CHRYSLER V8
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ROD AND CUSTOM PHOTOS

CHRYSLER

COURTESY ROD AND CUSTOM

THERE ARE ABOUT as many different versions of hot rodded Chrysler engines as there have been builders of Fire-Powered vehicles. With this in mind, we'll cover only one version, the record-attempt gasoline burner in the Denny Larsen Super Streetliner, a Bonneville Sports coupe. Driven on pump gas from the town of Wendover to the Bonneville Salt Flats, this car *coasted* through the trap at 183 mph after a drive shaft let go at 200-plus mph.

The fire is provided by an engine built by Ray Brown and owned by Clem Barnes of Midland, Texas. Basis of the engine is a Chrysler FirePower bored 3/16" and stroked 1/4 to bring its size to 3 7/8 x 4" respectively.

It was in the stroking operation that one of two major problems was met. In stroking, the crankpins must be metal-sprayed to bring them back out to size. The metallurgy of the Chrysler crank is such that the sprayed metal will loosen under stress and twist on the core, blocking oil holes, cracking and exhibiting other interesting but troublesome

This deep breathing Chrysler engine was fitted with Chrysler Marine rocker covers to provide clearance for altered jigglers. Hilborn injection system supplied pump gas during runs.

That the car can be street driven is apparent here as it motors along city thoroughfare.

traits. This resulted in two early engines scoring up at the bottom end before Ray found the answer. This answer was the simple but ingenious idea of pinning the sprayed collar to the crankpin with threaded pins set 180 degrees apart in the core. The pins were placed in the crank after the spraying operation and were ground with it.

In the Chrysler block an oil gallery runs down each side of the cam case with outlets to all the tappet bores; thus allowing in the stock engine, full pressure to reach the hydraulic tappets. Since the hopped up mill used roller tappets in conjunction with its Herbert #280 cam, this oil relief was not only unnecessary but detrimental, actually causing side thrust on the tappets. Each outlet in each tappet bore was plugged with brass rod. The rear end of the gallery on the left side of the block, facing forward, stops at the juncture of the gear on the cam and the cast iron driven gear which turns the mag shaft. These gears ordinarily have a tendency to wear excessively, causing as much as 10 degrees fluctuation in ignition timing. To help offset this wear, the plug at the end of the gallery was drilled with a .030" hole which ducted a small but steady and powerful stream of oil against these gears. This, with careful fore and aft shimming of the cam, eliminated the slop entirely. Oil pressure has been increased to 80 lbs.

As we mentioned before, the engine was equipped with a Herbert 280 cam (280° duration) having a lift at the valve of .450 of an inch. Characteristics of this particular cam are: intake opens 30° before TDC and closes 70° after BDC; exhaust opens 70° before BDC and closes 30° after TDC. This stick utilizes Herbert roller tappets and Ray's own push rods which have the Chrysler Marine top ends and the Herbert bottom ends set into .058" wall, chrome moly tubing of the same diameter as the stock solid push rods. The weight saving is tremendous and the stiffening effect is such that a ring of .010" clearance can be placed around one of these rods and attached to the head. With the engine running at 5000 rpm the rod does not touch the ring, Ray says. Another speed secret lies in the simple precaution of grinding and lapping the push rod ends into the tappet sockets and rocker sockets, eliminating all binding and run-out tendencies.

The heads of the big engine were reworked to go along with the increased size of the block. The outsides of the ports were left stock size at $1\frac{7}{16}$ by $1\frac{13}{16}$ but were cleaned and polished. The exhaust valves were also left stock size at $1\frac{3}{4}$ inches but the intakes were enlarged $\frac{1}{8}$" to take the $2\frac{1}{16}$" valves. The valves used were special sodium cooled units set in phosphor-bronze guides, another Brown Automotive speciality. No milling whatsoever was done on the heads.

