HAYDEN PROFFITT BLUEPRINTS the 327 Chevy

Text & photos by Alex Walordy

HAYDEN PROFFITT IS a likeable hombre who has done just about everything from busting wild broncos and riding in rodeos to drving fast machinery. But Proffitt is more than a fine driver. He also happens to be one of the sharpest engine men around, and on a recent junket to the West Coast, we were lucky enough to corral him for an interesting question and answer session.

Engine building is a never-ceasing operation at Hayden Proffitt Associates, and as you could well expect from Hayden's running record, most of them are Chevies getting ready for the drags. Diving right into the heart of the matter, Proffitt told us about the many little tricks that help Chevy live longer. For instance, oil pumps are pretty much taken for granted by people who build engines. They'll invest in $500 worth of pistons, aluminum rods and special valves, after which they will install the same tired old pump or perhaps a new one that hasn't been checked. Then they wonder what went wrong. Very simple, really. The pump wasn't putting out enough oil to let the engine live during full throttle run.

Hayden begins by taking the pump apart and checking clearances. If the gears have worn a slight groove in the end plate, or if there is too much clearance between the gears and the end plate, the oil will be able to get around the side of the gears, hence less oil flow to the engine.

How do you check the clearance? Very simple. You can use a depth mike resting against the oil pump body and see how many thousandths the spindle will go in before touching the gear. If you don't have a depth mike, you can place a plain straight edge across the pump body and use a feeler gauge. Anything over .005 inches is excessive clearance. If you find too much clearance, it is no problem to reduce it. Take a flat glass plate or a flat plate of steel that has been surfaced (window glass is not always flat, but an old mirror usually is). You can now place a piece of fine wet-or-dry sandpaper of 400 grade on the glass and rub the pump body back and forth across the paper. It's just like surface grinding or lapping, and it removes enough metal to reduce the oil pump clearance to the correct amount. A scooped end plate can be restored the same way, or a new one installed.

Too little clearance can be just as bad as too much. Keep in mind that the oil that goes through the pump is hot, and the steel pump gears will expand more than a cast iron body. On a pump with an aluminum body you can run smaller clearances since the pump body will expand more than the gears.

The ports in the pump can usually be helped along by cleaning them up and opening them a little wider to improve the oil flow. Should you be building a late model 396 or 427 Chevy, it's a good practice to replace the pump with a high performance version that has longer gears and a correspondingly larger output capacity. Always check the pressure relief valve for sticking and possible leakage. It's good practice to shim the pressure relief valve spring, and up the oil pressure.

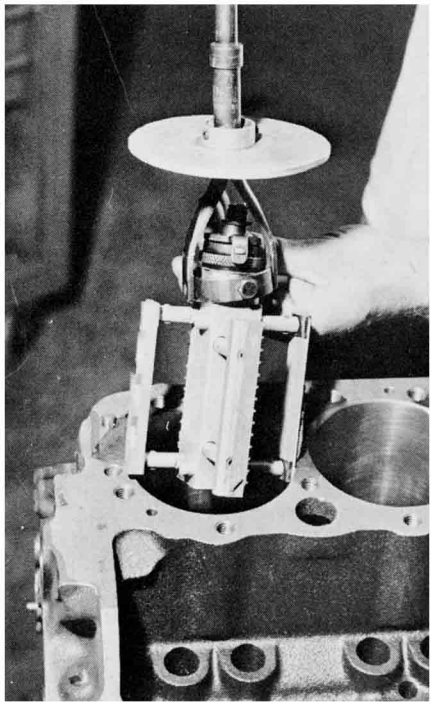
If you are doing some serious running, do install an oil pressure gauge. It not only gives you an indication of the actual pressure you are running, or a quick warning of a sudden oil pressure drop, but will also give you advance warning of problems. For instance, a lower than usual oil pressure tells of leaks or bearing wear and pressure fluctuations may speak of a sticking relief valve.

