HOW TO BUILD A BIGGER 283 CHEVY

Part 1

Buying speed equipment and paying for machine work has left people wondering where their money goes. Here is what is done when the rodder builds an engine for performance.

By George Elliott

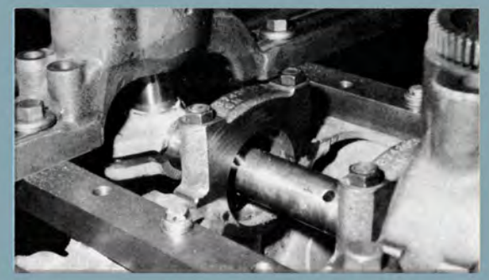
It does not take a bank vault of money to build an all-out performance engine. Of course, it can't be done for nothing either. But, the person who puts some forethought into his project can save himself quite a lot of money. It could even reach the hundred dollar area! It is with this article that POP ROD hopes to help the Chevy engine builder in building his engine.

Often people see speed products advertised but they don't know what to expect for the price. Sometimes a shop manager will quote the builder a price for machine work and the customer wonders for what he is spending so much money. Perhaps the lost and wondering world of "what's happening" will be clarified with this story. For now we are going to build the Chevy engine, explaining what is done from the machine shop until the last bolt is turned in your garage.

POP ROD readers have been sending

Once the block is hot tanked it gets steam cleaned to remove grease and particles from passages.

Align boring evens and trues the main bearing mounts. Main caps are removed and milled .018 inch to even caps prior to boring process.

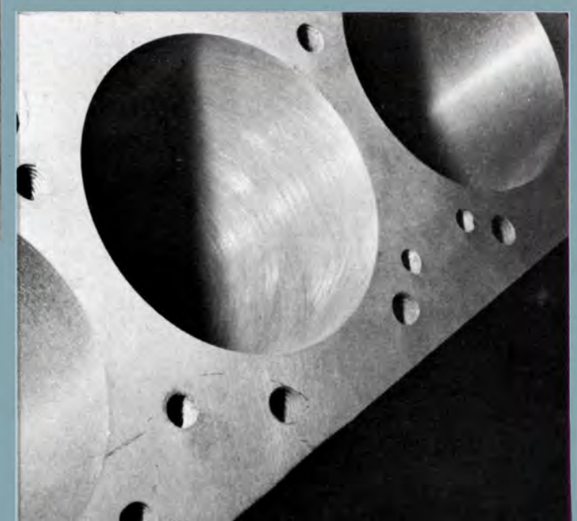


Each main bearing bore is machined individually. The process is very time consuming — but worth it. The engine will gain approximately 500 rpm from the job.

RIGHT, The Quick Way boring bar is being readied to enlarge the cylinders to three and 15/16 inches. Machine is fully automatic and very accurate.

John Ryans trues engine block to Quick Way boring bar. Block mounts at main bearing pads and cylinders are bored at the crank angle. Old boring bars bored at block deck angle.

Cross-hatch honing is used by Taylor Engine Rebuilders. Method aids rings to seat and enables more lubrication to the cylinder walls.



Evening the deck of block is done on a milling machine. Surface is machined only the amount it takes to skin-cut entire surface.

A radius is ground into the main and rod throws. This relieves stress and helps prevent a crank from breaking.

A CrankShaft Company Dyna-Rev crank is being used. Here the counterweights are being added. New weights eliminate crank flexing at high revs.

Cross drilling the main bearing oil holes is preferred over grooved mains. Process gives bearings better lubrication under racing loads.

suggestions as to what should be done with the Project "X" 1957 Chevy (we are using the engine from the '57 Chevy for this article). Of all the letters most everyone wants to rebuild or modify their engine. Some feel this should be accomplished by swapping a bigger engine into the car, such as a 327, while others would rather save the big expenses of buying another engine and rebuild their original mill. The starting point, therefore, will be with the 283-cubic-inch engine.

The 283 block will be bored to three and 15/16 inches, which will make the engine 292 cubes. The crank, rods and entire block will undergo special modifications. A set of pistons will be selected to best fit the engine's needs. The heads to be used are Mondello 327 heads and other equipment will be tailored to make the engine perform at its best. This outline might sound simple and brief, but it does not account for the fine detail that goes into each of these areas.

