FORWARD BY TONY BARON

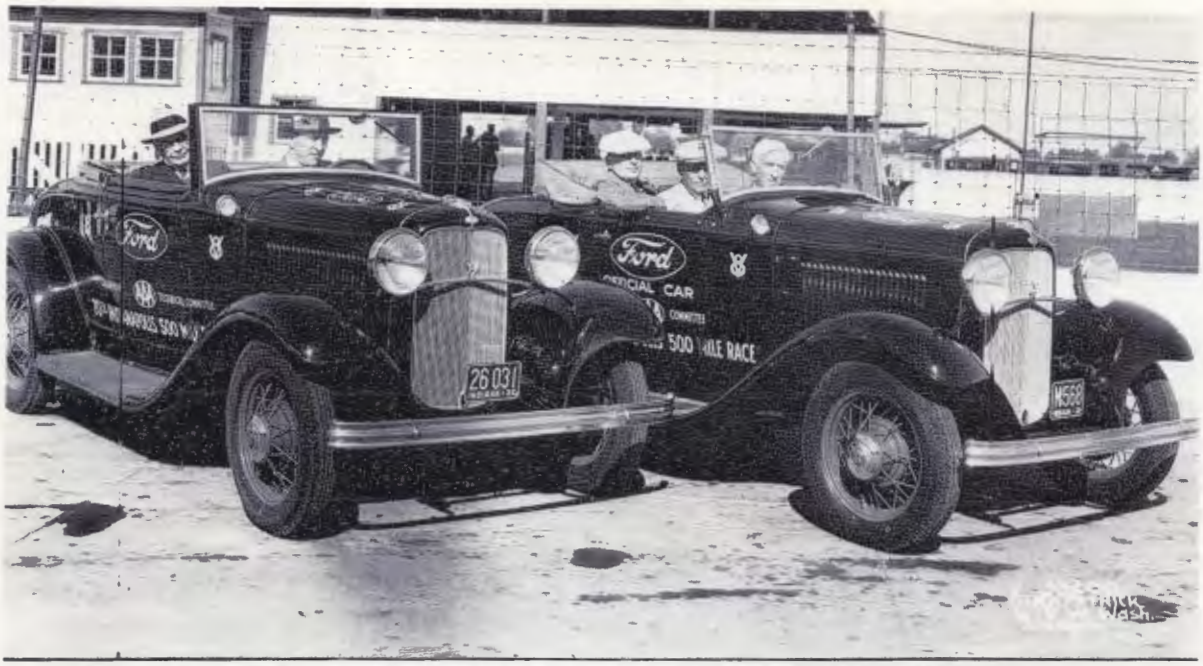
After the Army in the late 1960's, I returned to my roots, Ford Flathead powered cars. In the early 1970's, I acquired some of my father's cylinder head patterns, with the help of Lou Senter (Ansen Automotive).

I had met with fellow Flathead lovers Tom Senter and Mark Dees. Tom was busy building his own ultimate **'Flathead Ardun'** in his North Hollywood garage. Mark Dees was also giving him a hand on this project. Later they would team up putting this Ardun in Mark's Bonneville roadster. Mark had already been participating in Dry Lakes and Bonneville racing for over 20 years.

While talking to Mark, he mentioned his intention of writing a series of technical articles which would chronical the **Racing History of the Ford Flathead Engine.** What make this series so complete was that many of these early Hot Rod Pioneers (pre-war) where still alive and able to contribute. This Series of articles was published in 1973. Each Month I would eagerly await the second, third and fourth editions.

Mark would go on to write the definitive history of the Miller engine In 1981; 'The Miller Dynasty'. Hope you enjoy these Flathead articles as much as I did in 1973.

Tony Baron
November 3rd 2024



Deuces up. Two new Fords served as official cars at the Indianapolis Motor Speedway in 1932. Eddie Rickenbacker and long-time IMS Vice-President, "Pop" Myers, are in the Cabriolet; speedboat champion Gar Wood is at the wheel of the Roadster. Credit IMS.

A TECHNICAL HISTORY of the RACING FLATHEAD

by Mark Dees

APOLOGY—We printed a short article entitled "Racing History of the Flathead Ford" in the Sept/Oct *V-8 Times* that had appeared in "Deuce News" as written by Randy Leech of Mission Trail R. G. Unhappily, the piece had been taken from a series authored by long-time Early Ford V-8 Club member Mark L. Dees for Petersen Publishing Company's ROD & CUSTOM magazine in 1973. I am the one at fault — for not checking with Mr. Leech before borrowing the item, and I apologize to Mark Dees and to Petersen Publishing for my carelessness. In return, they have been so gracious as to permit us to reprint the entire four-part series in *The V-8 Times,* commencing here. My thanks to Mr. Dees and to Bob Gottlieb of Petersen Publishing for their broad-minded attitude.

— Roger Neiss, editor.

Dual-downdraft Winfield SR as used on the 1935 Welch Indy cars and a number of other early V-8 hot rods. Credit: Dees

Part 1

This aerodynamic Ford-based special managed 104 mph to become 2nd alternate starter in 1934. Engine modifications, if any, are unknown. Note the 16-inch Firestone Air Balloon "street" tires and wheels. Harrah's Automobile Collection, Reno, now has the chassis. Credit IMS.

WHEN THE FIRST FORD V-8 was introduced in March 1932, it was recognized immediately as a *tour de force* of engineering, production technique, and styling. The aging Henry Ford had dealt another masterstroke from his besieged position in the sales war with Chevrolet and Plymouth. But you can be sure that few realized that the new engine would become the most highly developed side valve engine of all time—the pattern for two generations of "big American bangers"—cheap, readily available packages with power enough for any racing application and torque enough for any truck.

Don Sullivan, a Ford development engineer from the first V-8 to the DOHC Indy engine of the '60s, was asked whether Henry's team of '30-32 was swayed in crucial design decisions by the notion that the eventual product would be used in racing to the subsequent glory or ignominy of the Ford Motor Company. "Not then," he responded, "we didn't think that way until later." Nevertheless, as somebody said about Model T, the flathead V-8 was spirited clay, and thousands of professional mechanicians and speed-crazed kids sculpted it into a tiger indeed.

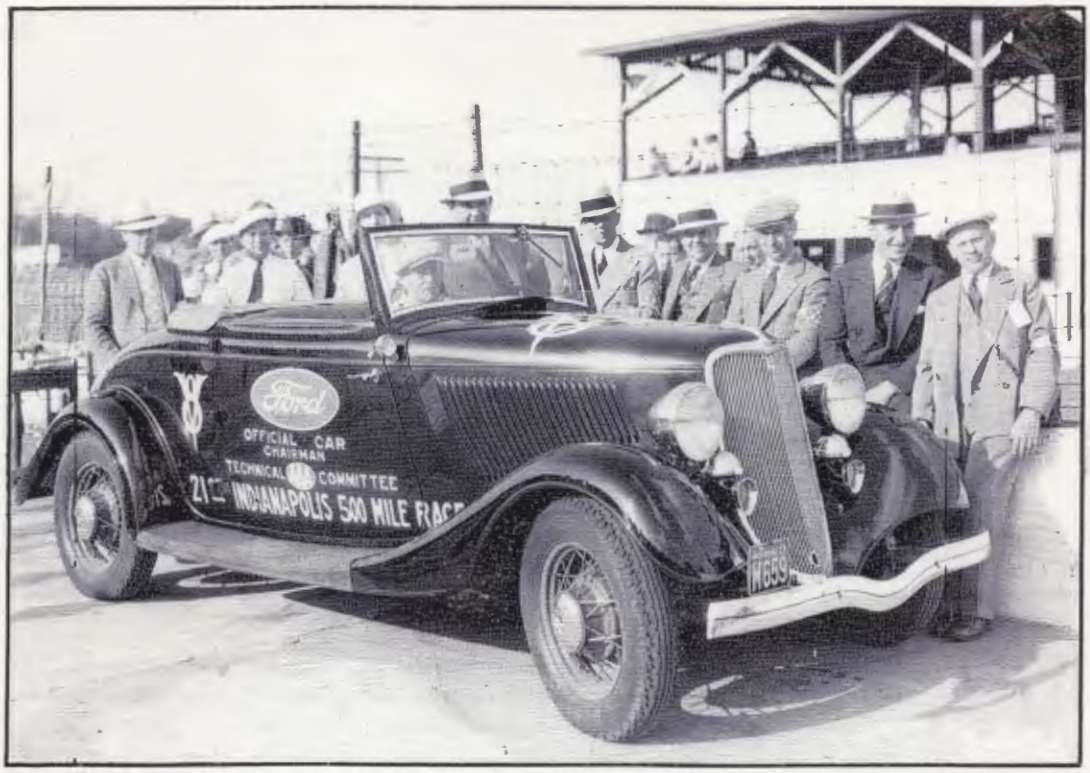
This is the first of a series of four articles which will explore in detail the sport and racing development of the Ford flathead V-8 and its various chassis from 1932 to the present day. We'll necessarily cover the majority of special parts, modifications, and speed secrets for those who either want to run 'em hard or just want to reminisce.

The knowing eyes of the few (very few) could see some distinct performance advantages in the first Ford V-8. A light, compact block with eight individual intake passages; good sized valves; lightweight, directly actuated valve gear; aluminum cylinder heads with a deep breathing heart-shaped combustion chamber; and a short, stout forged steel crankshaft. The next year the heart-shaped chamber would be abandoned in the quest for compression, and the forged steel of the crank would give way to cast iron. In time to come hotrodders would treasure the nearly indestructible steel camshafts and crankshafts of 1932 and fit them to later blocks. The '32 had a very nice cast alumi-

ABOUT THE AUTHOR: *Mark Dees, 44, is an attorney practicing in Beverly Hills, Calif. He has competed at the dry lakes and Bonneville since 1950, and with the Dees-Joehnck unblown Chevy-powered Austin roadster still holds the all-time gas roadster speed record (220 average).*

At one time Mark owned a huge collection of flathead V-8 speed equipment and photographs which constituted a major source and inspiration for this series of articles. He complains that he has too many automotive projects, but gives priority to the construction of a 27-T street roadster powered by a rare Dixon OHV conversion on a '37 Ford block, the restoration of a vintage Ferrari and a '40 Cadillac 60S ("I have to say it's a better car than any Ford"), and the completion of a definitive technical history of the works of Harry A. Miller.

Ted Horn's "Ambassador Brewing" '34 Roadster laps a hapless Chrysler on the way to 6th place in the 1934 Mines Field race. Ted drove the same car to second place in the Ascot Targa Florio later that year. Credit: Wilson



Eddie Rickenbacker and a group of AAA dudes in 1933 with a new Model 40 V-8 Cabriolet. Man at the wheel is believed to be Col. Arthur Herrington, who manufactured the Marmon-Herrington four-wheel drive conversion for Ford V-8s. Credit IMS.

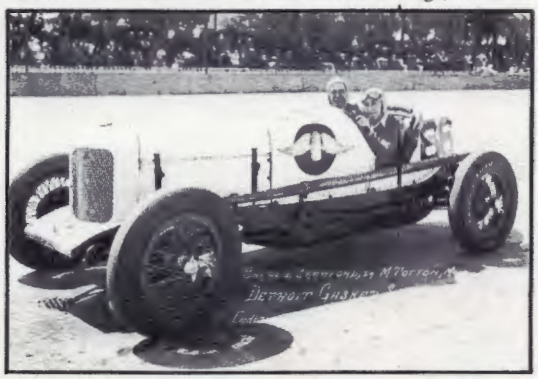
num oil pan which was to become a desirable item.

On the negative side, the first V-8 displayed a very poor intake manifold with an unsatisfactory single-downdraft Detroit Lubricator carburetor on a "single log" manifold which permitted adjacent cylinders to rob each others' charge to the detriment of low speed torque. Crankcase ventilation was woefully inadequate. By far its greatest defect, however, and the one that would plague the V-8 to the end of its days, causing bore distortion, oil consumption, overheating and power loss in every use from taxicabs to armored cars was the exhaust port layout. Three passages on each bank, the inner two exhaust ports being siamesed, wound around the cylinders and through the water jacket, creating a sure-thing boiler. The situation wasn't helped any by overdriven water pumps mounted on the front of the heads where they had to suck hot water out, not push cool water in. The problem didn't become too obvious as long as the engine ran behind the tall, efficient radiators of the earlier models. When I berated Don Sullivan for this design, he pointed out that on prototypes the exhaust had been brought out next to the intake on the top of the block, a la Cadillac, but that it made for reduced inaccessibility, increased underhood heat, and additional complexity of assembly. In this series we shall touch upon a number of approaches to the solution of this problem.

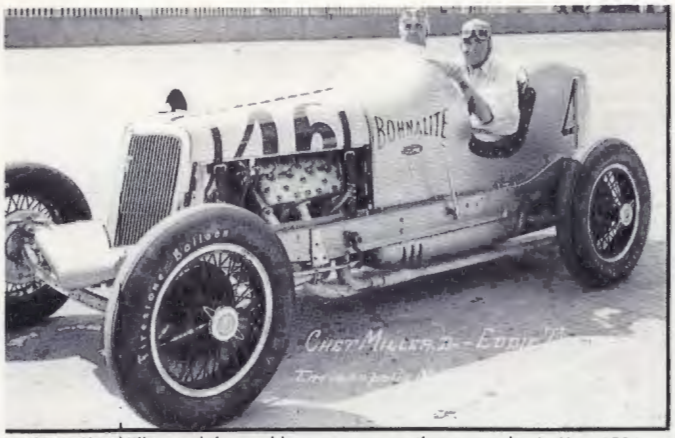
Of course, the side valve arrangement itself is hardly a high performance setup, but consider the state of the art in the American motor industry in 1932. Nearly all engines had side valves; of those that didn't, Buick and Chevrolet had poor porting and fragile lower ends, and the rest were too big, heavy and expensive for most racing applications.

Stripped Ford roadsters were victorious in stock car races at Elgin, Mines Field, Legion Ascot, and Oakland, but the rules required these engines to be strictly stock. Although A.A.A. scrutinization was pretty sharp in those days, it would be absolutely amazing if some of the fellows hadn't engaged in a little cylinder head shaving, camshaft alteration, venturi boring, and chassis hanky-panky in the grand old American racing tradition, where the only sin is to get caught.

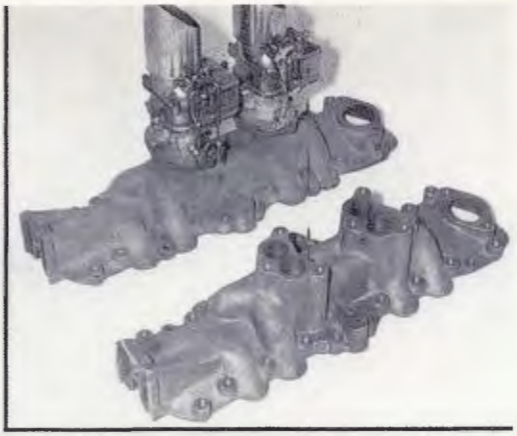
The first modified V-8s of which we have any certain record are those which appeared at Indianapolis during the so-called "junk formula" of the early '30s. Coincident with the onset of the Depression, the AAA championship rules were changed to eliminate the exquisite, expensive, all-conquering supercharged Miller and Duesenberg 91 cubic inch single-seaters in favor of what officials hoped would be a horde of two-seater modified stock cars. Up to 366 inches were permitted, blowers were banned, minimum weight limits were imposed. Many stockers were entered; they might as well have stayed home. Thoroughbred Miller-based DOHC straight eights and fours spotted the Detroit creations hundreds of cubic inches and still drove them into the ground with humiliating regularity. Among the least of these were the various Ford V-8s, somewhere behind theStudebakers, Buicks, and Model A Duesenbergs; but let us



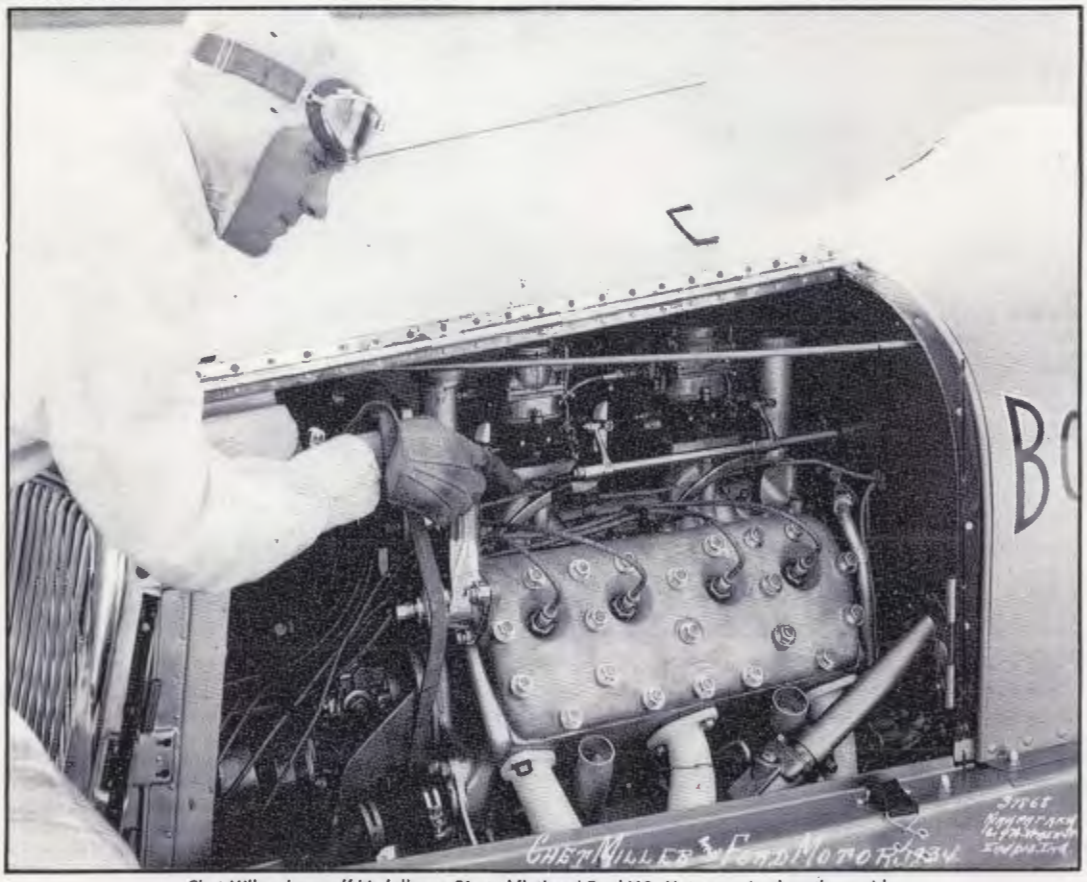
It's sad, but perhaps the crudest car ever to run at the Speedway in '34 was this crude '32-based two-seater. Nate the flimsy, improperly mounted rear radius rods, ill-fitting hood, stock '32 Ford rails, and 18-inch Dayton wheels. Credit: IMS



Ford V-8, Chet Miller, and the world were young on that sunny day in May, 1934, n the Bohnalite Special rolled out for its official portrait. Again, note the use of :e roils. Personally, I wos less than a year old and my mother had traded her '32 V-8 or for a Studebaker. Credit: IMS.



