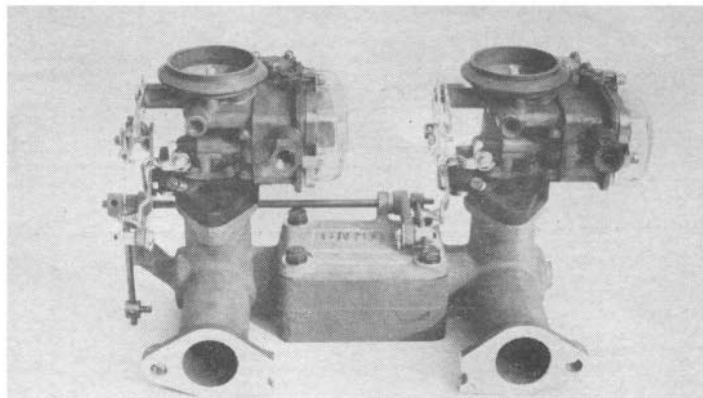
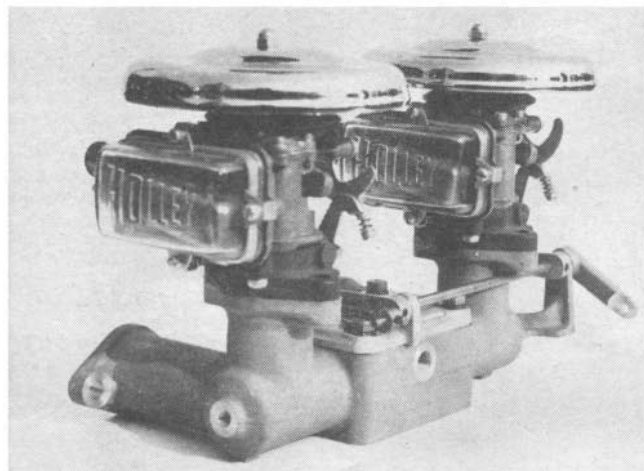


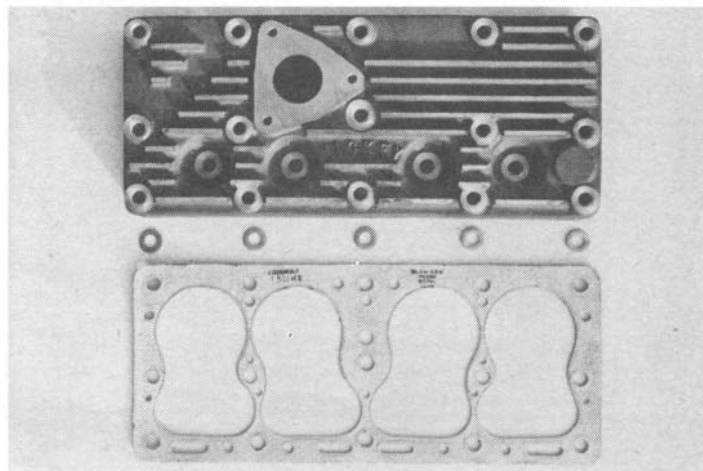
• Burns dual carburetor intake manifold for Ford and Willys Jeep, Henry J, and Allstate four-cylinder, flat-head engines.



• Cylinder block side of the Burns manifold. The carburetors are single-throat, glass-bowl Holleys for 1952 Ford six engines.



• Complete manifold, carburetor, and air cleaner setup. Throttle linkage cross shaft is supported by brackets cast into manifold.



• Hickey's high compression cylinder head for Ford and Willys Jeep, Henry J, and Allstate four-cylinder, flat-head engines.

## ENGINE CONVERSION

# WILLYS L-HEAD JEEP

BY DON FRANCISCO

HRM TECHNICAL EDITOR

The Jeep Engine presents many possibilities—Here are a few of them

It seems as though we can't get away from Vic Hickey's Jeep. Our first experience with this particular jack-of-all-trades buggy was shortly after Vic had installed dual wheels on the rear of the little beast. We took it out at that time and ran it up and down a riverbank and took it other places it shouldn't have gone. Then Hickey built a special cylinder head for his pet and installed dual wheels on the front end. After that we drove it up and down hillsides too steep to walk on. Not satisfied with the monster he had created, our friend, after due thought, decided that what his Jeep needed next was more horsepower under the hood. This he proceeded to provide and the results were more than gratifying.

