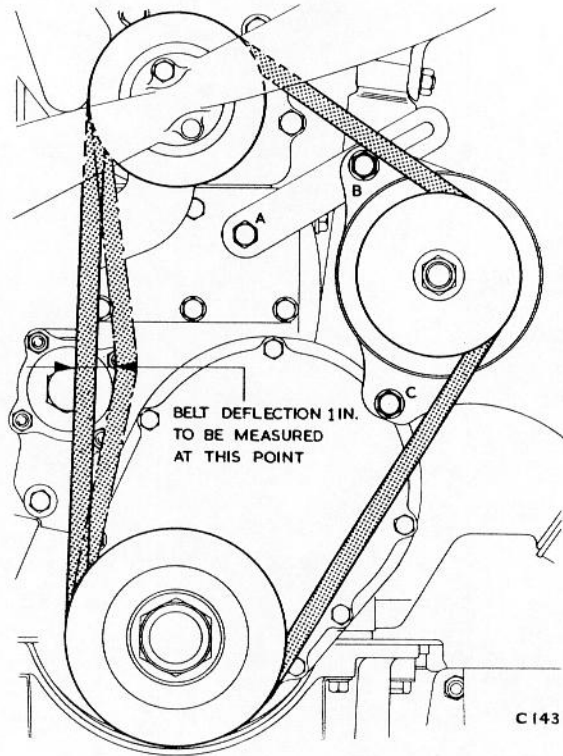


Fig. 3 Adjusting fan belt tension.

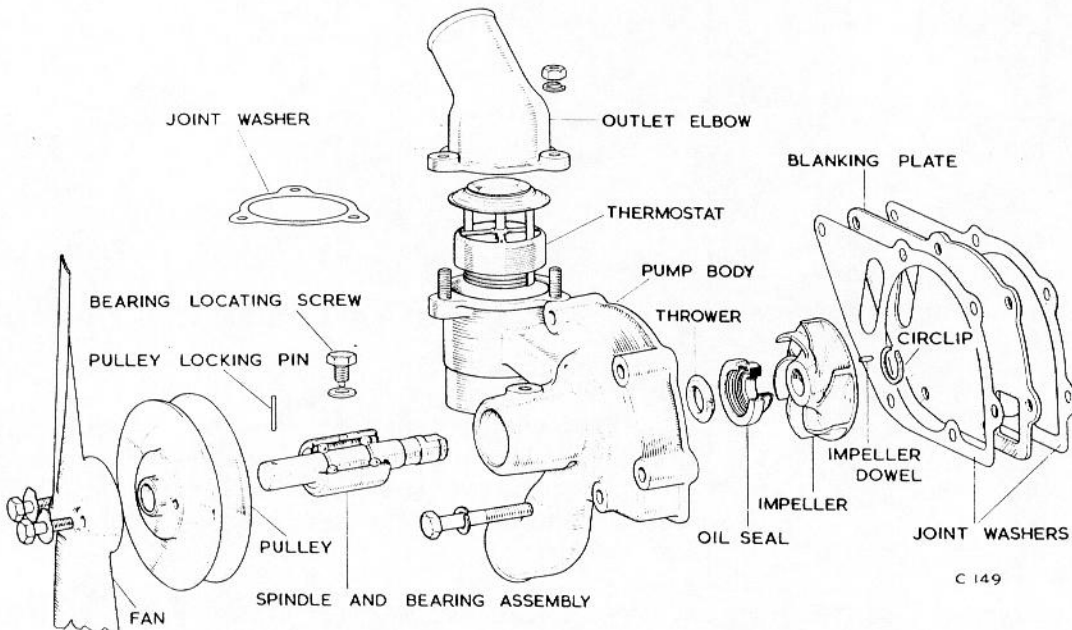


Fig. 4 Water pump components.

radiator, and the engine by opening the tap on the rear left-hand side of the block.

Flushing

Flush the system at intervals depending upon the local water conditions and the type of operation to which the car is subjected. Always flush the system after removal of water containing anti-freeze compound or if the car has been standing for a considerable period with the cooling system empty.

Any proprietary brand of flushing solution may be employed, provided that it is not harmful to aluminium.