Hexagon Tool and Die odapted the Sullivan design used on the Ted Horn Miller/Ford unit for the street in the '40s. Backward mounted carbs gave generator clearance.



Chet Miller shows off his full race 21-stud flathead Ford V-8. Note massive breathers, side-saddle-mounted 97s, forged throttle linkage and safety wiring. A first-class effort. Credit IMS.

be thankful they were there at all.

First of the V-8s to appear was the graceless and ill-fated C. O. Warnock entry prepared by Robert M. Roof for the 1933 Indianapolis race. Warnock was the entrant of some notable Model T-based cars at Indy in the mid-20s, and Roof achieved a degree of immortality as designer of the famous Laurel equipment for Fords which first appeared around World War I. Their racer was not much more than a slightly modified '32 sporting a crude racing body and two stock Detroit Lubricators on a handmade log manifold. As on every Ford V-8 that has run at Indy, the stock distributor was ash-canned, in this case for a Mallory.

Both Doc Williams and Terry Curley attempted to qualify the car, but couldn't do any better than 104.538 mph. Roof went on to produce a line of V-8 speed equipment out of Anderson, Indiana, which we will cover more thoroughly in a future article. The car returned in 1934, even more disreputable in appearance than ever, bearing the name "Detroit Gasket Special." Roof was apparently out of the picture, since the engine was now equipped with Bohnalite heads and a single large Stromberg duplex carburetor on a stock 1934 manifold.

The 1934 and succeeding manifolds, together with all modern V-8 production manifolds, incorporated a so-called 180

By virtue of stock car race wins in a '34 Roadster, 1933 Indy winner and AAA champ Louis Meyer was the recipient of this nice '34 Vicky with non-standard color scheme.

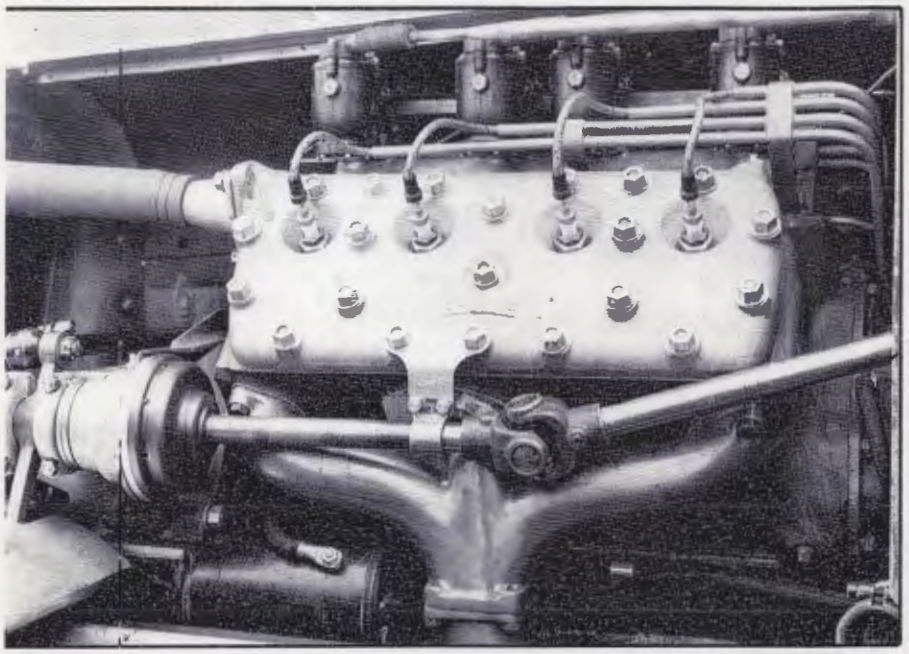
A wild Italian driver little known outside of Southern California posed with his new Fordor in 1934. The next year he would win the Indy 500 with the first engine to be called an Offenhauser, and thereafter would slide back into obscurity. Credit IMS.

degree firing order. In this design, the manifold is split into what amounts to two separate chambers, one atop the other, each one being fed by one venturi of the dual down-draft carburetor. Each chamber feeds four selected cylinders, one of which fires every 180 degrees of crankshaft rotation. If all eight intake ports are permitted to draw from a common plenum or log, one cylinder tends to rob the incoming charge of the cylinders opening 180 or 90 degrees before. At high rpm this effect is not so noticeable, which is why dual and triple carburetors on a log manifold give a worthwhile increase in maximum horsepower even though the torque curve is flattened badly. The Edelbrock organization has developed a carefully contrived non-180 degree street manifold in their *Tarantula* and *Torker* designs, but the principles upon which they operate are highly esoteric and for the most part extraneous to the flathead saga. The principle point is that many designers made, used, and sold lots of manifolds for the Ford V-8 which ignored the firing order problem with a consequent bad effect on broad range performance.

Charlie Crawford qualified the "Detroit Gasket Special" at 108.784 mph, third slowest in the field, but before the race someone's pride or the race stewards forced a complete refinishing in gloss black paint. Charlie blew a head gasket on his 110th lap, which didn't do much for the sponsor's image, and was given credit for 16th place. The car was back in 1935 as the "Harry Henderson Special." It was modified to the extent of a small Winfield Model S carburetor over each set of intake ports, for a total of 4 carbs. The bulbous nose was replaced by a stock '34 Ford grille. Doc Williams got back behind the wheel and tried to make up for his failure to qualify it in 1933. He wrote it off over the inside wall of the south turn.

In 1934 Don Sullivan laid out a car for the Bohn Aluminum & Brass Corporation, a large firm which then and now produces various automotive components for manufacturers and the aftermarket. This jewel was based on a '32 frame and running gear and was a low budget but professional effort. The '34 engine was equipped with Bohn's own Bohnalite aluminum racing heads and .030" over pistons (giving a compression ratio of 8½ to 1), a racing camshaft, and a Robert Bosch magneto. Most interesting was the Sullivan-designed Bohnalite intake manifold, which mounted two Stromberg "97s" sideways, with the bowls lined up with centrifugal force on the turns. Horsepower was alleged to be around 140 at 4400 rpm. Unless there was some restriction around the valve heads due to combustion

They still argue whether Al Gordon or Stubby Stubblefield won the 1934 Mines Field stock car race, although the official nod went to Stubblefield. Both were alumni of the old Legion Ascot Speedway, members of a brilliant, doomed group which included Ernie Triplett, Ted Horn, Rex Mays and Bryan Soulpaugh. Credit Wilson.



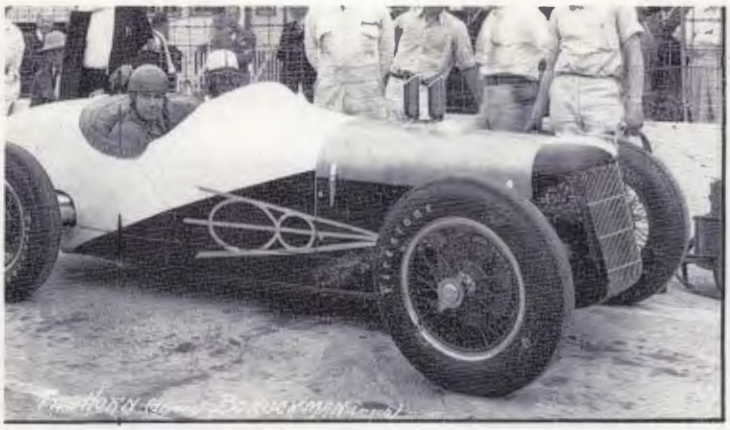
Engine room of the Miller Ford. The clever planetary steering gear was bolted to the engine where exhaust heat fried out oil the lubricant. If you don't salivate at the sight of those cast "W" headers, may we suggest you turn to the "Pigeon Fanciers Gazette." Credit IMS.

chamber design, or camshaft limitations, the engine should have turned at least 5000 rpm before reaching its power peak. In any event, Chet Miller and riding mechanic Eddie Tynan qualified the car at the respectable, if not spectacular, speed of 109.252 mph. On the 11th lap they sailed over the southwest wall on oil spilled by Wilbur Shaw, with little damage to the car or its occupants.

This car presents as good an example as any with which to make some important points about Ford suspension modifications. From the photographs, one can see that Sullivan split the front radius rod "wishbone" and anchored the severed ends on pivot points outside each frame rail. This course was more or less forced on him by the substantial rearward relocation of the engine and transmission. Be that as it may, the effect of splitting the wishbone is to permit the entire axle assembly to move only in one plane. The front suspension now has infinite roll stiffness, which means that when one front wheel hits a road irregularity, it tends to disturb the other wheel far more than would be the case if the front axle assembly could still pivot on the original single joint under the chassis. It also means that the mass of the car can't roll when it is affected by centrifugal force in a turn—such force isn't fed into the springs, it's transferred in large part to the outside front wheel. The cornering power of the front suspension is thus greatly reduced compared to the rear suspension, which means that the car has a very high degree of understeer. Understeer means that the car will "plow" on turns; the front end will want to keep on going straight in corners even as the driver pours on more and more steering lock.

Now in the case of the "Bohnalite Special" and many similar circle track cars, the problem is mitigated to a degree by the flexibility of the channel-type frame, the characteristics of those skinny old tires, and the desirability of understeer for the average driver. However, thousands of simple hotrodders, and some not so simple, not only split the front wishbone but the rear wishbone as well! This makes the whole darn car infinitely stiff in roll, with understeer or oversteer dependent on such imponderables as the flexing of the chassis and tires. Roadholding in most cases just departs to hell. Please don't cite examples of the dirt track car, which skids around under special conditions, or the drag or lakes machine, which might work just as well (many do) with absolutely solid suspension.

The fact is that for normal road use the ubiquitous split wishbond is an abomination. If we must use a beam axle, let's leave



Ted Horn's hood is still in primer after being adapted to the Hexagon-Sullivan high-rise dual manifold. Note the crazy velocity stacks and the zippy crash helmet on our Ted.

1935 Miller Ford front wheel drive gearbox shows many Ford components arranged in typical Miller foshion, with the indirect gears taking the power flow after it left the geor reduction of the ring and pinion. Credit IMS.

it the way Henry made it, or use four parallel radius rods, fully jointed with tie rod ends or ball joints, on each axle. This will permit chassis roll, some degree of independency, and the possibility of tuning the chassis for road or course conditions. And it's advisable to eliminate a shackle on one side so the axle can't move sideways, or install a Panhard rod (the famous "sway bar") or Watts linkages to accomplish the same result.

1935 of course brought the magnificent Miller-Fords to Indianapolis. The story of Preston Tucker's promotion of the project, the hurried manufacture of these lovely cars, and their failure during the race has been covered in detail elsewhere. We'll just touch on some of the more important technical details.

Harry A. Miller, the tragic genius of American racing, couldn't have been very excited about the Ford V-8 engine. He had already built hundreds of classic DOHC racing engines which were second to none in the world for specific output and elegance of execution. Yet before his engines had won more than a few races, he was coming to realize that power was useless unless it could be controllably applied to the road. By 1935 he had built, among other wild and wonderful things, the first successful front wheel drive Indianapolis cars, other racing cars with de Dion rear suspension, and a four-wheel drive car which led Indianapolis for many laps and went on to become the first four-wheel drive car to compete in a European Grand Prix.

In the Miller-Ford project, which in retrospect appears more as a design exercise than a racing program, his restless, fertile mind leapt decades ahead of his wishbone-splitting contemporaries to fashion a fully independent layout in which the suspension members themselves doubled as aerodynamic fairings for the whole axle assembly. It was the most aesthetically pleasing running gear ever placed on a racing car. Don't knock Miller's placement of pivot points, *nobody's* conception up to that point encompassed the interrelated dynamics of chassis, tire, and driver behavior. In that same year Mercedes-Benz was using swing axles at the rear of its Grand Prix cars and wondering why they were so beastly to handle. And, don't fault the leaf springs; it wasn't that Ford insisted on them so much as that they fit nicely into most suspension arrangements and contained a lot of internal damping. Miller would use them later for his final quantum leap into the future, the Miller-Gulf cars.

The transaxle was similar to previous Miller front drive units dating back to 1924, although it used a large number of Ford parts, including a stock ring and pinion. Accordingly, this gearbox suffered from the defect of its predecessors in that the transmission gears were mounted *outboard* of the final drive and received full main reduction axle torque—about three times more than they were designed for. Still, they offered a reasonable degree of reliability at the speedway even when the flathead was replaced by an Offy; hotshoes of those days knew that you shifted any Miller front drive *very* gently.

Miller had little or nothing to do with the engine modifications, which were assembled by Ford company mechanics Bill Speedie, Henry Todd, and others. Don Sullivan designed a four carburetor log manifold, but it was something less than

Milt Marion won a 250-mile stock car race at Daytona Beach in 1936 with a stock 1936 Roadster held together with nothing but Permatex. The name on the hood is a misnomer. Credit IMS.

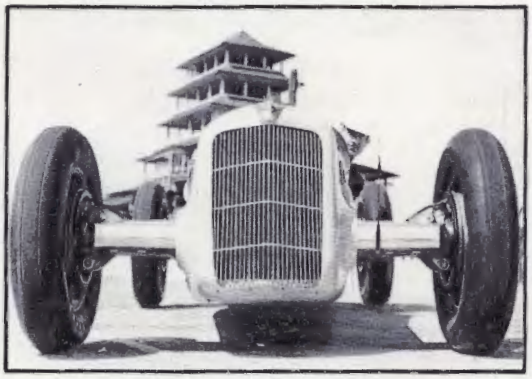
a success although it was used on three of the four Miller-Fords which qualified. The reversionary impulses in the inlet tract set up a "standoff" condition, that is, the air-fuel mixture vibrated right out of the top of the carburetors to throw off the mixture, rattle the carb floats, and give the driver and mech a facefull of gasoline. Don quickly designed a 180 degree high rise manifold for two "48s" which was cast up and finished by Hexagon Tool & Die Company, another Ford supplier. Since the engine was mounted backward in these front drive cars, the carburetor flanges were also turned backward to place the float bowls forward, as in a stocker. Ted Horn, who had placed a Ford roadster second in the 1934 Ascot Targa Florio, was given this trick setup. It killed the standoff problem, and rookie Ted qualified his Miller-Ford at 113.213 mph. He made 145 laps until the steering box packed up; but it was the best performance of the team.

Engine specifications of the Miller-Fords varied somewhat, since some of the engines were snaffled from Bill Speedie's hydroplanes and some were built up just for the race, but most were similar to the Bohnalite engine, that is, stock stroke and slight overbore, reground cam, Bosch Magneto, and extra oil capacity. Horsepower was supposed to be circa 160 at 5000 rpm. Hexagon Tool & Die kept the manifold patterns and discovered that the reversed carbs nicely provided the necessary clearance for the generator on a stock V-8 installation. They advertised and sold a couple of different versions as late as 1950.

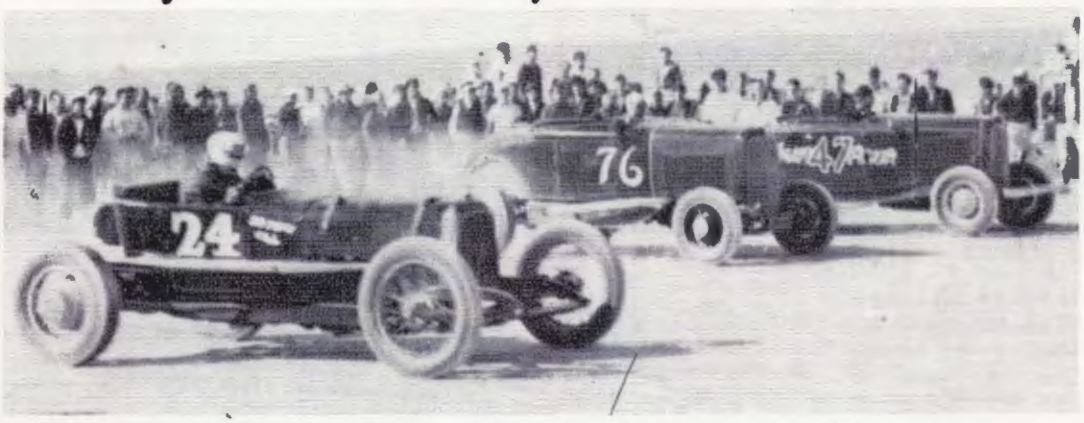
Engine rebuilder Lew Welch, who provided Herb Ardinger with a pair of V-8 powered rear drive cars which couldn't make the grade in 1935, bought a Miller-Ford which he equipped with a 255 Offy. Ardinger brought it into 6th place in 1938, and in 1939 Cliff Bergere placed 3rd with it. Ralph Hepburn drove it in 1940, and the steering froze again in spite of all the remedial measures Welch had taken. In 1941 the car appeared with a blown 183-inch V-8 designed by Leo Goossen, which was basically two Offy midgets on a common crankcase. The car took 4th place; you know it as the first Novi.

Andy Granatelli bought a Miller-Ford after World War II. In 1946 he showed up at the Speedway with a 268-inch bored and stroked 24-stud engine in place of the old 21-stud mill. Danny Kladis barely made the field with a 118.890 qualifying speed; he was disqualified for an illegal tow after running out of gas. In 1947 Pete Romcevich qualified slightly slower and managed 167 laps to be classed as a finisher. In 1948 Andy crashed it while trying to qualify. Not much of a record, but it was the best a flathead's done at the Speedway.

Next: Part II—Dry Lakes and Speed Merchants.



Cliff Bergere and a Miller-Ford. That isn't a piece of aluminum wrapped around the front axle on each side, it's a pair of alloy castings serving as A-arms with the tie rod running inside. Grille was patterned after 1935 Ford passenger car. Credit: IMS



The V-8s had a tough time during the early Thirties. Shown here is one of Ernie McAfee's first modifieds about to beat a pair of '32 V-8s in one of the multi-car acceleration trials that were a feature of the first lakes meets. McAfee was killed at Pebble Beach in 1956 while driving a 4.4 litre Ferrari.

A TECHNICAL HISTORY of the RACING FLATHEAD

- PART II -

by Mark Dees

Reprinted from June 1973 ROD & CUSTOM Magazine with permission from Petersen Publishing Co.

Muroc Dry Lake, 1938. The famous Harvey-McAfee modified, one of the first fast V-8s, nails Snuffy Welchel's Riley 2-Port in a match race. Credit: Eldon Snapp.

Part 2

NO ONE KNOWS who drove the first hot rod on one of the dry lakes of California's Mojave Desert, but photos exist of Edwardian racing cars on the hard alkali as early as 1910. Various AAA record attempts during the '20s and early '30s brought Muroc Dry Lake to the attention of the world, most notably Frank Lockhart's staggering 171.02 mph pass in his blown 91-inch Miller circle-tracker.

