BIGGER VALVES = BETTER BREATHING = POWER!

BIG VALUES are a gateway to power. The bigger the valves, the better on engine can breathe (improved volumetric efficiency) and the more torque you can count on at high rpm. Only it isn't quite as clear cut as that. A big valve weighs more, has more inertia and will cause valve float to occur sooner unless you use stiffer springs. The combination of big, heavy valves and stiff springs does things to camshafts. As a result we have to compromise. Big valves also pick up more heat—heat input is proportional to the area of the valve, or to the square of valve diameter. For instance, a two-inch valve will pick up almost double the heat of a 1.5-inch valve.

When an engine is designed for big valves, certain provisions are made; valve pockets, ports and manifold are all larger. When you install bigger valves into a ready made engine, problems arise; port walls are on the thin side and it's easy to strike water. Cylinder head walls interfere with the valves and breathing, etc. We asked Dick Di Biasi of DiBi enterprises in Madison, New Jersey, about big valve installation and were promptly invited to see a couple of jobs in process. Since Dick is both a good automobile man, and a first class machinist and welder, he doesn't feel bound by convention and old habits. In fact, we have never failed to learn something new after a visit to his shop.

To make larger valves for a 283 Chevy, Dick decided to cut down on 2⅛-inch Chrysler intakes. The valve

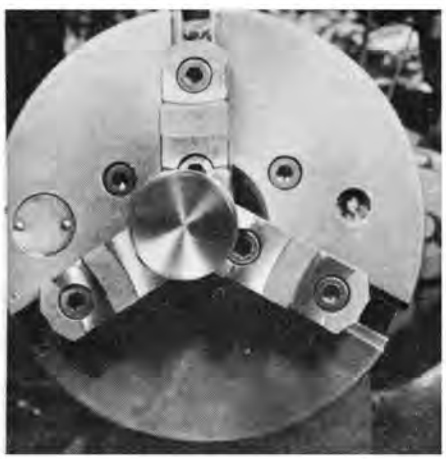
Chrysler intake valve is cut down to fit Chevy. You can always make a smaller valve from a larger one.

Do-All grinder cups valve, lightens it. Lighter valve has less tendency to float. Too light valve is weak.

Remove sharp edges, round corners with file to eliminate source of pre-ignition or corners overheat, glow.

Polish whirling valve with emery cloth. It may not improve performance, but it looks much better.

Finished product is neatly cupped. Cupping makes it flexible, springy, better able to conform to seat.



Cut valve faces on grinder. Provide ½-degree interference between valve and head seat. Some engines need more.

was chucked in a lathe, and machined. Corners were rounded off with a file, since knife edges in a combustion chamber spell nothing but trouble and early failure. A grinder attachment was installed on the carriage of the lathe and the wheel was set at an angle to the valve. With the grinder and valve both spinning, the top of the valve is ground into a cup shape, lightening it considerably. The angle at which the grinding wheel is set determines the depth of the cup.

Cutting the valve head excessively will weaken it. However, some cutting can be beneficial since it gives the valve a certain amount of flexibility, and makes it better able to conform to the seat under gas pressure. Most of the heat is transfered from the valve through the seat. Leakage or distortion of the seat will prevent heat transfer, causing early failure. If the valve is flexible, it is more likely to seat fully and live longer.

Emery cloth used against a spinning valve gives it a luster-like swirl effect. The effect on improved performance of polished versus unpolished valves and combustion chambers can probably never be measured on a dyno, but it does something for your pride of workmanship. A polished surface is reasonably devoid of small surface imperfections that can act as initial strain points or hot surface spots. It should also reflect heat better than an unpolished surface.

Dick favors the three-groove Chrysler valve keepers over the double and single groove keepers and valve spring retainers used by other makes. For instance, he will generally recut a Ford stem with a single groove to accept Chrysler keepers and valve spring. Here, the valves were shortened .360 inches and recut for the original Chrysler retainers.

The Chrysler valve stems are bigger than Chevy ones, which called for reaming the valve guides oversize from .345 to .375 inches, which includes a .003-inch valve stem clearance. Dick made up a counterbore reamer with a pilot end to fit the Chevrolet guide. Another reamer was then used for a finishing cut of .101 inches. A special jig held the head in perfect alignment while guides were bored out. However, even if there were an error, it would have corrected itself, since all seat cutting operations are based on a pilot shaft that is centered in the guide. Thus the seat and valve remain concentric.

A stone was used to enlarge the valve pockets and make room for the bigger valve. Next, a cutter was positioned on the pilot shaft and a recessed groove made to receive a cast iron seat insert. The insert provides a sound seating surface and is installed primarily as a safeguard against failure.

The first step at each port is to install a pilot shaft in the guide and

Here a valve is being shortened and recut for use with Chrysler valve keepers. Bit is shape of groove.

Piloted counterbore reamer opens Chevy valve guides to accept Chrysler stems. Then finish cut is made.