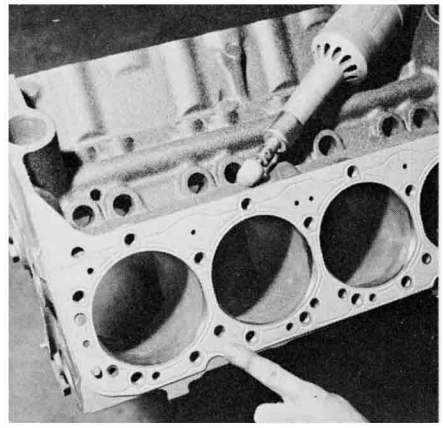
After you are through reworking the oil pump, scrub it down with detergent, to get rid of any dirt bedded into the pores of the metal and oil up all the pieces to keep them from rusting. During engine assembly the pump should be installed, primed with oil.

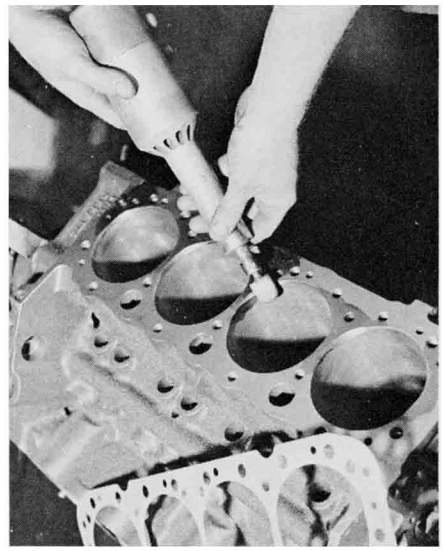
OIL PAN MODIFICATIONS

Oil pan work will depend on the type of car and the class in which you run. With an all-out machine, you can go to a deep sump pan that

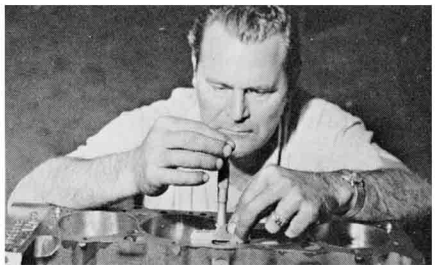
The Old Master goes on a step-by-step excursion through the Stovebolt for power and performance

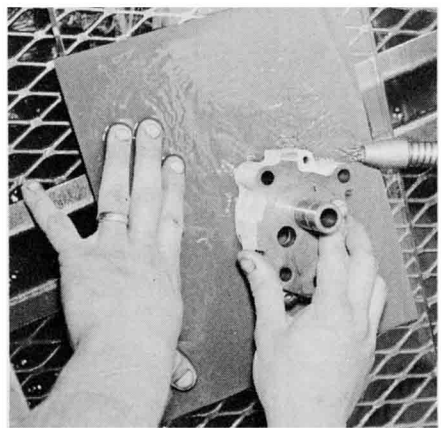




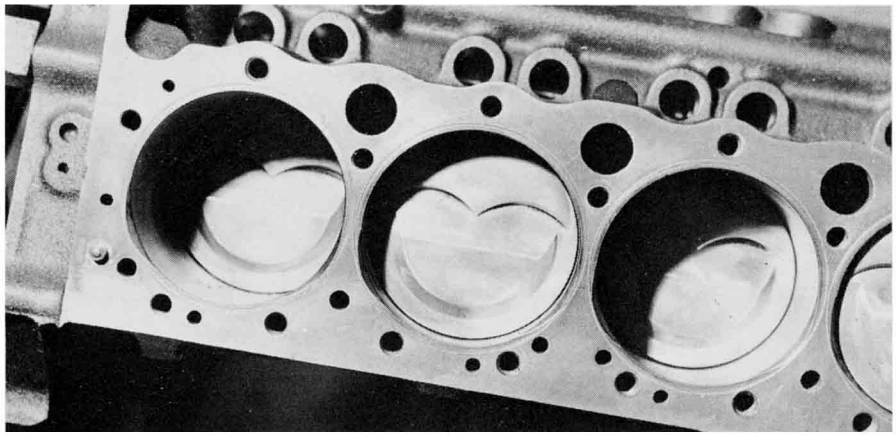


ABOVE—Cylinder hone carries a limiting disc on top to prevent hone travel too far into bores. Chip on one stone shows why the disc is needed. ABOVE RIGHT—To grind the proper size relief on block surface, place the headgasket over locating dowels and mark the area to be relieved. RIGHT—To complete the relieving job, select a grinder and a stone and go to it. Reliefs can be finished with fine emery paper, wet or dry.