Although hopped-up Model Ts and the like undoubtedly were running long before, the earliest speed meet records we've found date from March 1931. Amateur events were promoted by Colonel Alexander, the Purdy Bros., Gilmore Oil, and racing groups like Western Timing and the forerunner of today's Southern California Timing Association. Most contestants, like today's kids at the Wednesday night drag strip grudge races, were youngsters on a lark. Even the hot shoes had little access to sophisticated racing technology and no money to make use of it anyway. So if the typical lakes machine of the Depression era was exquisitely trashy and pitifully slow by Lockhart's standards, much less those of the present day, don't knock it. We have hundreds of events, monthly magazines, a massive industry, and the pioneering of our forefathers from Harper, Rosamond, Muroc, and El Mirage to help us out.

Shown on one of the SCTA programs is Eldon Snapp's drawing of Danny Sakai's Ord-equipped 125 mph modified. Sakai was killed that year in a bike accident. There were many Japanese-American lakes racers; it's incredible that they should have been clapped in concentration camps when the war broke out.

Through the '30s most lakes entries were categorized as either "stock," meaning stock body with no alterations other than removal of top and fenders, and "modified," meaning anything goes. About 1936 or so the SCTA recognized a "streamliner" class for any modified with a pointed tail rather than the traditional square or rounded fuel tank. In 1933, when the first V-8s showed up, the best hot rod time at the lakes was 118.43 mph, set with a Ford "B" based Riley Four Port modified. It would be years before the V-8s would run that fast. In fact, perusal of the early records impresses us with two facts: the embarrassing trouncing the Ford fours gave the first V-8s, and the incredible performances of four-bangers with Winfield flatheads against the overheads—mainly the Cragar (originally the Miller-Schofield), the slightly faster Riley Two-Port, and the best of the rocker arm heads, the Riley Four-Port. As an example, at a SCTA meet on Muroc in May 1938, Ernie McAfee set a new record for the streamliner class with a two-way average speed of 132.89 mph. This was done with an unsprung, open-wheel single seater with a Winfield-equipped four-banger. The next year he went 137.85 mph one way. No overhead four-banger conversion, and only one V-8 (Karl Orr's modified) reached these speeds before the war—and this particular record was actually broken by Bob Rufi's Chevy four.

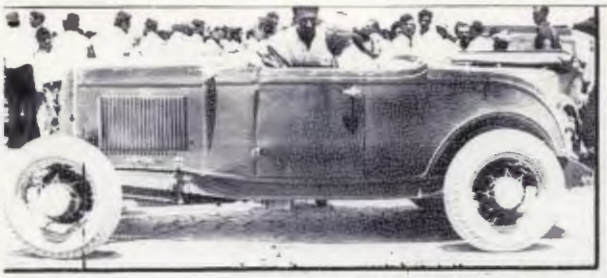
Things started to look up for the V-8s in 1937. Ford brought out a better engine, a number of homebuilt and production dual carb manifolds were in circulation, the cam grinders found the right combination, and, most important, the smart fellows at last switched from their not-so-faithful fours. That year, too, Bob Stellings, Gardner Harris, and the inventive Spalding Brothers each showed up with the first great engine swap—a flathead V-8 in a lightweight Model A roadster. By late 1938 the modified class record had fallen to the Spaldings' Harman-cammed speedster, and by the next year most of the top contenders were running V-8s. By 1940 it was obvious that the four had reached the limits of its development in the hands of the average tuner. There were exceptions—like McAfee's car and an equally streamlined but prettier car, Bill Warth's 132 mph Winfield streamliner.

Let's take up each aspect of the prewar flathead performance picture in turn:

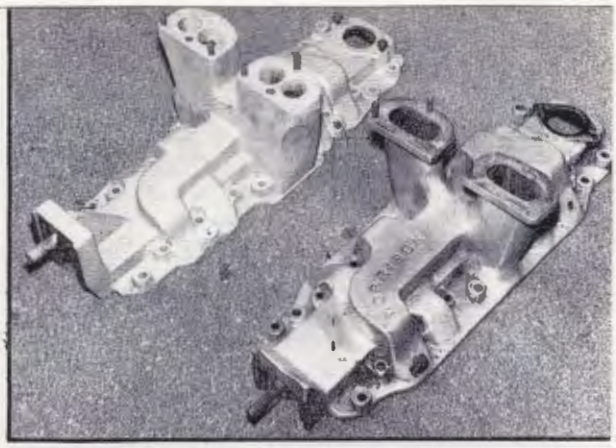
BLOCK AND CRANKSHAFT

As mentioned in the last installment, only the 1932 V-8 was sure to have the slightly heavier forged steel crank, although a few '33s and '34s may have been so equipped. We used to treasure these old crankshafts in the belief that they were stronger than the later cast cranks, but the biggest custom crankshaft shop in the country informs me that a late cast crank with nitride treatment is just as strong and perhaps a bit stiffer. Regardless of the material used, main journals from 1932 to mid-1936 were 1.999 inches in diameter and rotated in poured babbit bearings. Rod journals were also 1.999 inches in diameter, but rod bearings were of the insert type.

In mid-1936, main journal diameter was increased to 2.399 inches with insert bearings, which arrangement was carried through 1937 and most of 1938. Special inserts were made by Ford to adapt the early small journal forged crankshaft to the late-'36 to '38 blocks, and Ron Williams' 133-mph A-V-8 roadster of 1953, possibly the fastest 21-stud roadster ever to run at the lakes, was set up just that way. Of course, only the late '36 blocks had the water pumps in the heads in the old style; the '37 and '38 still had twenty-one head studs per bank, but went to block mounted pumps and center

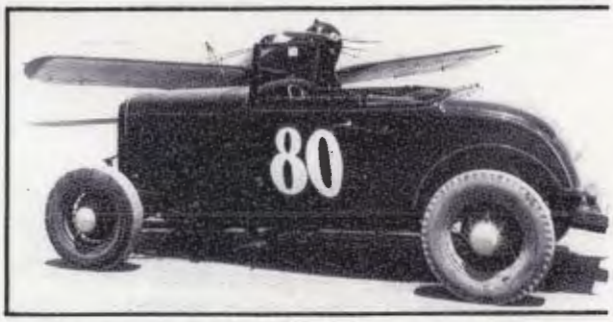


The roadster record in 1933 was held by A. McDonald's Deuce highboy at 108.10 mph. Unfortunately for V-8 freaks, it was a Winfield "Red Head" equipped Model B four-banger. Credit: Lou Rose.



Wayne Morrison was the first Californian to produce especially cast dual manifolds for the flathead. On left is 1935 example of his "Duo-Dual," on right the improved 1937 model. Manifolds had 180 degrees firing order, but rather constricted ports. These were made until shortly after the war.

Several say that Richie Richards' hastily stripped '32 was the first stock-bodied V-8 to exceed 100 mph at the lakes, doing 104.04 mph by Purdy Brothers timing in May 1937. Car had milled heads and Betry manifold, which was a stock unit with extra tubes running to the ports from the base of the carb. Richards and his son are still active Bonneville bike racers. Credit: Owen Betry.



Harper Dry Lake, 1939. Behind Walt McClurg's 106 mph Cabriolet is an Arrow Sport "F" airplane powered by a Ford V-8 engine. 105 of these two-seaters were made in Lincoln, Nebraska. Performance was rather marginal, top speed being around 85 mph. Credit: Knox Allen.

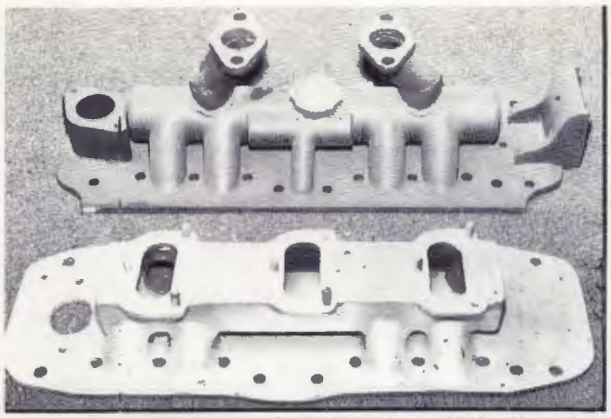
water outlets. So, if you can find one, the late '36 is the hot tip for the '33 to '36 restorer who wants the simplicity and durability of insert main bearings. You can't pass such a block off as a "gennie" 1932, however, as there are certain subtle casting differences that the expert can spot.

The "24-stud" made its debut in 1939, at which time main journal diameter was increased to 2.499 inches where it remained until the flathead was dropped. However, the 1939 Mercury was the power plant that gladdened the racer's heart by virtue of an increase in bore size to 3-3/16-inches standard for 239 c.i. displacement, up from 221-inches. Sharpies noticed that the new Merc had a rod journal diameter of 2.139 versus the previous 1.999. Grind the Merc journals off center 1/16, use the early rods, and presto, 1/8 more stroke for a total of 3-7/8 inches. Bore out the block 1/8 to 3-5/16 total to give yourself the classic "Eighth by Eighth" of 268 c.i. displacement . . . known later in some circles as "Edelbrock Standard."

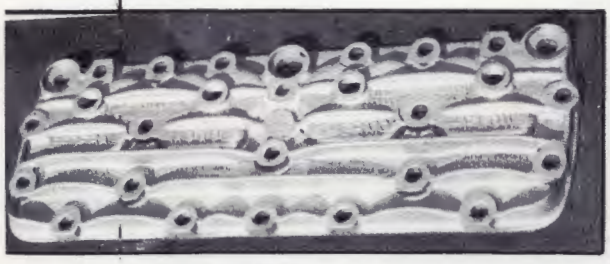
It's been said that Ford went to the 24-stud arrangement to prevent head gasket failure. In a sense that is true, but not because 21 studs weren't enough for a Ford engine. The problem was that the 3-3/16" Mercury bore would bring the edge of the cylinder perilously close to the bottom-most stud of a 21-stud block, as anyone who has bored such a block to Merc standard will have noticed. The factory therefore replaced that stud with two on either side somewhat farther from the bore. Flatheads, both early and late, blow gaskets, but usually between the cylinders.

The first lakes racer to try this trick is believed to have been Howie McKesson, who got the first Merc short block to come into his local dealer in early 1939, made a stroker out of it, and used it in his roadster and modified. He dominated Western Timing in 1939 with speeds around 120 mph and did well at SCTA meets. Other equipment on that engine included high-altitude Ford heads and a Winfield camshaft.

Most of the fast runners in the late '30s ground the block between the valve seats and the cylinder bore to open up the transfer passage from 1/8 to 3/16 from the top surface of the block. With a little hogging on the intake ports and as much of the tortuous exhaust ports as could be reached, one had a "ported and relieved" block. We know now that relieving was fine, but porting was often bad news. With a stock valve, very little intake port material should be removed except around the guide, and of course the typical mirror polish is absolutely useless. Oversize solid-skirt pistons with the later Ford style low dome (as opposed to the flat type of the '34 and earlier models) usually came from the Ray Day foundry in Los Angeles. '32 to '34 and '39 to '42 Ford blocks could usually be bored safely 1/8 over to Merc standard; '35 to '38 blocks got a little shaky past .060 inch over; '39 to '42 Merc blocks could be taken out to 3-



Many early V-8 racers built their own manifolds. Shown here are two well made examples from the author's collection. Top manifold even has a heat riser.



The Federal-Mogul bearing people made a copper alloy head with no water chambers other than an outlet manifold (not shown). Apparently the theory was that the copper was so conductive that the "ideal combustion chamber temperature" couldn't be reached otherwise. Although this style was made for late 21-stud and 24-stud blocks with integral water pumps, some fellows successfully ran them on '32-36 blocks with no water pumps at all, getting circulation on the thermosyphon principle.

3/8 with some risk of cracking from the head bolt holes to the cylinder at that size. Modern builders are cautioned to watch for flexing, rusty cylinder walls in those old blocks . . . not to mention the years' accumulation of cracks.

Early V-8s were marginal in the crankcase ventilation department, and racing cars were seen with wierdly bulged pans after a good run.

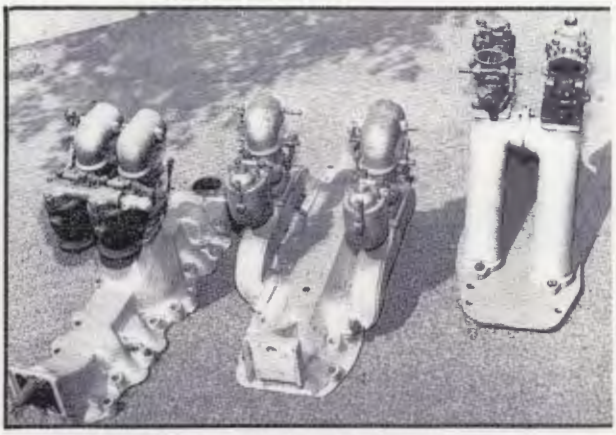
CYLINDER HEADS

The most common cylinder head at the lakes in prewar days was a milled stock-type cast iron head. On a typical 6.3:1 compression head (stock), a .060 inch cut would give about a 7 to 1 ratio. Earlier heads for flat top pistons could be shaved up to .090. The next stage involved the stock aluminum high altitude or "Denver" heads, which gave about 7-1/2 to 1. Both cast iron and aluminum heads were often filled with welding (without heliarc!), mainly by the Arco shop in Los Angeles. All of which often led to constricted fuel/air flow in the combustion chamber and too much compression for the low-octane fuels then available.

The first special heads for the V-8 were made by Bohn and Robert M. Roof in the East, few of which got to the West Coast. The Federal-Mogul and a similar waterless head made by Alf (not Eddie) Edmunds at the Ray Day foundry were the first to be placed on general sale, followed by the Ord (24-stud) and Eddie Meyer (24- and 21-stud). Navarro, Evans, and Cook (Cyclone) made 21-stud heads with pump flanges for '32 to '36 models *only*

One of the earliest cast aluminum dual manifolds for the flat-head was made by Robert M. Roof, of Anderson, Indiana, who eventually made a full line of V-8 engine and chassis equipment. This particular manifold design is very poor, but was produced until the late Forties.

Morrison-equipped modified, perhaps Wayne's own car, at the lakes. Note polished heads, "tuned" headers, fuel pressure pump, banjo steering wheel. Body is typical, a narrowed '27 T-bucket. This grand old type of hot rod is bound to come back! Credit: Snapp.

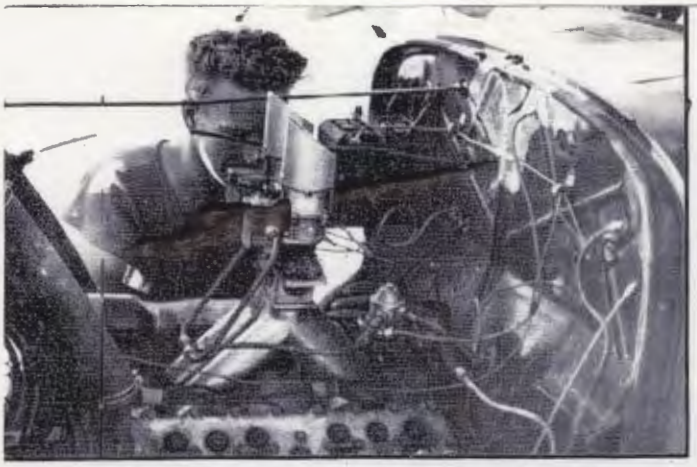


Three early Winfield SR setups. From left to right: Stock '34 manifold with dual SRs on Winfield adapter; Alexander manifold with space in middle for generator (circa 1935); Davies competition manifold (circa 1938).

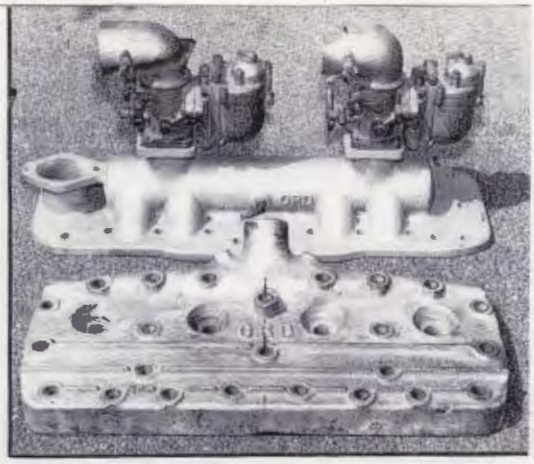
after the war; the sole '37-38 style 21-stud high compression head other than the Federal-Mogul was the postwar Cyclone. Riley, Dixon, Maxi, and Alexander manufactured overhead valve conversions for the 21-stud blocks which will be covered in the final segment of this series together with the postwar overheads.

CAMSHAFTS

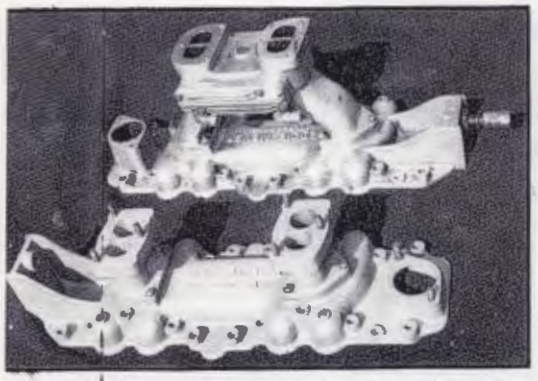
Then as now an esoteric subject. Many a prewar contestant used a stock cam, hopefully a '32-36 stick which had longer timing than later models. Reground cams, though, were readily available. Some fellows ground



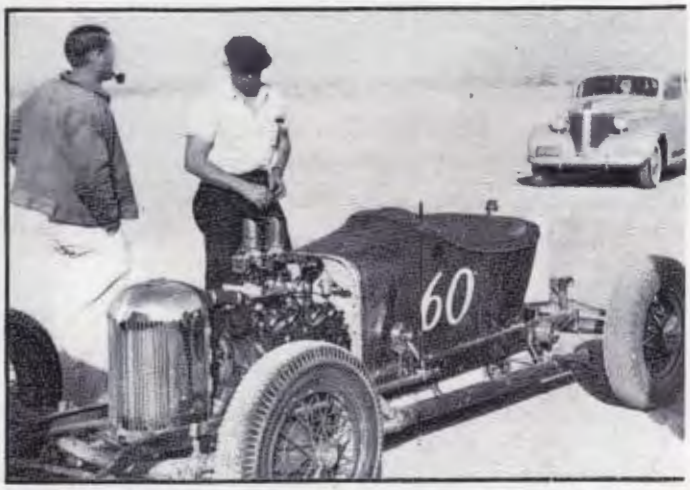
1939: Joe "Dirk" Davies tuning a roadster equipped with his manifold and the earliest style of Federal-Mogul 21-stud cylinder heads. After the war Davies manufactured a marvelous DOHC setup for the Merc block which we'll cover in another installment.



Mal Ord was the first on the West Coast to manufacture special high compression heads for the flathead, shown here with his log manifold (1939). These heads were made for a while after the war, together with variations of the manifolds for 2, 3, and 4 Stromberg carbs.



Eddie Meyer of Hollywood brought out his water-heated dual manifold in September 1939 and his 21- and 24-stud heads shortly thereafter. Heads were excellent, but manifold lacked 180° firing order and worked best as a competition type, as shown in the foreground. Meyer set roadster record of 114.228 mph in 1939, saw Edelbrock break it the next year.