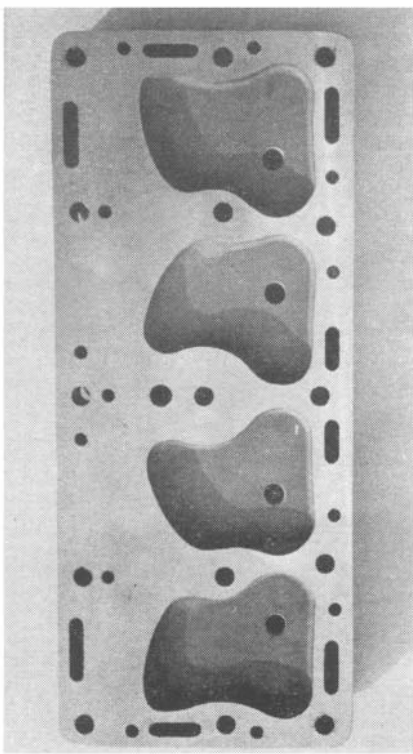
After publishing our first report on this super agile Jeep, we began receiving letters from unbelievably large numbers of Jeep owners interested in improving their buggies. Since that time many of these owners have purchased dual wheel adaptor spools, high compression heads, and rear fenders from Hickey and have been quite satisfied with the results. Now we find that many of these same owners would also like a little more horsepower; consequently, here we are again with another article on Hickey's Jeep.

Vic's hot engine is a comparatively mild conversion requiring a minimum of special parts and labor. The conversion procedures employed could be done during a normal engine rebuilding process with very little

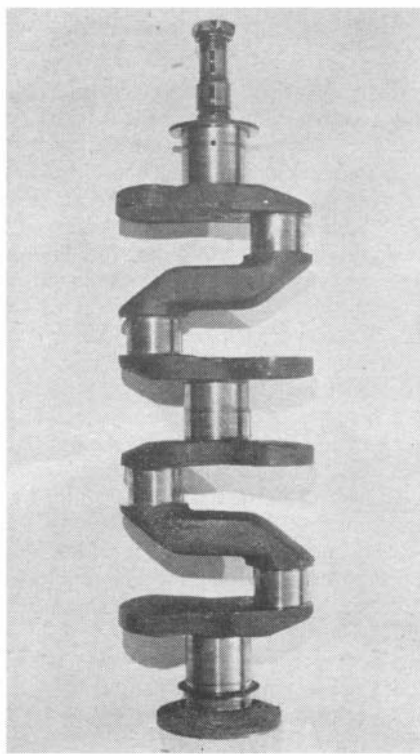
additional expense but would, of course, be more costly if the engine were torn down specifically for the conversion work. The changes made by Vic to his engine can be applied equally successfully to engines in either Ford or Willys military Jeeps, Willys civilian Jeeps, and four-cylinder Henry J and Allstate automobiles.

Going along with the adage of "no substitute for cubic inches," Vic's first step in gaining additional horsepower was boring the engine's cylinders to .080 inch oversize. This increased the stock bore of 3.125 inches to 3.205 and boosted the engine's total displacement from 134 to 141 cubic inches. Stock type four-ring replacement pistons were fitted to the cylinders

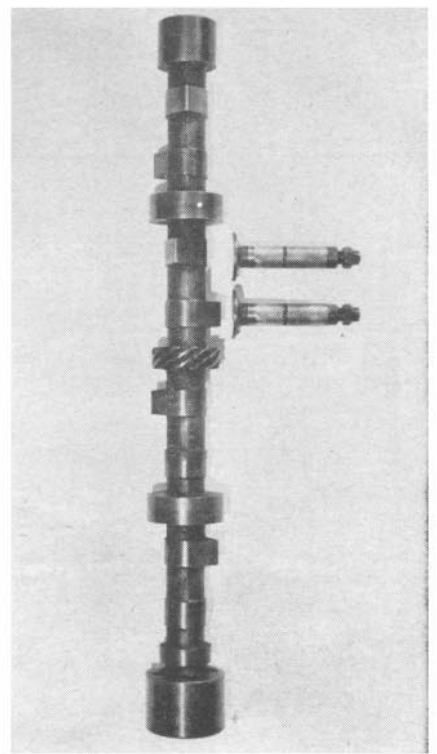
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• Combustion chambers of Hickey Jeep head provide compression ratio of 7.75:1.

