

Just Look What Plymouth's up to Now

"If we ever qualify (at Indianapolis), I'll be so happy I'll walk back to Detroit across Lake Michigan." — Pete Hutchinson.

By Eric Dahlquist

With the exception of Indianapolis, Chevrolet engines have won in every category of world competition they've been eligible for. And they haven't backed into many, mostly it's been a case of total domination.

Chrysler Corporation regards the Chevrolet phenomenon not so much with awe as with frustration; the disadvantages of being third are only slightly less aggravating than being fourth. The batting average for 1968, a Road Runner and a Charger is clearly satisfying, but it was only two-thirds, 66 percent. Powerful though it was, potential-laden as it seemed, the '68-fresh, 275-horsepower, 340-engine Chrysler laid on the world and aimed to meet the Chevrolet small-block head on, did not ignite any fires. Indeed it seemed as the months slipped by that the hands on history's clock were resetting themselves to 1951 for a replay of the first hemi's fate, immortalized in competition only after it was out of production. Was breaking Chevrolet's vise-grip on the spectrum they command too much to ask even of the people of the Road Runner and the Charger? Could they, admittedly with a great new engine, overcome fourteen high-revving Chevrolet years in several? They would need something big.

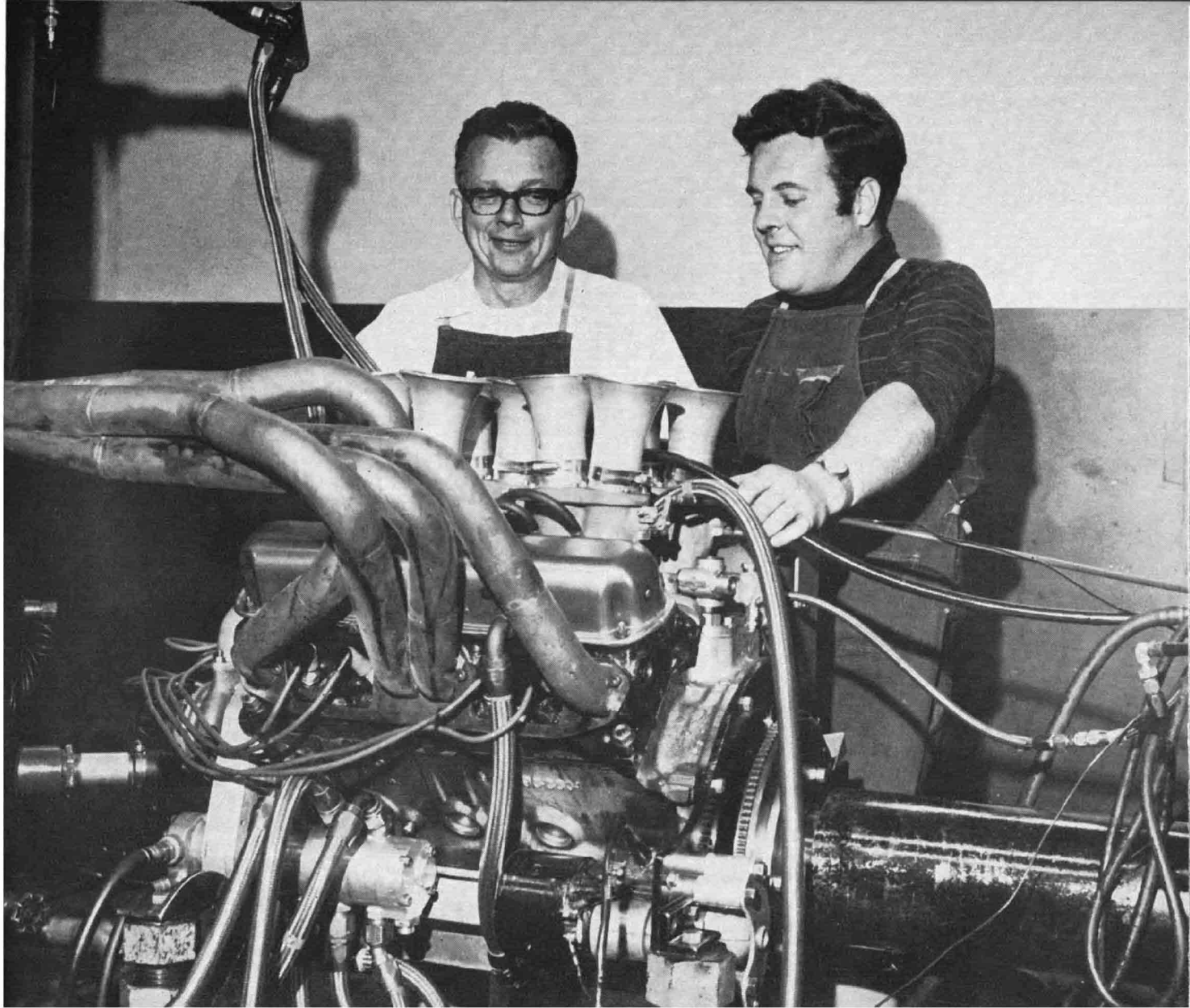
Indianapolis is big. If a Chrysler stock-block could win it . . . ? Look what happened to Gurney on 305 inches. US-AC's escalation of the stock-block displacement limit from 305 cubic inches to 320, slid their 318 engine nicely under the wire. But Chrysler has been in racing long enough to know that even with the fastest car on the track, Indianapolis involves so many imponderables that initial victory was, if not impossible, unlikely. Money and talent are not enough. Ford mounted a seemingly invincible armada, nourished by an investment of millions; but victory eluded them for three years. Besides that, winning Indy per se, though a delightful prospect, was really only equally important as making a good showing, race-in-race-out, over the entire USAC season.

