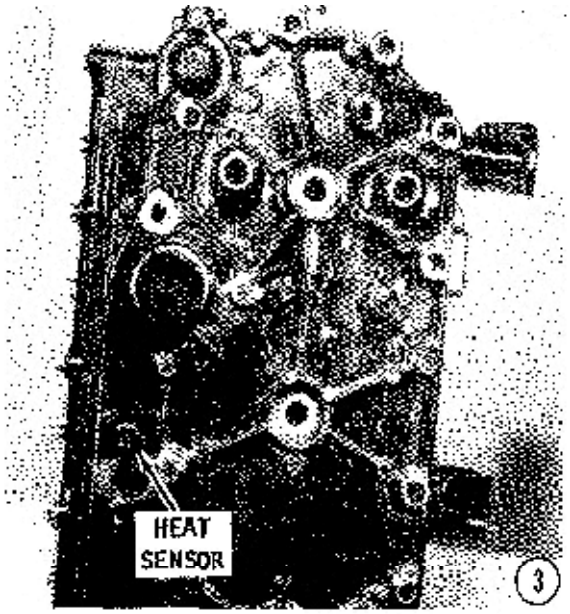


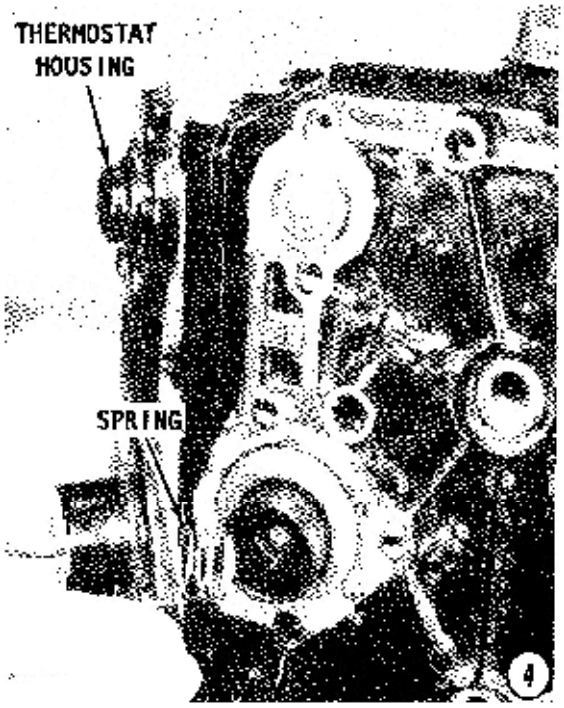
the pry area on the starboard side of the block and pry the cover and housing free.

Remove and discard the gasket on each side of the reed housing.

GOOD WORDS

It is not necessary to disassemble the reed assemblies in order to inspect them. If inspection indicates replacement of a reed assembly component is required, see the Cleaning and Inspecting portion of this chapter, beginning on Page 3-66.

3- Remove the screw on the heat sensor retaining bracket. Insert a small flat blade screwdriver between the sensor and the block and pry the sensor from the sealing grommet.



4- Remove the bolts securing the thermostat housing to the block. If the housing is stuck to the powerhead, tap it lightly with a soft head mallet to jar it free. Remove the spring.

5- Lift out the thermostat and at the same time note the direction the thermostat faces, as an assist in later installation. Remove and discard the thermostat rubber sealing ring. The spring should always face the powerhead. If the thermostat was not installed properly, serious heating problems may have developed in the powerhead.

If **NO** thermostat is found under the housing, purchase and install a new thermostat. Scrape all traces of gasket material from both sealing surfaces to prevent a water leak at this location.

Loosen, but do **NOT** remove the Phillips head screw on the water pressure relief (poppet) valve. Pull the valve assembly from the block.

Water Pressure Relief Valve Removal

FIRST, THESE WORDS

When water pressure in the cooling system reaches a predetermined figure, a pressure relief valve, also referred to as a "poppet valve" is lifted off its seat. While the valve is off its seat, additional cooling water is permitted to bypass the thermostat and circulate through the water jacket.

If the pressure relief valve is stuck shut due to scale, corrosion, etc., the powerhead will overheat at high rpm. This is a **VERY** common problem on older powerheads, especially units operated in salt water.

Procedures to free a stuck relief valve are drastic, but worth the effort.

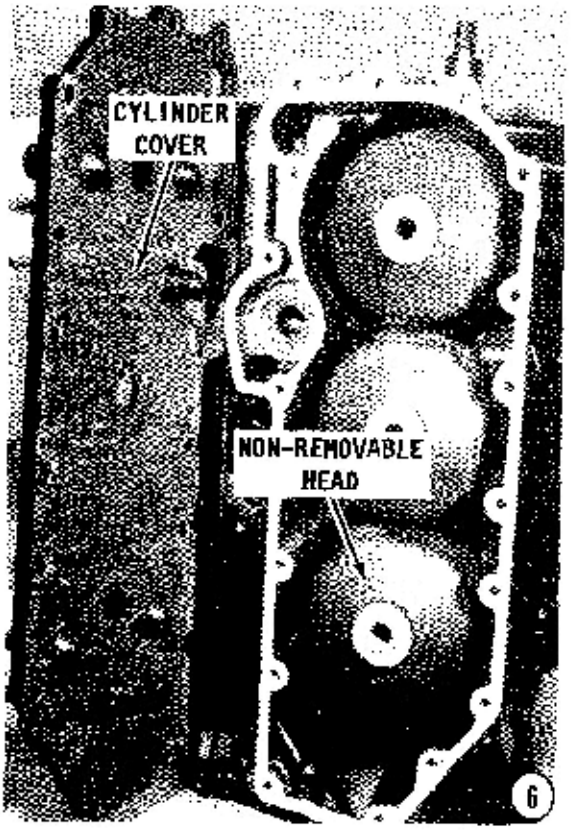
Penetrating oil, heat, brute force, any method is acceptable to free a stuck valve. Once a valve is in this condition it must be replaced. Therefore, if removal calls for destroying it with a chisel -- so be it. The valve bore must be cleaned free of any deposits to allow free flow of coolant, essential to powerhead longevity.