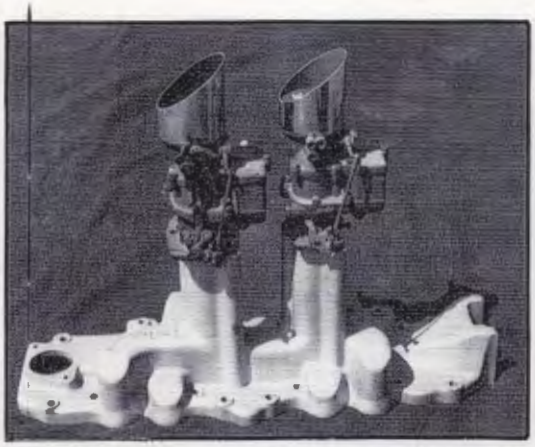


Possibly the great all-around hot rod of all time. Built in the early Thirties by Monty Motimuro, its subsequent owners included George Harvey, Doug Carruthers, LeRoy Neumayer, and finally Art Chrisman. It has run at every dry lakes course, Bonneville, and most of the early dragstrips. It has been powered by a Rajo T, possibly a Winfield B, innumerable flathead V-8s, ARDUN, DeSoto, and Chrysler Hemi. After Harvey and McAfee twice broke the modified record in 1939 using a home-built 180° manifold, milled heads, and a Winfield cam [first at 120.99 mph, then at 124.825 mph) the car was a contender for the modified record for many years and was nearly always on the high points lists. In 1953 Art Chrisman stretched the frame and used it as a very successful dragster. No, Art won't sell it!

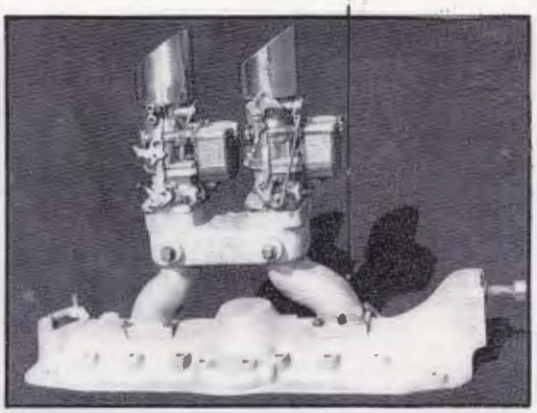
their own with a file and grindstone, seldom with good results. Among the lesser known professionals were Roof and Pop Green in the east and Russ Garnant, Binks McClean, and Ted Cannon in the west. George Riley may have sold some flathead cams, but the best known grinders on the coast were Ed Winfield, Kenny Harman, and Pierre Bertrand.

Winfield, "the Sage of Alder Street," was well established as the country's leading cam grinder and racing carburetor manufacturer by the time the flathead V-8 was introduced, and, as we've noted, his racing heads for the Ford four were second to none. He immediately started grinding racing camshafts for the V-8 and continued to do so until the Sixties. His best flathead profiles were the R-1 street cam and the "super-race" SU-1A which was the heart of many of the fastest flatheads ever built. Winfield cams were distinguished by profiles that were easy on the valve train and idle characteristics, even though on paper the maximum lift and duration looked quite radical. In this writer's opinion, Winfield was well aware that the average guy would order the wildest thing offered; though the engine in question couldn't use it even when flat out. So canny Ed deliberately designed profiles the *effect* of which would be rather mild. The customer marveled at the smooth idle while being able to go as fast as his carburetion, displacement, valve springs, ignition, and gearing would allow—and everyone was happy.

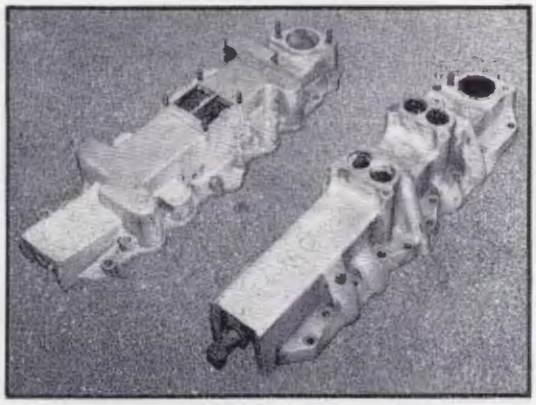
Ed Winfield's great rival was George Riley, who liked short timing and fast, tall lifts in his cams. In his unique shop on Floral Drive in Los Angeles worked a brilliant young machinist named Kenny Harman . . . at least he did when Riley could afford to pay him. Riley would never let Kenny run the camshaft grinder, so Harman started grinding them at home about 1934. At first he used them in his racing hydroplanes, but by 1937 the dry



Tommy Thickstun brought out his very popular dual manifold in late 1939. First of the classic 180° high rise dual manifolds, it was used by Vic Edelbrock and several others during the 1940 lakes season. The illustration shows the prewar model with abrupt angles on the ports where they meet the block. Thickstun made an improved model, together with special heads and other V-8 accessories, after the war. The line was taken over and renamed Tattersfield about 1947.



Jack Henry from Southgate, California, made an inexpensive but effective dual carb adapter for Ford and Zephyr manifolds in early 1940. Hot water could be run through the plenum for fuel vaporization. Henry made quite a business of custom-built A-V-8s.



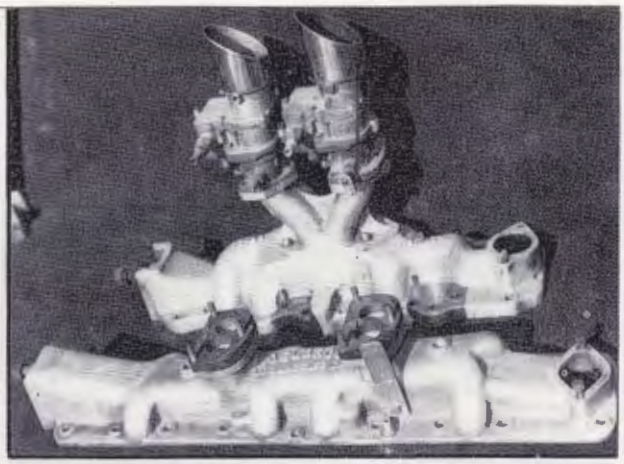
Eddie Edmunds apparently started making manifolds before the war, as shown by the example on the left which is missing its "Y" type riser. After the war Edmunds produced manifolds and heads for nearly all American cars. Since he can't be located at this time, we are unable to confirm whether his next design, shown on the right, was first made before or after World War II. Can any reader help? Carb bases are well aft to accommodate stock placement generator.

lakes crowd was beating a path to his door. Tom Spalding stated flatly, "Kenny Harman ground the first V-8 racing camshaft that *worked*." Tom Spalding ought to know, for he and his brother Bill ground some fine camshafts themselves in later years. Harman experimented with staggered exhaust timing on the center cylinders of the flathead to avoid interference between the closely spaced impulses in the siamese center exhaust ports, and he still believes in the idea even though no one would accept it during the heyday of the flathead.

It's tough to be positive on typical racing camshaft timing for the prewar scene; perhaps a "full race" cam would be something close to 18/60/60/18 with .305 to .320 inches of lift. Valve springs were nearly always Lincoln-Zephyr (originally made for use with the V-12's hydraulic lifters) with about 57 pounds on the seat and 130 pounds open. Adjustable tappets came after the war, but stock tappets were lighter and would rev higher. Of course, it meant a lot of work building up the tips of the valve stems with Stellite or similar hard facings.

This is the first full-envelope record car made in America and perhaps the first V-8 lakes entry to run methanol—the Spalding Brothers famous streamliner. Engine was bored-out 21-stud with Harman cam, milled heads, and the Spaldings' own manifold and ignition. The car officially ran 128.75 mph in 1939 and was clocked over 132 mph on another occasion. The Spaldings are thankful it never went faster, as it is now obvious that the body profile would generate enormous lift. Car was broken up for scrap during World War II. Jack Harvey built a similar car which didn't survive the war. Credit: Snapp.

The Pugh Brothers from Bell, California, took the modified record from Harvey & McAfee in November, 1940 with an average speed of 127.03mph. Their Mercury engine was equipped with the usual milled heads and a Jack Henry manifold. Cam brand is unknown. Credit: Snapp.



1941: Here (at rear) is the best dual manifold made before WW-II, the famous Edelbrock "Slingshot." It was discontinued in early 1947 only because the "Regular" model which replaced it was less costly to make. In the foreground is a prewar Edelbrock manifold for the Lincoln-Zephyr V-12, a few of which ran at the lakes in the early days.

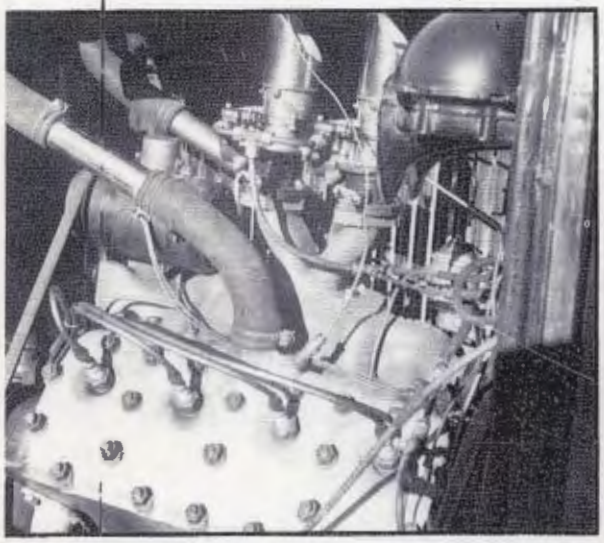
CARBURETION

Ed Winfield started selling his SR model carburetors for the single-downdraft-equipped 1932 V-8 right after the car was introduced, and a nice improvement it was. With the introduction of the "48" model of the Stromberg EE-1 downdraft carburetor in late 1933, Winfield developed and sold a "dual down draft" SR replacement, which consisted of two 1¼-inch units side-by-side on an adapter with a common throttle shaft and fuel manifold. This was a worthwhile if not astounding improvement and quite a few were sold for $30 each.

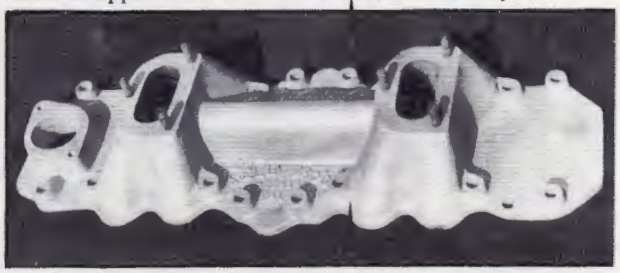
Robert M. Roof in Anderson, Indiana, apparently made some manifolds in the early '30s to take two large Winfield SRs, and we mentioned last issue the unique Bohnalite and Hexagon manifolds for Indy use designed by Don Sullivan. Few, if any, of these nice units reached California, although one or two of the Miller-Ford 4-carb manifolds of doubtful merit definitely did. Perhaps the first special manifold as such made on the West Coast was the so-called "Conduit Supercharger" manufactured in Glendale by tune-up specialist Owen Betry, who also made mechanical conversions for the somewhat soggy Winfield SR vacuum-actuated accelerator pump. Betry, like Lee Chapel (Tornado) and several others, later made a dual carburetor adapter for the stock manifold. Since the V-8 generator didn't allow room for carburetors to be spaced equidistant over the original flange, these adapters either ran the carbs up into the air on a tall "Y" or shoved the second carb back on a dogleg next to the fuel pump. Betry's and Chapel's were of the latter type and we can't say much for them.

The first specially-cast dual manifold for the flathead to be manufactured in California was the "Duo-Dual" produced by Wayland E. "Wayne" Morrison of Sierra Madre in 1934. This featured two 48s side-by-side, each on a "Y" leading to the ports on its side as on the later Davies manifold pictured. Around 25 of these were sold, and in 1935 Morrison came out with the first 180° dual manifold to be placed in general production. The side-by-side arrangement seems to be unique among the many, many special V-8 manifolds made thereafter. In 1937 the design was modified to clear the center water necks on the new V-8 models. Morrison manifolds worked very well although the 1935 model had rather restricted porting.

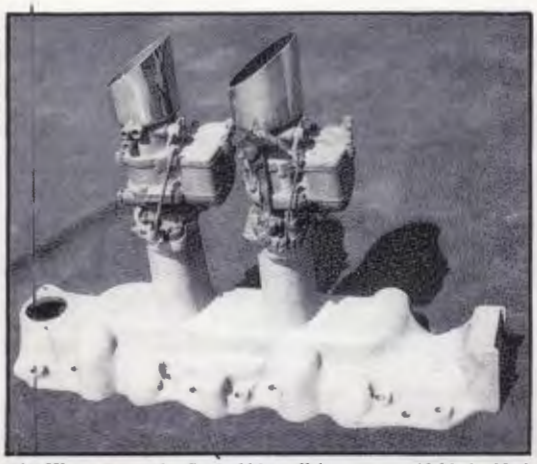
Trick manifolds came thick and fast after 1936. In order of appearance: Alexander, Ord, Davies, Meyer,



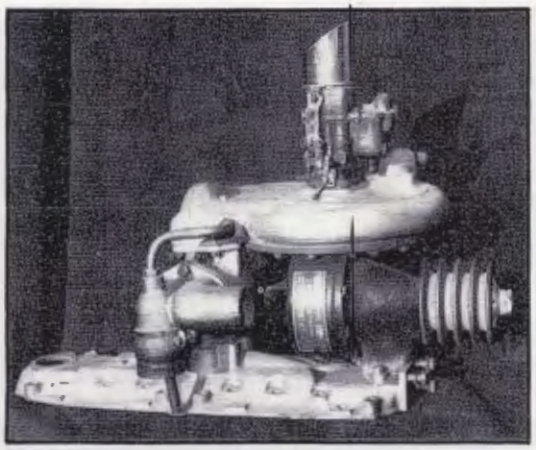
Although Vic Edelbrock, Sr. was a Thickstun dealer and set a 119.44mph record which stood until 1946 with a Thickstun manifold, he was unhappy with Thickstun's refusal to improve the design. It's August 1940, and here is the first Edelbrock "slingshot" with Arco milled and filled Denver heads on the '37 Ford 21-stud engine in the '32 roadster which would win him the 1941 SCTA championship. Vic turned 122 mph one way, yet it's obvious that this is a street engine. Credit: Snapp.



Little is known about the Kelly Brothers manifold from San Bernardino, California, except that the Kellys were well known on the circle tracks for their loosely-clearanced "Rattlin' Racers." The manifold is nicely made but not a particularly good design.

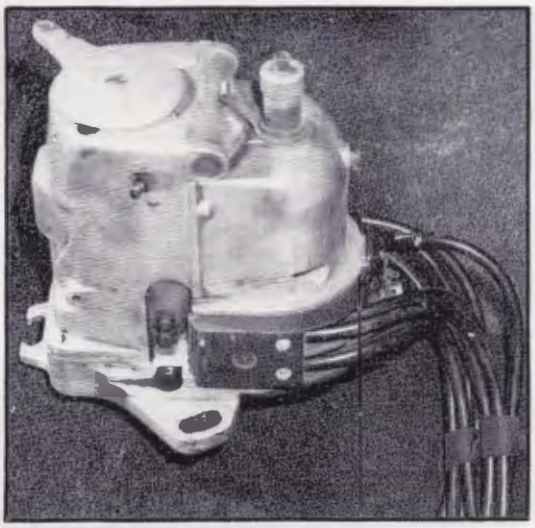


Phil Weiand cast the first of his well-known manifolds in 1941 and produced them in large quantities after the war. We don't know why he didn't match the port angles to those in the block; maybe he figured it didn't make much difference. The performance of this manifold indicated he may have been right.



McCulloch "40 M" centrifugal blower, the last model produced. The late Bob McCulloch produced a completely different model in the early Fifties that was adaptable to any car. McCulloch became one of the country's largest oil and land developers, the man who brought London Bridge to California's Havasu City.

Dave Burns produced this low-riser manifold in 1941 and also supplied risers which could be bolted on to provide generator clearance. This excellent design was made after the war with a different style of lettering in place of the raised block type shown here.



This is a picture of the best pre-war ignition setup for the flathead V-8—a Scintilla (not *a Sintilla-Vortex) magneto with manual advance.*

Kelly Bros., Henry, Thickstun, Edelbrock, Weiand, Edmunds and Burns. The latter five units were all 180° firing order designs to prevent one cylinder robbing another in the low and mid-range, but this writer has to give the palm to the Edelbrock for proper port angularity and constant area.

The simplicity, cheapness, and good performance of the Stromberg dual throat carburetor led to its enduring popularity and eventual displacement of the Winfield for multiple applications. The original "48" model had 1.03-inch venturis; the 1937 and later "97" was similar but had .97 inch venturis. The V-8-60 used the "81" with .081 inch venturis, a nice pot for the center spot on a triple manifold. For use with a dual manifold, stock .045 inch to .048 inch main jets are pretty close to correct, although accelerator pump discharge should be reduced by drilling a .065 inch hole from the base of the pump check valve up past the ball, taking care not to mess up the ball or its seat. Another carburetor used in Fords of the Forties was the Chandler-Groves "94" (also labeled "Holley" and "Ford") with a .94 inch venturi. This unit was never as popular as the Stromberg for racing use; however Holley now makes a high performance 310 c.f.m. version with 1-5/16 inch venturis (R-3903AAS) that bught to be just the ticket for an otherwise stock '37 or later Ford or Mercury.

FUELS

Needless to say, most fellows used 75/85 octane pump gas, although a few laced it with extra amounts of tetraethyl lead or benzol. Many have stated that alcohol wasn't used at the dry lakes until after the war, to which the old pros just laugh. Alcohol was being used at Ascot as early as 1934 and in qualifying at Indianapolis within a year or two thereafter. Kenny Harman was using alky in his race boats in 1937. Perhaps the first team to use it at the lakes were the Spaldings in their pioneering streamliner of 1939. One of the advantages of alcohol over gasoline is a very high anti-knock rating, but since the Spaldings didn't have much compression in their mild 21-stud engine, they didn't realize much benefit and went back to gasoline. Bob Rufi used around 16 to 1 compression with methanol in his Chevy Four streamliner and went 143 mph, one way (140 mph average) in May 1940. This was the best performance on the lakes by a hot rod prior to the war.

IGNITION

As compression ratios and engine speeds climbed, the stock Ford distributor tended to give up. Except for heavier point springs, there wasn't much one could do unless a Robert Bosch or early Scintilla (not the Vertex model) could be obtained. The day was saved in late 1936, when the Lincoln-Zephyr V-12 was released with a distributor similar to the 40B Ford, but with dual points and dual coils (in a single coil housing). The Spaldings, those clever boys, soon discovered that with a four-lobe distributor cam and a few other internal modifications the Zephyr could become a first class racing ignition that was in fact two synchronized four-cylinder distributors. These are still very good units for any flathead *if* that old Zephyr coil is still alive. If not, two separate coils can be mounted outside the distributor case.

