ENGINE-BUILDING TIPS

GET 467 CUBES FROM A 283 CHEVY

DICK DI BIASI, of De Bi's Enterprises, Madison, New Jersey, has tackled the difficulty of increasing cylinder bores with a refreshingly new approach. Instead of attempts to gain a meager .060 to .125 inches by boring, then running into weakened cylinder walls, he tackles the problem at its roots. The result is a 4 5/16-inch by four-inch stroke in a Corvette engine that retains the somewhat oversquare bore and stroke ratio of the modern engine and gains enough cubic inches to match its larger competition. Since cast iron offers far better wear characteristics than steel and is easier to weld to parent block material, Dick selected cast iron sleeves as the material for his new cylinders.

The block was set up on a stand and the existing cylinders were bored out until little more than "tissue paper" remained of the original stock. The remaining metal was then chipped out from the block, rather than take a chance on the boring bit catching and jamming. At this time, some bridge metal still joined the sides of the upper and lower decks of the block. Additional cuts, in far smaller bites, were taken until the bores actually overlapped, leaving a cast iron outer shell in one cylinder bank.

The cast iron sleeves which replaced the original cylinders were machined with small chamfers, top and bottom, to facilitate installation and provide a "V" for better weld penetration. A small step was formed in the top of the block by setting the boring bar ⅛-inch oversize and running it down a similar amount.

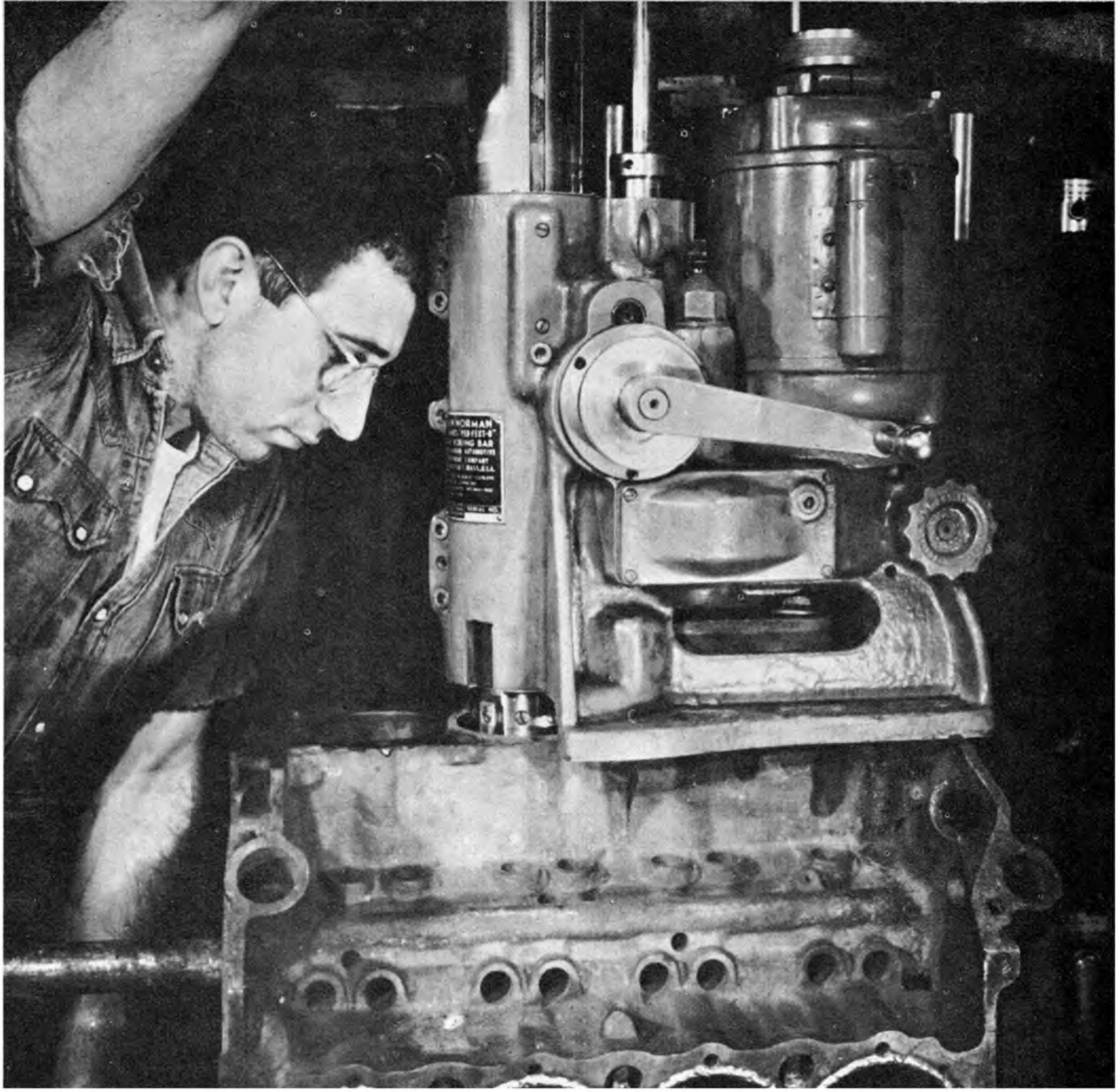
We now come to the most controversial feature of the installation, a set of flats machined where the sleeves adjoin each other. This feature enabled Dick to gain a good 1/16-inch on each side or a ⅛-inch larger bore diameter, while retaining a large ramount of meat in most of the sleeve. For its use as a competition engine, this design may be considered adequate and even ingenious. However, in an engine built for the street we call it a direct invitation to trouble. Engine builders strive to attain "round" bores. To do this they make all possible efforts to maintain uniform cylinder wall thickness so that heat will expand the walls evenly, without distortion. Also, siamesing the cylinders cuts coolant flow between them and furthers distortion. Last, but not least, two closely placed surfaces with drastically reduced coolant circulation around them are prone to cavitation corrosion.