70hp and Larger Powerheads

6- Note the locations of the clips under two of the cylinder cover retaining bolts, as an assist in later installation. Remove the bolts from the cylinder cover. Special pry areas are provided at the top and bottom of the cover to assist in cover removal. Scrape all traces of gasket material from both sealing surfaces to prevent a water leak at this location.

SPECIAL WORDS

This design block has no head. The combustion chambers of the cylinders are an integral part of the block. Only the cylinder cover is removable to provide access to the water jacket for cleaning and inspecting purposes.



Exhaust Cover Removal

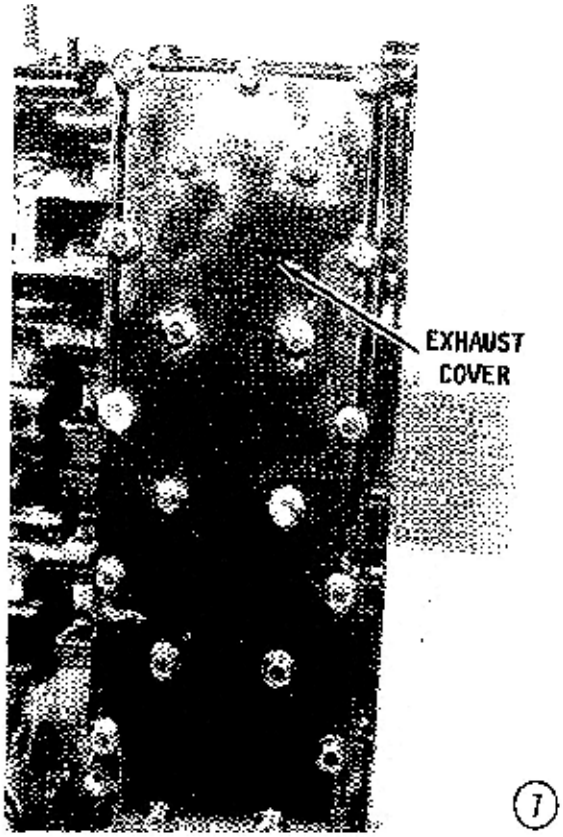
7- Remove the bolts securing the exhaust cover to the powerhead.

8- Remove the exhaust cover, gasket, inner plate, and another gasket. Inspect the inner plate for small pin holes in areas of corrosion. Water in a cylinder could be caused by a defective cover or gasket.

SPECIAL WORDS ON EXHAUST COVERS

The exhaust cover is one of the most neglected items on any outboard powerhead. Seldom are they checked and serviced. Many times a powerhead may be overhauled and returned to service without the exhaust cover ever having been removed.

One reason the exhaust cover is not removed is because the attaching bolts usually become corroded in place. This means the bolts are very difficult to remove, but the work should be done. Heat applied to the bolt head and around the exhaust cover will help in removal. However, some bolts may still be broken. If the bolt is broken it



must be drilled out and the hole tapped with new threads.

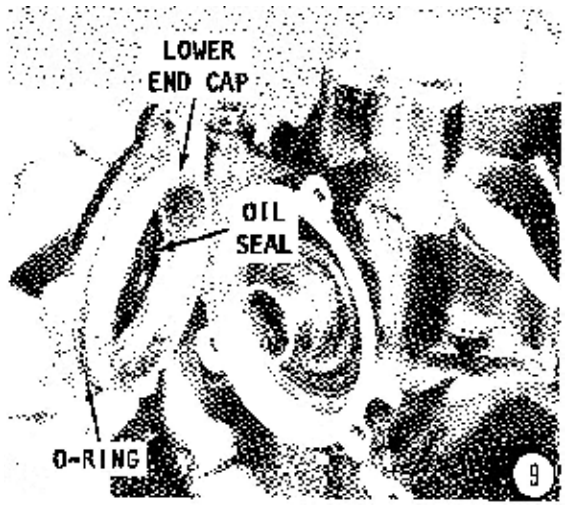
An exhaust cover is installed over the exhaust ports to allow the exhaust to leave the powerhead and be transferred to the exhaust housing. If the cover was the only item over the exhaust ports, they would become so hot from the exhaust gases they might cause a fire or a person would be severely burned if they came in contact with the cover.

Therefore, an inner plate is installed to help dissipate the exhaust heat. Two gaskets are installed -- one on either side of the inner plate. Water is channeled to circulate between the exhaust cover and the inner plate. This circulating water cools the exhaust cover and prevents it from becoming a hazard.

A thorough cleaning of the inner plate behind the exhaust covers should be performed during a major engine overhaul. If the integrity of the exhaust cover assembly is in doubt, replace the inner plate.

All Models

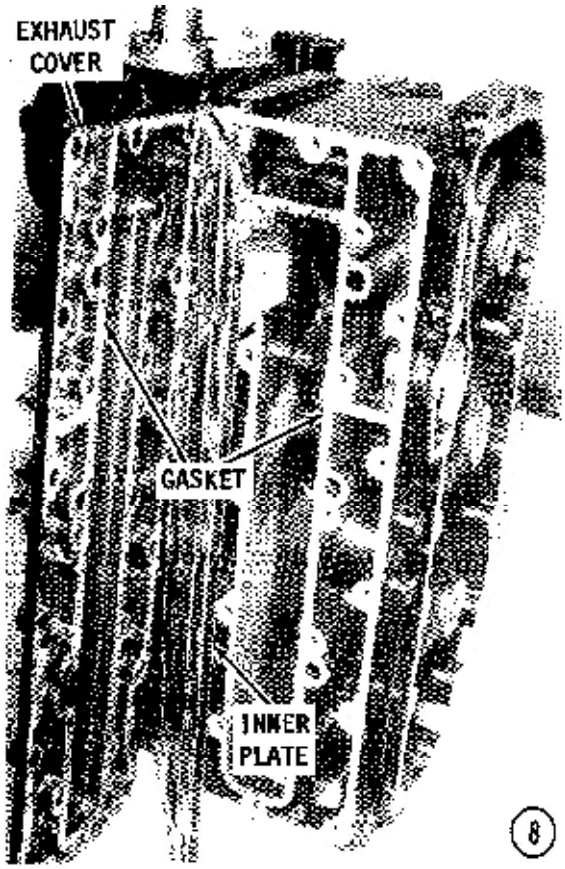
9- Remove the three bolts from the lower end cap, and then remove the end cap. Discard the O-ring around the cap. Inspect the condition of the oil seal. If the seal is no longer fit for service, pry the seal out with a screwdriver.