Compression ratio in the engine is raised to 10-1 as opposed to the 7.5-1 stock ratio. This was accomplished largely through the size increase in the cylinder displacement through the use of J.E. solid-skirt racing pistons. Clearance on these is .012" maximum. Chrysler Marine adjustable rocker arms are used in all of Ray's engines, accounting for the Marine rocker covers which provide the extra room necessary.

In the miscellaneous department, the ignition is a Scintilla Vertex magneto set at 32° advance. The water pump impellers have been pared down to $4\frac{1}{8}$" and although the

Wide radiator in front of Chrysler engine is one way to keep car cool for streets.

ROD AND CUSTOM PHOTO

rest of the cooling system has been left stock, the car runs like a refrigerator. Induction is by Hilborn fuel injection calibrated for gasoline. This rig is used primarily for straightaway runs although experiments have been conducted to see if it won't withstand a bit of road racing. A triple carburetor setup has been used successfully on the twin to this engine in the Mabee machine, but injectors would provide certain desirable factors if they can be calibrated to produce throughout the usable rpm range. It should be definitely pointed out again that this is a gasoline burner. A fuel user would not have the problem just mentioned; alcohol fuels, particularly with a dose of nitro, being able to tolerate a 20 to 30 percent rich condition.

With all these goodies and a lot of care in assembly, the engine has been dyno tested at 350 horsepower—at the flywheel—at 5100 rpm. At Bonneville, the mill was twisted up to 5600 rpm and above. This pressure is delivered to a Ford stick shift transmission and thence to a Halibrand quick change pulling, on the final run, a 2.3-1 gear.

DE SOTO

The "second brother" in the Chrysler series is the DeSoto V8. Although primarily used in the modified form for speed boat use this engine is almost ideal for a street machine. Not too large and not too small, the DeSoto can be easily converted to pack a gasoline inspired wallop of from 240 to 250 horsepower and still remain docile enough for daily transportation.

Once again we are indebted to Ray Brown who was stuffing just such an engine together as the 1956 Hot Rod Annual was going to press. The engine used was the '53, a model Brown prefers even over the latest and larger '55.

The '53 and '54 DeSotos have a bore of $3\frac{5}{8}$ inches and a stroke of $3\frac{11}{32}$ inches for a total of 276 cubic inches. The first step to power was an overbore to 3.728 inches to take the stock '55 pistons. The main reason for this was cost, since normally special compression raiser pistons are recommended. However, the special slugs run about $90 a set as opposed to $30 a set for the stock '55 pistons. Piston clearance in this case is .008 of an inch.

The stroke, while capable of taking an extra quarter of an inch, with careful metal spraying, was left stock also for reasons of cost squelching. All that was done to the crank was the standard dynamic and static balancing that should go into any modified engine. All reciprocating and rotating parts were given this treatment.

The stock camshaft was exchanged for a #280 Herbert roller tappet set-up which gives good idling characteristics and at the same time packs a reasonably hot high-speed belt under the hood.

The cam characteristics in this particular grind are as follows: Intake opens at 30 degrees before top dead center and closes 70 degrees after bottom dead center; exhaust opens 70 degrees before bottom dead center and closes 30 degrees after top dead center. Total duration is, as the number implies, 280 degrees.

One of Ray's little tricks is the blocking off of the tappet oil leads as described earlier in the Chrysler section. However for a

street machine this is not really necessary unless it is planned to go all out at a later date, and engine speeds in the 6000 rpm range are expected. This is the total of block modifications except for the use of the early Dodge truck flywheel.

At this point the major point of attack is reached: the heads. Wherever possible the hemispherical chamber type of head should be used. This is the one used on all the pre-'55 engines and on the Fireflite model in 1955.

Porting was the first operation, since the amount of milling where a hemispherical chamber is encountered is dependent on valve size. The original 1.75-inch intake and 1.407 exhaust valves were discarded in favor of stock '51 to '53 Chrysler valves. These are 1 13/16 inch on the intake and 1½ inches on the exhaust, making a modest but effective increase in valve area at the very low cost of about 25 cents per valve. Entry ports are rectangular in shape. These have been enlarged by 3/32 of an inch to 1 5/16 by 1 15/16 inches. Note that this is not "hogging out" but merely cleaning up. Extra large ports cause a drop in mixture velocity with a consequent decrease in low-end punch. All valve seats have been left at the stock 45 degree angle although narrowed slightly from the stock width. The common practice of using larger valve springs was deemed unnecessary in this case, small shim washers being placed under the stock springs to increase tension slightly instead.