ABOVE—Proffitt checks the height of the wire ring above the block deck with a depth mike. RIGHT—To increase oil pump capacity, get a glass plate and a large sheet of 400 wet-or-dry sandpaper, run pump body and end plate over paper to decrease clearance, up output. BELOW—Finished O-ring job looks like this. Note super sano block.



leaves ample time for the oil to flow out any entrapped air bubbles, and to cool. Proffitt prefers a well-baffled pan to one with swinging gates. He also routes the oil pump pickup to the bottom rear of the pan and avoids swinging pick ups because they can be a source of air leaks.

The block is cleaned up after the initial disassembly just so that it will be easy to work on. You can begin eliminating all the sharp edges both inside and out so you won't cut your hands in the rush. Inspect the inside of the cooling passages in the block and get rid of any casting flash or core wires that can be chipped out of the way so that the coolant will flow better and more evenly. The heads are reworked the same way.

To get the oil down from the heads to the crankcase more quickly, remove any sharp edges and open partially closed passages that would restrict flow. After you remove the plugs from the ends of the oil gallery, use a very long drill, or a drill to which a long extension has been welded, and take out any burrs that are left from factory machining. Also, it is good practice to replace pressed in plugs at the ends of the galleries. Tap the end of the gallery, clean out the chips and install threaded cast iron plugs.

You'll find that engine breathing will improve considerably if you provide small reliefs at the top of the cylinder bore, in the valve area. Use a cylinder head gasket as a pattern for the maximum size of the cut and never intrude into the ring travel area. If you cut these reliefs too big, without the use of a head gasket as a template, there is always the risk of going too far, and gaskets will not hold. On early 283 and 327 engines, Proffitt machines grooves in the top of the cylinder block deck, to accept copper wire for cylinder "O" rings. The wire should protrude beyond the surface of the block by .005 to .010 inches, depending on the head gasket which you use. This operation is done last, after the block has been decked, or the decking would upset the groove depth.

If you have ordered special pistons for your engine, your best bet is to hold up on boring and honing and decking until they arrive. You can then fit the block to the pistons rather than be locked in with your sizes and clearances. If the block is rebored, always allow .002 inches for honing and final fitting. Once the pistons are fitted, you can make a preliminary assembly of the engine, without rings, and check the

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deck clearance. There is still time to make a final change by trimming some metal off the top of the block. If you are changing cam lift, rocker ratio or pistons from the stock dimensions, now is the time to also check the piston to valve clearances in each hole. In other words, you are building a race engine and you can't take anything for granted. If you do, don't be surprised when expensive equipment breaks.

CRANKSHAFT CHECKOUT

The crank also comes in for its share of checking and reworking. In the street machine that will put on plenty of miles, heavy duty trimetal or aluminum bearings are best. However, these bearings will be harder on the crank journals. For straight drag use and frequent disassembly, you are better off with babbitt bearings and hard chrome journals. (The softer bearings protect the expensive crank and are replaced before fatigue sets in.) Proffitt has had good luck with grooved mains and a hard chromed crank, using .003 to .0035 inch rod and main clearances. The crank should never be hard chromed into the radius area, for chroming can weaken this critical portion. Hayden Proffitt also Magnafluxes all his cranks and rods to detect cracks that could cause engine failure.

The alignment of the main bearings with the oil galleries should be checked during a preliminary assembly. It doesn't pay to chamfer the oil outlets at the mains beyond 1/16 inch or the oil will start seeping between the bearing and the saddle in the block, altering the clearance.