SUPERCHARGERS

Except for a Mercedes SS Roots-type blower used on one car (another Spalding creation) the only superchargers used were the production units manufactured by Robert McCulloch of Milwaukee, Wisconsin. These belt-driven centrifugal blowers were introduced in 1936 and came in at least four different models. The first mounted on a stock manifold with the generator set out on the left head and driven by a short belt from a pulley on the right-angle impeller drive. Next came a similar but larger unit mounted on McCulloch's own cast iron manifold. The third type, for '37 and later models with water pumps in the block, was similar but the generator was mounted up front and driven by one of the blower drive belts. The last and most common type was the so-called "M" model which featured extra water jacketing on the manifold drawn from the right cylinder head outlet. These blowers were well made, but did not give much more than 4 to 5 pound boost even when reworked by experts such as Carl Fleishmann or Bob Path. Though they were used on a few fast cars, the SCTA never found it necessary to handicap McCulloch-equipped cars in any way . . . but D.O. 7 cylinder heads of any type were banned until after the war.

NEXT ISSUE: The Golden Age of the Flathead.

A very famous photo the old SCTA "Road Runners" club during the heyday of dry lakes racing just after WWII . . . yesterday a bunch of jalopies—today a king's ransom in '32 Fords and other street rods.

A TECHNICAL HISTORY of the RACING FLATHEAD

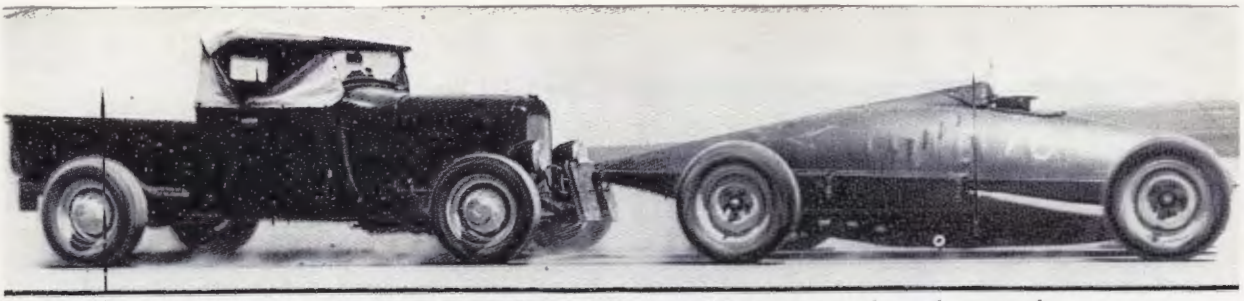
by Mark Dees

Reprinted from June 1973 ROD & CUSTOM *Magazine with permission from Petersen Publishing Co.*

PART III

The GOLDEN AGE

Part 3



Modified A roadster pickup pushes off a typical V-8 powered lakester constructed around a war-surplus drop tank. Such chassis are still being used and have reached over 280 mph with later powerplants.

DURING WORLD WAR II thousands of our young men developed their technical skills and whetted their taste for adventure by maintaining and wielding that dreadful marvel, the 20th Century mechanized war machine, which the Germans more or less invented but the Americans mastered. Many of these returning soldiers, sailors, and airmen turned to automobile racing to make reality out of the stifled dreams of all those bench racing sessions in Europe and the South Pacific. With an outpouring of latent energy and a few bucks earned in a rising economy, they seized on Henry's enduring flathead as the cornerstone of their achievements. The near-decade 1946-54 were the glory years of the Ford V-8, and most of it happened in Southern California on El Mirage Dry Lake (with some excursions to Bonneville a few hundred miles northeast) and on the very first drag strips—Goleta, Santa Ana, Pomona, Paradise Mesa and Fontana.

Today, wherever Americans race cars, you will find great men whose eyes mist (as do those of an old Englishman as he thinks of Brooklands) when they look back to those dawns over the desert and remember the sound and smell of a nitro-burning flathead leaving the starting line for the lights a mile-and-a-half away, in a billowing roostertail of alkali dust. They recall the old gang, the beer, the jokes, the scary runs in a rattling A-V-8 at speeds the rest of the world refused to believe. Some of us, too young to have fought, remember too our first kiss under the Carson top of a chopped '46 Merc. The golden tide of our youth came in on Ford V-8 power, and the snappy beat of its exhaust will sound in our ears forever.

Heads and Manifolds

Boxed on another page you will find a listing of every manufacturer of flathead cylinder heads and intake manifolds known to this writer, although there are surely others. Studying the old archives, however, makes it clear that the majority of the going engines used two brands—Edelbrock and Evans—probably because Vic Edelbrock and Earl "Pop" Evans both were ready to go at the cessation of hostilities overseas and both gathered around them a brilliant group of proteges who sortied out from the shops of their mentors to stomp up and down the record books. It's doubtful whether their equipment was really better than that of Navarro, Offenhauser. Weiand, Sharp, Tattersfield-Baron, and Smith & Jones, all of which (with a very few other brands) were used in top-flite powerplants.

The typical first-line racing head featured massive ribbing over the combustion chamber and greatly increased water capacity, which thickened the head to the point that the lower row of head studs had to be lengthened to accommodate it. In Clay Smith's heads, possibly the best ever made for the V-8, *all* the studs have to be lengthened. Of course, most special heads, including alternative "street" models by the major manufacturers, used stock studs. Nearly any compression ratio was available, but 8- or 9-to-1 was most popular for gasoline.

Cylinder head design is inextricably tied in with piston dome design (as well as block and valve modifications which we'll discuss later), so we should mention some common practices in this regard. Most racing pistons were made with a stock Ford low dome, although some of Lou Baney's record holding engines used the unique Tattersfield-Baron cylinder head and piston combo in which a rather flat dome came up 7/16-in. into the head itself. The idea was to maintain a very large transfer area from the valves while still maintaining some compression. Few others used such an arrangement, although Baney pulled 225 bhp at five grand and shared domination of the coupe classes at Russetta Timing meets with Don Towle during '49 and '50. Whatever old buckets are used in flatheads, their outside edges should come right up flush with the top edge of the block or a little higher, with heads domed accordingly to give about .020-in. clearance. Otherwise compression—that is tough to come by in a flatmotor—is thrown away.

Most of those manufacturers of speed equipment who got started before the war continued to produce variations of their "tall" or "regular" dual manifolds thereafter. We didn't call them "hi-risers" then, nor did we fully realize that in many cases the long passages of those old manifolds gave a definite mid-range ram effect. Everyone wanted, and nearly everybody produced, the "low" or "racing" style manifold which put the carburetors as close as possible to the ports and offset the generator (via bracket) on one or the other cylinder head. The better units had 180° firing order layout and were good for three to five more horsepower on the top end.

Edelbrock "Regular manifold replaced the pre-war "Slingshot" design about late 1946, was in turn replaced by another model (in rear) about 1949. All three were among the best dual manifolds for street use. Dees

A very rare Edelbrock manifold utilizes a "Slingshot: base with a special adapter for a single large two-throat manifold. It was produced for special stock car racing and heavy truck use. 1946. Dees

Most California racers blocked the manifold heat risers which were usually the only connection between the exhaust tracts of the two cylinder banks. This practice not only gave a cooler inlet charge but also kept the exhaust impulses from one side from dampening those from the other. You could always tell the sharp "rap" of a street machine with blocked risers—and the cops could, too.

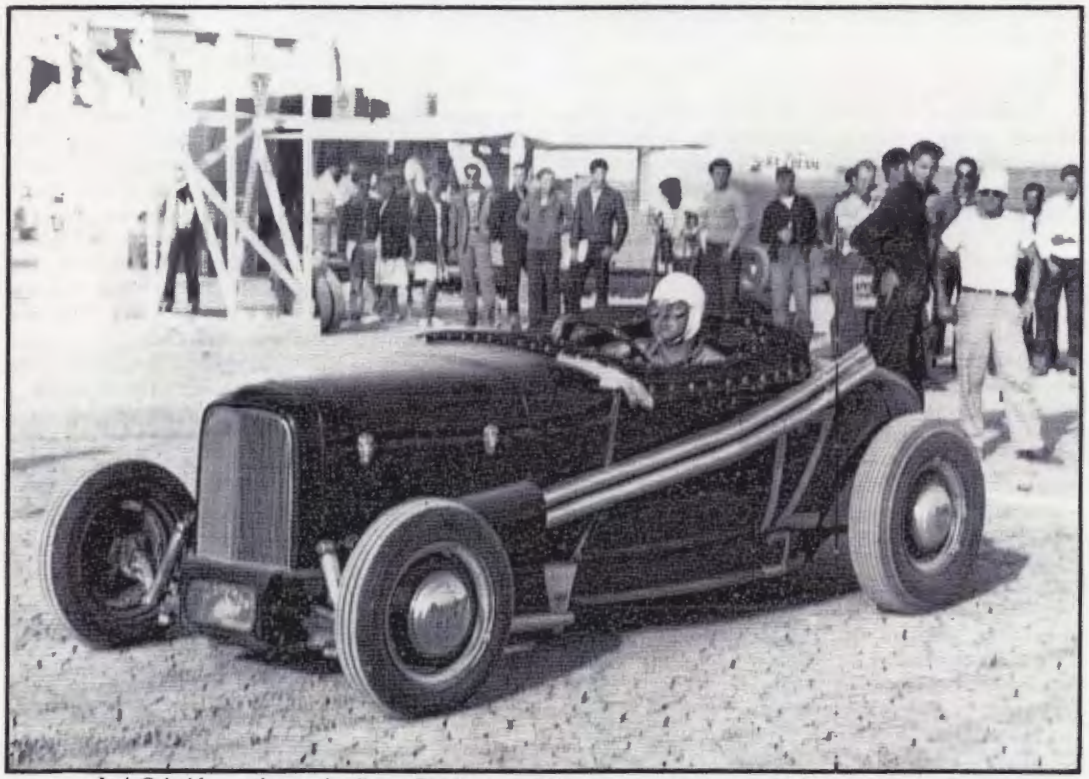
Al Sharp appears to have been the first to bring out a racing manifold for three Stromberg carbs in early 1948, and it didn't catch on at first. However, the use of alcohol-nitro fuels, which have to be passed in large volumes, and the advent of the big strokers in 1949, meant that everybody who wished to survive in the racing side of the speed parts business soon was making triplets. And, of course, they looked so wild that all the street racers had to have one.

If three is good, why not four? Bill Schnell of Portland, Oregon, had cast a few excellent 4-carb manifolds in 1945, but the idea didn't spread because on the early, rather mild engines, it was more trouble than it was worth. Frank Baron started producing a nice 4-jugger in early 1948, but most of the fellows had all they could do to make the triplets work. By 1951, the success of Lou Baney, Bruce Robinson, and a few others had convinced everyone that the 4-carburetor route was the way to go. For one thing, even though the eight ports were always connected by small balance tubes, it was possible to tune each cylinder individually. In the last great days of the flathead, Bob Joehnck, Bill Likes, Jazzy Nelson and other masters were running entirely different jetting and plugs in the inner, hot running cylinders than they were in the outer holes.

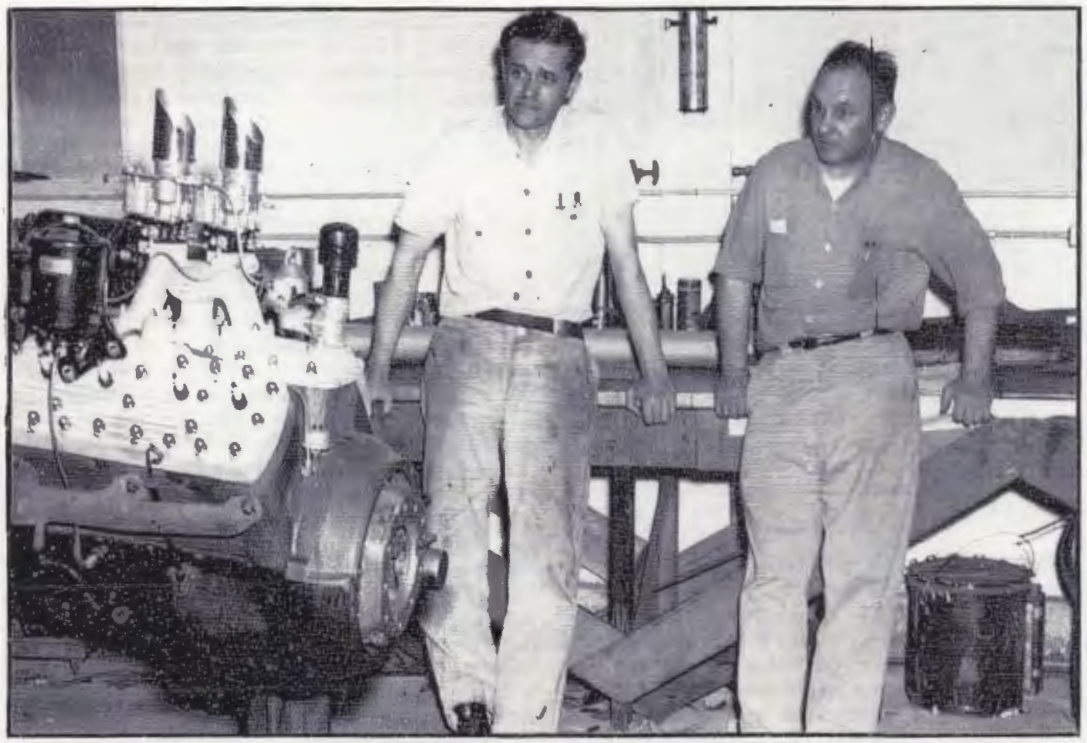
Actually, Stu Hilborn was into production with his fuel injection systems by early 1951, but the first units were not immediately popular. Many were delivered with nozzles too big for best results, the casting design did not permit full advantage to be taken of ram tuning, and an injector cost a lot more than an Edelbrock or Evans manifold with four old bored-out 97's. But there is no doubt that he who wants to go fast today with a flathead looks around for a Hilborn injector. John Bradley, one of the best of the modern flathead dragsters, doesn't use one because—he says—he's afraid the throttle response of an injector will tweak his stock Ford connecting rods.

Camshafts

Ed Winfield and Kenny Harman were the best-known



Jack Calori leaves the starting line at El Mirage in 1947. Famous show/go roadster, A on Deuce rails, ran "eighth by eighth" '40 Merc mill with Weiand heads, Meyer manifold, Smith cam. Turned close to 130 mph.

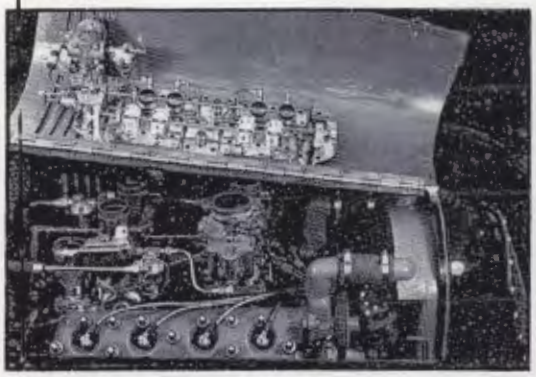


Eddie Meyer, former race driver and brother of Louis Meyer of Indy fame, and son Bud (left) take a break after assembling street V-8 with their speed equipment. The Meyers dropped out of the racing rat race in the late 'forties to concentrate on tune-up and repair of exotic cars.

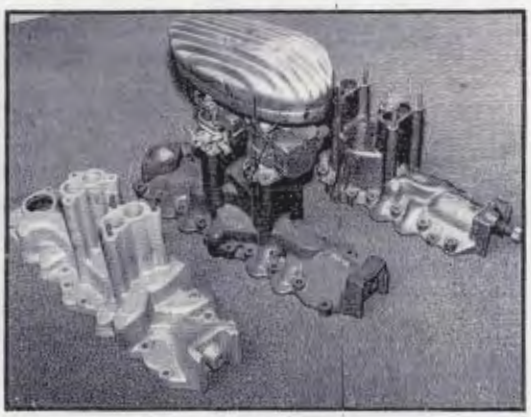
cam grinders before the war and they continued their preeminence through 1947. From late 1945 to early 1948, the Harman-Collins firm had ground over 12,000 camshafts, most of them for flatheads. The late racing genius, Clay Smith, soon challenged them and shortly thereafter we had, among others, Jack Brumby, Jack Engle, Bill Spalding, Harry Weber, Ed Iskenderian, eccentric Russ Garnant, and last but hardly least, the legendary "Howard" Johansen.

In the late '40s it seemed most of the fast cars used a Winfield SU-1A, a Clay Smith 272 or 282 (indicating degrees of duration), or a Harman-Collins "Super H." The design of the last named was a triumph of empirical engineering. Harman and Collins rigged up a flathead V-8 to run on seven cylinders with the eighth cylinder pumping only air through a plenum chamber made from an oil drum. Some sort of flowmeter was attached to the other side of the drum, and when the boys found the profile that pumped the most air while letting the valve train survive, they had the "Super H."

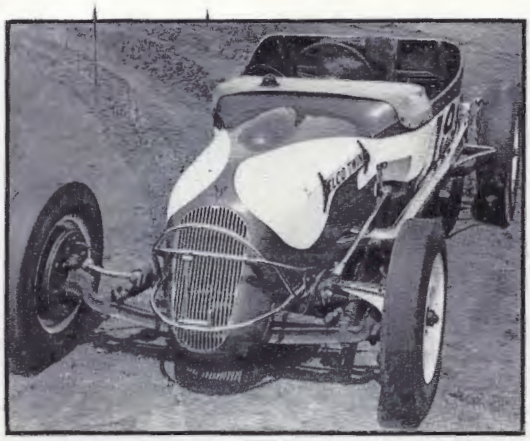
Clever, friendly Ed Iskenderian started to get a lot of business in the early '50s with a quality product and a flair for selling it. There's quite a story behind his great flathead racing camshaft, the famous 404A (for .404-in. lift) Magnum, the drag racer's delight. Ed arrived at the 404 by simply grinding the tried and true #4 Winfield



In 1946 Stu Hillborn placed his 1934 Ford engine with Eddie Miller 4-carb manifold and hand-ground cam in Bill Warth's beautiful old modified and turned 139.96 mph. Two years later, using his own constant-flow fuel injection system he turned 150 mph. You know the rest. One carb is larger than the others because the two cylinders it serves draw at nearly the same time.



L to R: *Prewar Thickstun dual manifold, improved 1946 model with teardrop air cleaner, same manifold as modified and sold by Bob Tattersfield after 1947. All were very good for street use.* Dees



Bert Letner's beautiful track roadster turned 126 in 1947 using Edelbrock Super manifold, Smith cam, and Letner's own dual ignition Elco Twin heads. Distributor was converted Pierce-Arrow 8. Robert L. Roof made similar heads, but dual plug principle gave no advantage whatever.

Offy profile on a Ford core and using it with special keyed-in tappets faced with the same radius as Harry Miller first used in 1923. He got an extreme rate of lift which gave a top end equal to anybody's and a phenomenal mid-range. Edelbrock's top engine man, Bobby Meeks, points out that the 404 worked best if you didn't use a lot of spring pressure in an effort to keep the tappet following the lobe: "Just use standard Zephyr springs, allow clearance over the valve, and let 'em bounce!" Some tuners did use Buick Roadmaster dual spring assemblies with Iskenderian adapters. Ed originally ground the 404 on steel 1932 Ford cores, but when those ran out he used later iron cores with good results. Still, abnormal wear remains a problem with the 404—which brings us to the camshaft considered by many to be the ultimate for the racing flathead.