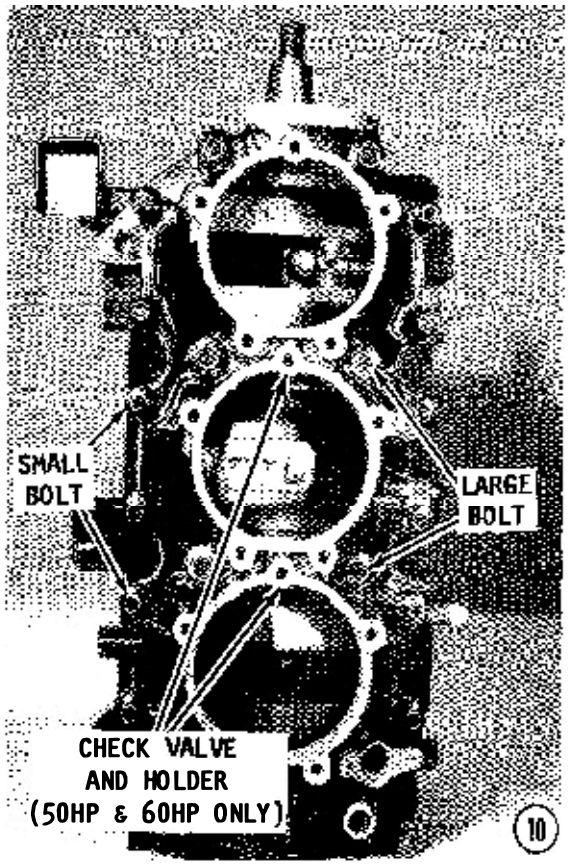


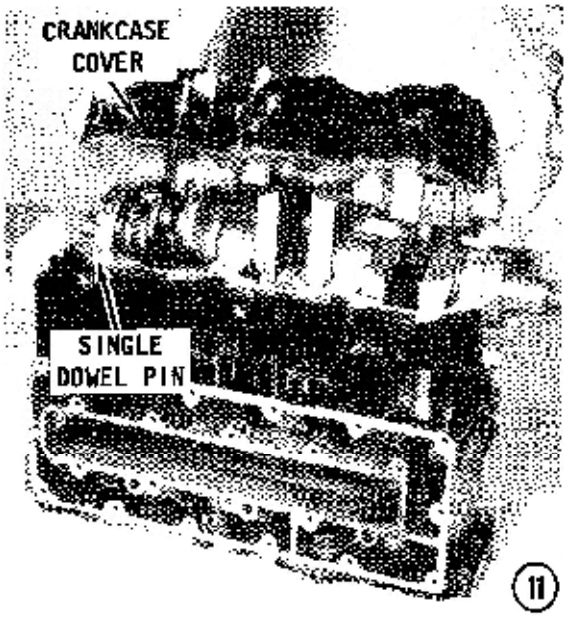
Crankcase Removal

10- Lay the powerhead on the work surface with the crankcase cover facing UP. Remove the crankcase bolts. Two different size bolts are used. Larger bolts are used on the two inner rows and smaller bolts are used on the outer edges of the crankcase.

If working on a 50hp or 60hp powerhead, remove the two check valves and holders from the locations identified in the illustration below.







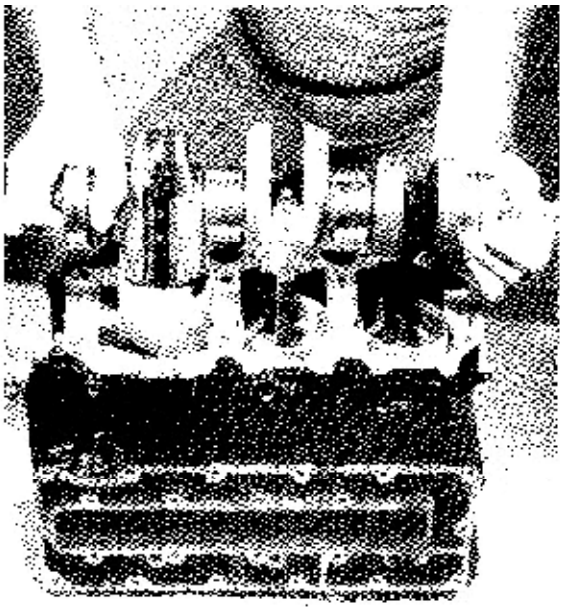
11- Tap on the bottom side of the crankshaft with a soft head mallet, alternately at both ends. The sound of the mallet on the crankshaft will change. A muffled hollow sound should be heard when the cover breaks loose from the crankcase.

If this sound is not heard, check to be sure all bolts have been removed. **NEVER** pry between the cover and the crankcase or the cover will surely be distorted. If the cover becomes distorted, it will fail to make a proper seal following installation. Such a condition would damage both crankcase halves and render both unfit for further service -- an expensive replacement.

Once the crankshaft has been tapped, as described, and the proper sound heard, the cover will be jarred loose and may be removed.

Separate the crankcase from the block. Take care not to lose the single dowel pin.

CAREFULLY remove all traces of sealant from the mating surface between the crankcase and the block without marring the surface, which **MUST** form an airtight seal.



The crankshaft assembly may be lifted clear of the powerhead, as shown, and the remainder of the work completed on the bench, or the crankshaft components may be removed one-by-one from the block.