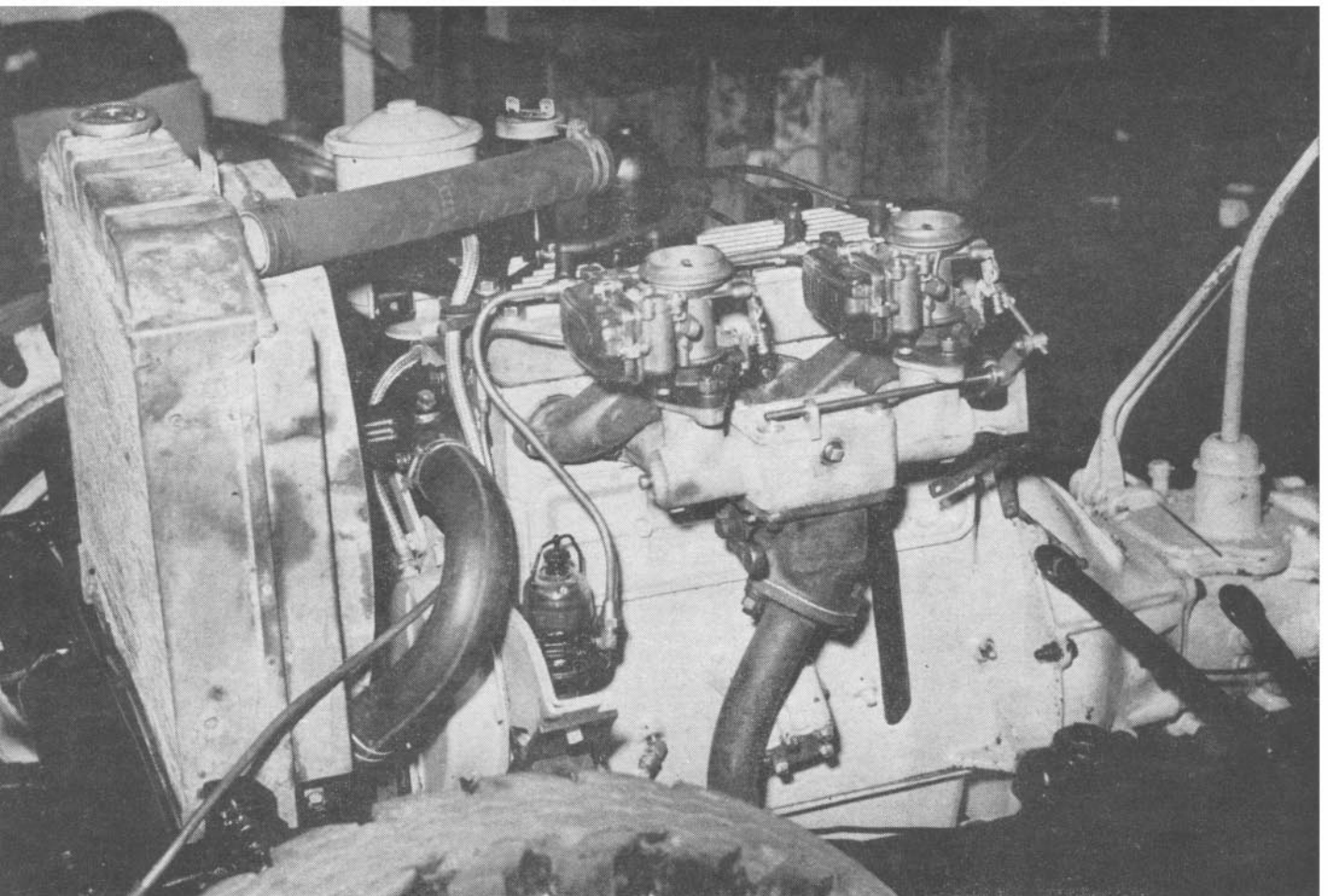


• Jeep crankshaft has adequate bearing areas and strength for converted engines.



• Sturdy Jeep camshaft has four bearings, lobes ground for mushroom valve lifters.

Photos by Felix Zelenka



• Red-hot Jeep engine complete with dual carburetors, Hickey cylinder head, and Potvin reground camshaft.