This fine detail is where we will begin this article and it will be followed up with balancing onto the final assembly and installation.

Once the engine was removed from the '57 Chevy engine compartment, all parts were stripped from the block. Those that were definitely going to be used in the reworked engine were set aside. The rest of the equipment was separated and stored. It is a wise idea not to throw away any parts until you have finished the complete engine and it is running again. Several of these parts will be exchanged as cores when purchasing new equipment.

The block, pan and any other steel

Finished Dyna Rev crank receives final inspection by Alex Alexander, owner of CSC. Straightness, index and throw sizes are double checked. Crank has been magnaflux checked three times.

CSC rods are 327 Chevy type. Extensive rework strengthens each unit for performance use. Pin points to reinforcement around crank end.

or cast iron parts which need cleaning can be readied for hot tanking. This includes cylinder heads, too. With the Project "X" mill we did not have the 283 heads hot tanked since a set of Mondello 327 Chevy heads will be used. Hot tanking is a cleaning treatment that breaks loose heavy sludge, carbon and rust which accumulates inside the engine block. The chemical is a caustic solution and the parts soak inside the tank for a minimum of four hours with an agitation tank. Taylor Engine Rebuilders of Whittier, Calif., performed the hot tank work on our 283 block. Taylor keeps the parts in the solution for 24 hours to assure that all foreign particles will be loosened.

Preparation of the block for hot tanking consists of removing any aluminum, babbit and other soft materials, such as bearings. When the hot tank soaking period is completed, the block is completely steam cleaned to remove the chemical solution and loosened crud.

Nelson Taylor and John Ryan, coowners of Taylor Engine Rebuilding, explained the work that should be done to the engine. Of course, the aforementioned hot tank process was included. The rest of the procedures should include align boring the mains, boring the cylinders, surface the deck of the block and hone the cylinders. This description speaks broadly about what Taylor suggests. The art of the job is noticed when the work is done.

Align boring the main caps is the first step in engine block machine work. The reason one starts here is that the boring bar used by Taylor bores the cylinders parallel to the mains. This procedure will be explained in detail further on. Before removing any main caps they should be stamped on the cap so not to mix them up from their original mount. The caps are then removed and milled .018 inch. The mill cut is taken in two passes with the first cut at .010 and the second (final) cut at .008. If any irregularities were in the caps' surface they would be cleaned up in the process. Burrs are removed with a file along the edges. The caps are torqued to the block at normal torque loads. The aligning tool is then set to take a "skin" cut at the bottom of the bearing bore. This trues the concentricity of the main bearing bores. After each cut is made the mains are checked with a micrometer to make certain that each bore is at the exact stock size. The align boring process is a timely one as each main bore is made individually. In other words one main support is completed before the next one is started. When the align boring process is completed, the engine owner can figure that 500 RPM will be gained by the process. This is from the elimination of crank drag, which is often found in the stock engine from main bores not being in perfect alignment or concentricity.

As we mentioned the cylinders are to be bored at three and 15/16 inches. The absolute bore size that one should consider making the 283 Chevy block is four inches. The four-inch bore block will give 301 cubic inches. Taylor does not recommend the 283 builder try the four-inch combination for street use. The walls will be too thin and stand a good chance of cracking from excessive heat. With the three and 15/16 bore there is enough wall to safely use the engine under both street and dragging loads.

The next step is to bore the cylinders. However, a set of pistons should be selected prior to this. By having the pistons the person boring the engine can make sure that each piston will properly fit the bore.

JE Piston Company filled the bores of our engine with a set of medium domed aluminum pistons. Bill Pendleton, owner of JE, suggested that the medium dome be used. This, he thought, would be the best set-up since a lot of street driving would be required of the engine. He also has a flat top, small dome and a high dome piston for Chevy engine builders. In other words, something for any need.

