NUMBER 3—REVISED

Piston Ring Replacement, Oversize Piston Pin Installation, Connecting Rod, and Water Pump Overhaul . . . HD Engine

SHOP TALKS

for

INTERNATIONAL TRUCK SERVICEMEN

INTERNATIONAL HARVESTER COMPANY
180 NORTH MICHIGAN AVE. CHICAGO 1, ILLINOIS, U.S.A.

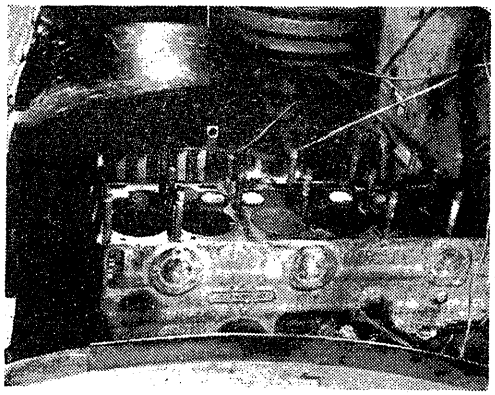
• Piston-ring Replacement

• Oversize Piston-pin Installation, Connecting-rod, and Water-pump Overhaul in the HD Engine

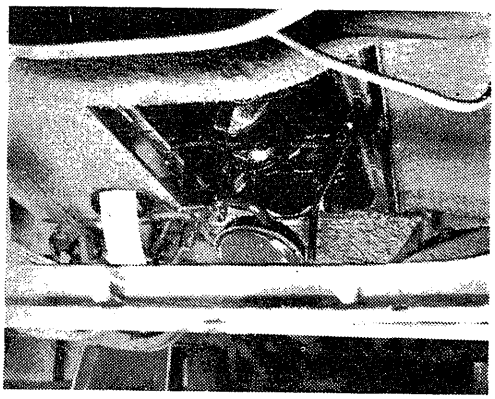
In Shop Talk No. 2 we outlined the recommended procedure for valve reconditioning in the HD engine. Service procedure is now presented covering piston-ring replacement, oversize piston-pin installation, and connecting-rod and water-pump overhaul.

Service equipment illustrated in use in these operations, or similar tools, will be found of assistance in performing the operations in keeping with the flat rates in the Service Operation Time Schedule.

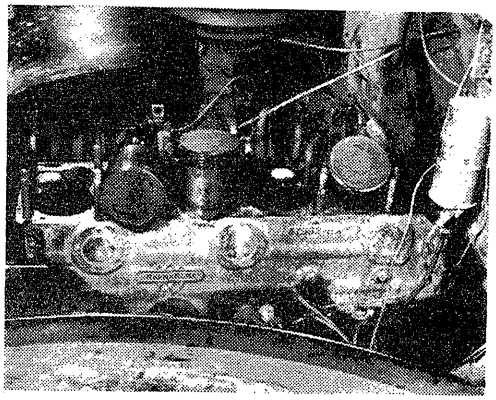
The recommended procedure for performing the piston-ring, piston-pin, connecting-rod bearing, and water-pump overhaul operations is as follows:



1. Drain radiator, remove hood, drain engine oil, and remove cylinder-head as shown in the illustration.

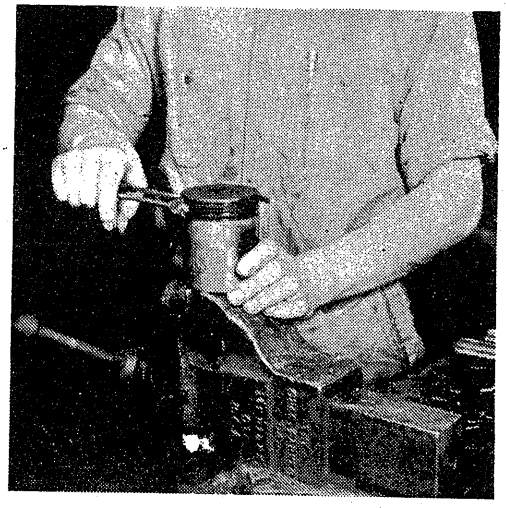


2. Remove oil-pan preparatory to rod and piston assembly removal.

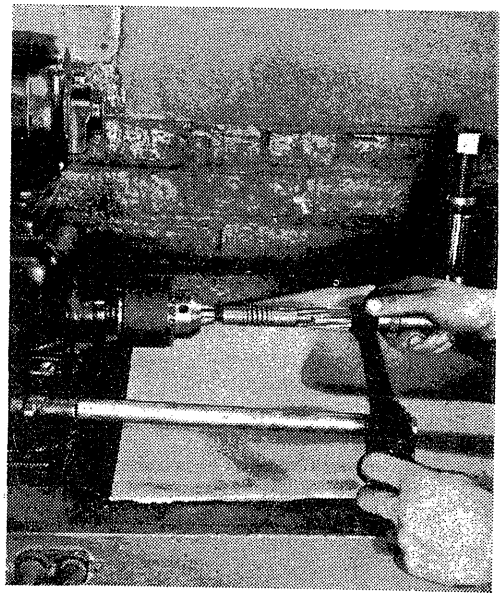


3. Remove connecting-rod caps and remove piston and rod assemblies through the top of the block as shown.

4. Place piston and rod assembly in a vise,



5. Clean ring grooves of pistons using either a broken ring from the respective groove or an especially designed groove cleaning tool as shown. The tool illustrated is available under SE-8014. Ring grooves must be thoroughly cleaned prior to installation of new rings. Carbon allowed to remain in the corners of grooves will promote rapid accumulation of carbon in the reconditioned engine. Oil holes in pistons must also be cleaned.



6. Remove piston-pins after removing the pin retainer snap rings. Snap rings are easily and readily removed with a pair of pliers. Clean and check all parts.

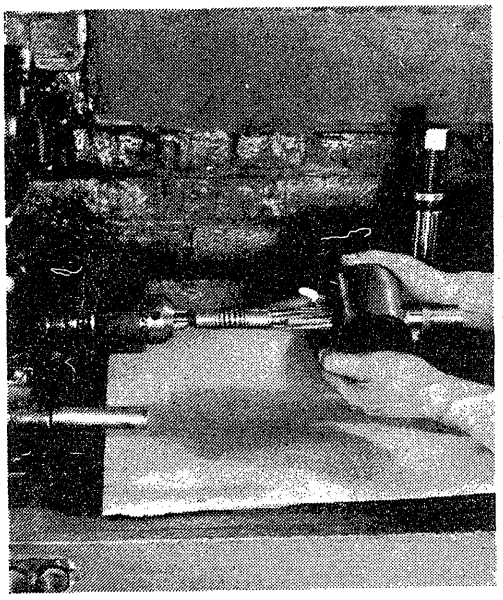
Ream piston-pin bushings using an expansion reamer similar to SE-7613. If such is available, a power reamer-drive will be found both rapid and efficient. The machine shown in use is the SE-878 Reamer and Hone Drive.

Lard oil should be used as a lubricant for reaming operations, for its use will produce a smoother finish and will serve to protect the reamer equipment, prolonging its life of usefulness.

Do not force the reamer through the work. Allow the tool to feed itself through and difficulty will not be encountered due to grabbing or chattering of the reamer.

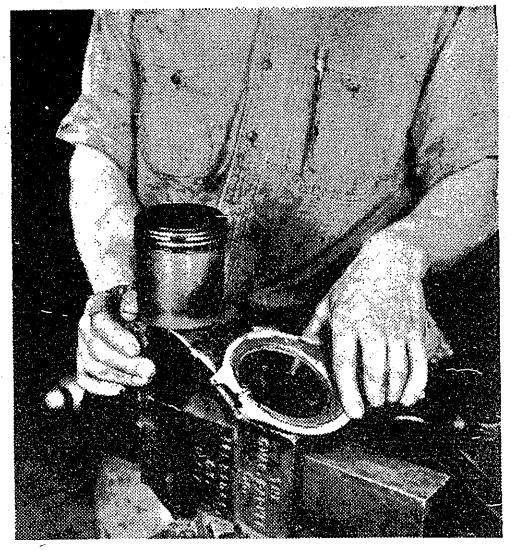
The reaming operation should continue until such point that there is a piston-pin to rod fit of approximately .0003". This will be found to be a push fit with the palm of the hand, the parts being at room temperature of 70 degrees Fahr.