Photo by Rickman  
continued

## L-HEAD JEEP *continued*

with .007 inch skirt clearance instead of the recommended .002 inch. A clearance of .007 inch seems a little on the wide side for stock type pistons but Vic assures us that oil consumption is not excessive with SAE 30 oil in the crankcase for normal driving and SAE 40 for hunting jaunts over rough terrain. A shallow relief which starts flush with the top of the block about  $\frac{3}{8}$  inch from the edge of the cylinder and increases uniformly in depth to approximately  $\frac{1}{8}$  inch at the edge of the bore was ground on the valve side of each cylinder. The theory behind the relief was to ease the flow of combustible mixture and exhaust gases into and out of the cylinders.

The engine's breathing facilities were improved substantially by enlarging its intake ports approximately  $\frac{1}{8}$  inch at their outer ends and approximately  $\frac{3}{8}$  inch in the area around the valve guide bosses. The passages were reshaped and streamlined by grinding away part of the guide bosses and the upper surfaces of the passages. New valve seats  $\frac{1}{16}$  inch wide were ground to a diameter slightly smaller than that of the valve heads, and the ports under the valves were enlarged to match the diameter of the seats. The exhaust ports and passages were given the same enlarging and streamlining treatment as the intakes, and the valve seats narrowed to a width of approximately  $\frac{1}{16}$  inch.

Stock intake and exhaust valves were used with their original seat angle of 45 degrees. The valve faces were narrowed to  $\frac{1}{8}$  inch by undercutting the valve heads on the valve refacing machine. This was accomplished by setting the machine at 30 degrees and grinding the underside of the heads until the faces were narrowed to the desired width. Narrowing the faces by removing material from the heads in this manner provides greater passage areas

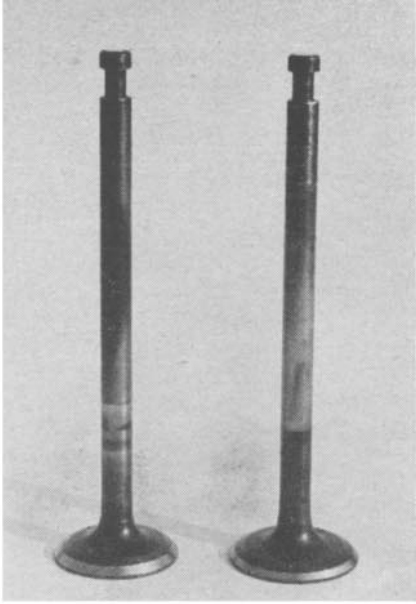
for fuel and air mixture and exhaust gas flow when the valves are open. Valve spring tension was increased by installing spacers .060 inch thick between the upper ends of the stock springs and their seats in the cylinder block. The spacers were made by using sufficient thin steel shim washers to build up the desired thickness.

The valves are actuated through stock cam followers by a Potvin camshaft which opens the intake valves 18 degrees before top center and closes them 58 degrees after bottom center, and opens the exhaust valves 56 degrees before bottom center and closes them 20 degrees after top center. Valve lift is .320 inch for both intakes and exhausts. Stock camshaft specifications are 9 degrees before top center and 50 degrees after bottom center for the intakes, and 47 degrees before bottom center and 12 degrees after top center for the exhausts.

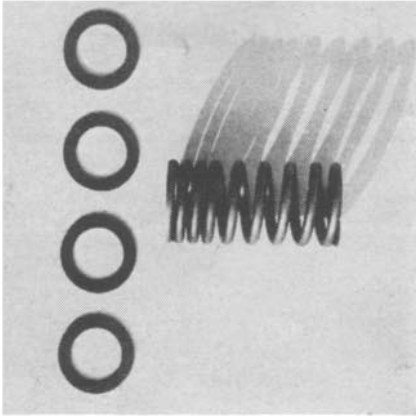
The main bearing journals on a stock crankshaft were ground .0015 inch under-size and the connecting rod journals .001 inch for additional bearing clearance. Factory type bearing inserts were used for both mains and connecting rods. Reducing the journal diameters caused a slight drop in oil pressure at idling speeds but no change could be noticed at speeds above idle. The Jeep crankshaft and bearing assembly is exceptionally rugged for the engine's displacement and should be capable of withstanding the rough treatment usually given converted engines without suffering any loss of durability.