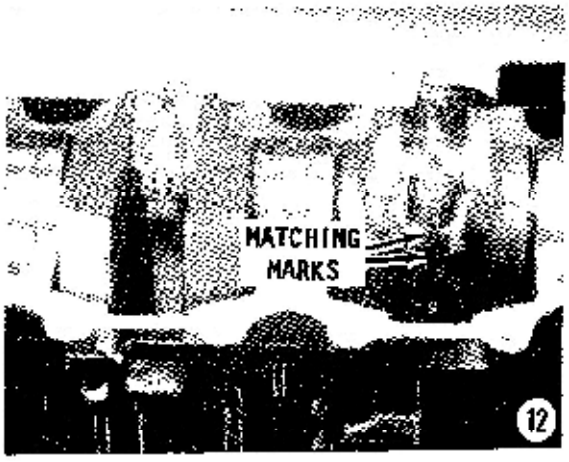
Crankshaft and Connecting Rod Removal

The crankshaft assembly may now be lifted clear of the powerhead and the work completed on the bench, or the components may be removed one by one from the block.

WORDS FROM EXPERIENCE

CLEANLINESS is the password, when handling roller bearings. Take care to prevent any dirt, lint or other contaminents from getting onto the bearings or in the cages. If the bearings are to be used again, store them in a numbered container to ensure they will be installed with the same rod and cap from which they were removed. **NEVER** intermix roller bearings from one rod to another. **NEVER** intermix used roller bearings with new bearings. If just one bearing is unfit for further service, the entire set **MUST** be replaced.

New bearings should be installed in the connecting rods, even though they may appear to be in serviceable condition. New bearings will ensure lasting service after the overhaul work is completed. If it is necessary to install the used bearings, keep them separate and identified to **ENSURE** they will be installed onto the same crankpin



throw and with the same connecting rod from which they were removed.

12- TAKE TIME to mark the cylinder number on both halves of the connecting rod caps. This mark should be made with a marker, whiteout, paint, or any substance which will adhere to a metal surface. **UNDER NO CIRCUMSTANCES** should the mark be a series of notches, gouges, or even scribed. Such a mark can cause "stress risers", and under heavy powerhead load can cause parts to crack and even fail.

SPECIAL WORDS

The connecting rods and caps are a matched set and **MUST** be kept together, not only as a pair, but also in the direction of installation.

13- Obtain a 12 point socket the same size as the rod bolts. Loosen each bolt just a little, alternately, and evenly. This procedure will prevent one bolt from being completely removed while the other is still tightened to its recommended torque value. Such action would very likely warp the cap.

ADVICE

New connecting rod bearings should be installed around the crankshaft journals, even though the bearings may appear to be in serviceable condition. New bearings will ensure lasting service after the overhaul work is completed. However, if it is necessary to install the used bearings and bearing cages, keep them separate and identified to **ENSURE** they will be installed in the same location from which they were removed.

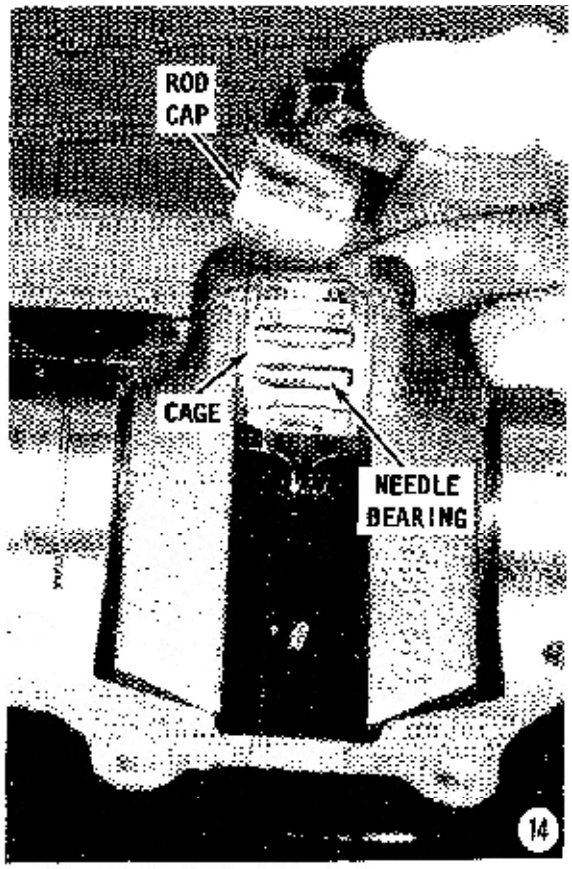
14- Remove the bolts as described in the previous paragraph, and then **CAREFULLY** remove the rod cap. Remove the needle bearings and cages from around the crankshaft. Count the needle bearings and insert them into a separate container -- one container for each rod. Label the container clearly to ensure the bearings will be installed with the proper rod at the crankshaft journal from which they were removed.

Lift the crankshaft from the block. The crankshaft should have been jarred loose when the crankcase cover was removed.

SPECIAL CENTER MAIN BEARING WORDS

When the crankshaft is removed, observe closely how the center main bearings have a hole in the outside circumference. The bearings are held in place by a locating pin indexing in the hole in the bearing. The purpose of this arrangement is to prevent the bearing shell from rotating.

Close inspection will reveal the hole to be off center. If the bearing is to be removed from the crankshaft, make a critical identification mark to ensure the bearing is installed back into the same position from which it was removed. Only in this manner can the pin be indexed into the hole.