With the porting done, the heads were checked for extra metal between the lower edges of the valves and the gasket surface. It was found that a milling job of .060 of an inch was feasible without causing valve interference, either with the side of the bore or with the tops of the pistons. On a stock block, a .060-inch mill will give a compression ratio of 8.1 to 1. With the additional increase provided by the eighth-inch overbore, the total compression ratio amounted to just under 8.5 to 1, almost as much as could be achieved through compression raiser pistons and still have the engine run quietly and reliably on pump gas.

At this point, the engine is complete as far as internal modifications go. It would be quite possible to use the engine with stock carburetion and still get the desired extra belt in the region of the shoulder blades. The impecunious owner could stop here and give his bank balance a chance to catch up. However, with the internal modifications completed, a lot more power hides under that stock-looking equipment. Naturally the first thing that comes to mind is extra carburetion to feed the new inches and breathing capacity.

The choice is strictly up to the needs, purse and fearlessness of the builder. A very good bet, at least for a beginning, would be the installation of the '55 four-throat manifold and carburetor. This would provide smooth acceleration and would be almost ideal for a car driven in the city. A little more nerve on the part of the owner dictates the use of a dual two-throat manifold and a pair of AAV-26 Stromberg carburetors which would provide a very satisfactory swat in the hip pockets with proper throttle application.

In the case of the engine under discussion, however, the ultimate in fearlessness caused a choice of the Weiand four carburetor layout with four Stromberg 48 carburetors. These were equipped with stock .048 main jets but the accelerator pump jets were switched for the #71 jets out of the Stromberg 81 carburetor used on the V8-60. Except for setting the accelerator pumps at their shortest stroke the carburetors were otherwise strictly stock—and cheap. The reason for cutting down on the accelerator pump stroke and jet size is that the normal shot of fuel delivered by four 48s would be similar in effect to yanking out the choke whenever the loud pedal was mashed down exuberantly.

The final change is, of course, the switch to dual exhausts. This can be "poor-boyed" by using the factory equipment, either bought new or scavenged in a wrecking yard. A deluxe layout including headers purchased from any of the custom exhaust manufacturers is naturally the ideal and was used on the engine described above.