When you select a set of pistons, JE recommends that you fully know what your engine will be displacing. This means the cubic centimeters of the cylinder heads, bore desired, cam lift, gasket thickness, deck height and if cast or forged pistons will best fill your needs. With this information Bill Pendleton will compute the best piston for your engine. When we say compute we mean with a computer. JE actually feeds all this information into a computer machine and the exact, accurate description is figured. Another point that JE emphasizes is that the person boring the engine should bore the cylinder to the exact size desired. The pistons are cam ground to provide proper cylinder wall clearances for that size. For instance, our engine will be bored to exactly three and 15/16 by Taylor. The wall clearance will be built-in, so to speak, when the piston is made.

With the piston selection made, Taylor proceeded to make the cylinders three and 15/16 inches. The boring bar used is one of the most improved machines that hot rodders have working for them. This machine – called the Quick Way – will bore the cylinders at exact angles to the crank. Old type bars would bore the cylinders at the angle of the cylinder block deck (top). If the deck was off – so would be the bore. Since the mains were align-bored first, the cylinders will match the crank.

The block is set on a trunion (the part which the mains are mounted to the machine) and alignment is made to set the angle of the block level to the machine. This is done with an oil level and tool which is part of the machine. The cutting tool is set with a device that prevents inaccurate settings. The bar is lowered into the cylinder and automatically centered. The push of another button locks the setting in place and the tool makes its pass down the walls. Although the procedure sounds time consuming it really isn't. Everything is done by pushing buttons, with the exception of the initial mounting of the block to the machine. The bar makes the rough cutting of the cylinder and a hone is used to finish the cylinder or bring it to its base metal. The type of hone that is cut into the cylinder wall is called "cross hatch" honing. This is done by honing the wall in both a left and right hand direction of rotation. It will provide better cylinder lubrication and help the piston rings to seat.

When the boring and honing is completed the block is transferred to Taylor's milling machine. The block is mounted to the table of the machine by the crank main bearing supports. Again this makes every step performed on the block coincide to the mains, or it might be referred to as being aligned to the crankshaft. The large milling machine is set to make a thin cut only. Each pass is made in this manner until the engine surface has been evened. Usually this is from .003 to .005 of an inch. The procedure makes for better sealing when the block and heads are mated in assembly.

The final step in the engine block preparation is to install new freeze plugs and the cam bearings. A large variety of freeze plugs are available and there are no particular recommendations for the type to use.

Installing the cam bearings requires a special tool to prevent any damage to them during the installation. The most important step is to make sure the oil holes in the bearings line up with those in the block.

While the block preparations are being made, the builder could be having the crankshaft reworked. This can be done by rejuvenating the stock unit or by purchasing one that is specially designed for performance use. The latter idea is the better.

Crank Shaft Company of Los Angeles has a crank that offers more than just a reworked unit for the Chevy enthusiast. It's referred to as the Dyna-Rev crank. This crank is made from a 283 crank and incorporates several devices to make the hot rodder's engine last longer and perform with less strain. Here is how the Dyna-Rev crankshaft gets reworked.

Every crankshaft is checked between two centers to measure the straightness of the unit. The index is measured, (index is the term used when measuring the throw's position to tell whether or not the piston travel will be on time) and the crank is then magnafluxed. If the unit passes these tests then it will be built into a Dyna-Rev unit. The first and major modification is the addition of two counterweights. The counterweights will reduce crankshaft flexing which is produced during high RPM revving. Of course, less flex means less chance of blowing-up your engine. This step, also is credited for a 25 HP gain in performance. The counterweights are heli-arced to the crank after it has been pre-heated to 400 degrees for two hours. After welding they are stress relieved by heating to 1050 degrees for a period of three hours. They are magnafluxed again for cracks and then checked for straightness. Providing they still conform to standards of Crank Shaft Company they continue getting modifications. This now includes cross drilling the main throws for better oil distribution. Although this procedure is common among late model performance engines, the earlier Chevy crankshafts did not provide for this. Cross drilling also eliminates the need to groove the mains in the Chevy crank. Grooved mains are not preferred by Crank Shaft Co. since they tend to dig into the bearings. The