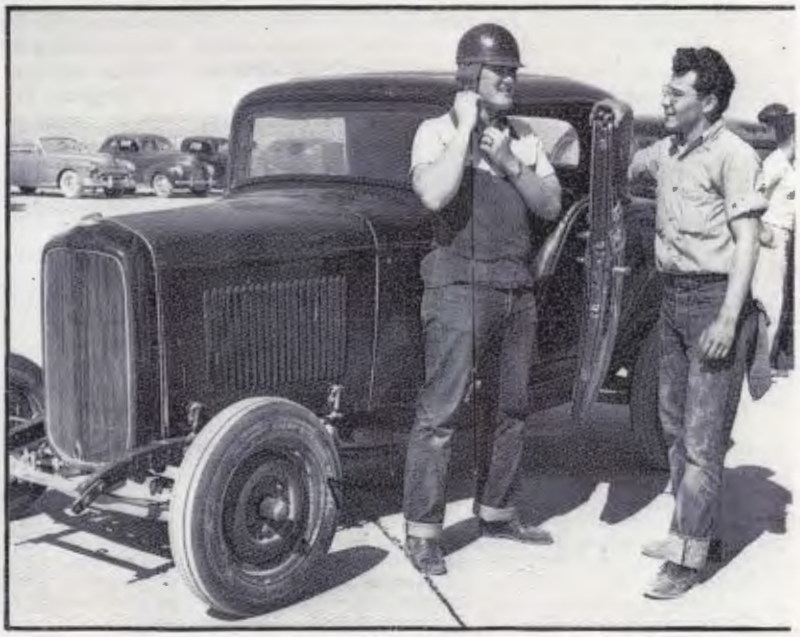
Chuck Potvin more or less duplicated the Isky 404's characteristics on a flat-tappet profile, and for some reason it seems to last better in service. Certainly in my research I have heard nothing but unreserved praise for Potvin's masterpiece, the .425 Eliminator ("Eliminate the competition or eliminate the engine"), still available on new billets from Moon Equipment Company.

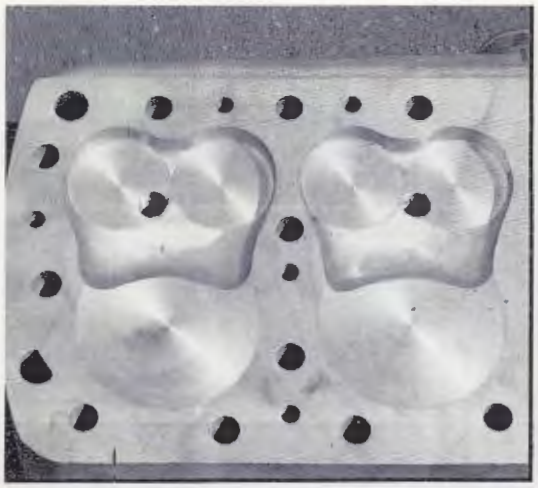
A word on installation: For most applications Johnson or Witteman adjustable tappets are a must. It's a good idea to drill a 1/8-in. hole through the tappet bosses, through which you can insert a pin into the tappet slot to hold it from rotating while you set the adjustment screw, rather than fighting and cursing the special wrench they give you for the purpose. For maximum rpm, adjustable tappets are rather heavy. For all-out use, silver-solder a washer to the top of the stock or radiused tappet, as the case may be, and turn it down to the required clearance. And in ordering or degreeing-in a cam, remember that postwar blocks (41A, 59A and later) have 100° included angle between the valves, while prewar blocks have an angle of 101.45°. To put it another way, the valves on a late block are .090-in. farther from the bore than on an early block. This is something to consider when fitting cylinder heads as well.

Block Modifications

The combustion chamber and valve location being the principal weakness of the flathead V-8, many attempts were made to improve the situation. The most important step was to grind a relief sloping from the valve seats to a depth of about 3/16-in. at the cylinder bore. The com-

Below, left: *Frank Burton shows off the first widely promoted four carb manifold in early 1948. It didn't catch on until use of big strokers and super fuels made its use a virtual necessity. Frank's son, Tony, is now manufacturing new heads on the famous Baron pop-up piston principle.* Below, right: *Fran Hernandez (arm on door) with the famous '32 Coupe that pioneered the use of nitro research by Vic Edelbrock's gang. They still talk about the great drag race when this car blew off the fearsome blown flathead of Tom Cobbs. Hernandez later associated with Fred Offenhauser's nephew in the manufacture of speed equipment of that name, then went with Ford high-performance activities. Driver: Dav Corwin.*





Closeup of a racing head shows machine work for low-dome pistons and pockets for the valves. Ideally the flycuts should be at exactly the same angle as the valve heads, so that clearance can be reduced to the absolute minimum. The valve heads may then hit the combustion chamber roof with no damage in extreme RPM situations.

Right: *The late Earl "Pappy" Evans fits his first 4-carb manifold to one of his racing flatheads. Note wide, deep relief and low domes on the pistons.* Moon

pression ratio stamped on most competition cylinder heads assumes a 3/16-in. relief on a 239-cu.-in. engine. Stock 1-1/2-in. valves were often replaced on the larger engines with oversize valves, usually 1-5/8-in. Sometimes the intakes were taken out to 1-3/4-in. In such events the "pocket" under the valve seat was bored with a 70° cutter to a nominal diameter about 1/8-in. less than the valve diameter and the remainder of the port ground out accordingly. Then, as now, people got carried away with porting and did more harm than good. The valve guide was "streamlined" or ground away completely where it intruded into the port.

The height of the valve head was often cut down about .035-in. and the valve seated well out on its margin to permit the roof of the combustion chamber to be brought down as low as possible over the valves in order to maintain compression. Some experts ran the valve head up into a closely fitting fly-cut pocket in the chamber roof and fitted the chamber walls *very* closely around the back of the valves—so the valves ran in a "box," which was only wide open on the cylinder side. This ran counter to the practice of a few people (Ed Winfield, Doane Spencer) who felt that the mixture should be free to flow back over the top of the valve and accordingly left at least 1/8-in. clearance over the valve head. They also left a "sump" or depression in the chamber roof just forward of the valves into which the mixture could flow smoothly from the underside of the valve before being turned downward into the cylinder.

If I were building a street flathead today, I would definitely follow the former approach, as not much mixture comes back around the top of the valve. It's a better tradeoff to try for the compression one would otherwise lose. And I would not hog out a big relief; just round off all the edges and give the top piston ring a little protection.

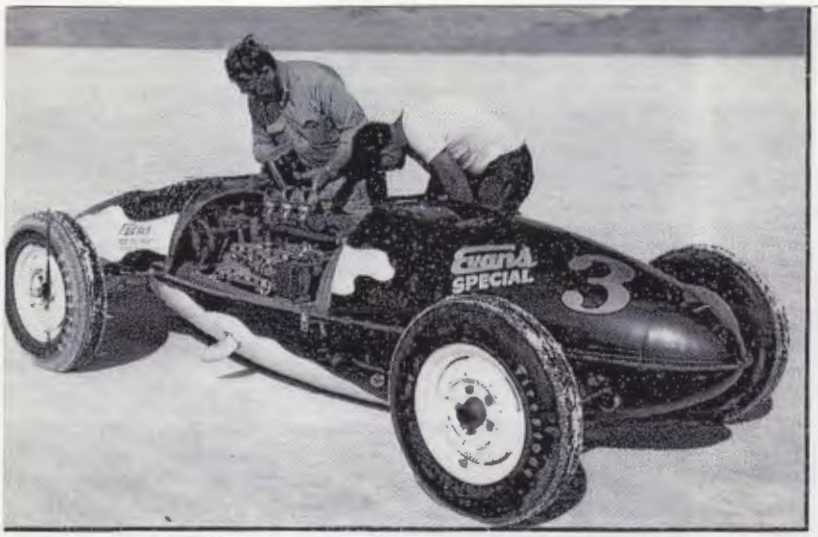
Most race engines were built with 30° valve seats (more flow *area*) but some builders stayed with 45° (better flow *direction*).

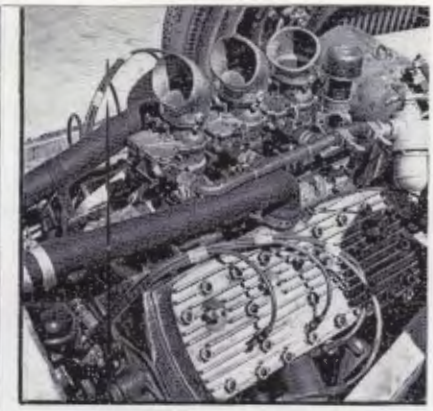
The tortuous flathead exhaust passages were cleaned out to the extent that a grinder would go down them. An early California "speed secret" and an absolute must for competition was the installation of iron or steel dividers (called "baffles") in the center Siamesed exhaust port of each bank. A number of racing flatheads have been built with the two heat riser holes, which are situated directly over the center ports, bored out and connected by tubing to the main headers. One can go so far as to give each cylinder its own exhaust port by this method.

These techniques have reached their fullest flower in the engines of John Bradley. In order to hog everything out to the absolute limit, he fills all the water passages with Bloc-Roc or a similar substance, which he can get away with in an engine used only for drag racing. Intake valves measure 1-7/8-in., exhausts 1-3/4-in., with ports taken out to the point that they are wafer-thin shells buttressed by the Bloc-Roc. Fabricated exhaust ports are plugged in through the heat riser hole and each end of the cylinder banks, so that the only stock exhaust ports remaining are the center ones, each serving just one cylinder. For distances of 1/4-mile, exhaust porting, the great flaw of Henry's design (other than the side valves themselves), is rectified.

Crankshaft and Rods

As pointed out, the rod journals of Mercury and post-war Ford crankshafts could be ground 1/16-in. off-center to give an extra 1/8-in. of stroke when used with early (21A) small-journal rods and bearings. By using special pistons and 3-5/16-in. bore (1/8-in. over stock





Top left: *Evans' tank was consistently the fastest unblown flathead lakester, and when this picture of Evans and sidekick George Bentley (still active in competition) was made it was the fastest open wheel car in the world. Car turned 188 mph at Bonneville in 1950, over 100 mph with a 21-stud!* Top right: *AMERICAN STANDARD—Evans' engine with his own heads and manifold, converted Zephyr ignition, Clay Smith cam, surplus fuel filter, converted Stromberg 97 carbs, and a load of nitrates in the tank.* Bottom: *Bill Kenz, out of Denver, used a full-race '32 Roadster to push off his twin engine streamliner on a 210 mph-plus run in 1953. With three V-8s the car reached over 250 mph and is still the fastest side-valve car ever constructed.*

Merc), you had an "Eighth by Eighth," 268 cu. in., the standard "big" engine until 1949. In that model year the 255 cu. in. Mercury engine came out with 4-in. stroke. The '49 and later cast steel Merc shaft (ICM-6303) was given the same treatment to get a 4-1/8-in. stroke (3/8 over stock Ford) which often as not was combined with a slightly risky 3-3/8-in. bore (3/16 over stock Merc or late Ford) to give the classic "Three-eighths by Three-eighths." The builder of today will find he'll run just as well with less trouble and expense if he'll stay with stock 4-in. Merc stroke and no more than 3-5/16 bore—i. e., 274 cu. in.

Several record-setting engines were built by the Edelbrock-So-Cal Speed Shop group for SCTA class B competition (under 250 cu. in.), done by *destroking* a Ford crank 1/8-in. for a total stroke of 3-9/16-in. Bore used was about 3.479 (.100-in. over stock) for a high-revving 246 cu. ins. In recent years 1/2-, 3/4- and 1-in. strokers have been built using welded-up journals. When used with a 3-7/16-in. or 3-1/2-in. bore (by wet-sleeving or using certain rate thick-walled Canadian blocks), flatheads have been built displacing as much as 365 cu. in. If you build one, don't expect to beat all the normal engines, as you'll be running out of valve and bearing area, block and crank rigidity, and money.

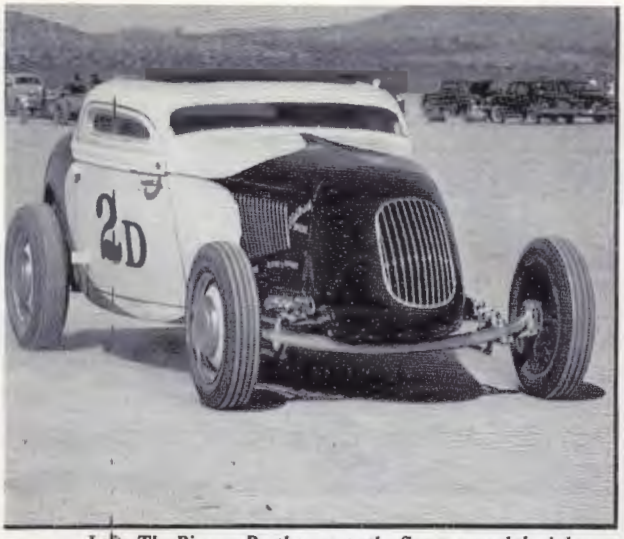
A few engines were built with 180° single plane crankshafts which looked just like they came out of a 4-cylinder engine—the cylinders still fired at 90° intervals no matter what you've heard. These were lighter and gave good acceleration, but the only real advantage was lack of interference between the exhaust pulses in the Siamesed center ports. Most of these were built by Norden Machine Works, but the only one I ever knew of that seemed to have an edge was Karl Orr's sprinter.

Stock Ford rods were hardly bullet-proof but held up amazingly well. Today you can use Ed Harding's rods (made from two Chevy rods heliarced together in a jig) or, for drag racing, modern aluminum alloy rods. Be warned that modern inserts for the flathead have extra clearance built in for all the weird old cranks they have to fit, so check your tolerances closely and try for a thou or so over stock. Full floating bearings are the way to go with stock rods, as used by Ford in '48 and earlier models.

Here's a tip on building an engine today: Look around the swap meets and parts houses for Ford-made main bearings not only for the undersize you need on the journal diameter, but a greater width on the thrust surfaces (rear main). Then grind your crank accordingly. Original Ford V-8 parts catalogs have an entire page set aside in bold type giving all the many combinations of undersizes/oversizes. But some of these combos are very hard to find. We'll go into this again in the next installment.

Ignition

Many racers used the dual coil Lincoln-Zephyr ignition or later Ford distributors converted to dual points or dual coils by Jim Kurten, Tom Spalding, or loving hands at home. A few used English Lucas magnetos, a



Left: *The Pierson Brothers were the first to reveal the inherent beauty and evil of the Model 40 Ford Three-Window Coupe with this chopped, channeled and nosed powerhouse seen here at El Mirage. Dawson Hadley, now doing state of the art fuel injection and emissions control work at Edelbrock's, reached over 164 at Bonneville with this car in 1951 using an unblown flathead.* Right: *It's a pity we can't show all the drag racers of the early days who used flatheads—Art Chrisman, Holly Hedrich, Calvin Rice, Otto Ryssman, etc.—but here's one of the best—Joaquin Arnett and the Bean Bandit, 1953.*

Scintilla-Vertex on an angle drive, or two Wico 4-cylinder mags on a Barker drive. A very popular ignition was made by Charles "Kong" Jackson. It had a manual advance cable-actuated by a large plunger in the cockpit. The driver could adjust the spark advance while storming down the lake bed on his way to the traps, but it was a good idea to have a positive stop in the system right around the maximum conceivable advance lest he get carried away. Harman-Collins brought out a very fine magneto for the flathead, and that same basic design is found today under a couple of brand names on the fastest blown hemi Chryslers.

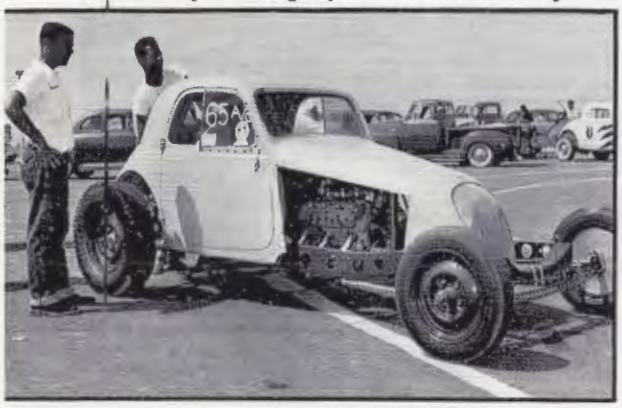
Youngsters will be surprised to hear how little spark lead is used in a racing flathead compared to a modern OHV design. On gas use somewhere between 18 and 24 total crankshaft degrees; go up to 28 degrees on straight alcohol; perhaps back off a couple of degrees when adding nitromethane.

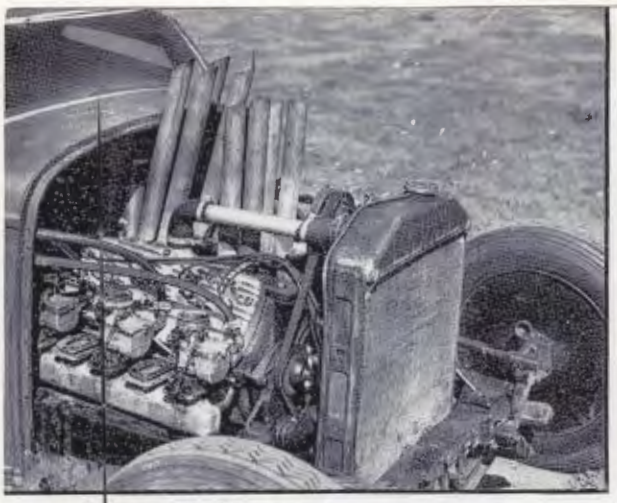
For plugs my cronies recommend the following Autolite plugs or their equivalents: On gasoline run from an A-9 on the street to an A-7 in competition (some heads may take a longer reach AL-7). On straight alcohol use an A-9 or an A-903 racing plug. On nitrates warm up on A-903s; then try an A-603; if that's too hot go to an AE-403.