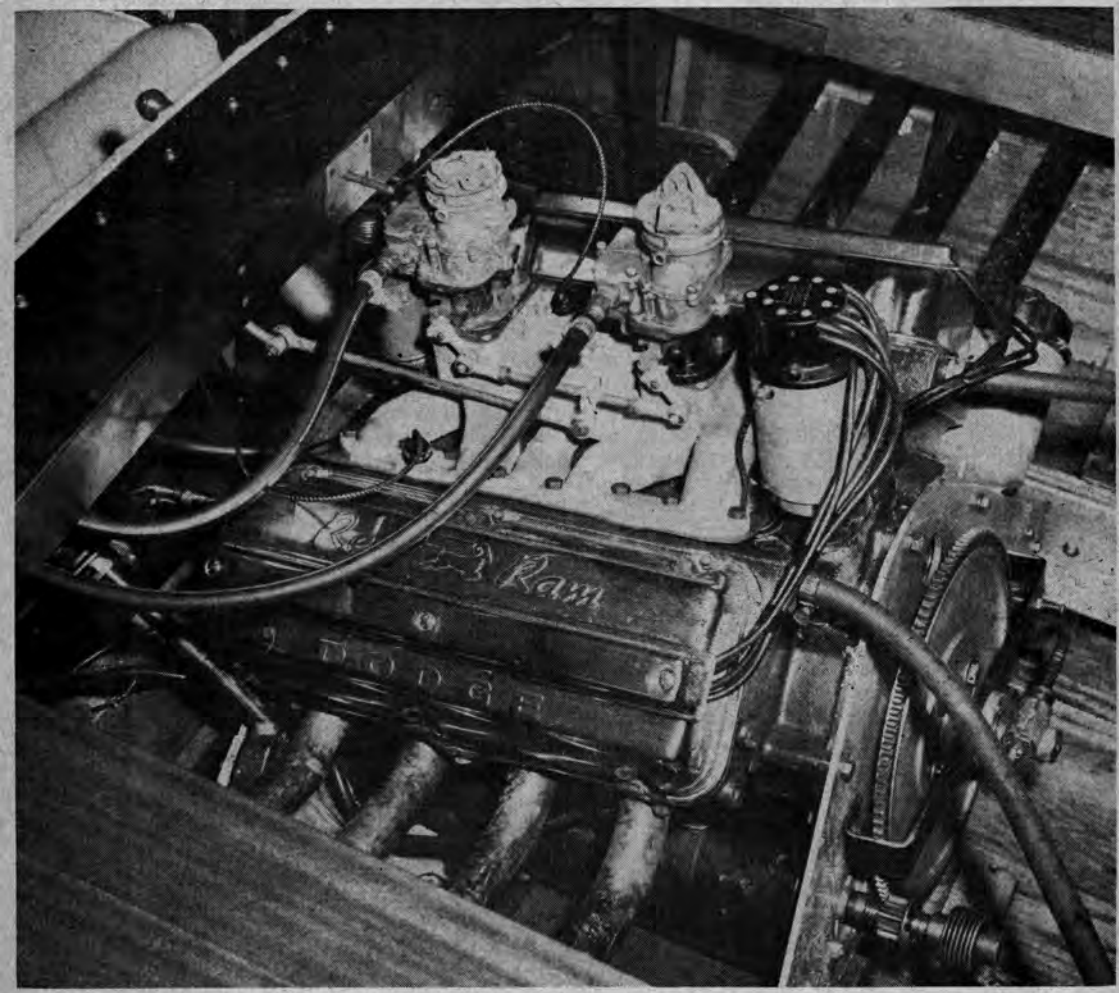
Although the engine has not as yet been dynamometer tested, past experience shows that the sum total of changes should, if carefully done, produce approximately 240 to 250 flywheel horsepower (uncorrected for temperature) at about 5000 rpm, give or take a thousand. This represents a minimum figure of 80 additional hp over the stock rating for the '53 and 40 more than that advertised for the '55 Fireflite despite the '55 engine's .100 of an inch longer stroke. This is by no means as far as can be gone for competition use but represents about the best balance for street machine that is still capable of either a Sunday afternoon tilt at the drags or a week-day jaunt to the salt mines.

DODGE

The official record for the water-borne crackerbox class is 72 miles per hour, clocked over a measured mile. With one burnt piston, *Hot Ice*, the nation's number one crackerbox, has been clocked at 73 miles per hour. However, this was over a quarter-mile course, not long enough for a record. But now, with a few improvements made to its engine, *Hot Ice* is ready to set a new record of no less than 80 mph. Mighty big words, these, but after watching the power-plant that hurtles *Hot Ice* through the water develop an even horsepower per cubic inch on aviation gasoline, we're inclined to believe that Carl Maginn, the man who spoke these words, knows what he's talking about.

Hot Ice's power plant is a 1953 Dodge "Red Ram" V8 modified to its present condition at a price well within the $1250 limitation specified by the American Power Boat Association for engines in this division. To comply with this rule the list price of the engine itself, plus the list prices of all accessories, including the starter, generator, carburetors, ignition system, and any special parts that are used and extra labor required for their modification or installation, must not exceed $1250. The factory hp rating for the Red Ram is 140 at 4400 revolutions per minute. Stock piston displacement is 241 cubic inches; bore and stroke are $3\frac{7}{16}$ and $3\frac{1}{4}$ inches, respectively. It has hemispherical combustion chambers with inclined valves and a compression ratio of 7.1 to 1. Valve lifters are of the zero lash hydraulic type.