The main bearing saddle receives a light sanding and the sharp edges at the bearing parting face is rounded. This is done so that this edge will not accidentally scrape off some metal from the steel backing of the bearing, upsetting the clearance by either jamming between the bearing and the saddle or between the block and the main bearing cap.

Proffitt always insists on having his crank checked for straightness and the flywheel flange trued up. Both can be done while the crank is checked in a crank grinder and eliminates potential bearing and clutch problems. Incidentally, it also pays to replace a solid bushing with a ball bearing type of pilot bearing.

Part of the job in preliminary engine fitting is to check the crank end clearance as well as the side clearance on the rods. The end clearance can be set up while the crank is touched up on a crank grinder. You can also remove a small amount of metal from the side face of the bearing, using a glass plate the same way as was done on the oil pump. Your best bet is to use very fine wet-or-dry sandpaper under a steady stream of solvent and to then make a thorough job of cleaning up the bearings. Added rod side clearance can be gained by machining the sides of the rods or by removing some of the metal from the crank while increasing the fillet radius.

Hayden Proffitt prefers to build his engines with Mickey Thompson aluminum rods, where possible. Aluminum rods help carry away the heat from the bearing and are also lighter than their steel equivalent. When using aluminum rods, always wire brush the serrations in the cap and rod because any dirt that gets jammed into the locating grooves will result in excessive bearing clearance.

Proffitt prefers to pin the bottom bearing shell in the rod. This prevents the bearing from turning and burning up the inside of the rod should the bearings tangs fail. He also makes up a simple drill jig that looks like a squared-off bearing cap with a steel drill bushing right in the middle. This jig is used to drill extra sets of connecting rod bear-

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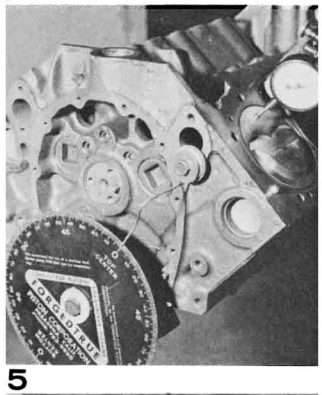

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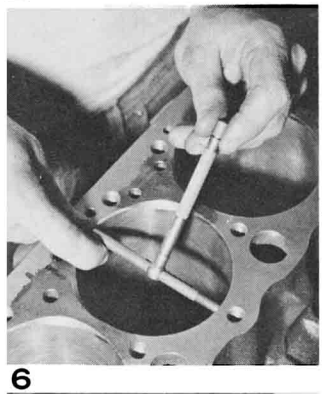

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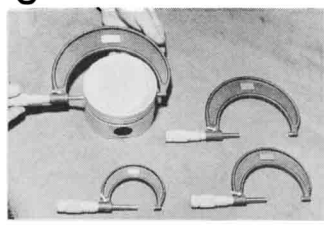

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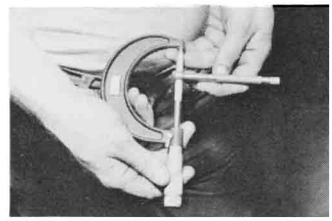

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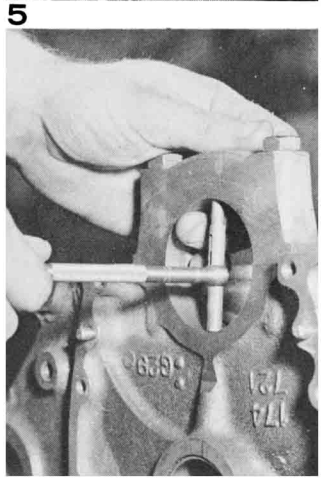

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1. With a correct TDC reading, all you have to do to check deck clearance is swing the dial indicator from piston top to deck surface. 2. Check bores with inside mike during boring and honing operations. 3. Piston size is measured below bottom ring land, at right angles to pin bores, on thrust faces. 4. The way to match up holes with whatever goes into them is to use an expanding inside micrometer with an outside micrometer, as shown. 5. Another mike technique is used to check main bearing saddles for stretch, checking horizontal and vertical planes in each one. 6. For freer lifter action, hone all the lifter bores lightly after checking fit. Too much boring here will result in a loss of oil pressure. 7. Oil holes in main web get a light chamfer job.

