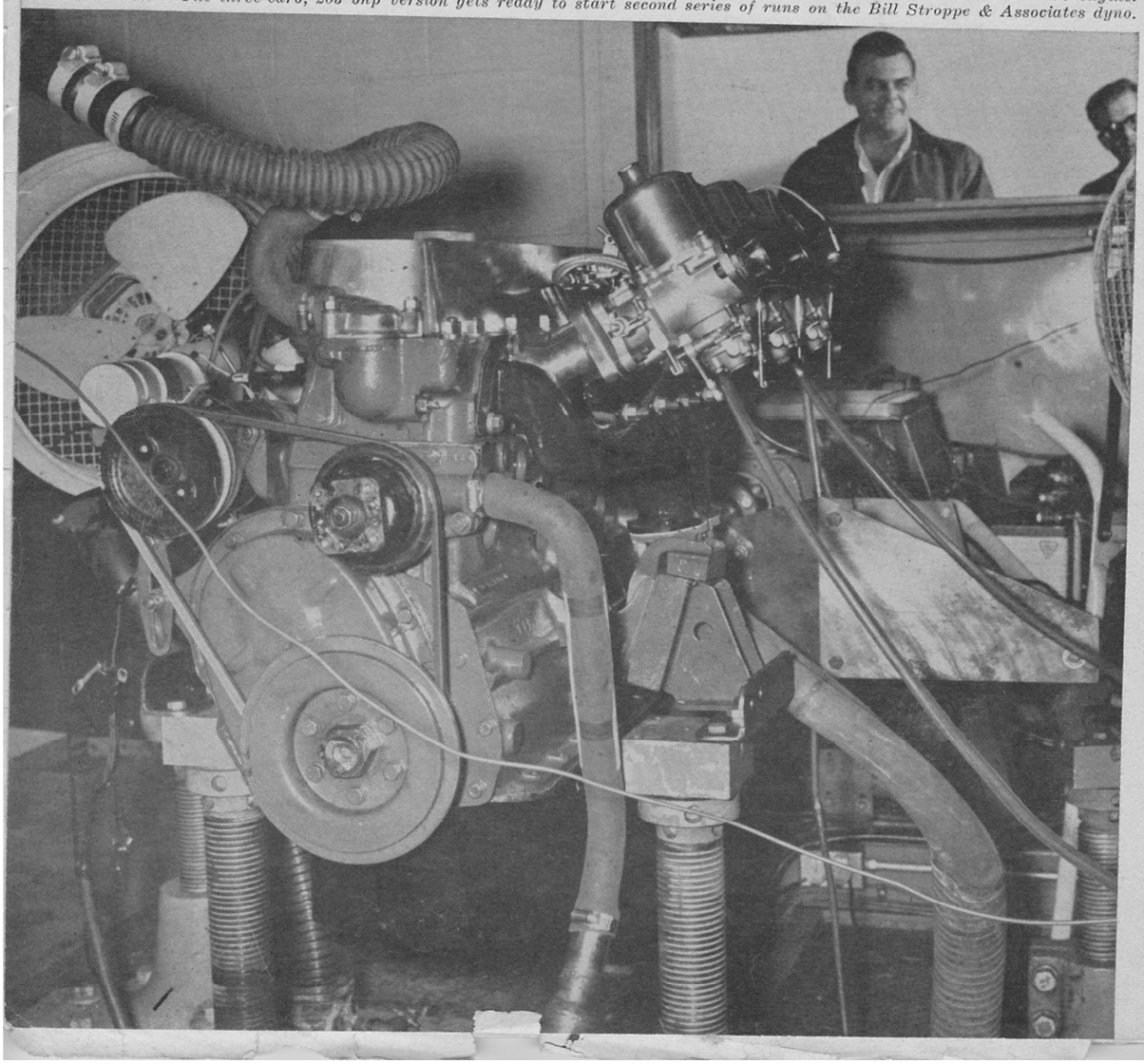
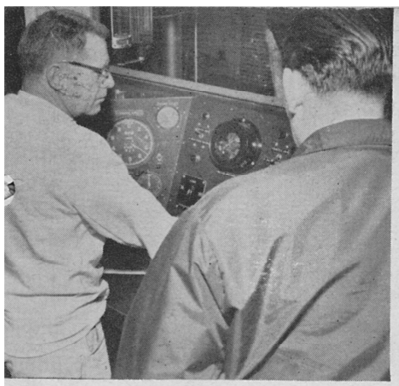
SLUGGER

Above — Ronnie Bucknum behind wheel of Hollywood Sport Cars' 3-liter, equipped at the time with the two-carb engine. Below — The three-carb, 203 bhp version gets ready to start second series of runs on the Bill Stroppe & Associates dyno.