CAR CRAFT PHOTOS



Hot Ice's Dodge V8 engine is equipped with two Strombergs calibrated for aviation gas.

Owner Carl Maginn checks engine over before its run on Wilcap dynamometer. Engine is set up for gasoline, produced 258 bhp.

The Red Ram's crankshaft is a steel forging with five main bearing journals.

As his first step in boosting the engine's horsepower output Carl increased its displacement to 258 cubic inches by boring its cylinders .125 of an inch oversize to $3\frac{9}{16}$ inches. A.P.B.A. rules limit the displacement of engines in the crackerbox division to 267 cubic inches. J. E. three ring, dome head pistons were fitted to the cylinders with .011 of an inch clearance. These special pistons raised the engine's compression ratio to a powerful 12 to 1.

It is far more satisfactory with engines of this type to raise compression ratios by installing domed pistons rather than by milling their cylinder heads. Milling cylinder heads on an overhead valve V-type engine creates misalignment between the intake ports in the heads and intake manifold. Also, difficulties are created in the valve actuating mechanism of engines that don't have adjustable valve lash or adjusting screws in their rocker arms. This particular condition can be properly corrected only by shortening the rocker arm pushrods an amount equal to that removed from the heads.

The crankshaft's connecting rod journals were ground and bearing inserts selectively fitted to provide .0035 of an inch clearance. New main bearing inserts were align bored to a clearance of .003 of an inch. These clearances are on the loose side but the inserts appeared to be in perfect condition after considerable running on an engine dynamometer. A factor that undoubtedly contributed a great deal to the excellent bearing condition is the optional equipment full-flow oil filter Carl installed on the engine. The filter, identical to those used on Chrysler and DeSoto engines, bolts directly to the cylinder block. Filters of this type filter all the oil delivered by the oil pump before it reaches the engine's bearings. By filtering the oil in this manner only clean oil is delivered to the engine's lubricated parts—wear producing dirt and metal particles are trapped in the filter. The value of such a filter is immeasurable as far as bearing wear is concerned.

The oil pan was enlarged to hold ten quarts of oil and shaped to conform to the limited space between the cylinder block and the bottom of the boat. By increasing the crankcase capacity to ten quarts the necessity for providing a means of cooling the oil was eliminated. High oil temperature can become a problem with boat engines because the oil sump is submerged in the hull where it is not cooled by a flow of relatively cool air. S.A.E. 40 oil is used in the engine.

A Wilcap aluminum boat flywheel designed for a Ford ring gear and starting motor was adapted to the crankshaft. Four of the eight drilled flywheel mounting holes in the crankshaft flange were enlarged to $\frac{29}{64}$ of an inch and threaded with a $\frac{1}{2}$ inch, 20 thread tap. These four tapped holes and