Photos by Lester Nehamkin

Chrysler being Chrysler, the Indy small-block program assumed the character of their powerplant, small. Essentially two engineers in the field, one for the engine and one for the chassis, would develop and supervise the completion of Chrysler's team, one car. True, always at the ready in Detroit was the sprawling resources of the corporation, but these would amount by comparison to Ford's efforts in the same field to only a slush fund. Sent to Los Angeles to operate from Keith Black's engine emporium was boyish, round-faced, abrasive Pete Hutchinson, a brilliant racing engineer whose defensive mechanism is the direct frontal assault. Complimenting and contrasting Hutchinson for the driveline work was George (M. that is) Wallace, a young, thoughtful specialist with a photographic memory who seemed more at home in a college class on automatic transmission shift cycles than preparing surprises for Chevrolet.

On the face of it, independent Dan Gurney's All American Racers Eagle pushrod venture appeared to have had as much or more men and financing than Chrysler's but then Chrysler has always honored the homily about too many cooks and the broth. Besides, the people who were to campaign Chrysler-Plymouth products were not exactly novitates. Chrysler wanted and needed to glean the maximum publicity possible from the whole project, attention must be focused at ground zero throughout the undertaking. Of course, there is only one person who is a no-risk, money-back, guarantee winner in the printer's ink sweepstakes. Chrysler had picked their field generals well and followed it with the shrewdest associate of all, Andy Granatelli, the man who discovered that losing the race can be as good as winning, maybe better, if you do it right.

The fact that their engine would be run in one of last year's four-wheel-drive Lotus turbine chassis with an AMT fiber glass body after a 95 percent rebuild was not a handicap either. Even considering the Plymouth car would be one of many in the STP legion, some of which were Ford-pow-



Happiness is 540 horsepower out of your first Plymouth 318 engine for Indy. Right, Bobby Sykes (left) and Pete Hutchinson?

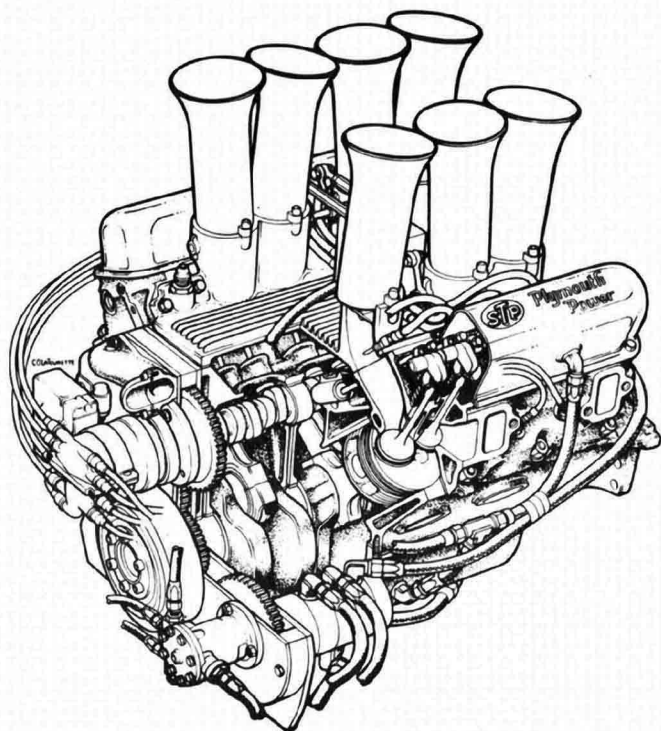
ered, curiously uniting competing companies in the same squad — the price was more than worth it.