Replaceable hone blades for the SE-7613 reamer are available as SE-8714. Their use will produce a smoother finish than that



7. Pistons must be reamed in the same manner as that used for connecting rods. First ream one boss and then the other, using a tapered pilot on the reamer to produce line-reamed bosses. If hone blades are available, they may be used here in the same manner.

Reaming or honing operations should continue until there is a fit between the piston-pin and the piston at room temperature of 70 degrees Fahr. requiring palm push.

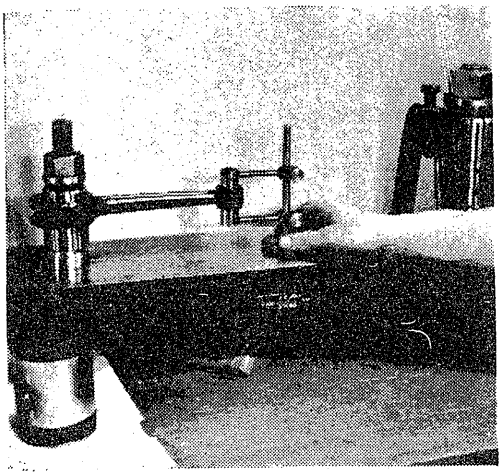


9. Assemble pistons to the connecting-rods and install piston-rings in their respective grooves. A piston-ring expander will help prevent ring distortion. The tool shown is SE-11491.

An instruction sheet is included with each set of service piston-rings and these must be closely observed

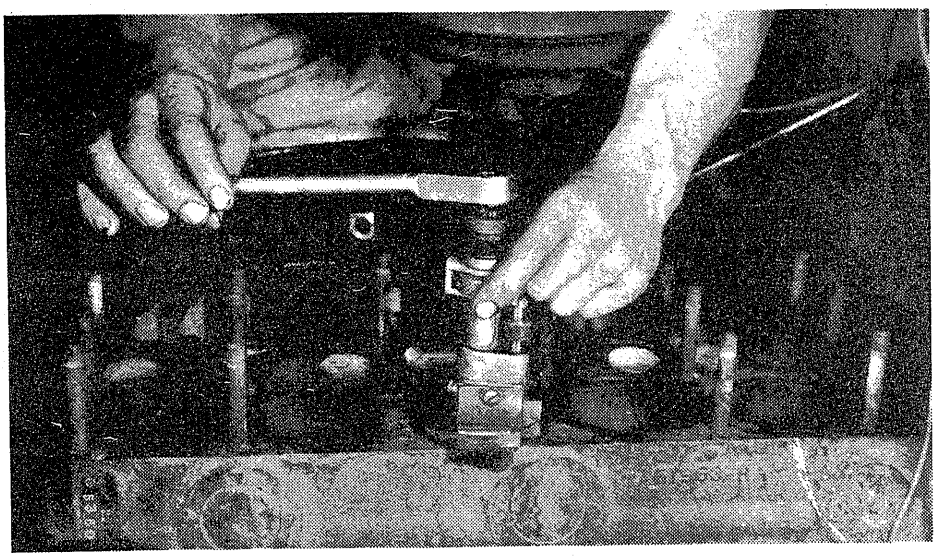
Compression rings should have a fit in the grooves allowing a clearance of .0015", and oil control rings should have a clearance of from 001 to .0025".

Piston-ring gaps should be from .007" to .015", as measured at the lower and unworn portion of the cylinder.



8. Connecting-rods must be checked for alignment, and if bend or twist is encountered, the rods must be straightened. Rods which are bent or twisted will contribute to early failure of the reconditioned engine, for they will prevent the ring faces from being parallel with the cylinder wall. Rods which are badly bent should be replaced.