Should you attempt to duplicate this job on a Corvette or other make engine and want to use the mill for a long time, we would suggest foregoing that extra ⅛-inch gain in bore. On the other hand, for an all-out mill like Dick's which is is intended only for the strip, anything goes and more power to you.

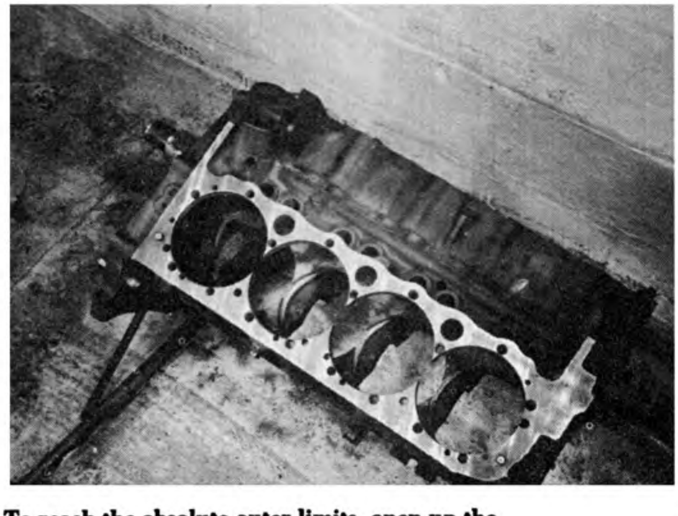
To provide maximum strength for the block and keep at a minimum the pull exerted on the sleeves by cylinder head bolts, Dick decided to add reinforcements in the form of ¼-inch ribs welded to the sides of the water jacket between the cylinders. The ribs extend from the top to the bottom decks and are drilled to offer

Use a screwdriver to remove the remaining sections. The cylinder walls' remarkable consistency of thickness is a tribute to Chevrolet's casting practice.