The final decision to go on the scheme was given in early February, 1969. There were no pieces — no connecting rods, pistons, camshaft injectors — nothing. Just some 318 cubic inch blocks, some 340 heads and an idea to take a crack at the biggest race of all and in the doing create not only attention but a whole body of tested performance parts. The 4.00 x 3.18-inch bore/stroke cylinder block (319.6-cubic inch) would remain, in essence, identical to the five million Chrysler has ambling over the country's highways. To begin, the superior breathing 340 heads were added with the intention of contracting England's Harry Weslake to manufacture a Chrysler-design aluminum set later. Although increasing the normal 340 intake and exhaust valve diameter from 2.020-inch (intake), 1.600-inch (exhaust) to 2.105-inch (intake), and 1.658-inch (exhaust), as well as opening the exhaust ports fifteen percent giving Chrysler a 25 cubic-feet-per-minute (cfm) air flow advantage over the best Tracoized Chevy, the Weslake was still considered superior because its mixture path drops straight into the combustion chamber rather than coming in at an angle. And, they're 50 pounds lighter. The Plymouth-Weslake heads, used with a Bosch-timed fuel-injection is thought to be the ultimate, irresistible 340 combination especially on

road courses. Until its potential is tapped, a more-or-less standard Hilborn injector and PG-150 pump will be more than adequate for Indy's full-throttle cruising.

To offer fail-safe backup equipment as well as increase the number of 340 aftermarket vendors, most of the new pieces were ordered from two manufacturers simultaneously. For example, ForgeTrue created the first set of conventional 12.0:1 compression forged aluminum pistons. Later, an undulating or "figure-eight" skirt design which would be available from TRW. These pistons were unique in that they featured a pocket in the middle of the crown, between the valve reliefs, directly under the spark plug. The theory here is that a tiny reservoir of fresh mixture immediately below the plug will accelerate flame travel and improve the quality of combustion. As far as pure compression ratio was concerned, Hutchinson reconfirmed from previous hemi experience that an increase of a point (from 11.5 to 12.5, say) did not show a corresponding increase in output.

With an intended power peak of 7500 rpm, stock rods would obviously be inadequate so Fred Carillo designed a forged steel set using ½-inch 8620 hemi tapered bolts. Standard 340 crankshafts for the Indy engine are also forged steel (4340) and Tuff Trided for extra wear. Later in the season a flat-plane, 180° cam like the Australian Repco



V-8 uses, will be evaluated. Main and connecting rod bearings are Clevite 77 material throughout. Numbers two, three and four main-bearing caps are a Milodon nodular-iron four-bolt configuration with a normal two-bolt design on one and five.