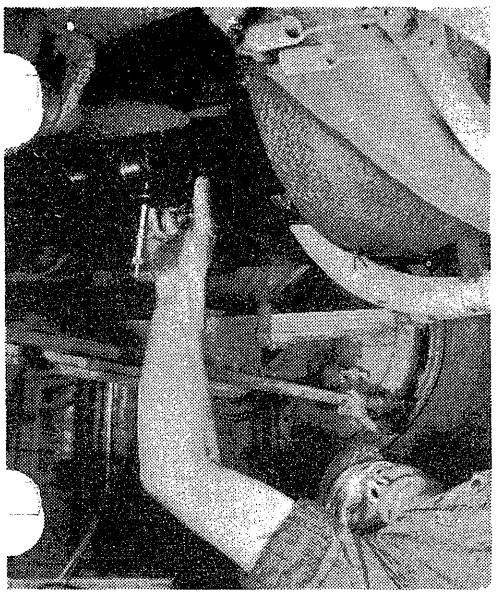
The photo shows the mechanic checking a connecting-rod on the SE-1099 Connecting-rod Aligner. This equipment is provided with all necessary bending bars and clamps to be used in straightening connecting-rods. The piston-pin must be parallel with the crankshaft journal.



10. After considerable use, an engine will reveal an unworn portion of the cylinder at the very top of the bore. This is known as the cylinder ridge. This ridge must be removed to prevent the new top ring from striking against it in the reconditioned engine.

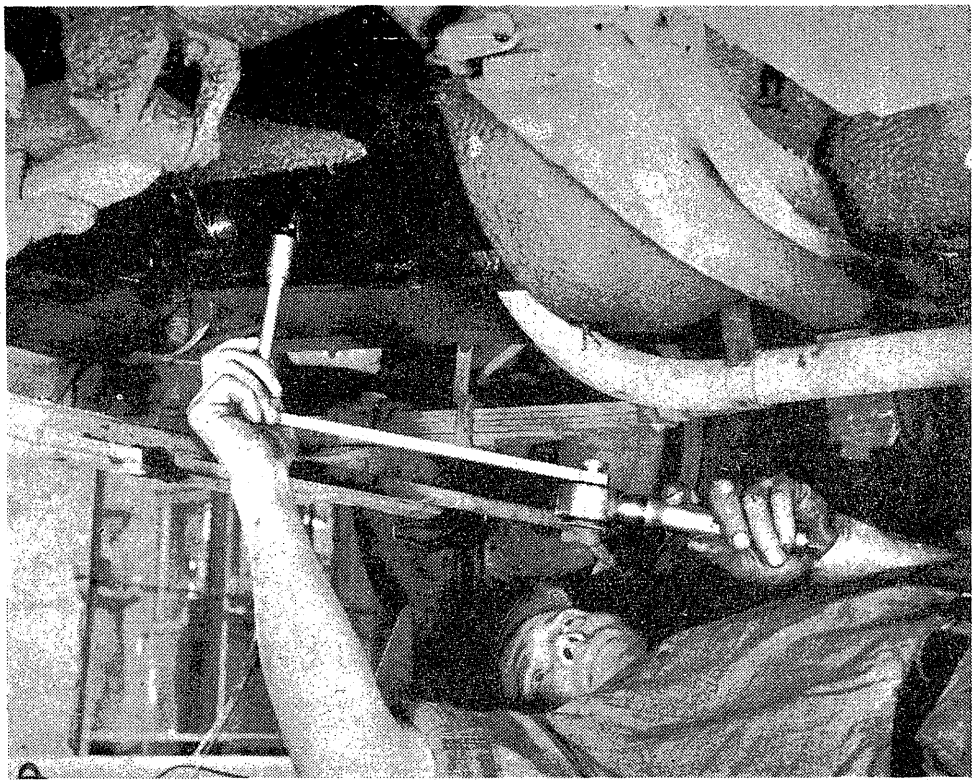
The tool illustrated is the SE-936 Cylinder Ridge Reamer, and it or a similar should always be used for ridge removal. Do not use a file, for such will produce a rough finish.

Carefully remove all trace of carbon and steel shavings from the cylinder bores and cylinders before proceeding with subsequent operations.



11. A crankshaft journal which has been damaged, leaving flat spots or revealing an out-of-round condition, cannot be expected to permit satisfactory bearing life. If taper or out-of-round exceeds .003", the shaft should be reground.