Fuels

At the first couple of Bonneville National Speed Trials in '49 and '50 the fellows from the East couldn't believe how badly they were blown off by the Southern Californians. Apart from a little more expertise in setting up a chassis for straightaway competition, the secret was fuel—first alcohol, which everybody was using by '48, and then nitromethane, the oxygen-bearing additive which Vic Edelbrock pioneered in his Offy-scalping V-8-60 Midget. Nitro took some learning to handle—flow passages had to be even bigger than used with alcohol (which needed 100% more jet area than stock), the system had to be flushed after each day's running, and if nitro didn't find some hydrocarbon to combine with, it was very happy with the tops of pistons. Still, lakes racers were able to use up to 40% on long runs for

Below, left: *Absolute top drag racer of the flathead's glory days was Jazzy Nelson. His 9.03 E.T. record stood for years, and was a tribute to Nelson's expertise in setting up a chassis and the Iskenderian 404A Magnum radius tappet cam.* Below, right: *Most consistent of all the Roadster entries was the handsome highboy of Bill Likes, shown here with Bob Pierson of Coupe fame at the wheel. "Deuces Wild" usually held down the "B" Roadster record in the face of incredible competition, ran 148.75 in that class at Bonneville in '52, and with Fran Hernandez' 3/8 x 3/8 Merc made a banzai 160 mph pass in 1951 that stood as the record for an unblown flathead highboy until the recent advent of Don Ferguson's nitrous oxide-equipped '29.*





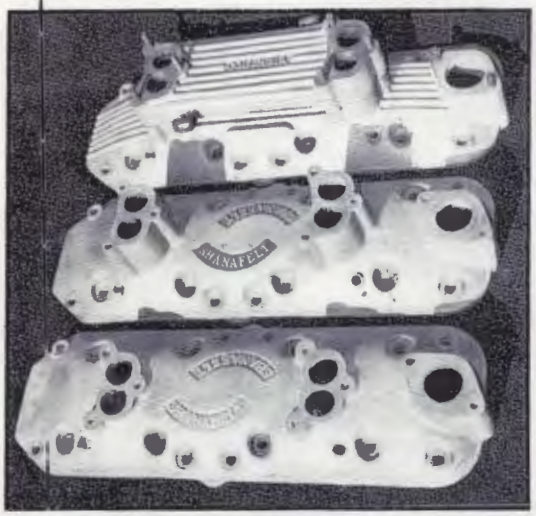
Left: *Don't laugh at the Nichols-Smith equipped reverse-flow V-8 with special Tucker cam. This 3/8 x 1/8 ran 25% nitro and turned over 7200 rpm. Trap speed was (for then) a honkin' 110 mph. Trouble with this arrangement, which looks keen for a turbo-charged flathead, is that the intake ports are not sufficiently surrounded by water to be used as exhaust ports.* Right: *John Bradley's present-day dragster is the strongest ever built, turning (last I heard) 163 mph in 9 secs. flat. 300 incher runs Bradley's own heads, Potvin Eliminator cam, Edelbrock 4-carb manifold, Harman-Collins magneto on filled 1953 block. Engine uses a slider clutch, peaks at 6500 rpm and turns 7000 rpm in the eyes. Stock rods and Merc crank live run after run.*

about 10-15% more horsepower, although I remember vividly that when Bob Joehnck did this, he had to reseat the valves every night. John Bradley runs 106% in his dragster — which is what it reads on the hydrometer when you stick the fuel can in the freezer before running.

Chassis

The speeds of the old lakes machines were not due entirely to nitro-booted horsepower. For one thing, the best chassis were converted to ball bearings throughout, which substantially reduces drag compared to roller bearings. On the front axle this was usually accomplished by turning down the Ford spindle to take Chevrolet ball bearings (as used until '54 in passenger cars and '62 in Corvettes). This makes it necessary to bore out the Ford hub as well. On my street roadster I used a 1940 Chevrolet ball bearing assembly, which fits the Ford spindle without machining, and a '62 Corvette hub altered with a space-adapter for the 5x5.5-in. early Ford bolt pattern. I think it's a little stronger

—Continued on page 15



Some manifolds out of the northwest—Emerson Payne made the Columbia unit at the top, with water manifold to heat the mixture on those cold Oregon mornings, then sold out to Shanafeldt who made the low risers at the bottom. Dees

Here is the list of flathead equipment manufacturers. When grouped together it means that the names mentioned were used on the same pattern first used on the first manufacturer named:

Manifolds and Heads:	**Manifolds only:**
Alexander	Algon
Allard (English)	Ansen
Allstate-Champion	Athans
Almquist	Bass
Bohnalite	Betry
Cyclone (Cook Machine Works)	Columbia-Shanafelt-Rocket
Edelbrock	Davies
Edmunds	Dixie
Evans	Freiman Bros.
Fenton-AA Custom-D&S-Von Esser	Hexagon
E & S	Hilborn
Harrell	Indusco
Grancor	Kelly Bros.
Eddie Meyer	Lightning
Navarro	Harry Miller Eddie Miller
Offenhauser	Morrison
Pacific Jackrabbit	Nicson
Ord	P-H
Roof (R & R)	Police
Sharp	Schultz
Smith (& Jones)	Supermarine
Thickstun-Tattersfield-old Baron	Thomas
Waggott (Australia)	Tornado
Weiand	

Heads only: Elco Twin
Federal Mogul
Hotton-Sullivan
Kogel

'39 FEVER
—OR—
You Gotta Be Nuts!

by DICK ORMISTON, Dearborn, Michigan

SOMETIMES I WONDER what drives a perfectly sane person into buying and trying to redo old Fords. Maybe it's greed, hoping the price will double, or maybe it's the pride that comes with having put the thing back together from all over the garage floor. In my case I think it's dumbness, but I'm learning—the hard way.

I got my '39 fever from my wife, believe it or not! While on a search for a good split-core radiator for my '40 Standard Coupe, I happened across a fellow restorer who thought he had a radiator in the rafters of his garage. The weather had just dumped an ice storm, and the wind was howling about 50 miles an hour—a perfect time to go get that radiator. Nobody was going to beat me to this one. Who else would drive 50 miles on glare ice for a '40 radiator?

We made one final spin, and, as luck would have it, we were there. My wife held me up through the ice puddles and into this frigid five-car garage. Every V-8er has heard about or seen these types . . . NOS parts hanging all over the place—four restored cars, and a '39 Ford Fordor tour car for sale. The radiator I was after turned out to be a junker, but my wife was drooling over that '39. Something snapped in the back of my head and I got the fever. The owner reached through the window of the '39, flipped the ignition on and bumped the starter. It fired up instantly with that deep V-8 sound bursting through the Hollywood muffler. It sounded like a

$50,000 Chris Craft in twenty feet of water . . . beautiful. The next week, after the ice had melted a bit, I drove it home.

The owner had cautioned that the old '39 used oil, but he didn't say how much oil. On a short 65-mile trip I thought the old flathead had been converted to a diesel. It used three quarts of oil! I made arrangements to purchase a *professionally* rebuilt '39-40 engine from the owner who had realized the '39 needed work and had

FLATHEAD RACING – *Continued from page 10*

than the other way.

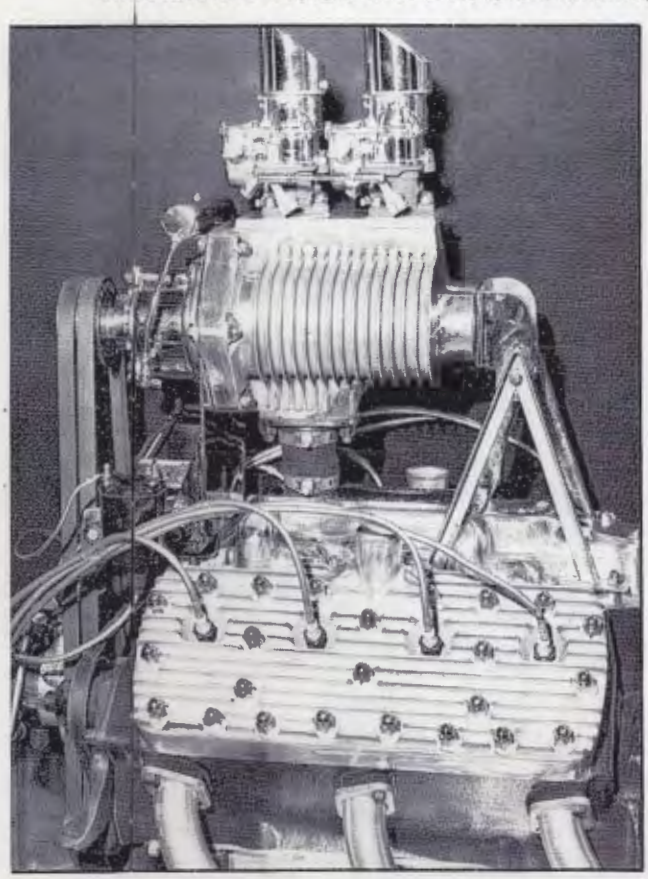
On the rear hubs the run-the-balls-right-on-the-axle-end arrengement, which always gave me the creeps no matter how well it worked, was replaced with a series 310 ball bearing integrated with a so-called safety hub, which was in effect a full-floating conversion for Ford passenger car axles and housings used for many years on circle track cars. Without such an arrangement, a broken axle lets the part outboard of the fracture, wheel and all, slide right out of the housing. If there is enough interest, we can supply an article on installation of safety hubs (together with instructions on blueprinting and beefing a Columbia rear end) in a future issue.

What could be more fun than to go to Bonneville in your '34 beater with your 296 cu. in. '29-on-'32 roadster trailing behind? Norm Lean and Doug Harrison smiled when they pulled back from a 153 mph run in 1951, not realizing how badly the C & T ARDUN, the first of the hot overheads, would blow them off.

A TECHNICAL HISTORY of the RACING FLATHEAD

by Mark Dees

Reprinted from June 1973 ROD & CUSTOM Magazine with permission from Petersen Publishing Co.



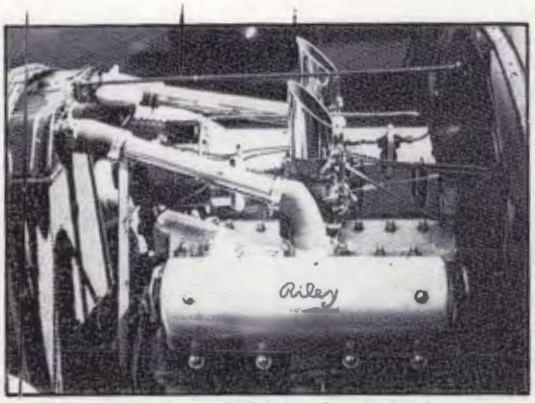
Earliest really successful supercharged flathead was Don Blair's lakes modified of 1946, which reached over 140 mph. Don used a Mercedes SSK blower on a Weiand-equipped 258 cu. inch Mercury. Peterson

WE'VE SPENT A LOT OF TIME in previous installments discussing ways to improve the breathing of the side-valve layout as a means to obtaining more power, but it's all a drop in the bucket compared to what can be done with a well-designed overhead valve setup. While that was at least one of the reasons for the various overhead valve conversions made over the years for the flathead Ford V-8, most designers were also trying to do away with the accursed exhaust passages winding through the cylinder block, which indeed rob power, but even worse, dump so much heat into the engine and cooling system. The situation was particularly bad in heavy truck service in hotter areas of the world. Those of you who have had a V-8 fry itself on a long grade, warping the cylinders and destroying the rings, know well what I am talking about. In consequence of this design oversight, at least half of the hopeful manufacturers of overhead conversions had visions of even greater sales to commercial users than to racing car owners.

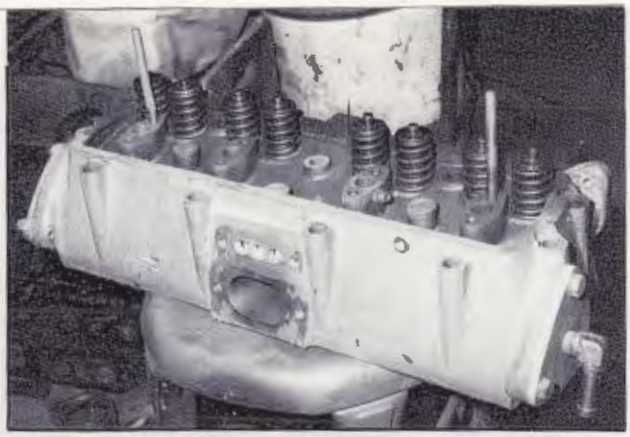
In the following descriptions I will try to follow the chronological order of the appearance of each make of conversion. At the outset let me give a tip to the collector who would search for any of these very rare and/or expensive items—unless you intend just to hang

PART IV

Overhead Valve Conversions and Superchargers



Riley overheads as installed on late 21-stud block in street roadster. They were impressive to look at and had a legendary reputation, but in fact were not very good by any standard.



Intake side of Riley head being prepared for owner Jim Basso by Wes Cooper. This particular engine used a Norden crankshaft and cam to avoid cross firing within the integral manifold. Note flanges for early ('32-36) V-8 water pumps.

them on the wall for decoration, beware of cracks in the castings which may be impossible to repair, or heads that have been planed so many times that the bottom surface is so thin that it will not seal against the block. Gaskets are invariably a problem, and although you can make such out of soft copper, it will be difficult to obtain a good seal on the narrow ridge between the cylinder bore and the old flathead valve pocket. The overhead road is a dubious and thorny one.

RILEY

George Riley of Los Angeles, builder of the famous Riley Two and Four Port heads for Model A and B Fords, made a very few sets of rocker-arm overheads for the 21-stud V-8 during the mid-thirties. Apparently they were made for some class of boat racing then in effect which required only one carb venturi per cylinder, as these heads had only *one* intake port per head. Like the Riley four cylinder heads, the V-8 heads were designed to use a stock exhaust manifold, and thus had three exhaust ports. The weird intake not only restricted breathing, it allowed exhaust gases to blow back into adjacent cylinders during certain overlap periods, which created fires in the carburetor. It is almost impossible to make a Riley V-8 setup run without catching fire, unless one uses an 180 degree crankshaft or a special camshaft of the kind once ground by Kenny Harman to stagger the valve timing around so exhaust flames can't get at the fresh fuel/air mixture.

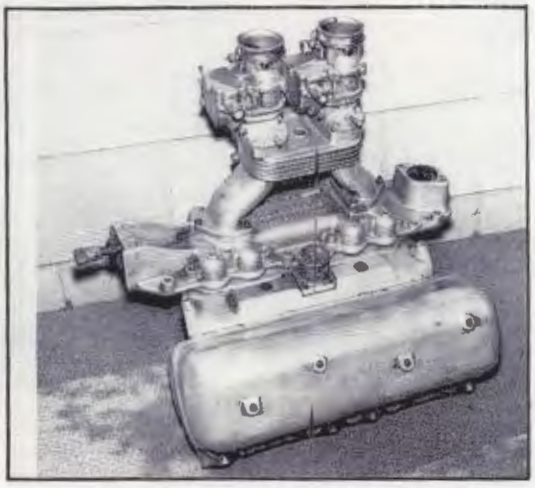
Riley also manufactured a couple of very special racing engines with a single overhead cam on each bank. The block as well as the heads were special and only the crankshaft, rods, and a few smaller parts were stock V-8 Ford. Two of these are known to exist in private collections.

DIXON

Very little is known about the origin of the two types of Dixon rocker-arm heads designed for the '37-38 21-stud blocks, but they appear to be the best overhead conversion made until the advent of the Ardun. Each type is cast from aluminum alloy and has four intake ports and four exhaust ports in each head. Valves are quite large although somewhat shrouded in the com-

Early Dixon engine built up on 1937 block shows outboard *intake manifolds. It appears to have only two intake ports per head, but in fact there are two pairs of small ports with a knife-edge divider at the manifold flange.*

Later Dixon heads mocked up to show how a Standard V-8 manifold (or, in this case, an Eddie Meyer high-rise) may be used. These alloy heads use Cragar rocker arms and are being used by the author on one of the special engines described in the text.



A very wild street engine using Alexander heads and a modified Schwitzer-Cummins centrifugal blower. Alexander heads had poor porting, gave cooler running than a standard flathead but not much more power. Peterson

Another shot of an Alexander conversion makes it clear that the intake system remained standard—in the block—while only the exhaust came through the head. This "F" head arrangement is the reverse of all others, such as Rolls-Royce, Willys, and Riley fours, in which the intake was routed through the head. Peterson

bustion chambers by modern standards. The earliest type, which has also been called a "shafer" head, has the intake ports entering the engine from the outboard side, unlike any V-8 of my knowledge except for a few special Pontiacs built up some time ago by Mickey Thompson. The later type has ports on the inner sides of the heads in a conventional manner, with special adapters to make possible the use of any flathead V-8 manifold, stock or special. A set of the latter heads helped a large "modified" reach 120 mph in 1938, and a fellow named Jack Prickett did well with a set in a sprint car before the war. Louis Senter took over the later patterns after the war and may have sold a few sets, but the only examples I have ever seen are in my collection.

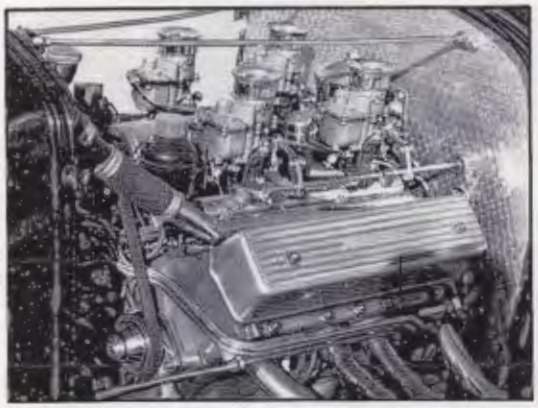
ALEXANDER

Colonel Alexander of Inglewood, California, made quite a number of these cast iron heads before WWII. The intake system remained stock; all the rocker-arm actuated exhaust valves accomplished was to get the exhaust passages out of the block. Each pair of cylinders shared an exhaust port, not the best plan for a V-8 with a "90 degree" crankshaft as the impulses on one pair are only 90 degrees apart in the firing order and will fight each other. Alexander used the same set of patterns for both 21- and 24-stud heads.

In spite of the theoretical disadvantages of the Alexander heads, they worked well enough. I once saw a very trashy track modified with a T *touring* body and V-8 engine with Alexander heads completely dominate a field of track roadsters and modifieds at the Santa Maria dirt track in 1948.

MAXI

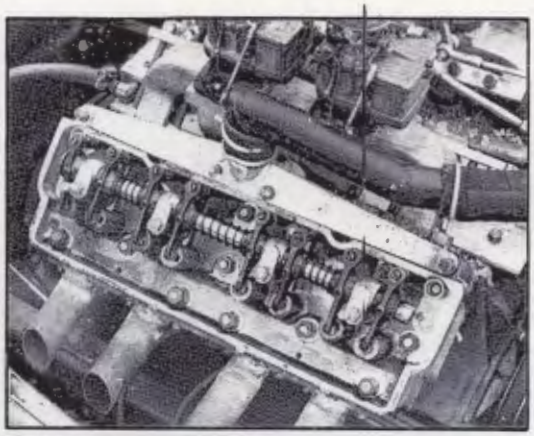
These rare heads were very similar to the Alexander, except that they used three exhaust ports per head. Ed Iskenderian's famous street roadster has sported a set of these heads for almost 40 years.



Al Barnes used a set of the rare Cummings overheads on a 21-stud block in his beautiful street roadster, and there are another set or two in use. Al built a fuel injection system for this car also. Peterson

Lee Chapel's "Tornado" overheads were manufactured in small numbers. Lee used them to power his less-than-competitive streamliner, which eventually reached 225 mph at Bonneville. Design was similar to Dixon heads, 4 ports in, 4 ports out per head. The beautiful car, built by Bob Allinger, flipped and was destroyed at Bonneville in 1952. Peterson

Arnold Birner tunes the converted Mercury using his heads in a belly tank which reached over 140 mph at Bonneville.