◀ *Verne Houle, left, Chick Vandagriff, right, take a high rpm reading. Tach, visible behind Houle, reads 7000 rpm.*

▶ *Vandagriff, at left, and engine-builder Doane Spencer change needles in the big carbs. One change gave a 20 hp gain.*

ON THE DYNO

Two-hundred-and-five real horses from 3-liters of legal, production Healey!

BY JOHN CHRISTY

PHOTOS: JIM ALEXANDER & PAT BROLLIER

AS A CO-FEATURE of the 1961 Los Angeles Times GP for sports cars, readers will remember, was a three-hour event for production cars in which there were a pair of Austin Healeys, a 2.6-liter 100-6, owned by SCG's Editor, and a 3-liter, owned by Chick Vandagriff of Hollywood Sport Cars. Both cars suffered problems but both finished well enough to take home some brassware. The problems suffered are not germain to this article; in both cases the fault lay in accessory items, not in the engines themselves.

The preparation of these cars was detailed in a general way in the August 1961 issue of SCG, but the whole story was not then told for the simple reason that full tests had not been completed at the time of writing.

To re-cap briefly, the 2.6-liter engine was equipped with a nitrided crank, shot-peened and microfinished con rods, Healey turbulator pistons and an experimental cam, of 283 degrees duration and a lift at the valve of 0.414 of an inch. Additionally, as shown in the SCG feature, all the rockers were lightened and polished and all reciprocating and rotating parts were balanced to near zero tolerance. The 3-liter engine was similarly prepared, except that flat-top pistons were used and a 274-degree cam, with slightly more lift, was installed. Both engines used the two carburetor set-up; the 3-liter was equipped with two-inch SU's while the 2.6 engine used the 1¾ inch units, complying to the Cal Club and SCCA Areas 9 and 10 rules.

There was no time to put the 2.6 engine on the dyno but the 3-liter slugger was run on the Autolite dynamometer at Stroppe and Associates. The prime purpose of this test was to determine the proper plug range and the right needles for this set-up. The original VB needles were too lean and a set of VF needles were substituted — the engine picked up no less than 30 horsepower and 34 lbs. ft. of torque! Obviously those needles are important for more reasons than mere smoothness of operation. The interesting part of this was that the pickup of power was gained at 4500 rpm, not just at the peak end of the scale.

Plugs used at the start of the test were Autolite AG 901's, a fairly warm rating. Using these with the VF needles, power climbed rapidly from 143.5 hp at 4500 rpm to 170 at 5500, fell slightly to 168 at 6000 and then plummeted to 139 at 6500 revs.

Switching to a hot-tip plug (AG 3) produced a gain of two more horses across the board in spite of a reduction in the overall spark lead of six degrees. The distributor was then cranked ahead until the final advance was a full 40 degrees, at which point audible detonation occurred. Reducing the overall advance to 36 degrees, still with the AG 3 plugs, produced 175 bhp at 5500, no significant change from the extreme useable spark lead.

With no further changes in spark setting or carburetion, a colder range of hot-tip plug, the AG 32, was installed. Immediately peak power jumped from 175 to 179 and 180, staying at these figures over a series of several runs.

One of the most interesting aspects of this series and the ones that followed was that the power churned up by the heavy Six was as steady as time. In many cases an engine will pull a given power peak and then gradually fall off over a period of minutes or even seconds. Not so the senior Healey engine. At any setting the power reading remained steady as long as that setting was held and was consistent to a half horsepower over a series of runs.