An accurate micrometer similar to SE-6872 should be used to measure the crankshaft journals as shown in the photo.



12. Connecting-rods and caps should be thoroughly cleaned prior to bearing shel installation. Do not allow foreign matter, such as dirt or oil, to remain betwee the bearing shells and the rod or cap, as this material prevents proper contact at th backs of the bearings.

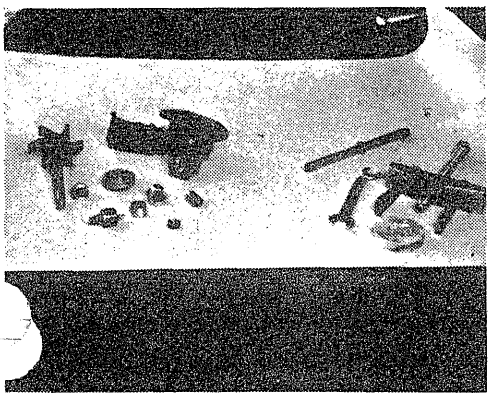
Assemble bearings shells in rods and fit to the crankshaft journals. If bearin wear cannot be adjusted to proper clearance by removal of shims, new bearings mus be installed. NEVER FILE CONNECTING-ROD OR CAP.

Be sure that shims are properly aligned in the assembled rod so that they do nc rest between the bearing shells when the cap is tightened down. When assemblin the cap, the shims can be easily lined up with the fingers. When installing new con necting-rod bearings, always start with the specified number of shims in place, an then remove shims as required to produce proper clearance. *Reduce clearance b shim removal rather than attempting to increase clearance through shim addition.*

Recommended connecting-rod bearing to crankshaft clearance is from .001" t .0025", and can be checked with a one-inch square of paper as described in the CT-14 Motor Truck Service Manual.

When the bearings have been assembled and properly adjusted to the crankshaf journals, the connecting-rod bolt nuts must be tightened with a tension indicatin wrench similar to SE-1137, as shown. The wrench should be set for an initial settin of 56 foot-pounds. If the holes in the bolt and in the nut do not line up to permi the insertion of the cotter pin, the nut should be *tightened enough more* to permi inserting the cotter. Do not back off on the nut. Insert new cotters.

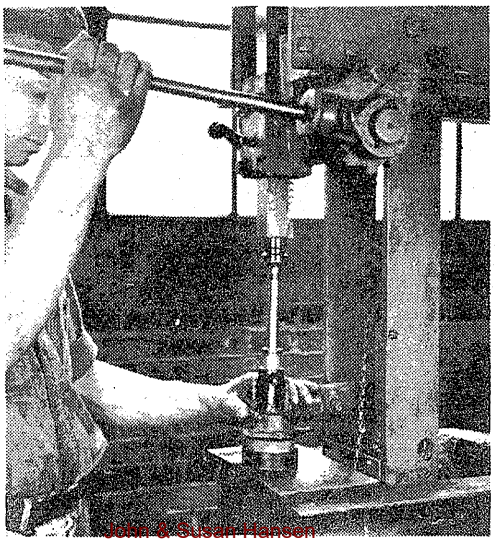
Install oil pan and refill with oil.



13. Examine the water-pump, and if found advisable, remove and dismantle. Use a puller to remove fan hub from water-pump impeller shaft. *Do not use a hammer.*

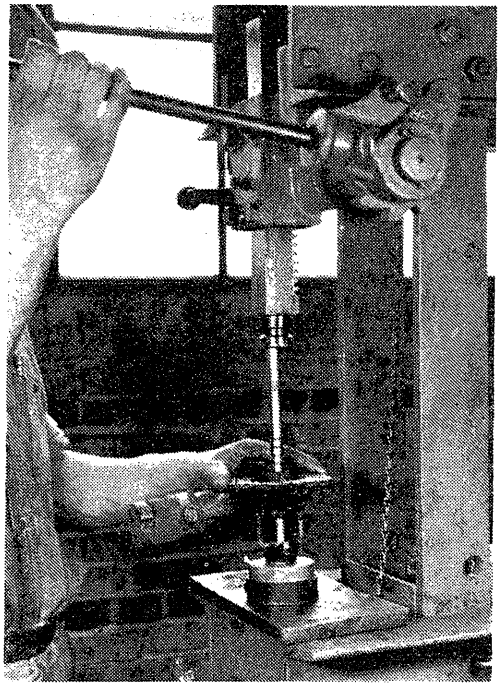
Bushings can be readily removed through use of SE-963 Bushing Arbor.