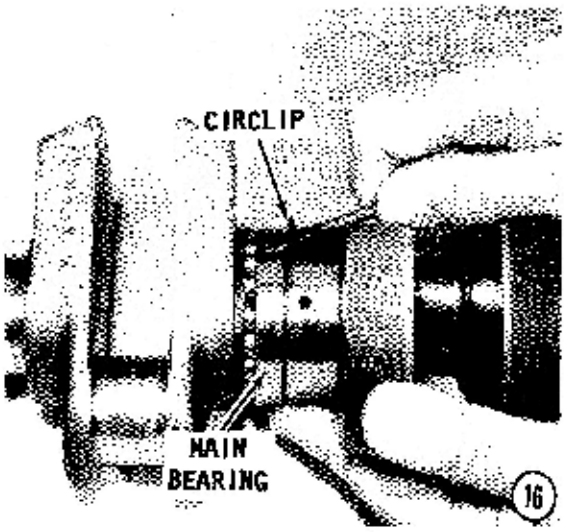


Piston Removal

15- Pull each piston and connecting rod out from the crankshaft end of the block. If water has been allowed to enter the cylinder, the piston may be "frozen" in the bore. Inject penetratating oil through the exhaust ports and allow the oil to "work" for a short time, before making another attempt to remove the piston.

CRITICAL WORDS

Once the piston is out of the block, immediately attach the proper rod cap to the rod, matching ridge to ridge, and hold it in place with the rod bolts. The few minutes involved in securing the cap with the rod will ensure the matched cap remains with its mating rod during the cleaning and assembling work.



Make an identifying mark on the outside edge of each rod "I" beam and a matching mark on the inside of each piston skirt. The identification mark must match the cylinder from which the piston and rod were removed.

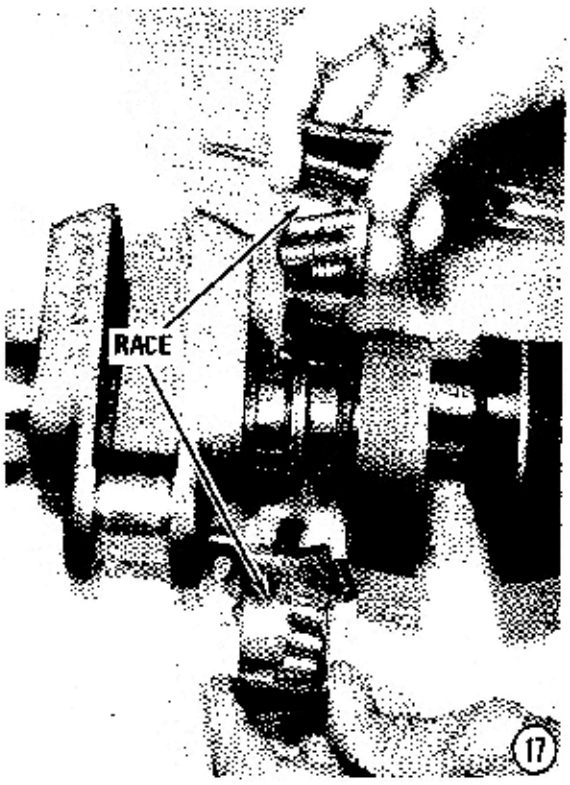
This mark should be made with a marker, whiteout, paint or any substance which will adhere to a metal surface. **UNDER NO CIRCUMSTANCES** should the mark be a series of notches, gouges, or even scribed. Such marks could be considered "damage" and cause "stress risers". Under heavy powerhead load a "stress riser" could cause parts to crack and even fail.

Crankshaft Disassembling

ADVICE

New main bearings should be installed, even though they may appear to be in serviceable condition. New bearings will ensure lasting service after the overhaul work is completed. If it is necessary to install the used bearings, keep the bearings, circlips, bearing shells, and crankshaft sealing rings separate and identified to **ENSURE** they will be installed in the same location from which they were removed.

16- Remove the large crankshaft circlip from around each set of main bearings by



gently spreading each ring enough to ease it over the top of the main bearing shells. Take care not to scratch the highly polished bearing surface as each ring is removed.

Remove all the rings in a similar manner. These rings are **EXTREMELY** brittle and **MUST** be handled with care if they are intended for further service.

17- Remove the two halves of the bearing race and the roller bearings from the crankshaft. The bearing race halves are a matched set and **MUST** be kept together.

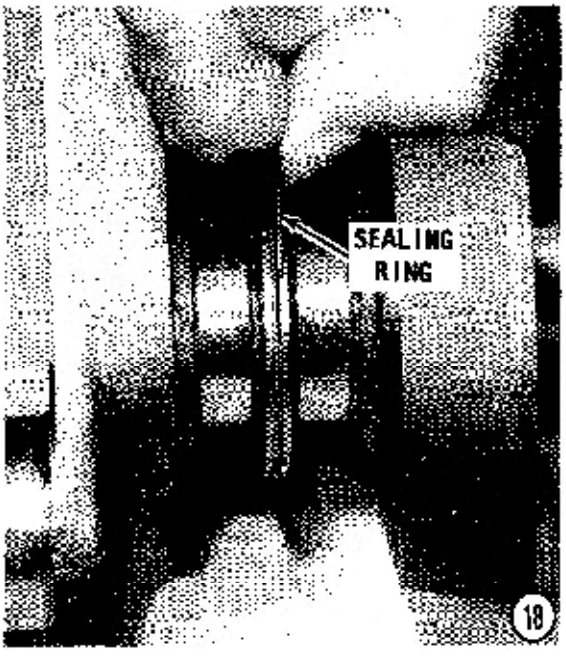
18- Remove the two large sealing rings from around each set of main bearings by gently spreading each ring enough to ease it over the crankshaft surface. Take care not to scratch the highly polished bearing surface as each ring is removed.