A milled Hickey aluminum alloy cylinder head which provided a compression ratio of 10 to 1 was tried on the engine but detonation proved to be too severe for normal use with pump gas. The detonation was eliminated by installing a standard 7.75 to 1 Hickey head—the bore increase, however, boosted the compression ratio to approximately 8 to 1.

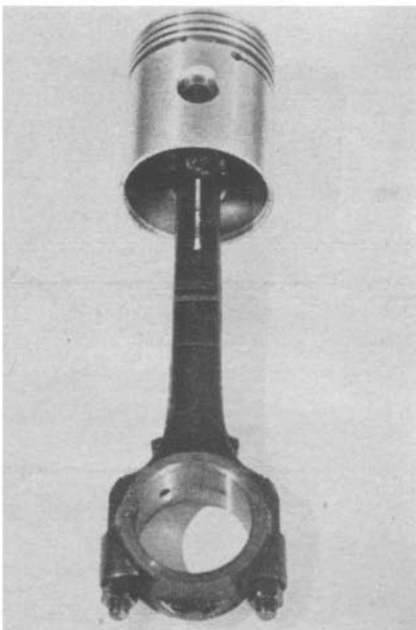
Two carburetor and intake manifold setups were tried. One of these was a



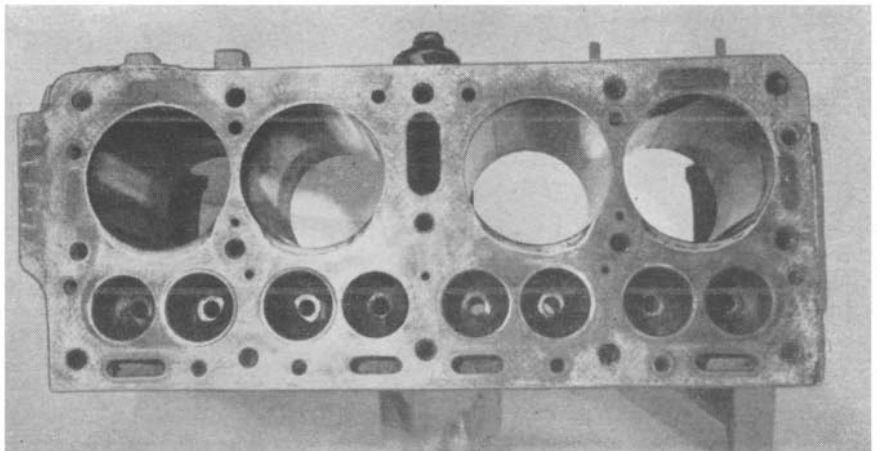
• Faces on stock Jeep intake and exhaust valves narrowed by undercutting heads.



• Valve spring tension was increased by installing shim washers with each spring.



• Connecting rod is long and heavy. The slot at upper end is potential weak spot.



• Modifications to cylinder block and valve seats and ports can be seen in this view. Valve seats were ground to the largest diameter possible for use with stock valves.

Burns dual manifold with two 1952 Ford six Holley single-throat downdraft carburetors. Because of restricted hood clearance, a flat Hellings air cleaner was adapted to each carburetor. The Holley carburetors operated fine for ordinary driving on level ground but were not satisfactory in the hills. A Henry J manifold and a single-throat Carter YF downdraft carburetor were then tried and found to be satisfactory for hills as well as level ground. Stock metering jets were used in the carburetors of both setups, and the stock exhaust system was retained. Ignition is provided by a late Willys IGW 4189 Auto-Lite distributor.