Clean and then carefully check all parts. Puller SE-967, Packing Gland Wrench SE-969, Housing Support Plate SE-968, Bushing Arbor SE-963, and the dismantled pump are all shown in the photograph.



14. Install new bushings, making use of th SE-963 Bushing Arbor, SE-969 Housin Support Plate, and a suitable arbor pres Install the front, or porous, bushing in after having soaked it in light oil. T ne is no oil hole in this bushing and : or should be drilled because the bush ng being porous in texture, will absorb o from the oil cup and channel in the pum housing.

NOTE: For extreme service where th porous-type bushing is not satisfactor there is a needle-type bearing availabl This bearing was announced and describe in Service Bulletin 129—'39.

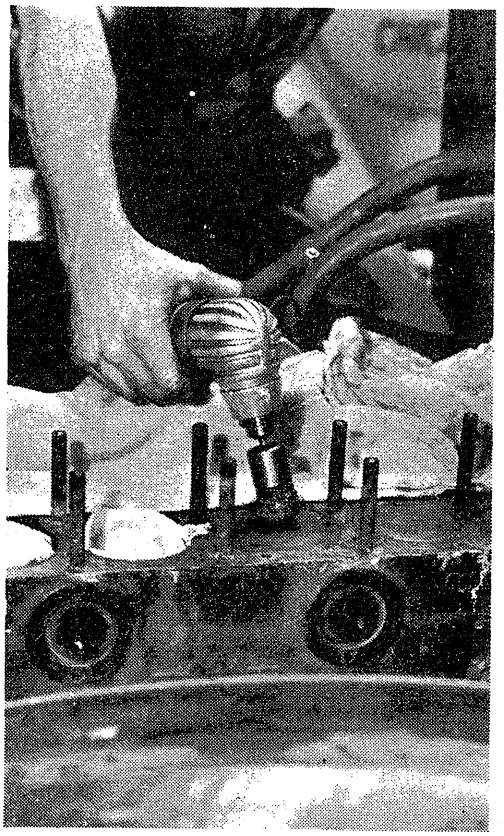


15. Install the rear, or split bushing, using the same tool equipment. There is an oil hole in the bushing and this must index with the lubrication hole in the housing.

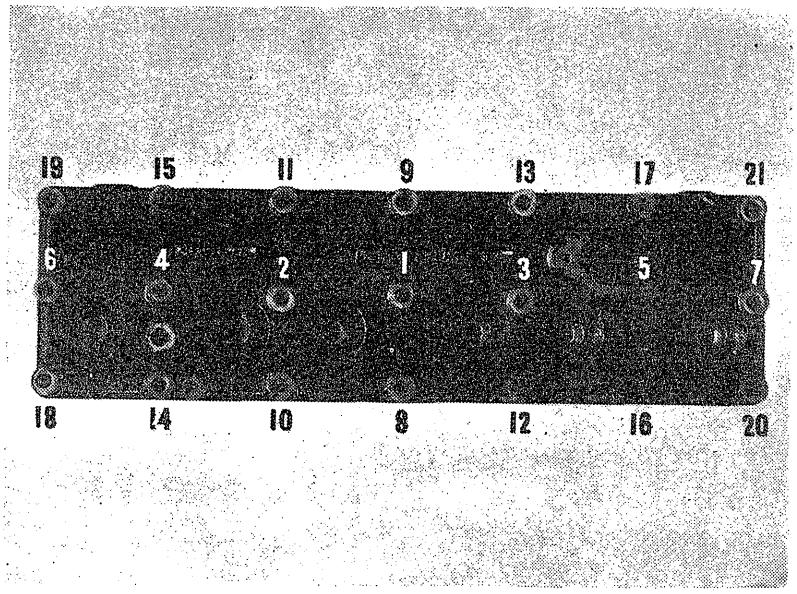
Burnish the rear, or split bushing with Burnishing Bar SE-964 which will properly seat the bushing and will remove excess material to permit the proper shaft to bushing clearance. Burnishing or reaming is not required for the flanged, or front bushing.