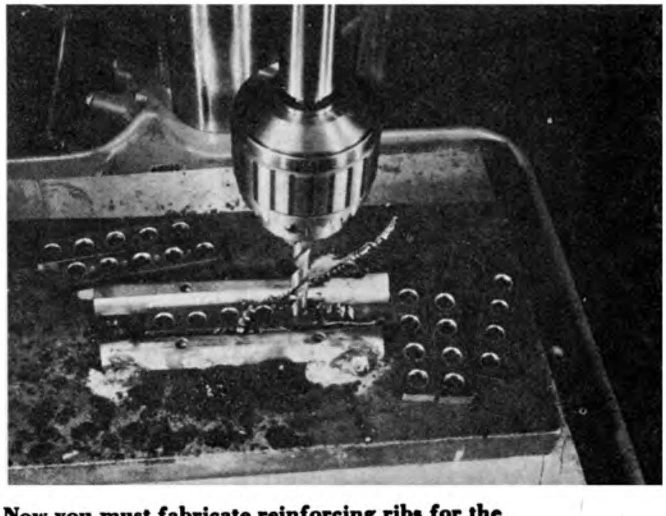
Stage one having been about completed, the cylinders have been almost completely removed. All that remain to go are the upper and lower decks.



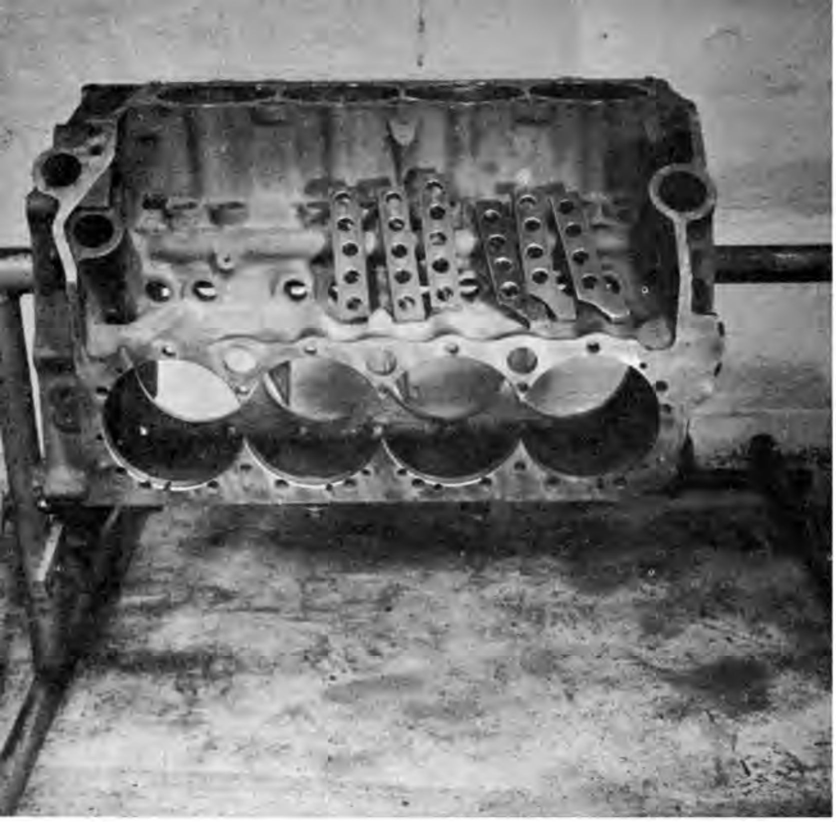
The boring bar is at work "hogging" out larger holes in the block. You must be careful not to go too far so the bit doesn't catch.



To reach the absolute outer limits, open up the block to its maximum. Cylinder separations are gone. The bit has eaten into some head bolt holes.



Now you must fabricate reinforcing ribs for the block. Drill them to allow coolant passage through it. Again, use caution and don't go too far.