Insert pilot into guide and cut bigger pockets for valves with stone. This is preview of what's coming.

Cutter piloted on same shaft now cuts deep groove for inserting valve seats. They'll be faced-off with head.

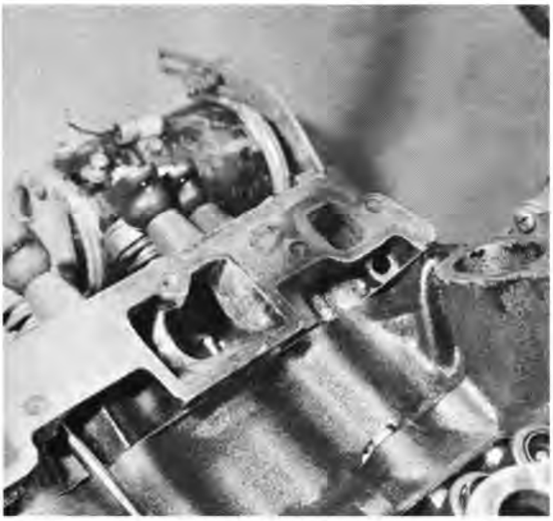
Install seat into newly cut groove with driver. Minimum interference fit will avoid distortion.

Place seats, valves closely so cut for next seat overlaps first. This draws maximum power from engine.

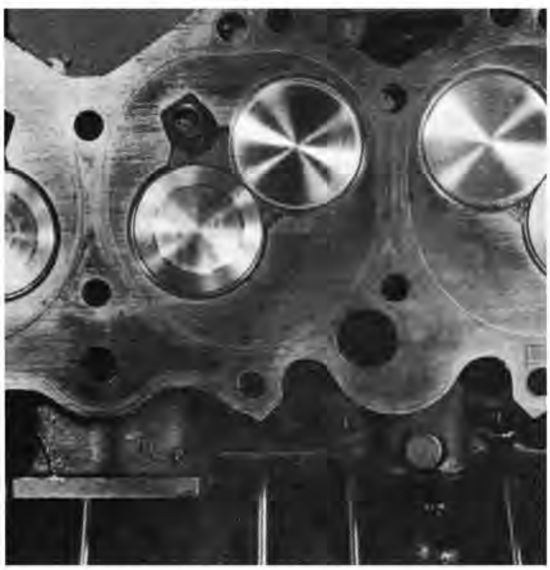
Next valve seat's ready for installation. All excess metal in bowl is removed with hand grinder.

Use blueing on head for reference lines. Remove sharp edge across squish area for smooth gas flow.

High speed toolmaker's grinder (also used by your favorite dentist) helps unpocket valves, round out corners.



Valves on this 348 have just enough room to move. This is largest you can make them without going to eccentric guides. Ports below are as big as you can get them without striking water. Big exhausts came from set of Chrysler intake valves.



use a stone to enlarge the side of the combustion chamber. This makes room for a larger valve and unpockets it for better breathing. Next, a cutter is used, on the same pilot shaft, to cut a recess for the valve seat insert. Since the head will be liberally ported and the walls thinned out, the seat offers a form of insurance against premature failure at a critical point.

Because of the close placement of the valves, the cut for the second seat overlaps the first one. Dick solves the problem by installing one insert before taking the second cut in the same combustion chamber. Normally, one would avoid this procedure, for uneven seat thickness spells distortion. But because this head was designed for a dragster, and would run only for short bursts of speed, the shallow overlap would not matter.

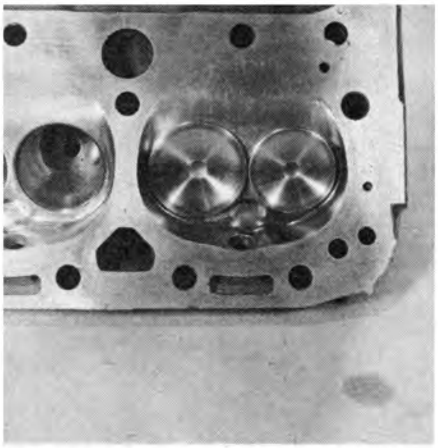
The depth of the seat insert grooves is set so that the inserts protrude slightly above the combustion chamber surface. This is done so that they can be planed down flush with the head by using a stone. All porting operations are carried out before the valve seats are cut so as not to take a chance on marring them.

During porting, Dick found a few thin spots in the casting and went through part of the way. The problem was solved in a simple way by denting the metal still further, with a rounded brass punch and filling in with a Eutectic rod FL18. This is a high grade, flux-coated brazing rod which really does a job on sealing up cast iron. While it cannot be used on cracks, since it is primarily designed for puddling, it was perfect for this application. A little grinding feathered in the brazing job.

Combustion chambers were modified to assist breathing and eliminate potential problem areas. Enlarged valve pockets were faired into the general combustion chamber contours. To facilitate layout, the flat surface of the head was blued and lines were scribed to determine the extent of the grinding areas. The sharp edge formed by the combustion and squish areas was then evenly rounded off for all cylinders.