RADIATOR

Removing

1. Drain the cooling system.
2. Disconnect the inlet and outlet hoses.
3. Remove the two hexagon headed $\frac{1}{4}$ in. screws and spring washers from each side flange of the radiator; these screws are secured by captive nuts which remain integral with the front cowling.
4. Remove the radiator, bottom brackets, but retain the rubber mounting pads.

Caution :- Take care not to damage the rigid brake pipes.

5. Lift the radiator clear of its location, but retain the two rubber mounting pads at the base.

Refitting

1. Make sure that the rubber mounting pads are in position on the mounting brackets, then lower the radiator carefully into position, and secure the mounting brackets to the cross member.

Caution :- Take care not to damage the rigid brake pipes.

2. Fit the two $\frac{1}{4}$ in. hexagon headed screws and spring washers to each side flange location of the radiator. Tighten them securely.
3. Ensure that the inlet and outlet stubs of the radiator are clean, connect the hoses and tighten the clips.
4. Turn off the drain taps and refill the system.

WATER PUMP

Removing

1. Drain the cooling system.
2. Disconnect the radiator hoses from the pump.
3. Slacken the dynamo belt adjustment and mounting bolts, press the dynamo towards the engine as far as possible and detach the belt.
4. Release the six $\frac{5}{16}$ in. B.S.F. set-bolts securing the pump to the cylinder head and unscrew completely and remove the four uppermost bolts.
5. Support the pump and unscrew the two remaining bolts, then withdraw the pump complete with its blanking plate and joint washers. These two bolts cannot be withdrawn from the pump body until the fan and driving pulley have been withdrawn.

Refitting

1. Make sure that the pump attachment face at the front of the cylinder head is clean and dry, then smear the face with grease and fit a new joint washer (Part No. N.350240) in position.
2. Check that the two lower securing set-bolts and spring washers are already in position in the pump body. Smear the pump blanking plate and the pump body face with grease, and fit a new joint washer (Part No. N.350250) between the plate and pump body.
3. Smear the rear face of the blanking plate with grease and assemble the pump to its location, screwing in the two set-bolts finger-tight. Fit the four remaining set-bolts and spring washers and tighten all bolts evenly.

4. Refit the fan belt and adjust the position of the dynamo until the belt is tensioned correctly. Tighten the dynamo adjustment and mounting bolts.
5. Fit the two hoses to the pump, tightening the clips securely.
6. Check that the radiator and cylinder block drain taps are closed, then refill the system.

Dismantling

To dismantle the pump, proceed as follows, referring to Fig.4.

1. Detach the fan by unlocking the tabwashers and removing the two bolts.
2. Remove the grooved pin securing the pulley to the pump spindle and detach the pulley, using extractor T.186444.
3. Cut the locking wire and remove the bearing locating screw and washer.
4. Grip the front end of the spindle, then detach the circlip from the rear of the spindle, using external circlip pliers.
5. Withdraw the impeller with the extractor T.188257, taking note of the small locating dowel in the impeller bore.
6. Withdraw the seal from the bore of the body, followed by the rubber thrower.
7. Remove the three $\frac{1}{4}$ in. B.S.F. nuts and washers and detach the outlet elbow, followed by the joint washer.
8. Lift out the thermostat valve.
9. If the spindle and bearing assembly is considered unserviceable, press or drive it from the pump body by its spindle. If, however, the assembly is to be refitted, do not apply pressure to the spindle but remove the assembly with the hollow drift shown in Fig.5.

Inspection

Examine the pump body for damage. Inspect all internal waterways (including the impeller chamber) for excessive corrosion; if corrosion is very heavy,

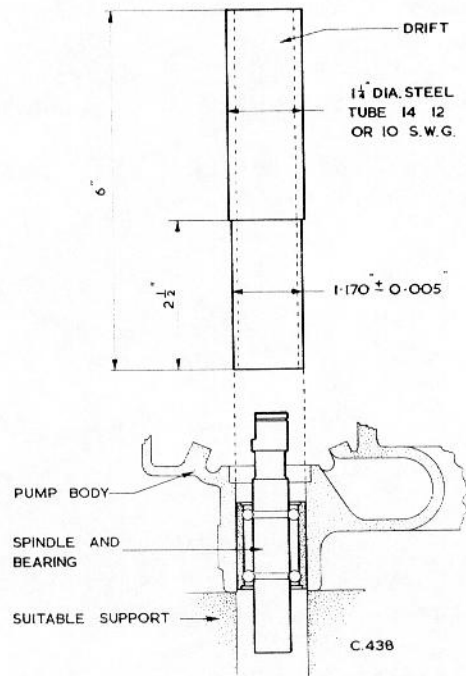


Fig.5 Drift for pump spindle bearings.