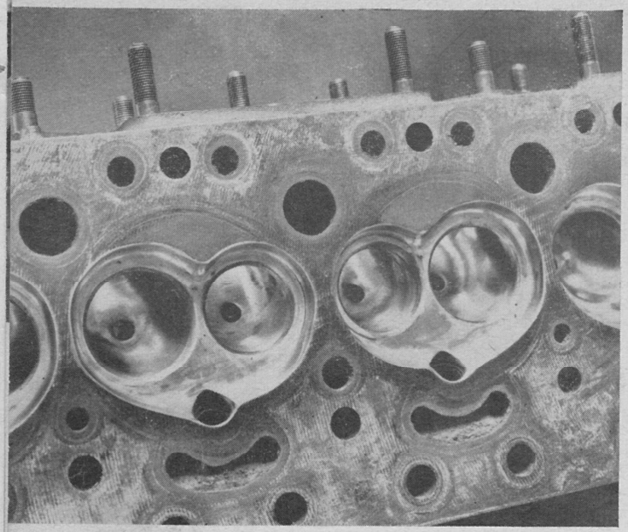
Although the 2.6-liter engine was not run on the dynamometer, the two cars were compared later in terms of pulling power and performance. Both cars were almost matched. The larger engine, as might be expected, was slightly quicker off the mark but only momentarily so. In terms of top speed both cars were about equal, taching 140 to 142 mph. In the middle range, thanks to a slightly wilder valve timing and half a point more compression, the smaller engine was if anything slightly superior. Power came on strongly at 3500, increased rapidly to 5700 rpm and then fell off sharply after 6000. Even then it had to be watched carefully if that figure was not to be exceeded in the lower gears.

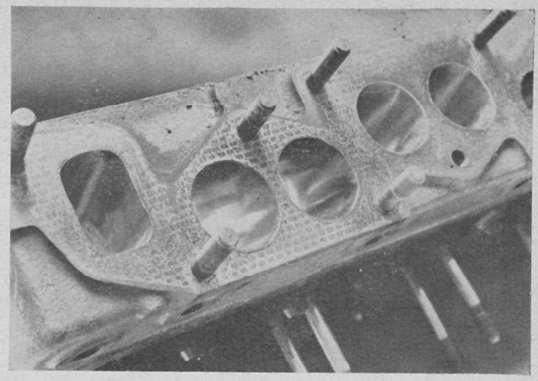
Due to an unfortunate mishap, in which the smaller car was totally wiped out, further work on the 2.6-liter engine was discontinued; however, it was probably about as fully developed as it could have been and still remain legal under the production category rules. It is safe to venture the opinion that it was probably producing a peak torque rating in the neighborhood of 170 lbs./ft. and a peak power rating of between 175 and 180 bhp at the flywheel.

Work on the 3-liter engine continued, however. Thanks to the fact that there are more options for the bigger engine, particularly in the line of breathing, a good bit more could be expected. On the second series of tests these expectations were borne out.

For the second series the engine was

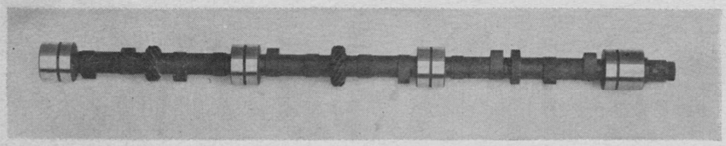
(continued)



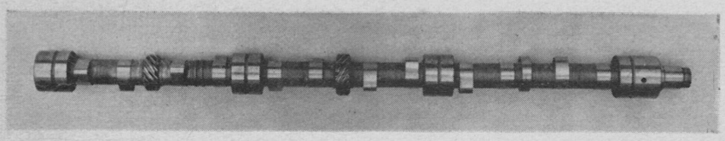


Combustion chambers in both the 2.6 and 3-liter cylinder heads were cleaned and polished and all sharp edges and corners were rounded off to prevent any detonation damage.

Ports were opened out only to the gasket line and matched to the manifolding. Excess hogging out here can cause a drop in velocity and a drastic shortening of the rpm range.



Experimental cam R-1, used in second test series, has narrow lobes and very high lift. Power was high at 205 bhp.



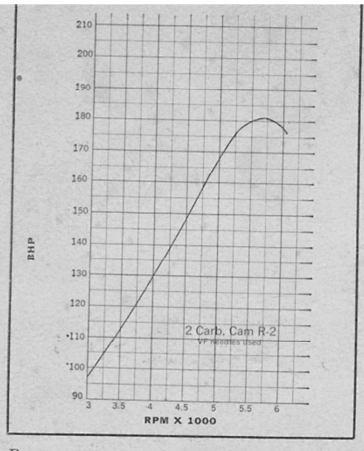
Cam G, used in final test series, was a bit milder with less valve acceleration and gave broad torque curve, 196 bhp.