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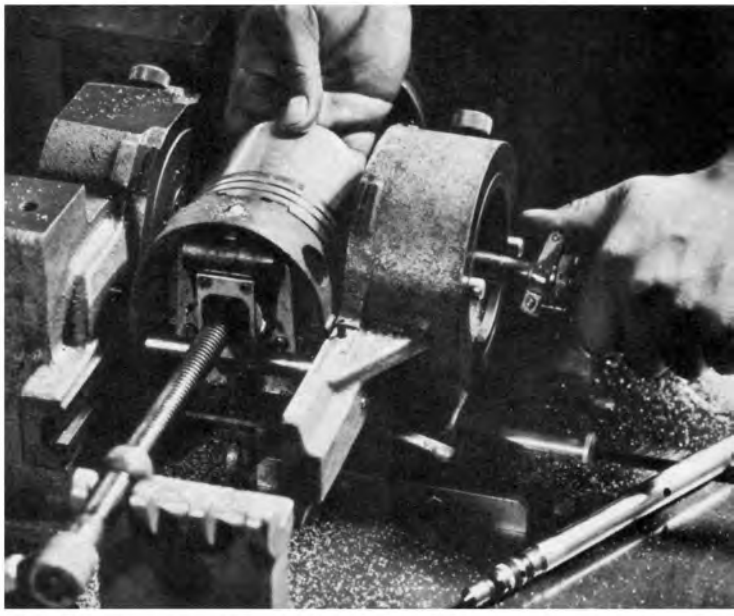
Rod bolt ends get small radius to relieve stress points. This can be done with a small rat-tail file if using your stock rods.

Forging overlap ridges are polished smooth. Rods are magnafluxed to assure no cracks are present.

Special high stress bolts replace stock type. CSC has found these to make higher rpm engine speeds safer.

Pistons are rough machined on automatic lathe. Final sizes are cam ground for perfect concentricity.



Pin fitting is given close attention. Pins come pre-fitted with pistons.

JE Racing Pistons fill the bores with medium dome aluminum units. All JE pistons have polished tops.

Final inspection of JE pistons includes micrometer inspection of skirts, pin bores and ring land depth.

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crank pads are widened by side grinding and a radius is ground-in. The radius is .062 inch for the rod throws and .093 on the mains. A final grind to make the crank .010 – .010, under stock, and the proper bearing clearance finishes the grindings. The unit is magnafluxed again and then polished. The final step is inspection where the crank is miked on each throw and checked for index and straightness again. Once the crank passes its final step you can assume that your engine will easily gain another 800 RPMS over a stock unit. This, of course, does not mention the amount of strain that will be relieved from the crankshaft under high RPM loads.

Connecting rods also undergo modification by Crank Shaft Company. The original 283 rods are replaced by 1965 Chevy 327 rods. The 327 rods are stronger due to reinforced pin hole shanks. The "I" beam is thicker and the big end of the rod is beefier, too. Before the rods are reworked they are checked to conform to minimum standards. The pin hole must be able to take a special thin aluminum bushing that CSC uses. They are magnafluxed, checking for cracks.

The rod is polished along the ribs to remove the forge laps and any stress risers that might be on the rod. The bolt holes are radiused to relieve the area from stress. This is often where a rod breaks and it is usually because the bolt holes were not radiused. High performance bolts, which have a considerable higher "pull" range than stock bolts are installed. The rod ends are re-bored and honed for perfect roundness. The inside diameter of the big end of the rod is finished at 2.1247 inches. This is smaller than stock and will give the rod a firm bearing "crush." In turn this reduces the chances for bearing spin. Rod ends are surfaced to give the required lateral clearance and to parallel the ends. Center-to-center of each rod is matched. A hole is drilled in the top of the rod to allow added oiling to the wrist pins. Final inspection is made to assure straightness and proper sizes.

As you have probably noticed, each part or procedure mentioned in preparation of the block, crankshaft and rods included some procedure for double checking a measurement. Even though the manufacturer double checks his product or work, the builder should not be afraid to check them again. During assembly every part should undergo your personal inspection. If there is doubt or a question perhaps a phone call to the manufacturer will prove beneficial. They would rather talk and discuss the problem than have you bring the part back broken when double checking might have prevented the problem. Assembly and balancing will be covered in the next series on building the 283 engine to 292 cubes, double checking procedures will be shown.