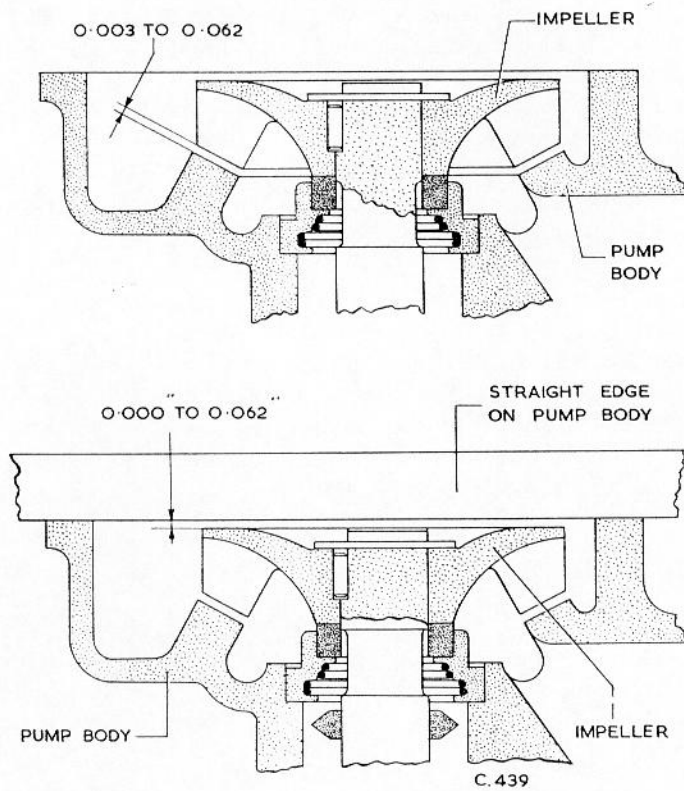


Fig.6 Checking pump impeller clearances.

check its depth and reject the body if the wall section at any point has been reduced excessively. Check the impeller for excessive corrosion and inspect the front face for scoring and wear. Examine the blanking plate and discard if badly corroded.

Check the fan pulley for wear by setting a new belt of the correct size round the pulley groove: the outer face of the belt should be approximately flush with the periphery of the pulley flanges, but must not "bottom" in the groove.

Re-conditioning

Clean out all water passages and the impeller chamber, removing all deposits. Carefully lap the joint face of the body on a lapping plate; it is important that this face is quite flat. If the pump spindle and bearing assembly is to be refitted, remove any corrosion and dress running scores using fine grade emery and paraffin; take care not to reduce the spindle diameter to an extent that will render the oil seal ineffective.

Replacements

The spindle and bearing assembly of this pump is a complete unit, the bearings being pre-loaded, packed with grease and sealed. If excessive wear in the bearings is detected, do not attempt to strip the unit; a replacement unit must be fitted on re-assembly.

Re-assembling

1. Immerse the pump body in boiling water and allow it to remain until heated throughout. Smear the external surface of the

spindle bearing with grease. Remove the pump body from the water and place on a suitable surface, impeller chamber downwards. Insert the spindle and bearing, grooved end downwards, aligning the locating hole in the bearing with the locating screw hole in the body. Lightly drive or press the assembly into position, using the hollow drift shown in Fig. 5. If the locating holes are not quite aligned, adjust the position of the bearing with a suitable drift before the body cools. Fit the locating screw and its washer and tighten securely.