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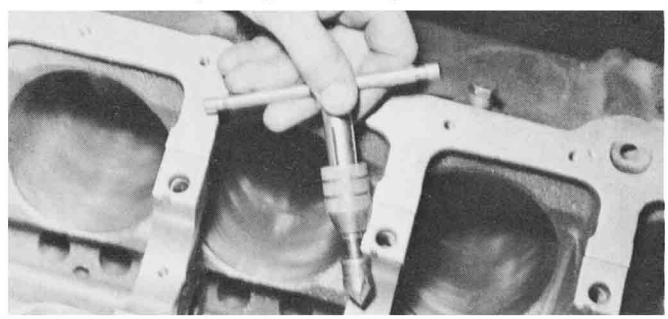
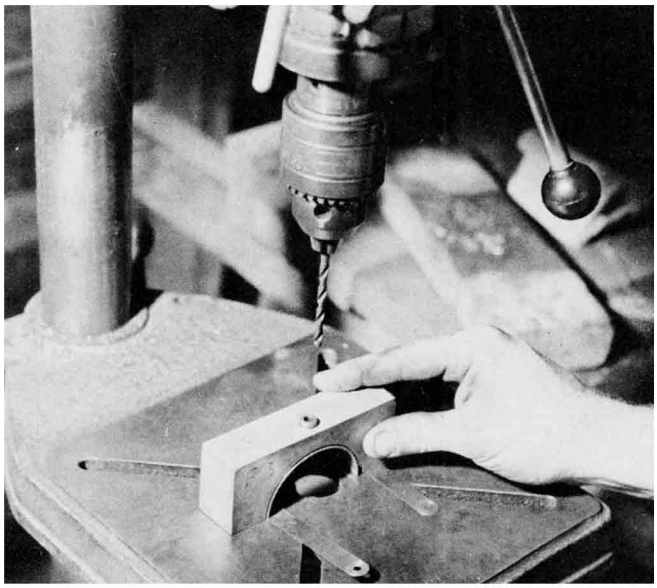
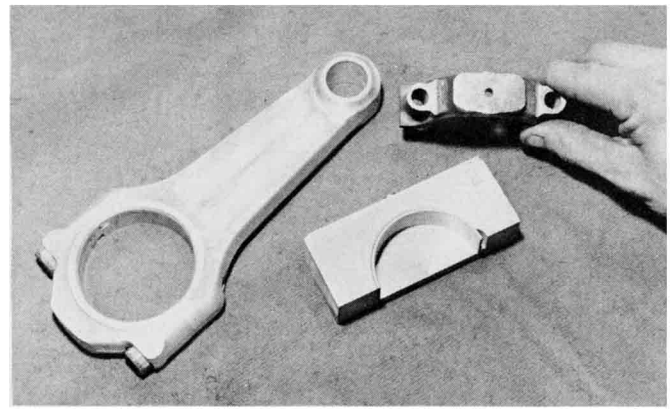
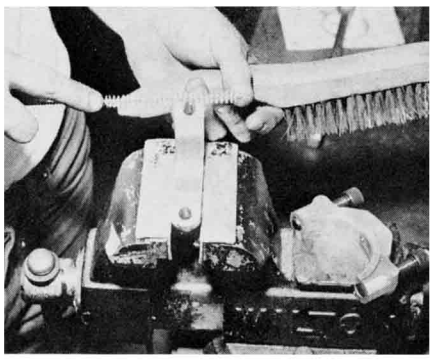