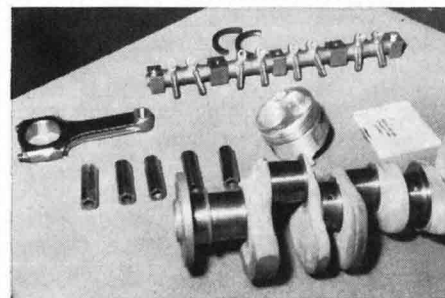
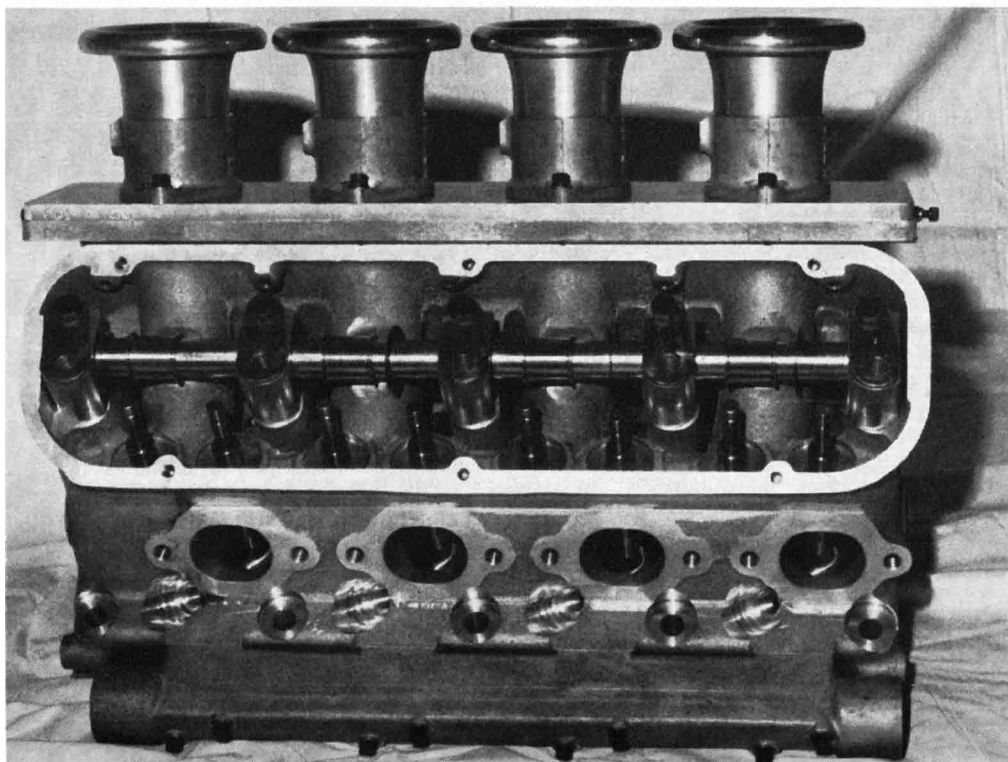
For an effective valvetrain combination with 9500 rpm potential, Chrysler-Plymouth had to look no further than the quality purple-stripe, 426 hemi valve springs. Interestingly, all the new Turbo-Offies use the identical valve spring because it is the best they've found. Since the hemi spring-inch is longer than the 340, the rocker arm shafts had to be elevated $\frac{3}{8}$ -inch on special steel stands. Then,

located on a higher plane, the rocker arm geometry was thrown out of whack, a situation remedied by casting a shorter set from steel. A Racer Brown 71R billet-steel roller-tappet camshaft with a .570-inch lift and 320° duration was selected after a half dozen alternate grinds were tried.

In the process of creating your dream child you not only try to build a world-beater but world innovator as well. Often, they are not the same. For Chrysler's part, their accessory gear-drive is novel, if not unique. All the vital systems: ignition, oil, fuel and water are driven off the front of the engine by the crankshaft at half its speed. In the design the normal camshaft chain was abandoned for a direct gear with idler arrangement. As you might expect, the oil system is of the dry-sump type made by Aviad Metal Products using a barrel-shaped housing with two scavenge and one oil pump. The oiling unit's outstanding feature is the half-round magnesium collection pan that closes to within $\frac{1}{8}$ -inch of the crankshaft. It is a clever gambit to utilize the "windage" phenomenon in speeding oil flow. Unlikely though it may seem, the rotation of a crankshaft causes a similar movement of the wind surrounding it (to around 120 mph at 6000 rpm), a force that can seriously affect lubrication. Maintaining a close pan/crank tolerance then reduces turbulence and, if an open ledge is designed into the pan's bottom, the oil coming off the crank will be literally thrown into the slit like a scroll blower. So well did the concept work when the initial engine tests were made that a negative or zero internal pressure condition existed, guaranteeing a minimum of blowby.

Stoking the fire in the Indy Plymouth will be one of two systems—a normal Mallory magneto or a Spalding BDI capacitive-discharge system. The mega-spark Spalding outfit beams infrared rays through a slotted wheel to trigger current release instead of the common ignition contact points. Everything is solid-state except the distributor shaft and it belts out a wallop that would cold-turkey King Kong. The only hangup with the Spalding unit is that it uses a battery.