2. Referring to Fig. 1, fit the thrower over the spindle and onto the face of the bearing.
3. Coat a new seal with anti-freezing rubber lubricant containing "Dag" colloidal graphite and slide it (carbon face outermost) over the rear end of the spindle. Press the seal carefully into its recess in the pump body.
4. Fit the impeller to the spindle, aligning the dowel hole with the spindle, then insert the dowel.
5. Fit the impeller retaining circlip, using external circlip pliers; make sure that the circlip contracts fully into its groove and that the rear face of the impeller abuts the circlip.
6. Using feeler gauges, check the clearance between the vane face of the impeller and the pump body, and between the pump and impeller faces as shown in Fig. 6. Provided that the components are in a satisfactory condition, these clearances are usually obtained. However, if the impeller vanes are touching the pump body, loosen the locating screw and, using the hollow drift, tap back the bearing as much as the locating screw spigot will permit. If this does not give sufficient clearance, remove the impeller and slightly reduce the vane faces. Should the clearance of the vanes be excessive and there is insufficient clearance between the impeller and pump body faces, reverse the direction of the above procedure. When the clearances are satisfactory, tighten and wire-lock the locating screw.
7. Fit securing set-bolts and spring washers to the two lowest holes in the pump mounting flange. This is important since these cannot be fitted once the pulley is assembled.
8. Fit the fan pulley to the front of the pump spindle, aligning the drive pin holes and insert the grooved pin (Part No. N. 350580).
9. Fit the fan to the front of the pulley and secure it with the two set-bolts and tabwashers.
10. Fit the thermostat valve assembly, positioning it so that the side pieces do not obstruct the transfer passage.

11. Make sure that the housing joint face is perfectly clean, then fit and secure the outlet elbow, using joint washer (Part No. N. 350630).
12. Segregate the pump blanking plate and washers pending the assembly of the pump to the engine.

Removing the thermostat

Should the operation of the thermostat valve be suspect, remove it for examination in the following manner :-

1. Remove the radiator cap and drain the radiator; it is unnecessary to drain the cylinder block.
2. Release and disconnect the upper radiator hose from the pump outlet elbow.
3. Remove the three securing nuts and spring washers from the elbow flange and lift away the elbow.
4. Carefully ease the thermostat assembly from its recess in the pump body and remove it.

Checking the thermostat

If the bellows are punctured and water has entered, discard the assembly as unserviceable. The presence of water may be detected by shaking the assembly and listening. Ease the valve off its seat by pressing gently on the bottom of the bellows and check that the valve returns completely to its seat on the release of finger pressure. If the movement is stiff and the assembly is corroded, soak it in thin machine oil and carefully remove excessive corrosion to ease the valve action. Make sure that the valve seating and valve face are clean.

To check the action of the bellows immerse the assembly (cold) into a water filled container. Heat the water and check with a thermometer that the

valve begins to lift at about 75°C. (167°F) and is well clear of its seat at 85°C. (185°F) up to boiling point.

Refitting the thermostat

1. Ensure perfect cleanliness of the recess in the thermostat valve housing and that the flange face is clean and smooth.
2. Insert the thermostat assembly (bellows end first) into the housing so that the side pieces do not obstruct the transfer passages, and ensure that the locating flange of the assembly settles correctly in its recess.
3. Ensure complete cleanliness of the outlet elbow joint face, lightly grease both mating joint faces, fit the joint washer (Part No. N.350630) and fit the outlet elbow. Fit the spring washers and nuts, and tighten the nuts evenly and securely.

FAULTS AND REMEDIES

Overheating

Insufficient water.	Refill and check for leaks.
Thermostat sticking closed.	See page 15.
Incorrect ignition timing.	Re-time the ignition.
Fan belt loose or slipping.	Adjust the tension or replace the belt.
Water pump inoperative.	Overhaul the pump.

Overcooling

Thermostat sticking open.	See page 15.
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Loss of liquid

Radiator relief valve sticking open.	Clean the valve and check the seating.
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Loose or deteriorated hose connections.

Tighten the connections or replace the hoses.