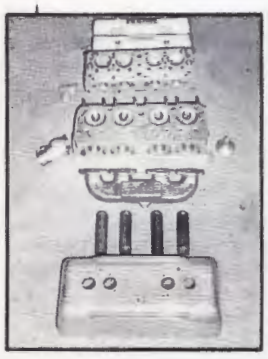
Valve gear of the Birner head is typical of Dixon, Cummings, and Tornado heads. All of these heads used Cragar, Buick, or Nash 8 rocker arms, and were restricted by the comparatively small Ford/Merc bore and single rocker layout to small valve sizes. As a result none were—or are—competitive with the post-1949 Detroit-built OHV V-8. Peterson

ARDUN

By far the best known and most successful overhead valve cylinder heads for the flathead blocks are the Ardun units manufactured in the late 'forties by the ARkus-DUNtov brothers. The complete history of these remarkable heads was covered in detail by Tom Senter in *Rod & Custom* for May and June, 1971, and Tom's account of the assembly of an Ardun street engine was carried in *Rod & Custom* Quarterly for Summer, 1971. In brief, shortly after WWII, Zora Arkus-Duhtov designed a full hemispherical head with big ports and valves operated by rocker arms. The aluminum alloy heads were made in England but most were shipped to, and sold from, the Ardun outlet in New York, which is why the valve covers say "ARDUN-NEW YORK-MADE IN ENGLAND," a confusing legend if there ever was one. On a stock Mercury block these heads were supposed to be good for 175 horsepower using the Ardun manifolds which mounted two stock carburetors.

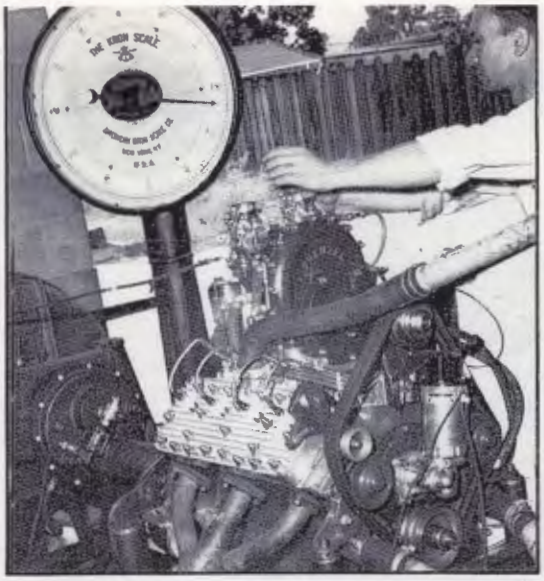
These heads were used immediately after their introduction on trucks and on the English-made Ford V-8-based Allard sports cars (even today *any* hopped-up flathead in an Allard is called an Ardun-Mercury in England, as I found out to my sorrow just before I nearly bought one). Bob Estes ran an Ardun at Indianapolis in 1950, but there wasn't too much interest until Don Clark and Clem Tebow, two young hot rodders, began to really work with the heads on Tony Capanna's dynometer. After much work on valves, rocker gear, valve springs, and the induction system their Ardun was able to pull 267 bhp. at 5250 rpm on straight alcohol and 303 bhp at the same speed with nitromethane additives. One of the secrets was the Chet Herbert roller camshaft assembly. Bore was 3-5/16", stroke was stock '51 Mercury, 4".

This, the first fully developed Ardun, served notice in dramatic fashion that the faithful flathead was all but dead as a racing engine, and I was lucky enough to be there when it happened, at the Bonneville Nationals of 1951. My friends and I had come with a GMC-powered coupe, and though we had reached over 150 mph, we trailed slightly behind the hot dogs in our class who were still using flatheads: Hadley, Hartelt, Rounthwaite. But we kids had come so close with a "Jimmy" built so easily, quickly and *cheaply* that we knew we



From bottom to top: Ardun valve cover (some also say "Made in England"), spark plug wire tubes, original intake manifold, and cylinder head. Beyond these parts is a very rare V-8-60 Ardun head, designed by Arkus-Duntov for midget racing cars. About 20 of the latter were built, about 200 of the big-block conversions. Peterson

Lincoln-Mercury dealer Bob Estes, motoring sportsman par excellence, stands with young mechanic Jud Phillips with Joe James in the cockpit of Bob's Ardun-powered Indy car. In 1950 this car just missed qualifying at a speed of 124.176, but it was the fastest time turned by a stock block engine up to that date. Bob still has this car, in one of America's finest private collections of classic cars and racing equipment. Peterson



The Stephens-Frenzel Co. of Denver not only produced some pseudo-Ardun heads, but they also produced a fair number of centrifugal superchargers which performed well although I recall their drive gears to be quite noisy. The man is Tony Capanna, still active in the automotive business although he now concentrates on Diesel conversions for passenger cars and light trucks. Note the Vertex magneto on an angle drive, the best ignition of the time. Peterson

For many years the most powerful flathead by far was Tom Beatty's GMC-blown tube-frame belly tank, which turned 199 at El Mirage, 212 at Bonneville. Here Tom checks the plugs of an early version, while engineer Barney Navarro checks the oil for telltale signs of bearing dust. Tom blew up a lot of engines trying to improve on these speeds; used to bring his boring bar, extra blocks, and boxes of parts to Bonneville and build complete engines on the steps of the Western Motel. Peterson

were on the ground floor of the coming thing. And some other fellows such as Ak Miller were playing with Oldsmobiles and Cadillacs, and one or two had one or two of the new, untried Chrysler hemis which bore such a suspicious resemblance to the Ardun. Then Clark and Tebow (C-T Automotive) pulled in late with a nearly stock '32 roadster fitted with their Ardun. Clark had constructed a special slide-valve fuel injector body which left the intake ports completely unobstructed by any butterfly valve at full throttle (just like a modern Cosworth GP engine). They confronted in the "C" roadster class the nastiest field of "3/8 x 3/8" flatheads ever assembled, topped by Norm Lean and Doug Harrison who had just been clocked at 154 mph. Don Clark took the tow bar off his barn-like '32 highboy and ambled down the course—on straight alcohol—at over 162 mph! The next day he and Clem removed one spark plug and shattered the "B" roadster record at over 150 mph—on seven cylinders!

We stood around with our mouths agape in amazement. There was talk of banning Arduns, or handicapping them, but everyone knew the game was up and started plotting how to dump their flatheads and get *some* kind of overhead V-8. By 1954, at the lakes, drags, and points between, the flathead was completely obsolete.

Many other sharp tuners used Arduns during the mid-fifties, people like Art Chrisman, the Motor Monarchs, Safeway Sandblasting, Clark Cagle, LeRoy Neumayer, and many others. The C-T crew put their Ardun in a sprint car and with it or a similar engine won the CRA Championship in 1957. Even today an Ardun will run right with all but the most highly modified Chevy V-8s, although, of course, it does not have any practical degree of reliability in doing so.

MOLLER-ADAMS

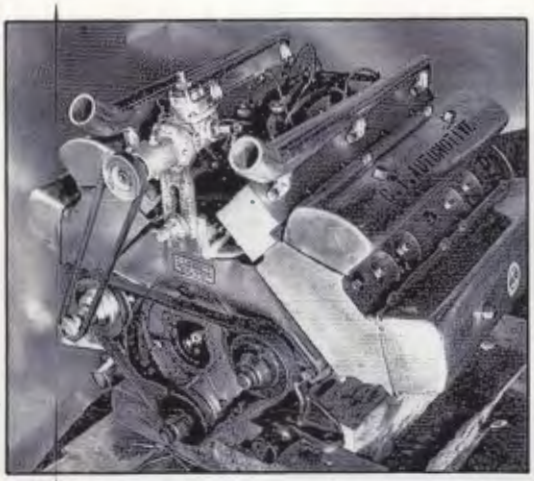
Rudy Moller and Kenny Adams built up some very nice hemi racing heads similar to the Arduns, but the pushrod arrangement to the exhaust valves was somewhat different in that the pushrod from the camshaft actuated an intermediate rocker arm which in turn drove a pushrod lying at right angles to the cylinder bore and *that* pushrod actuated the exhaust valve rocker arms. It gave a few more horsepower than the old Ardun. Such an engine was used by C-T Automotive in the Hill-Davis streamliner which was the first hot rod to break the long standing records set by various specially built Mercedes Grand Prix cars. The Hill-Davis-CT AAA record of 230.16 mph set in 1952 stands today as the best performance by a flathead *block and crank*.

OTHER HEADS

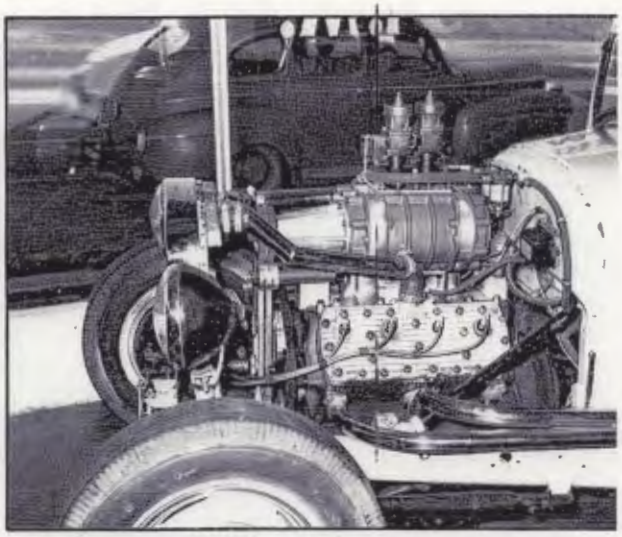
Captions under the photos mention the Chapel "Tornado," the Birner heads, and the fabulous four cam engine built on a V-8 block by Joe "Dirk" Davies. We should also mention the Stephens-Frenzel heads made in Denver, which appeared to be more or less of a cast-iron version of the Ardun and made little if any mark in racing. There were a number of home-built overheads around, but we have covered all those conversions which had any success or hope of it.

SUPERCHARGERS

More fellows fiddled with blowers to get the last bit of performance from a flathead than ever tried the overhead valve route. The most successful post-war commercial setup was the Italmechanica (I.T.) Roots-type superchargers which were replaced by the improved S.C.O.T. blowers. Both brands were made in Italy, and if properly set up and maintained gave use-



Finest and most powerful unsupercharged version of the early Ford V-8 ever built was the C-T Automotive engine of 1952 using Moller-Adams heads and slide-valve fuel injection. Using lots of nitro this engine showed 320 bhp on Capanna's dyno and powered the Hill-Davis streamliner to over 230 mph, breaking a record held by Mercedes-Benz for over 15 years. Peterson



This is a typical conversion of a GMC 3-71 Roots-type supercharger, appearing here on a '27 on '32 rails street rod owned (years ago) by Bob Bergstrom. Two V-belts appear to be a very marginal drive system. Peterson

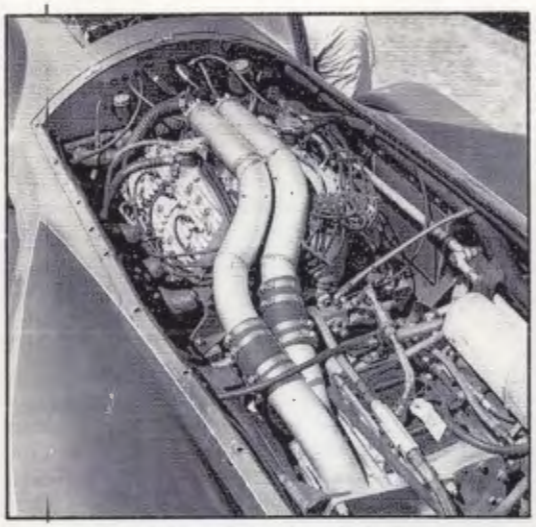
ful boost and good service. There was a short-lived effort to sell a turbosupercharger called the Besasie; I've seen one for a Chevrolet six, but never one for a flathead although they were offered. The Ford V-8 is about the worst prospect in the world for turbocharging, even with a modern Airesearch unit. The Judson outfit of Conshohocken, Pennsylvania manufactured a vane-type positive displacement supercharger similar to, but larger than, the blowers they sold for many foreign and domestic small cars. I hope that their Ford/Mercury unit worked better than the Judson I was so unfortunate as to have on my '65 Corvair.

The best of all supercharger installations for the flathead were the various adaptations of GMC Diesel 3-71 and 4-71 Roots-type superchargers. Most of these were home-made, although Speedomotive made some kits for using a 3-71 on a flathead. Some drove the blower off the nose of the crankshaft, others mounted it above the engine and drove it at various ratios of underdrive or overdrive by a chain or V-belt. Experience has proven that the best arrangement when frontal area is not a problem is to mount the blower on top and drive it by a toothed (or "Gilmer") belt, just as the fellows do now on blown Chevies and Chryslers. Manifolds for such setups are usually based on I.T. or S.C.O.T. blower manifolds. Such a blower assembly was used on the famous Navarro and Beatty lakes machines, which were probably the strongest engines ever built using the original Ford side-valves and L-type heads.

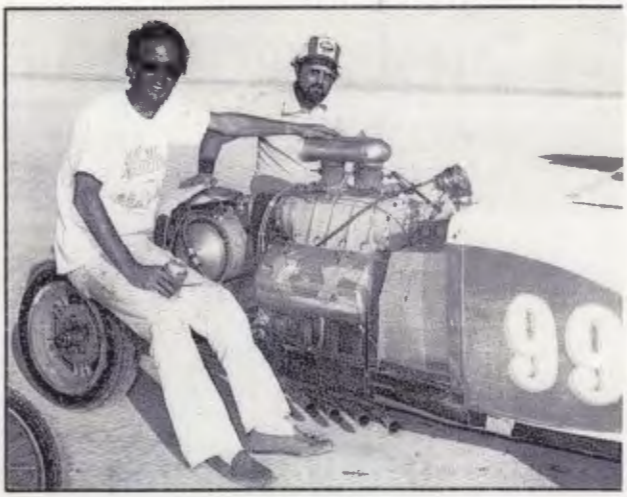
TWO SPECIAL PROJECTS

This series concludes with a description of a pair of exotic conversions of early Ford V-8 engines which were indulged in by Tom Senter and the author in an attempt to build (in Tom's case) the ultimate 24-stud engine and (in my case) the ultimate, or near-ultimate, 21-stud. Neither engine has yet proved to be a record-breaker, and certainly these words are not meant in any way to be a guide for the reader. Take them rather as a case history of the time, money and grief expended to satisfy extreme cases of masochistic Fordomania.

Tom started with a set of early Ardun heads; I started with a set of late Dixons. He selected an 8BA block, I used a 1937 late 21-stud block modified to the 8BA bell housing configuration. Each block was decked, line bored, de-rusted, and fitted with a Werksman main bearing support (or "girdle") by Hydro-Head of Inglewood, California, which firm did nearly all the machine work on these projects. Both Tom and I wanted for



If Tom Beatty's blown flathead wasn't the strongest side-valve engine ever built for reasonably sustained running, Ed Harding's was: 229.73 mph in the Redhead streamliner at Bonneville in 1971. GMC 6-71 supercharger was driven 1 to 1 by 258 cu. in. flathead with Winfield SU-1A cam, 1-5/8" valves. Peterson



Last but we hope not least. Tom Senter (left) and the author with Tom's 258" blown Ardun in my Austin-bodied lakes roadster, Bonneville 1976. Tom reached 177 mph in tuning runs before a broken valve stopped the fun. This engine has been rebuilt and placed in a '32 highboy for the 1978 event. Valve covers are taped to retain plug wires which tended to vibrate off the plugs.

various reasons to obtain a displacement of just under 260 cu. inches. Tom's block was bored to 3-5/16", mine went to only 3-3/16" (stock Merc bore), which is virtually all you can get on a 21-stud block because of interference from the bottommost stud on each cylinder. Tom then used a late Ford 3-3/4" stroke crank and I used a late Merc crankshaft permitting a 4" stroke. These *cast,* not forged cranks were completely blueprinted and otherwise massaged by Hank the Crank, who turned down the rod journals to standard late Chevy 350 diameter. He refaced the thrust surfaces on the cranks to match stock Ford main bearing replacement sets with .015" wider thrust dimensions. (See your parts catalog for the proper numbers and suffixes.) Such odd sizes are very hard to find, but can be picked up at swap meets and from the major antique parts suppliers. The cranks were then nitride-hardened and returned to their owners with a bill for about $295 each—a fair amount of work on a $5 core!

For connecting rods we turned to the rods used in late 292 Chevy-GMC six-cylinder truck engines, which is 1/4" shorter center to center than stock Ford rods. JE Pistons of Monterey Park, California, made up special pistons from special foreign car forging blanks. They took the rod length difference into account (as well as our measured deck heights) and turned the pistons for modern narrow rings. This type of rod is not only stronger, but permits use of the Chevy-GMC rod inserts and much heavier piston pins—cut down to fit the flathead bore, of course. Tom went even further and used a forged aluminum "Superod" replacement for the GMC rod, but discovered to his grief that he had to cut very large reliefs in the bottom rails of his block, which had to be brazed up with considerable difficulty where he was forced to go into the water jacket. In the case of both the stock GMC rod and the Superod, the rod has to be Blanchard-ground to the width of a Ford rod. The big ends are too large to pass down through the flathead cylinder bores, so they must be placed in the cylinders *before* the crank is dropped in.

For the time being each engine is fitted with an Iskenderian LDB (Long-Duration-Bigelow) flat tappet cam supplied by Ed Iskenderian from the last of his old stock. This was a very successful grind developed by the late Kenny Bigelow for his GMC and should work well with the 1.4 rocker ratio of both the Dixon and Ardun. More radical grinds may be used in the future. Gaskets for both heads are more or less hand-made and are a constant problem, particularly with the Dixon, which has an irregular chamber not suitable for O-ring grooving. Vertex magnetos are used, although we have experimented with adapters for Chevrolet-Delco mag-pulse distributors.

Both the Dixon and the Ardun heads utilize so-called "cartridge-firing," which means that the spark plug electrodes are set away from the combustion chamber by a short passage. This dubious design feature is mitigated in the case of the Dixon by drilling and tapping for extra-long reach 14 mm plugs and in the case of the Ardun by using 18 mm Champion racing plugs designed for Allison unlimited hydro engines. Firing is by Vertex magnetos, though we have experimented with adapters for Chevy-Delco mag pulse distributors.

Tom uses a GMC 6-71 supercharger driven one-to-one on a special manifold fed by a Hilborn "two-hole" blower injector. Because of the handy Dixon adapters I'm able to use any intake system designed for a flathead; I'll be starting out with my old Hilborn port injector. Tom's Ardun was finished some time ago and ran at Bonneville in 1976 in one of my roadsters with inconclusive results; since that time he has been finishing his 1932 Ford highboy and by the time this is published will know whether he has a winner or an expensive curiosity. My engine is nearing completion and while I will run it in competition it is primarily meant to be an unusual but reliable street engine for my '27 T on '29 rails—which is to say that I *know* it's an expensive curiosity.