Arc weld the ribs on both sides of the block inside the block, using low melting point Eutectic 224 rod. BELOW By welding short sections at a time, and alternating between the various ribs, you can keep the casting fairly cool. It can be touched with the hand within seconds after a weld has been completed. When the block's too hot, stop until it hits room temperature.

Fit ribs to inside shapes of block so they'll reinforce the decks between the cylinders. Note (right) how ribs fall next to bolt holes between cylinders. Reinforcement restores block's strength. Stud holes are partially opened, will be closed via welding, retapping.

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passage for the coolant. We certainly consider this modification to be a key to the success of this block.

If you tried to weld cast iron the same way as you would a steel part, cracks would promptly appear next to the weld as the section cooled. Localized thermal stresses caused by sudden chilling from welding to ambient temperature, combined with the natural brittleness of the cast iron, can make a sturdy cast iron block pop like glass. To avoid this, the entire block could be preheated to a deep red, reducing the thermal shock of welding. After the welding, the block would be allowed to cool down slowly. This relieves internal stresses. However, all mating surfaces would be be remachined.

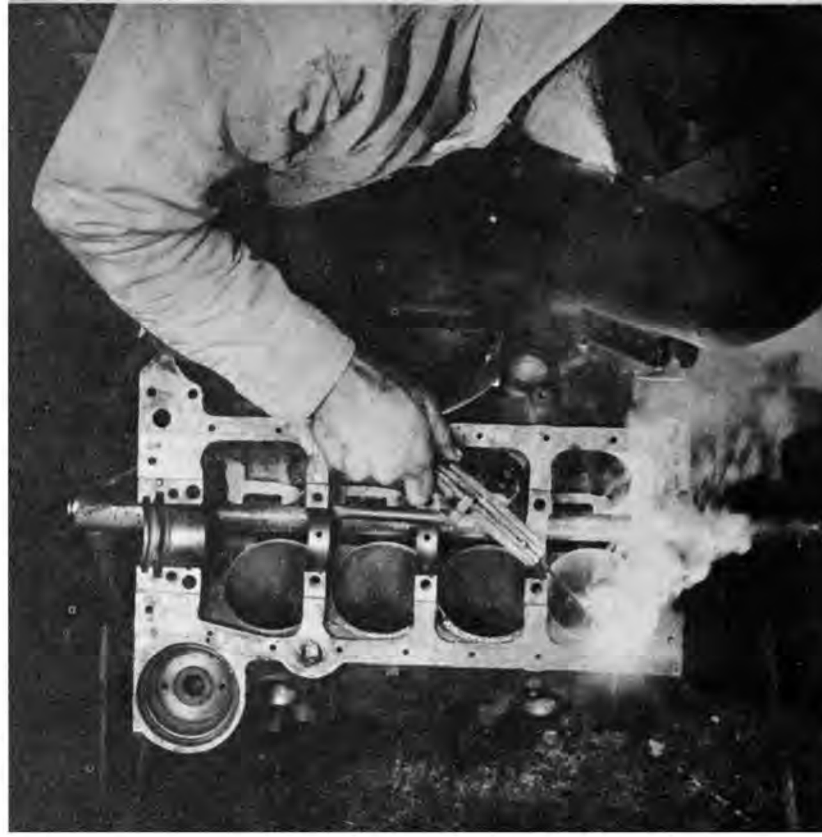
Dick chose a much simpler method, the use of a Eutectic 2-24 cast iron alloy rod which melts at a substantially lower temperature than the block itself. By welding only a small section at a time, heat was kept to a minimum . . . so much so that the block could be touched for an instant with a bare hand within five seconds of any pass with the rod. When the block became too hot for touch, it was allowed to cool back down to room temperature. The care certainly paid off since the casting shows no signs of internal or external "weeping."