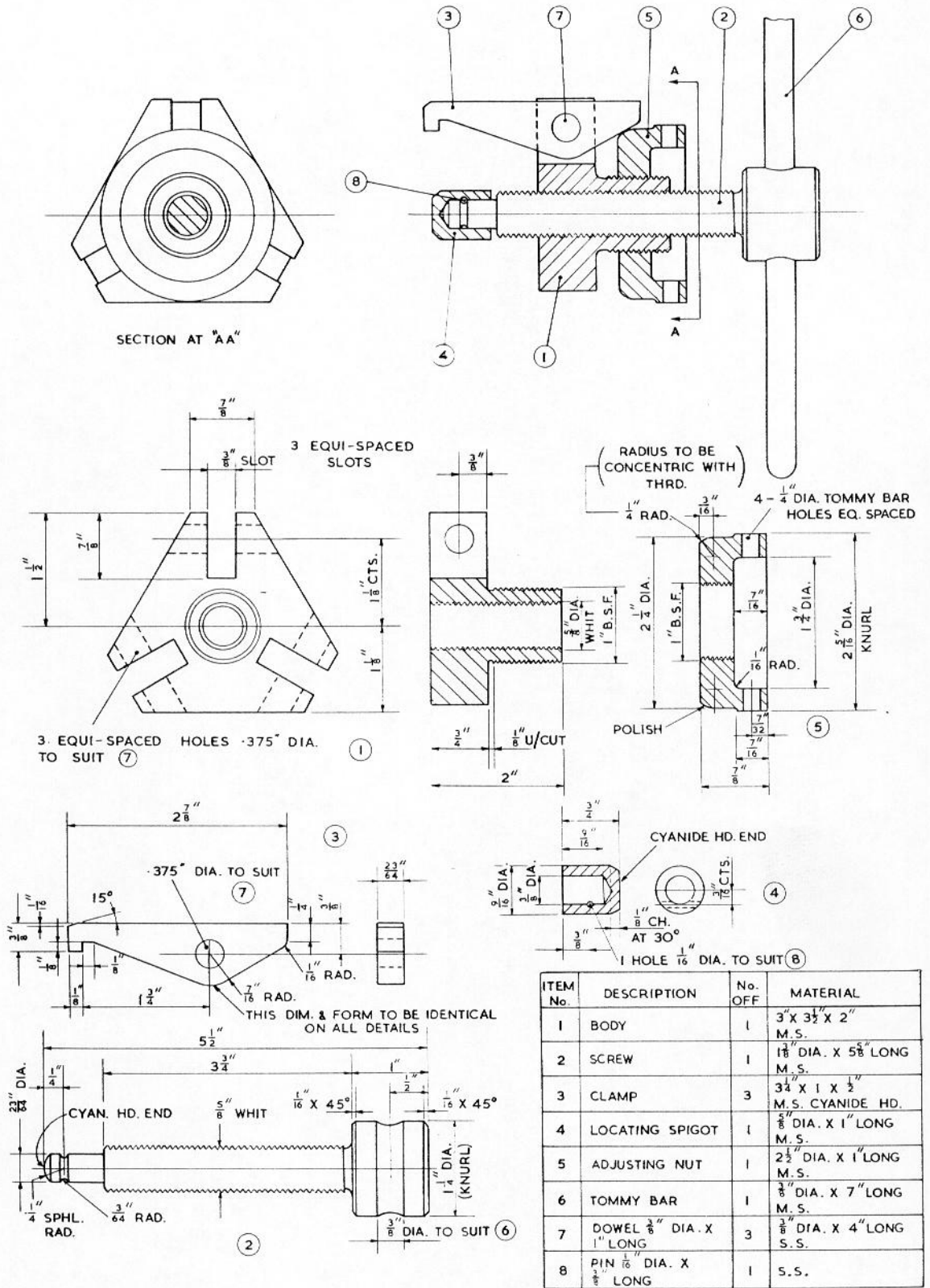
Worn water pump seal.

Fit new seal.