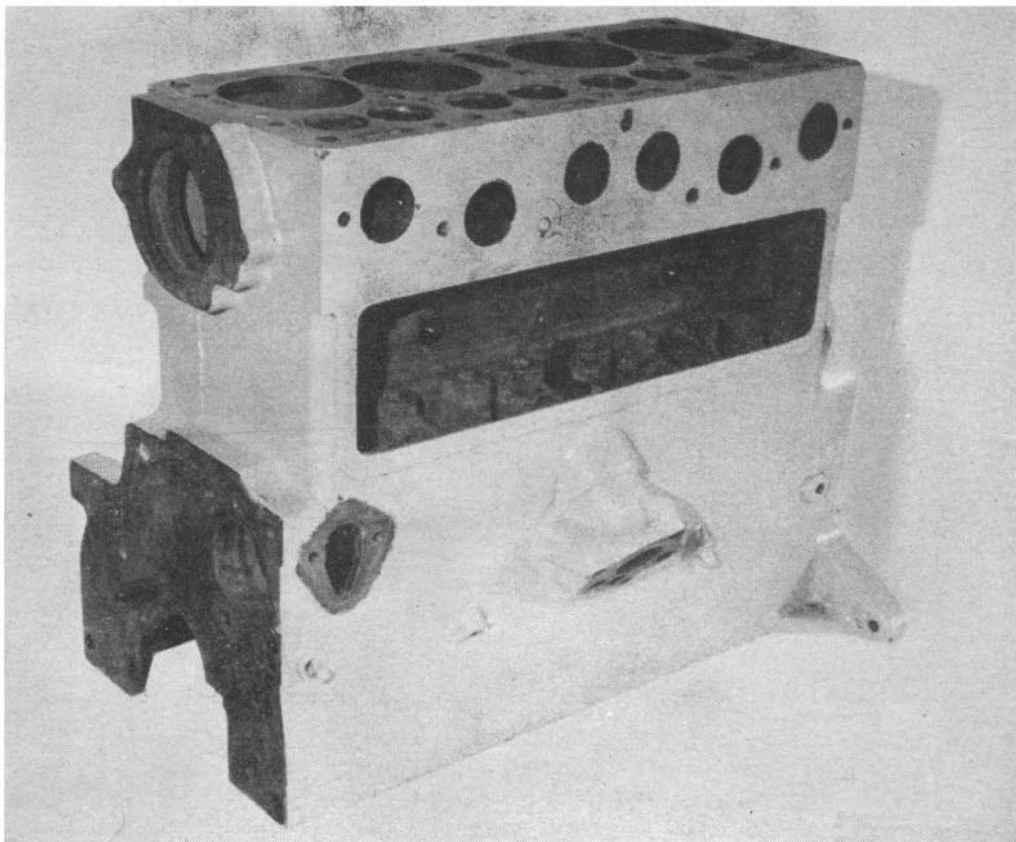
Vic recommends an optional high altitude radiator with its thicker core instead of a regular-service radiator for rough going. The thicker core provides that extra bit of cooling capacity sometimes necessary to prevent engine overheating.

Another recommendation of Hickey's, which adds to driving ease rather than performance, however, concerns the Jeep clutch linkage. By simply drilling a new hole in the clutch actuating lever on the shaft that runs between the frame and transmission, the pressure required to operate the clutch pedal can be reduced considerably without adversely affecting the releasing characteristics of the clutch. The new hole should be drilled in the lever nearest the transmission, just an inch below the original hole. This reduces the leverage between the pedal and the clutch release arm and, consequently, the pressure necessary to operate the pedal.

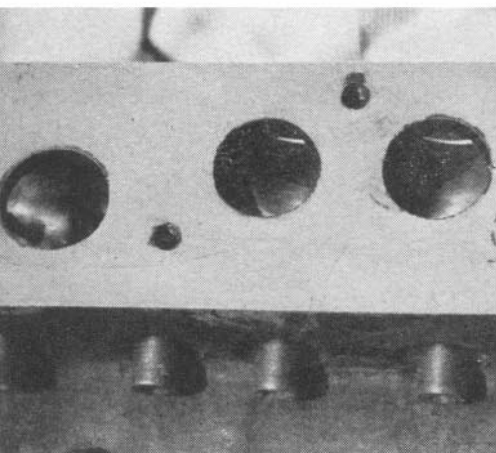
From all indications this will be our last article on Vic's Jeep—but, on the other hand, who knows what Hickey will do next? Maybe he'll decide it needs a Hydra-Matic for smoother shifts on the hills, or maybe flotation gear for deep-sea fishing. Perhaps, on second thought, it would be wiser in the long run to wait and see what happens before we make any predictions.



• Vic Hickey and Don Francisco discuss installation of finned aluminum head on Jeep.



• The Jeep cylinder block is of conventional en bloc construction. It has removable bell housing, full pressure lubrication, replaceable valve guides and external oil pump.



• Closeup of block's reworked ports shows polished surfaces and lack of restrictions.