SLUGGER *(continued)*

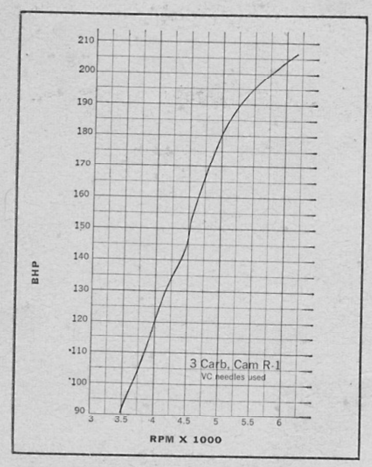
fitted with the optional triple carburetor manifolding and three two-inch HD8 (AUC 938) S.U. carburetors with short, belled intake tubes were mounted. A much wilder cam — in terms of lift — was used. This one had a duration of 278 degrees and a whopping lift of 0.440 of an inch. As the accompanying graphs show, it was a shade too much lift — about 0.035 to 0.040 too much, as it later turned out. The carburetors were equipped with VB needles as a starter. Plugs used throughout the whole series were AG 32's and the spark setting was 38 degrees peak advance. With the VB needles the engine was as soggy as an old dish cloth at anything under 4500 rpm and even at 5500 rpm power was only 170 horses. Working up the scale, a set of richer VC needles was installed and power immediately jumped by 20 bhp across the board, going to 170 at 5000 rpm and a thumping 191 bhp at 5500 revs. Operating on the theory that if some is good, more is better, a set of VD needles were tried (no rude remarks please). This theory, as is often the case, proved dead wrong except over a very narrow band. The engine would hardly run below 4500 rpm, sputtering and banging as though every plug was coked solid. At 5000 revs it cleaned out and turned up 171 bhp, and at 5500 it produced 192 horses. Then it dropped dead. With still richer VE needles it just plain wouldn't run, period. Changing back to the leaner VC needles again, a series was run from 4500 rpm up. Although it was a good bit soggier under that figure than was the two-carb version with the milder cam, above 4500 it started producing power in great, leaping chunks. At 4500 rpm power was 145, or just about peak for the showroom stock engine. At 5000 it had soared to 180 hp; at 5500 it was 193.5 to 195, and at 6000 the 200 bhp barrier was passed with a healthy 203 horses on one run and 205 on another. However, this was horsepower gained through twisting the engine rather than through torque, with the result that the useable power band was narrow and packed way up at the top end. In other words, a good sprint engine but not really useable in a relatively heavy car which was to be used on varying road circuits.

For the third and final set of tests the exterior set-up remained the same but another experimental cam, with less lift and unequal timing, was installed. This shaft gave 0.405 of an inch lift, 274 degrees on the intake and 268 degrees on the exhaust side. Ignition timing of 39 degrees advance at peak was set as standard and, with the exception of two runs, VC needles were used throughout the series. On the first run a healthy 139 horsepower (corrected), with 178 lbs./ft. of torque, was recorded at 4000 rpm. Dropping back to 3500, the engine still put out 115 bhp. Moving on up the scale, power climbed rapidly and steadily: 161 at 4500 again, 180 at 5000, 193 at 5500. Then a set of richer VD needles were tried with the same results as before. Power was 168 at 5000 and 186 at 5500. Back to the VC needles again, but with colder AG 23 plugs installed. Power remained the same as with the AG 32's almost to the fraction. Next, medium-cold long-nose or hot-tip AG 22's were tried and fractionally better torque was observed. Then one step colder AG 12 plugs were installed and a full-scale run made with the resulting curve seen on the accompanying graph. Power went from 138.5 at 4000 to 195.5 at 5500 and then dropped slowly to 192 at 5700, to 189 bhp at 6000 revs where it was arbitrarily redlined. The torque pattern was high and flat, with 178 lbs./ft. at 4000 to 186 at 5000 and back to 175 lbs./ft. at 5700.