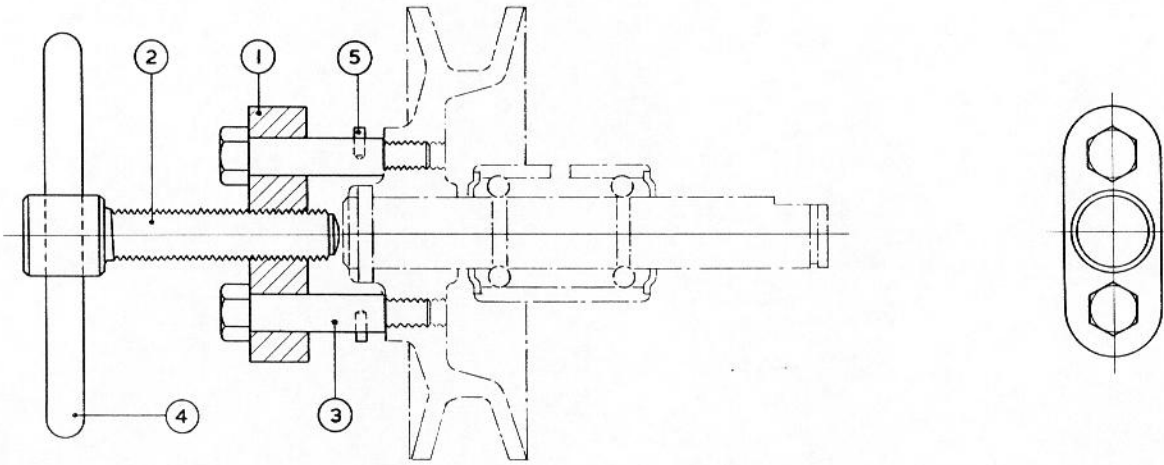
Radiator leaks.

Remove the radiator and repair or replace.

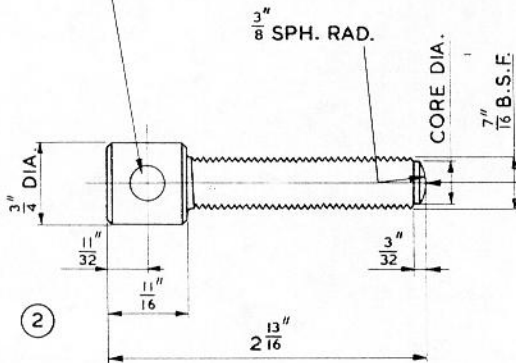
SPECIAL TOOLS



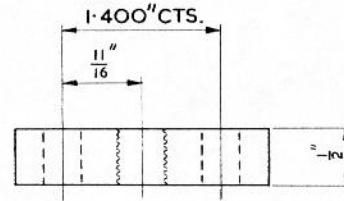
T.188257
EXTRACTOR FOR IMPELLOR



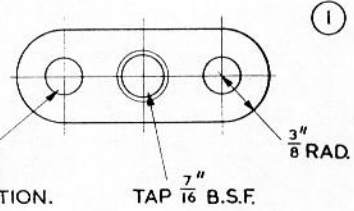
TO SUIT $\frac{5}{16}$ " DIA. TOMMY BAR, DRIVE FIT.



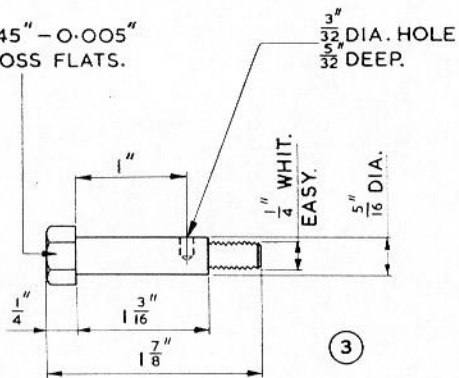
POTASH HD. END.



2- $\frac{11}{32}$ " DIA. HOLES TO BE WITHIN 0.005" OF SPECIFIED POSITION.



0.445" - 0.005" ACROSS FLATS.



ITEM No.	DESCRIPTION	No. OFF	MATERIAL
1	LINK	1	$\frac{3}{8}$ " X $\frac{1}{2}$ " X $\frac{3}{4}$ " M.S. 1 OFF.
2	EXTRACTING SCREW	1	$2\frac{1}{2}$ " X $\frac{3}{4}$ " DIA. M.S. 1 OFF.
3	BOLT	2	0.445" A/F X 5" LG. M.S. 1 OFF.
4	TOMMY BAR $\frac{5}{16}$ " DIA. X $3\frac{3}{4}$ " LG.	1	M.S.
5	$\frac{3}{32}$ " DIA. PIN X $\frac{1}{4}$ " LG.	2	SILVER STEEL

T.186444

C 248

EXTRACTOR FOR REMOVING PULLEY