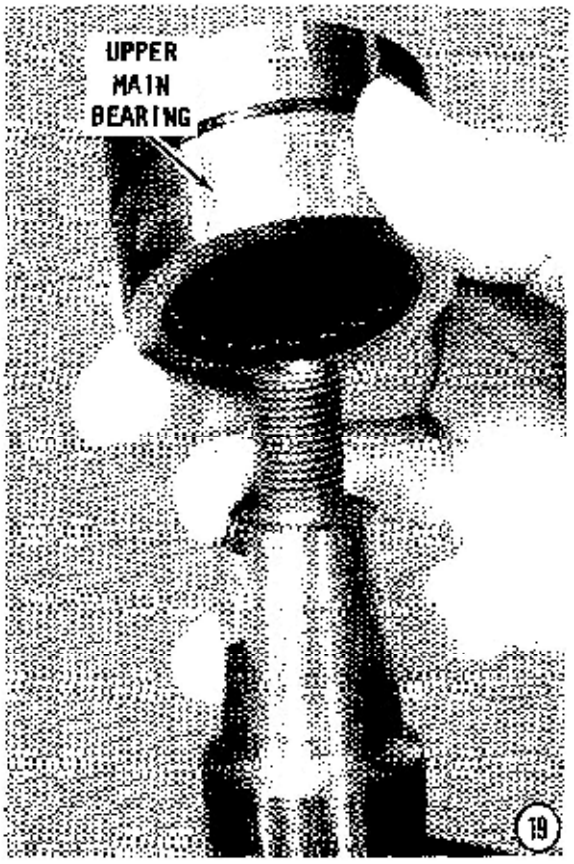
Remove all the rings in a similar manner. These rings are **EXTREMELY** brittle and **MUST** be handled with care if they are intended for further service.

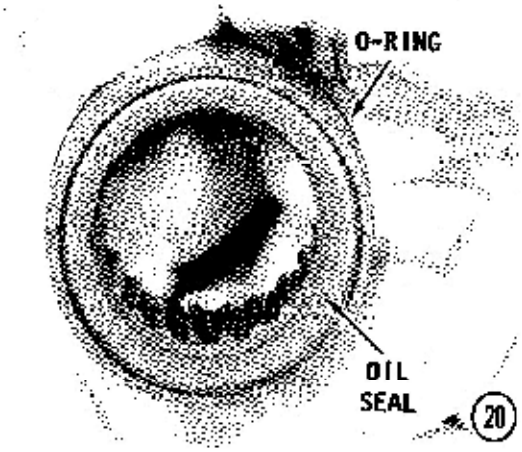
19- Slide the upper main roller bearing free of the crankshaft.

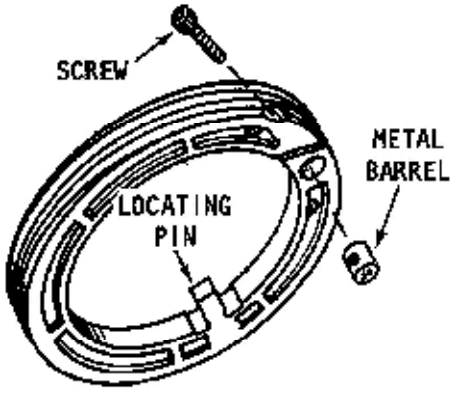
20- Inspect the condition of the oil seal housed within the bearing. If the seal is no longer fit for service, pry the seal out with a screwdriver. Remove and discard the O-ring around the bearing.

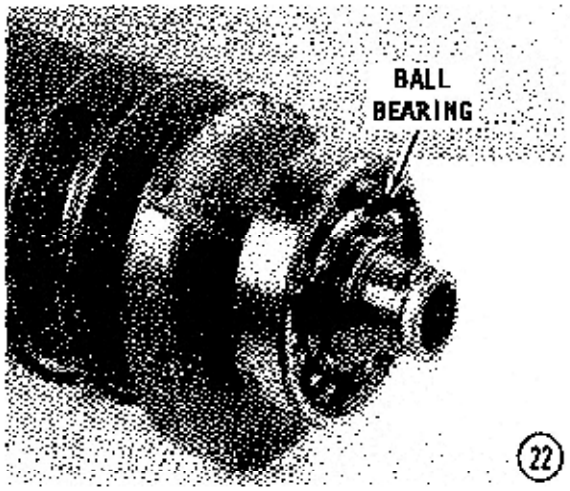
21- Remove the Allen screw from the oil pump drive gear. Extract the metal barrel from the gear. **CAREFULLY** spread the two ends of the gear apart enough to clear the crankshaft journal. **DO NOT** spread the gear any more than absolutely necessary.







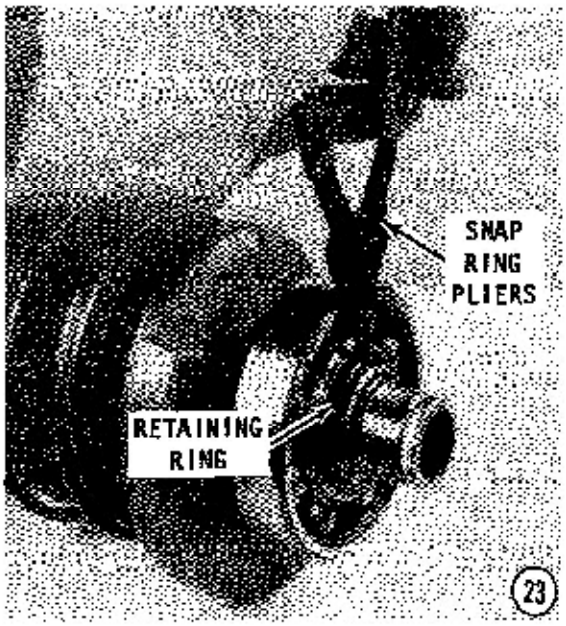


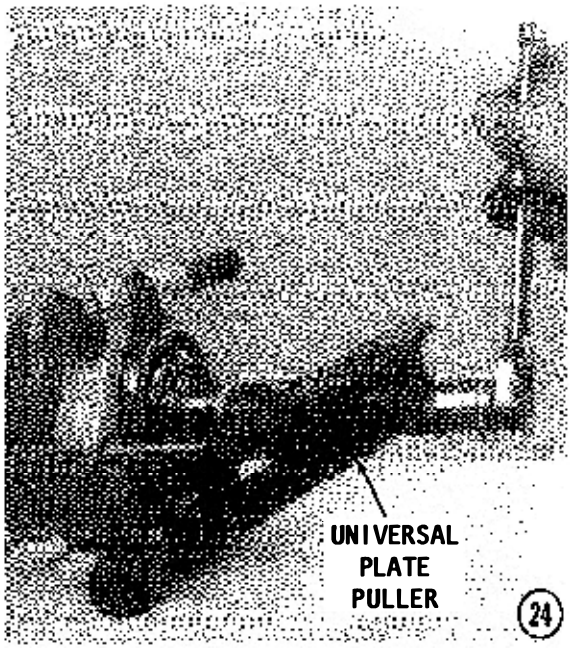


22- Inspect the crankshaft ball bearing installed on the lower end of the crankshaft as outlined in the Cleaning and Inspecting section at the end of this chapter. **DO NOT** remove the lower crankshaft ball bearing unless it is unfit for service and it is to be replaced.