Even as Hutchinson and Keith Black's best man, Bobby Skyes, meld the very young parts together, they realize their success is dependent in great part on the fate of the horsepower after it disappears into the transmission. In the beginning and for the oval tracks, power will be transferred



What make Plymouths run? Well, stuff like new pistons, forged-steel rods, and 9500 rpm valve gear (above), if it happens you're going to the Speedway. And then you'll want a set of Weslake heads (left). Even if they didn't flow air like crazy, a 50-pound weight reduction in a 1400-pound car is a big bite. Although it is always difficult to know how much power the Weslakes will add, a good guess is from 40-50 horses, probably more with Bosch metered fuel injection. Beyond its fate at Indy, the significance of the Plymouth project is that the wealth of information gathered will apply with equal effect to Trans-Am and Formula A.

to the Ferguson four-wheel-drive by a Chrysler aluminum-case, close-ratio, four-speed standard transmission. A remnant of the corporation's NASCAR program of 1965, the unit weighs 70 instead of 120 pounds. George Wallace's hardest task for the manual was locating some virgin assemblies, long since out of production. Modifications to the transmission will amount to shortening the in- and output shafts and adapting the tail-housing to the Ferguson chain-case cover. An 8.3-inch Borg & Beck four-plate clutch assembly, similar to those used on the Offy but with an additional plate, is to be the coupling agent.

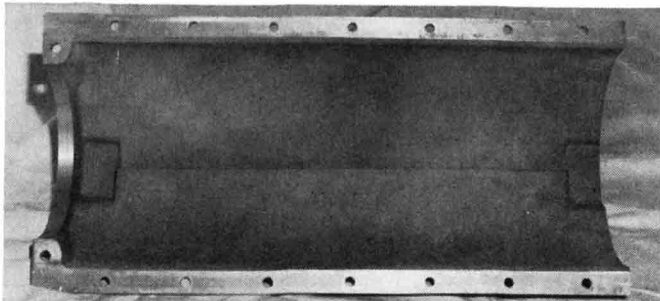
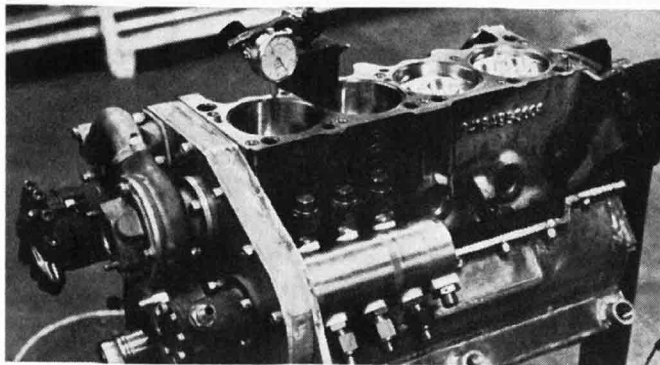
Wallace's visit on the West Coast, however, goes quite beyond a common standard transmission. His main efforts are to produce a workable TorqueFlite automatic for the road courses. Whatever Jim Hall may or may not have in the future, Chrysler wanted a reworked standard model rather than a one-of-a-kind item only-the-military-industrial-complex could finance. There was just one slight problem. In order that the TorqueFlite work properly in high rpm racing situations, its 2.45:1, 1.45:1, 1.00:1, first, second and third gear ratios were to be exchanged for 1.93:1, 1.29:1 and 1.00. Higher ratios demanded larger gears which meant, if you've ever looked at a packed automatic transmission diagram, something would have to be moved. This you do not do without great experience and time. B & M Automotive had the experience and time, they are the only firm the factory recognizes as competent to modify one of their units.

To achieve the new ratios, the pinion and annulus gear were enlarged and took up part of the area formerly assumed by the neutral-reverse clutches, handily eliminating neutral and reverse. B & M's Bob & Don Spar huddled with George Wallace and decided if they narrowed the neutral-reverse clutch assembly and reduced the clutch apply pack from four to three discs, it would accept the larger gears. In these advanced technological days you don't build anything unless you know it will work so the boys back in Chrysler's Transmission Lab ran the problem through the computer and found the clutches would hold with a 1400-odd-pound car weight. In the end, eleven separate pieces had to be narrowed, expanded, reworked or reshuffled to make everything fit. This was in addition to recalibrating the valve-body for faster shifts, incorporating a low-gear slowdown band (heavily modified drag-race TorqueFlites