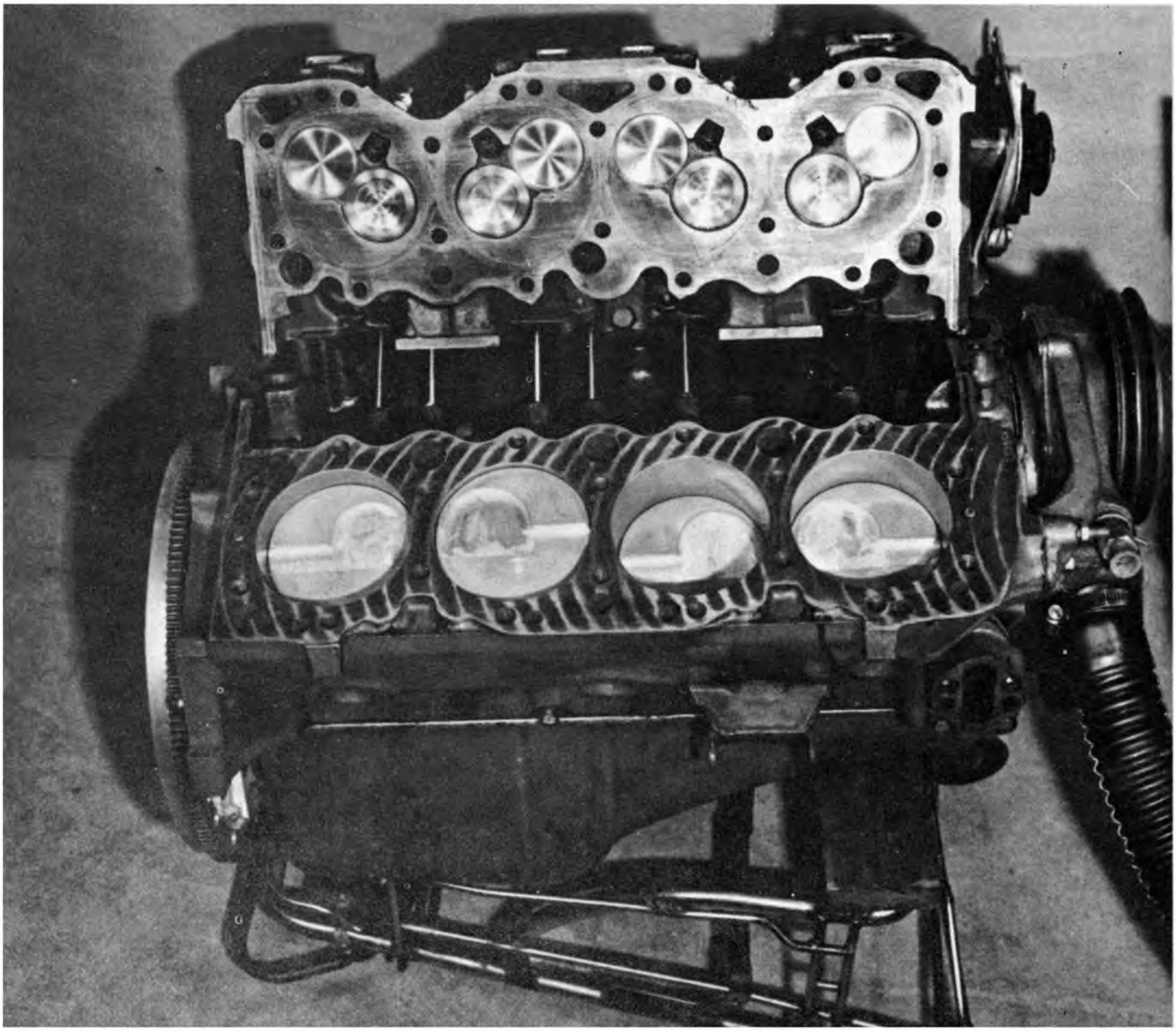
Protruding sections of the valve guides at all intake ports were removed. While this definitely improves breathing, lateral support for the valve is reduced and valve guide wear increases. This is a perfectly valid trade of increased power in exchange for shorter operating life. The partitions at the Chevy ports were cut away quite deeply to gain better breathing at high rpm. For a street machine the partitions would be thinned out, but retained full lengths.

Grind away protruding intake guide bosses for better performance, too. But this invites greater wear.



Fully round combustion chamber to smooth gas flow, improve breathing. Remove combustion chamber's ledge.

Carve ports for maximum breathing at high rpm. Port dividers are almost completely removed for peak hp.



Tops of pistons were altered to accommodate big valves. Valve sizes on 348 were upped from two to 2⅛ on intake and from 1.650 to 2 1/16 on exhaust. This operation can be carried out on the new 409 cu. in. Chevy, too.