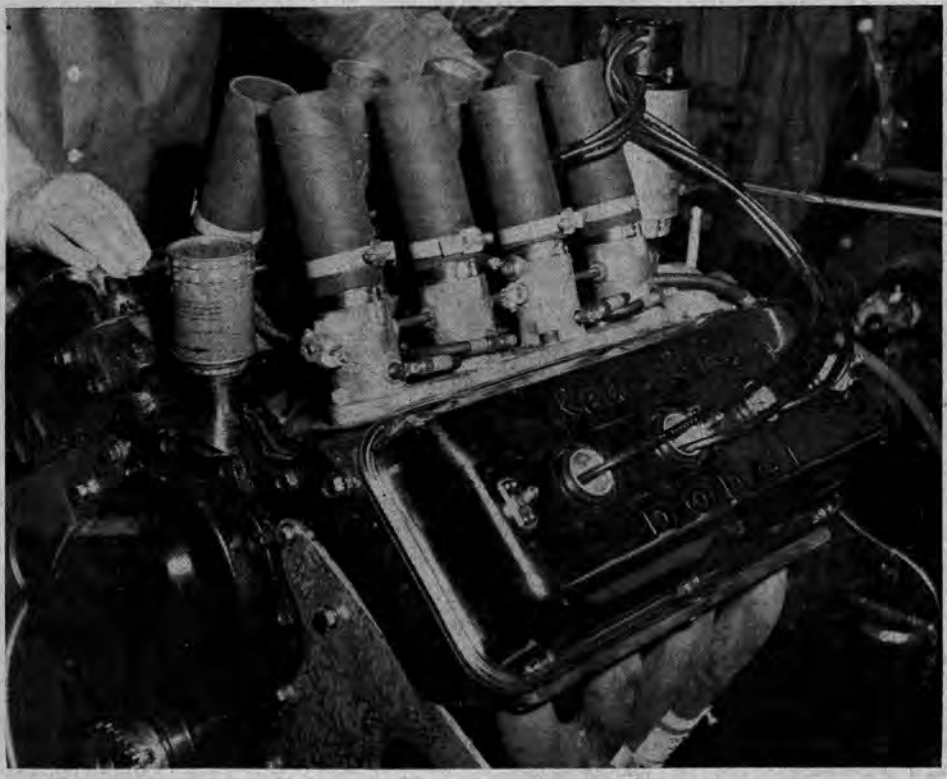
With alcohol fuel and dual carb setup, engine produced 270 horsepower at 5500 rpm.

suitable capscrews are used to secure the flywheel to the crankshaft. The only apparent advantage to this method of retaining the flywheel is ease of installation. Stock Dodge flywheels are ordinarily retained with eight ⅜ of an inch bolts and nuts, with the nuts on the forward side of the crankshaft flange. This is a sufficiently sturdy arrangement but flywheel installation in a boat is somewhat difficult due to the cramped quarters between the flywheel and oil pan.

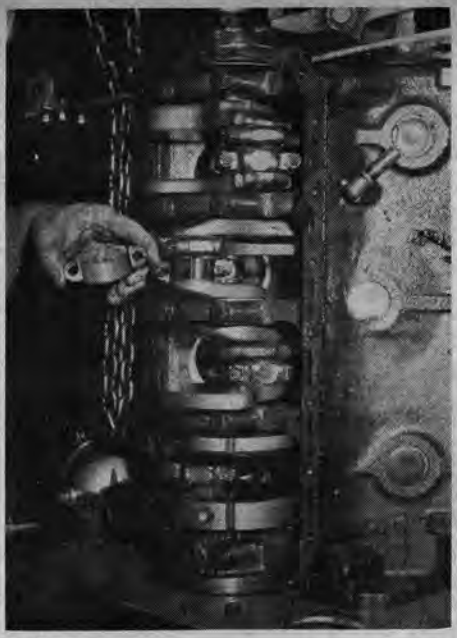
Rotating and reciprocating parts of the engine, including the crankshaft, connecting rods, pistons and pins, and flywheel, were statically and dynamically balanced by Weber Tool Co., Los Angeles. If a V type engine is to run smoothly at all speeds, rebalancing of its crankshaft and connecting rod and piston assemblies is absolutely essential after weights of any of the parts, or the crankshaft's stroke, have been changed from stock. As a precautionary measure the parts in the crankshaft and piston assemblies were inspected for flaws.

Intake and exhaust ports and passages in the cylinder heads were enlarged by grinding and polishing. Oversize valves were installed with stock valve springs and keeper washers. Combustion chambers in the heads are machined at the factory to equal capacities; therefore they did not require any additional machine work other than that done to the valve seats. A Winfield Super grind flat-tappet camshaft operates the valves through Studebaker non-hydraulic cam followers and Howard adjustable pushrods. Valve lift is .410 of an inch; spring pressure with this lift is 160 pounds, valves open. Rocker arms are stock. Intake and exhaust valves operate with .015 of an inch lash. Stock steel and asbestos head gaskets, coated with aviation Permatex, have been found to be entirely satisfactory; however, Carl torques the head retaining capscrews to 100 foot-pounds, which is considerably tighter than the stock specified tension of 80 to 85 foot pounds.