23- If the bearing is to be replaced, remove the retaining ring with a suitable pair of expanding type snap ring pliers.

24- Install Universal Puller Plate, C-91-37241, between the crankshaft ball bearing and the crankshaft counterweight. Position the crankshaft assembly in an arbor press. The crankshaft will be supported by the puller plate. Place a metal plate over the end of the crankshaft, and then press the crankshaft out of the bearing. **TAKE CARE** to prevent the crankshaft from falling to the floor and being damaged when it clears the bearing.

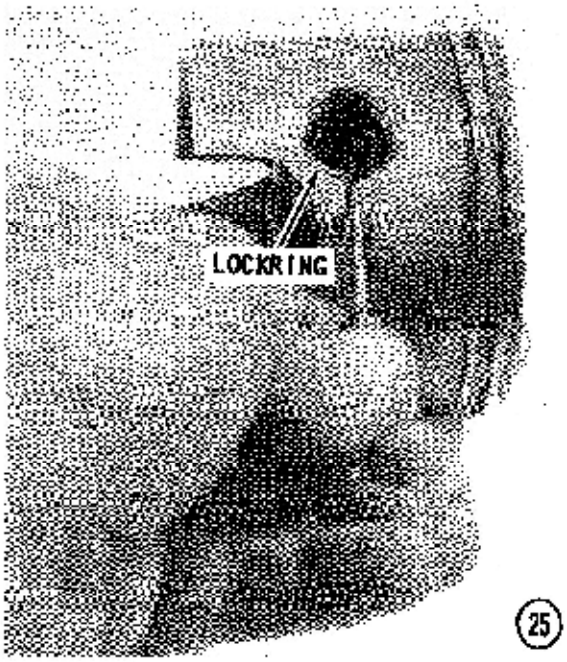




SAFETY WORDS

WEAR eye protection glasses while removing the piston pin lockrings, because the lockring is made of spring steel and may slip out of the pliers or pop out of the groove with considerable force.

25- Remove the two G-type lockrings using a pair of needle-nose pliers. A lockring tool, C-91-5252A1, may be used to remove the lockring. A third alternative, is to use a punch to pop the ring out. If a punch is used **TAKE CARE** not to damage the piston. **DISCARD** the lockrings, because they should not be used a second time.

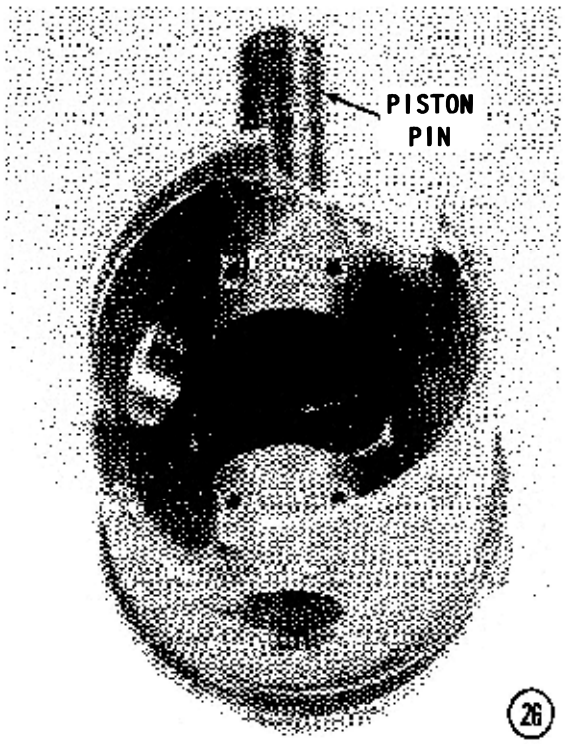


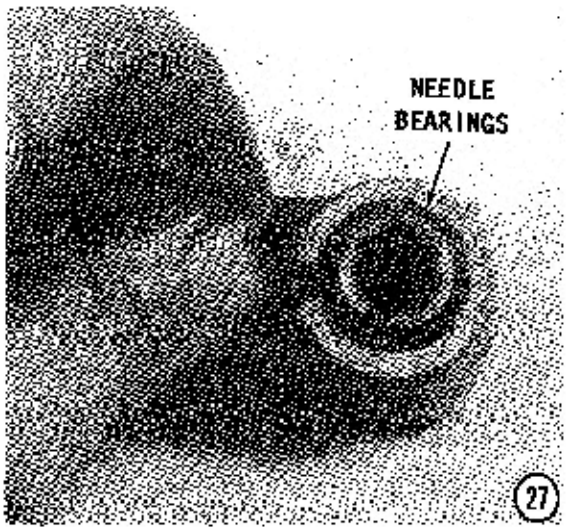
26- Heat the piston dome to approximately 190° by submerging the piston in hot water, or by heating it with a heat lamp.

Three tools are required to remove the piston pin from a piston without damage to the piston, the pin, or the rod: An arbor press, a Piston Support Block, C-91-77005, and a Piston Pin Tool, C-91-74607A2. Position the piston and rod assembly in place on the support block. The piston may be placed on the block with either hole facing up. Use the piston pin tool and the arbor press to press the piston pin down and free of the piston.

27- If the connecting rod is to be used again, save the needle bearings, 29 by count, on each piston end of the rod and the two locating washers.