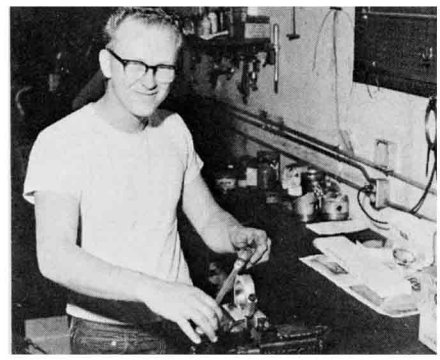




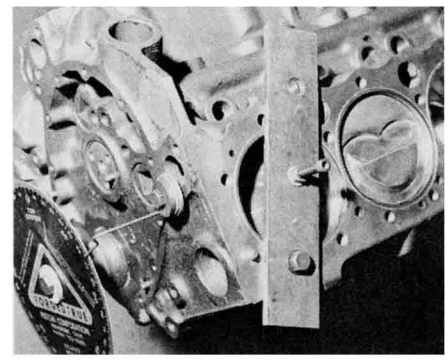
LEFT AND ABOVE—If you should choose aluminum rods for your 327 engine, and these rods have locating pins for the bearings, you'll need a jig like this to rework the bearing shells. When the jig and bearing are placed on the drill press bed, feeler gage leaves are used to level the assembly, and the hole is drilled. The drill bit guide used with the jig points it in the right direction without wearing out after a few uses.



ABOVE—Serrations in connecting rod mating faces should be completely clean to maintain clearances.



ABOVE—When loosening rod cap screws, put the big end in a covered vise to prevent twisting the rods.



ABOVE—This top dead center tool uses a stop screw and two different readings to find TDC position.

ings so that they will fit into the pinned rod.

RODS, PISTONS, & RINGS

All of Proffitt's engines are built with full-floating wrist pins and he prefers spiral-lock type clips, which can be wound into the groove at each end of the wrist pin. These spiral locks are checked at each assembly and replaced if there is the least doubt about them. Hayden also points out that when a wrist pin bangs back and forth between it's locks it tends to put a small ridge right next to the lock. This ridge must be cut down with a knife before taking out the pin, for just pressing the pin through ridge will damage the lock area. The pins are fitted so that they drop through the pin bore in the pistons. For his blown fuelers, Proffitt uses tapered Forgedtrue wrist pins. These have a thicker center section for maximum strength at the rod, and lighter end sections to save weight in lower stress areas.

Aluminum rods will stretch more than steel ones, and you have to allow at least .050 inches between the top of the piston and the cylinder head deck; more is really preferred. To figure out the piston-to-head clearance, add the thickness of the compressed gasket to add the deck clearance if the piston is below the block deck. If the piston pops up above the deck, subtract the deck clearance from compressed gasket thickness to find the clearance from the piston to the head.

Proffitt doesn't believe in just ordering a set of pistons blindly. He specifies what he wants in terms of clearances and piston popup. One of the things that he prefers is a heat dam in the top ring land. This heat dam deflects some of the heat from the top ring area and lets the ring live longer. Hayden prefers a milled-out area in the popup facing the spark plug, rather than a notch.

You can improve the oiling at the wrist pin by drilling through the top of the pin boss and intersecting this drilling with one from the oil ring groove to insure an ample oil supply. Incidentally, the oil ring has enough to do without fighting off excess oil trapped under it. A few relief oil holes under the oil ring will get rid of this.

When all the pieces are pre-fitted, the engine receives its final cleaning operation and this doesn't mean washing it down quickly with a little solvent. The entire block and all of the parts in the engine are washed with a detergent and then with acetone or lacquer thinner to clean out all the pores in the block. As far as Proffitt is concerned, the block seems to work best when it isn't even painted on the outside.

Now is the time when you close up the shop doors and start assembling all those clean parts. Don't stop until the engine is buttoned up and keep the final assembly time at a minimum so that dirt will have less time to settle on the freshly cleaned pieces.

Now that the engine is all built, a tough blueprinted short block, we have left the hardest task up to you. The little finishing touches such as jetting, ignition timing, working out the length of the intake and exhaust stacks, selecting the right gearing, picking the cam, and such. To which Hayden adds: "If you need a little help, come see us." ■