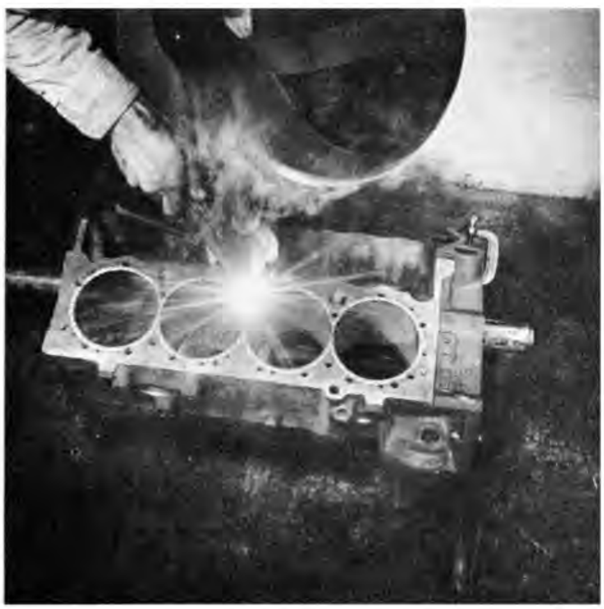
Eutectic makes a cast iron filler which flows on like solder when first heated but requires much higher temperatures for remelting. This makes the filler invaluable in closing porous areas, but it should not be relied upon for initial mechanical strength.

After welding in the ribs, the cylinders were pushed into position. Beads around the tops and bottoms of the cylinders locked them inside the block and assured watertightness. Weld was also deposited in the cylinder head bolt holes affected by the boring operation. Only one side of the block was done at a time to retain maximum support and stability during machining operations.

A considerable amount of reinforcement was added to the main bearing webs, and new four-bolt main bearing caps were installed in the engine. As an additional precaution, the lower section of the block was refaced and the mains were linebored. For maximum accuracy, the tops of the block were refaced with

Now fit the sleeves into the block. The side of each sleeve must be milled where it connects to the adjoining cylinder. This offers a ⅛-inch gain in permissable bore size. The lower sections of the sleeves are also welded to the block. Then reinforcements are added at the main bearing webs where the boring bar has met them. Extra reinforcement must be added along the flange width.





ABOVE Completed block is about to go out for refacing and a final boring job. The cylinders are, for all practical purposes, siamesed. LEFT Resurfaced block is ready for final finishing such as facing decks, drilling, retapping holes.

reference to the crankshaft centerline. Then the cylinders were bored out.

Affected cylinder head bolt holes were drilled, tapped and fitted with Helicoil inserts for extra strength. C&T supplied a four-inch Caddy crank reworked to fit the Corvette block, Buick connecting rods and forged pistons. Added as a safety precaution was a new oil pan having an eight-quart capacity and extra baffling.

Generally, the bugaboo of engines with unusual increases in displacement is the lack of sufficient breathing ability. However, Dick reserved a special ace-in-the-hole for this engine. After casting one unbelieving glance at the valves he was using, we took a scale to them. Suspicions were confirmed; 2.125-inch intakes . . . straight from a '60 348 Chevy! The exhausts were 1¾ inches, formerly 283 intakes.

"But Dick, there isn't *that* much space between valves on a 283!"

"Yes there is . . . now."

The guide bores had been drilled out to accommodate a set of insert-type cast iron guides. These guides have an offset valve stem bore that adds ¼-inch to the center-to-center distance between stems. A Weber 292 cam supplies ample lift and wild timing in putting these valves to maximum use. '60 Olds valve springs with a sizeable amount of shimming supply the return pressure. The engine was fitted with a Corvette twin quad manifold and a pair for the new Hilborn injectors with two king-sized butterfly valves. Port partitions on the intake side were knocked out.

The engine first went into Dick's '60 Corvette to run as an A/Sports Modified, then was slated for a tour of duty in a railster. There is little question that it is going to set some strip records and likely set a new trend in Corvettes. Most important, though, is the fact that here is a *complete* system for transforming an engine long before the model year changes. If the cylinder block bore-to-bore spacing is large enough, and it always is on a new mill, you can anticipate the displacement increase. While the increased bore approach is certainly as expensive as the stroked crank method, it is more reliable mechanically if used by itself. More inches to you!