CLEANLINESS is the password, when handling needle bearings. Take extra care to prevent any dirt, lint, or other contamination from getting onto the bearings or in the cages. If the bearings are to be used again, store them in a numbered container to ensure they will be installed with the same rod and rod cap from which they were removed. **NEVER** intermix roller bearings from one rod to another. **NEVER** intermix used roller bearings with new bearings. If just one bearing is unfit for service, the entire set **MUST** be replaced. Handle the piston with care, because the skirt can be





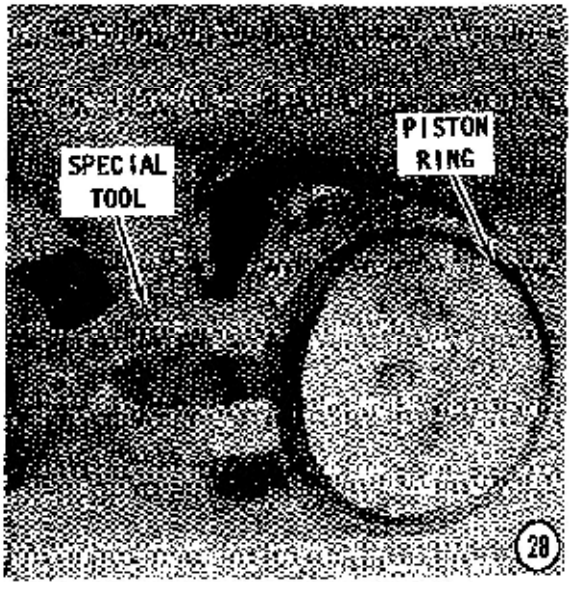
easily bent out-of-round if it is handled roughly.

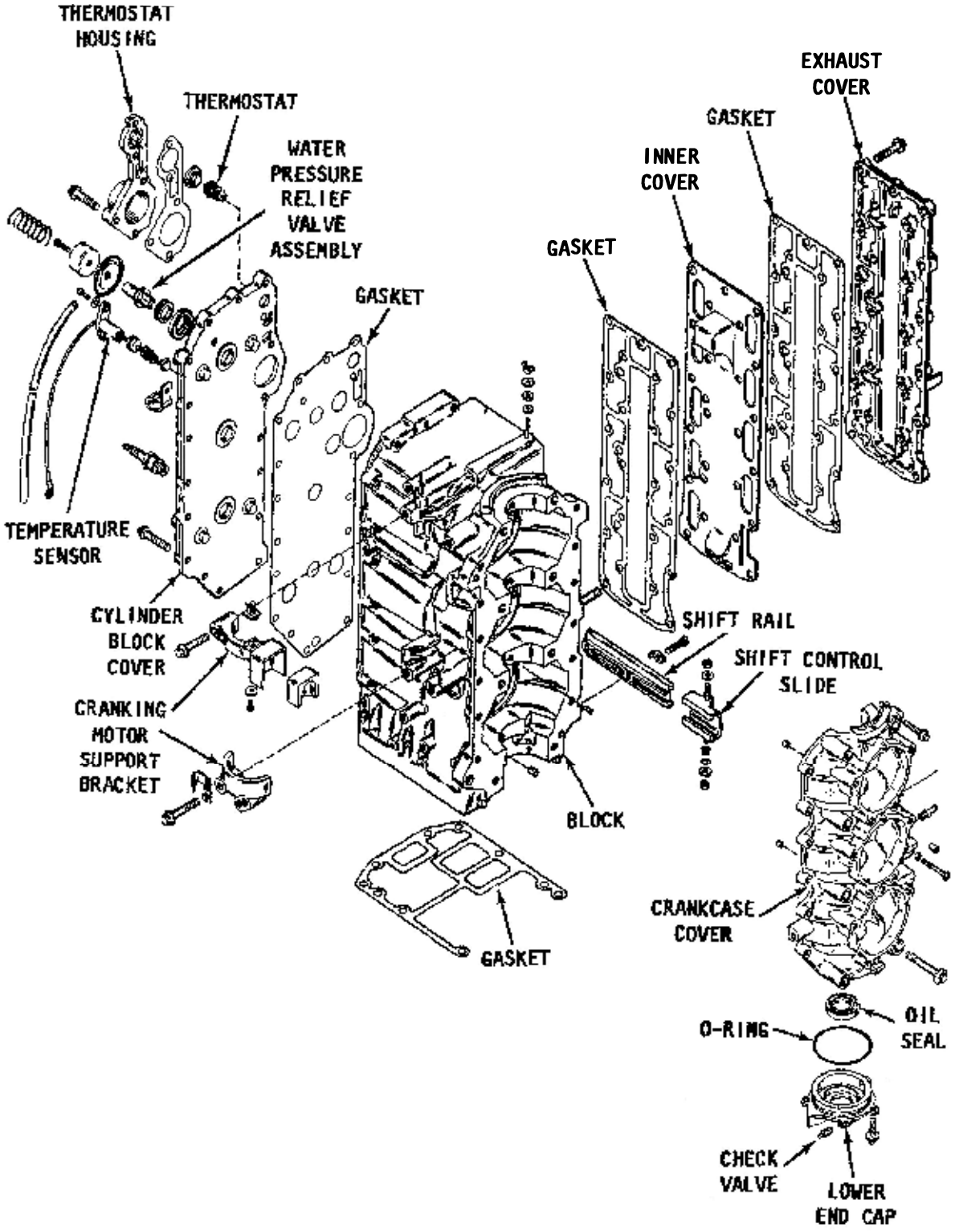
Piston Disassembling

28- Remove and **DISCARD** the rings, as each piston and rod assembly is removed. Use a Piston Ring Expander, C-91-24697, to remove the rings. If this special tool is not available, remove them with your hands. After the rings have been removed from all pistons, carefully inspect each piston and rod assembly according to the procedures outlined in the Cleaning and Inspecting section at the end of this chapter.

CLEANING AND INSPECTING

See the last portion of this chapter, Section 3-4, for detailed, comprehensive procedures to clean and inspect all components of the powerhead.





Exploded drawing of the redesigned, large bore 3-cylinder block, Models 70hp and larger, with major parts identified.