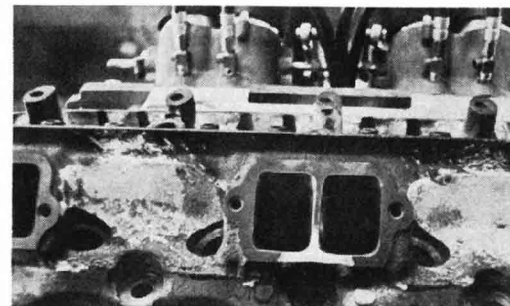
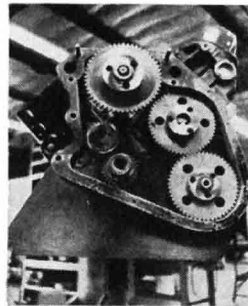
have this removed) and increasing the general capacity of the lubrication circuit and clutch material. If what B & M and Wallace have wrought functions as the computer says it should, by switching torque-convertors of various stall-speeds, the car will be able to be fine-tuned to each track. Even Jim Hall couldn't do that before.

When racing people recall the wonderful year of 1969, they will remember not only how the Plymouth Indianapolis adventure fared in the field but that it got there in so short a time. In six weeks beginning with almost nothing, there was an engine on the dynamometer. Using 340 heads, mild cam and cobbled-up fuel injection, it produced 495 horsepower on straight methanol. Exciting the methanol with fifteen percent nitromethane equaled 540 horsepower @ 6800-7000 rpm! When the finalized Hilborn injector arrived and the 71 R Racer Brown camshaft was inserted, the methanol power range was 503@ 7000 rpm, 520@ 7500 rpm, 506@ 8200 rpm and 565@ 7500 rpm on fifteen percent nitro. Dan Gurney finished second in 1968 with just over 500 horsepower. Projecting Chrysler's accomplishment, it is not unreasonable to assume Weslake heads, Bosh injection and other minor touches will yield 50-60 additional horses, bringing the grand total to the magic 600 horsepower.

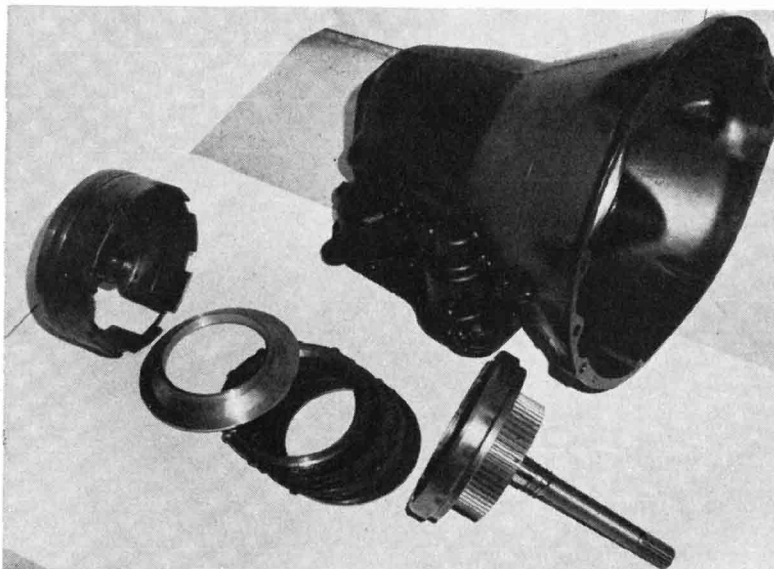
In the overview, with the perspective of the first half of the '70s, the Chrysler-Plymouth instant Indy program is perhaps most significant because it created a public fund of knowledge about some potent engines and set in motion the wheels of industry to make the necessary hardware. The Formula A, Trans-Am, Junior Fuel dragster, gas-class drag racers will thank them for it. "If we even qualify," Hutchinson said, "I'll be so happy I'll walk back to Detroit across Lake Michigan." You other guys, start walking. /MT



Magnesium oil pan (above), works on scroll-blower principle, throwing lubricant into slot in its bottom. Oil pump for dry-sump (top) is Aviad unit mounted on lower left side of



Gear drive uncovered (above left) puts all vital systems right out front where they can be easily serviced. Exhaust ports of standard 340 head (above right) were opened up fifteen percent.



engine. Common gear-drive motivates oil and water pumps and distributor. Ultra trick-of-the-week that most of the press missed is re-engineered TorqueFlite (above), built by B&M.