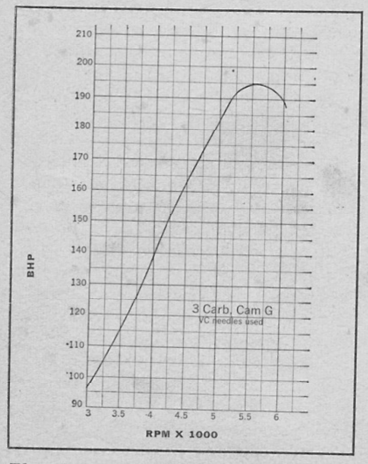
At this point, sharp-eyed, engineering type readers may note that in all



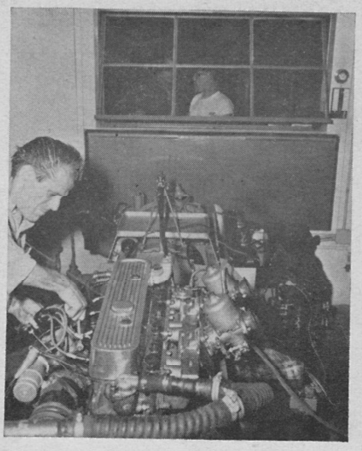
Power curve produced by the two-carb version run at Riverside and during the first series of the dynamometer tests.



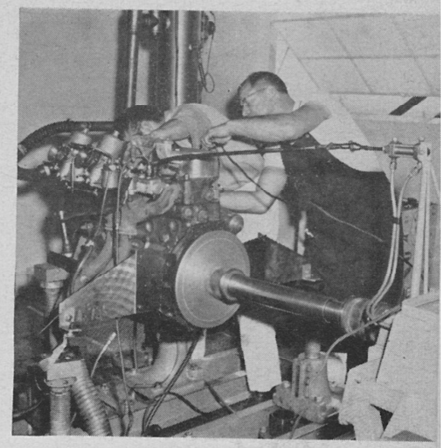
High, steep curve shown in the second series indicates most horsepower but it was gained with high revs, low torque.



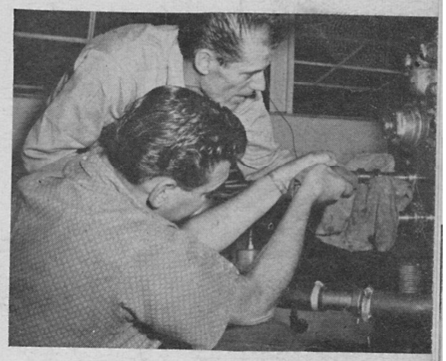
The third series produced this power curve. Slightly lower peak rating was gained but torque figures were higher.



Spencer changes ignition timing on the first test. The best setting was between 36 and 39 degrees peak spark advance.



Houle and Spencer check spark lead with timing light with big engine running on dyno. Lead varied with cams.



Right, Vandagriff and Spencer change one of the cams (R-1) during second series of runs. Note careful handling.

cases the torque and horsepower figures don't quite fit the raw formula calculations. The power is corrected by adding two percent to the calculated figure to adjust for the loss through the dynamometer input gears, a double gear set. In many cases two percent for each gear is added, but in order to be scrupulously fair only a flat two percent was used as a correction factor here. Temperature and humidity were close enough to the norm so that any correction applied for these conditions would have been insignificant for our purposes, at most being fractional. The main point here is that none of these were flash readings; at one point the engine was allowed to produce peak power for a steady five minutes with the needle on the scale showing less than a one-pound deviation over the whole period.

Two aspects were proven by this series of tests. First, there is a tremendous potential in both the 2.6 and the 3-liter Austin Healey engines under the current production restrictions and, second, that this potential is within reach of anyone who would have it if real care is used in assembling the engines. Little in the way of equipment not already installed was used in any of the engines, either the 2.6 or three-liter. The former engine used only the cam and optional pistons as added speed equipment although a competition flywheel and six-bolt crank were used as safety equipment. The 3-liter used standard flat-top pistons and only the cam and carburetion differed from absolute stock. Both had ports matched and polished but not hogged out; both had standard valve gear, though the rockers in each case had been ground and polished as shown. Rods, too, had received this treatment, primarily to achieve zero-tolerance balancing as mentioned in the beginning. In each case the combustion chambers were polished and all, repeat ALL sharp edges rounded or chamfered, a vitally important point with these engines since any and all pre-ignition or detonation is to be avoided like the plague if the engine is to stay together. However, properly assembled, there is no reason why the Austin Healey engine shouldn't last a full season and then some, with proper maintenance. In the case of the 2.6, the bearings were scarcely worn-in after some 12 racing hours and hundreds of miles on the road. The same applied to the 3-liter when it came off the dynamometer.

Every item used in building these two sluggers will be available from Donald Healey America Ltd., shortly to begin operations on both the East and West Coasts.

Perhaps the most important point proven was that the Austin Healey is hardly a has-been for production category racing — in fact, for this season at least, it is a potential winner in two classes.