Present A.P.B.A. rules state that not more than one single-throat carburetor can be installed for each two cylinders of an engine to be used in the crackerbox division. According to this, four single-throat carburetors, or two dual-throat carburetors, or one four-throat carburetor are all that would be allowed on an eight cylinder engine. Constant-flow fuel injectors of the Hilborn type



With Hilborn injectors, engine turned up 302 hp on alky. Setup could be used in automobile.



Connecting rod bearing removed after dyno tests showed little evidence of rough use. Rod nuts are self-locking. CAR CRAFT PHOTOS

are not allowed. To comply with this rule Carl equipped his engine with two Stromberg 97 carburetors on an Offenhauser two-carburetor manifold. The venturi tubes in the carburetors were enlarged from their stock 31/32 of an inch diameter to 1⅛ inches to allow a greater quantity of air to flow to the engine's cylinders. But even with their bored-out venturi tubes these carburetors do not have an adequate air capacity for the engine. However, they will have to suffice until something better becomes available or the A.P.B.A. changes its rules. The exhaust system used in the boat consists of individual 1¾ inch inside diameter exhaust pipes for each of the engine's cylinders. The pipes extend straight out from the sides of the engine and protrude through holes cut in the sides of the hull.

The ignition system is comprised of a Scintilla Vertex magneto mounted in the stock distributor location. The magneto provides a maximum spark lead of 36 degrees at engine speeds above 3000 rpm.

Carl made several test runs with his engine on the Clayton engine dynamometer at Wilcap Company, Los Angeles. Although A.P.B.A. rules permit only gasoline fuel for overhead valve engines and twin two-throat carburetors or their equivalent, Carl checked the engine's horsepower output with three different carburetion setups. These included a Hilborn fuel injector calibrated for straight methanol; dual Stromberg 48 carburetors, jetted for methanol and bored-out to 1⅛ inches, mounted on an Offenhauser two-carburetor manifold; and the previously mentioned dual bored-out Strombergs 98's jetted for 145 octane gasoline, also on the Offenhauser manifold.

Results of all three tests were truly outstanding. The most impressive, of course, was the run with the Hilborn injector-methanol combination. Maximum horsepower attained on this run was 302 at 5800 rpm. At 5500 rpm the engine developed 300 hp. With the propeller Carl is using on the boat at the present time the engine turns 5800 to 6000 rpm's when racing.

For the second test the fuel injector was replaced with the dual bored-out 48 Strombergs on the Offenhauser manifold. The fuel was straight methanol. Maximum horsepower with this setup was 270 at 5500 rpm. As the difference between 270 and 302 is 32, the horsepower boost provided by the Hilborn injector over the two-carburetor setup amounted to 11.8 percent. This cannot, however, be considered a true comparison of the two types of carburetion systems because the engine was definitely under-carbureted with the dual carburetors. With three carburetors instead of two, or with two carburetors with larger venturi areas than are possible in the Stromberg 48's, the difference in the horsepower results would undoubtedly have been less pronounced. It is almost a certainty, though, that horsepower out-put to match that made possible by the unrestricted breathing of the Hilborn injector could never be matched by a conventional carburetor and manifold setup, regardless of the number or type of carburetors employed.

On the final dynamometer run, made with dual carburetors and 145 octane gasoline, the engine developed a maximum of 258 hp at 5700 rpm—exactly one hp for each cubic inch of the engine's displacement. The comparatively slight horsepower boost of 4.6 percent obtained with alcohol over the 145 octane gasoline attests to the quality of this gasoline, which is far superior to the pump grades available to motorist. Fortunately, fuel of this type can be used in A.P.B.A. competition engines restricted to gasoline. If the rules specified pump gas only, the fellows with overhead valve engines would lose some of their advantage over the alcohol burning flatheads.

By this time it should be apparent to all who are interested that overhead valve engines are here to stay. ■