Water-pump overhaul is completely described in the CT-140 Motor Truck Service Manual outlining, step-by-step, the use of the special tools required for proper pump reconditioning

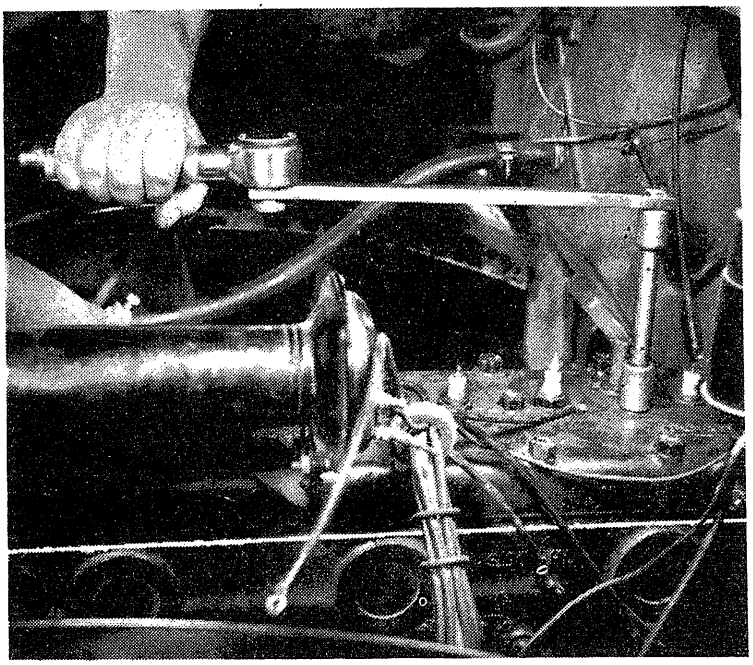
Reassemble pump parts, using new parts where advisable, and install pump. Adjust fan belt to proper tension allowing approximately ½" slack. Too tight a fan belt will promote early belt failure and will also cause undue wear in water-pump parts.



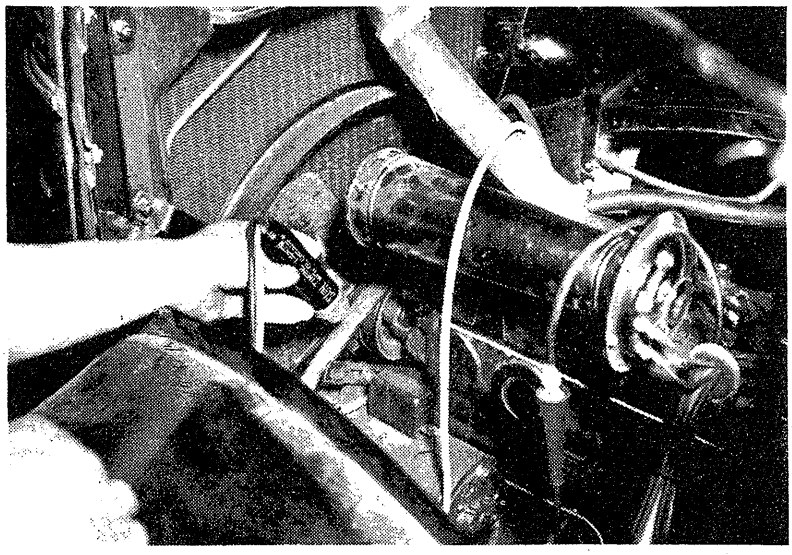
16. Clean carbon from combustion chambers of cylinder-head as shown, using scraper or wire brush.



17. Install cylinder-head, drawing nuts down evenly and in the sequence shown.



18. Use Tension Indicating Wrench SE-1137 for correct and equal tightening of cylinder-head nuts. Tension Wrench should be set at 60 foot-pounds.



19. Refill radiator, and install hood. Check distributor points, and adjust ignition timing as shown with the SE-969 or similar Synchroscope.