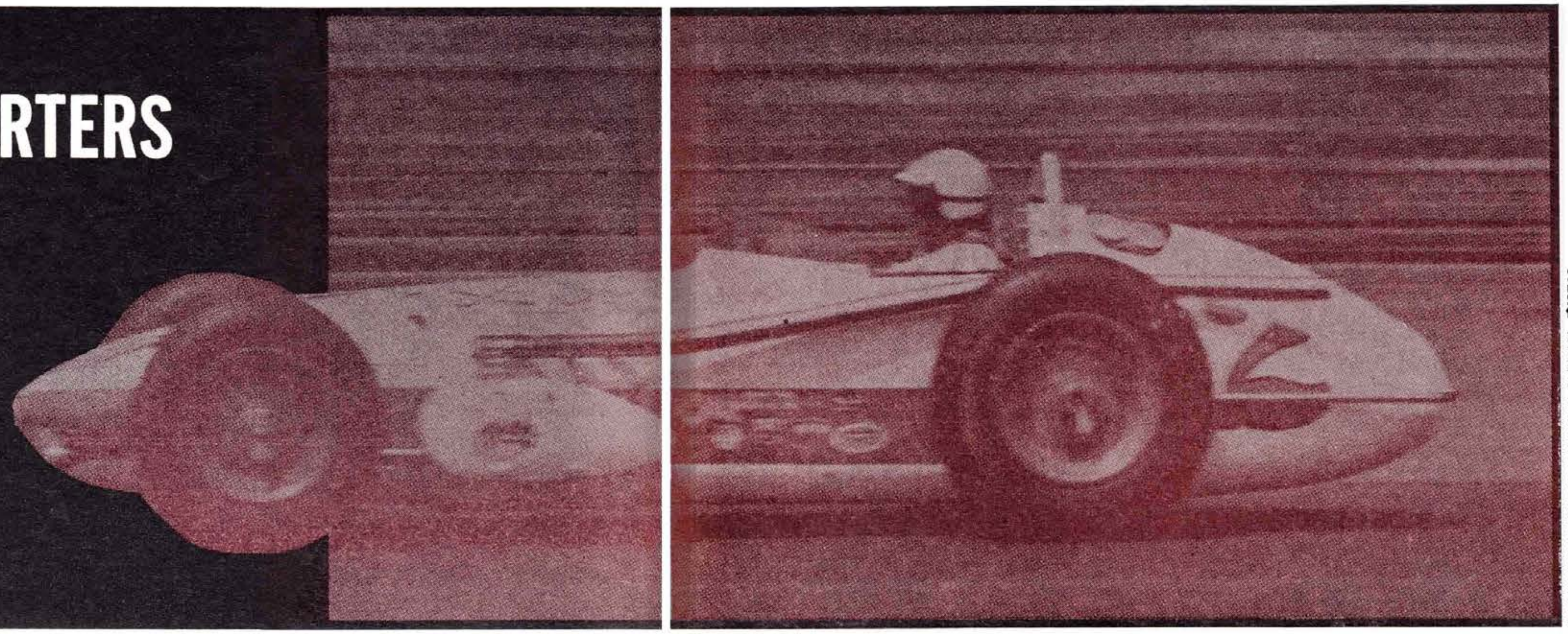
THE CIRCUIT IN QUARTERS

PART II

Indianapolis & NASCAR Cars

BY ROGER HUNTINGTON



INDIANAPOLIS MOTOR SPEEDWAY OFFICIAL PHOTOS

RODGER WARD showed the latest in 500 cars in winning the 1962 race.

Car	Bhp	Gross Wt., lb.	Frontal area sq. in.	Drag Cw	0-30 mph	0-60 mph	¼ mile e.t. @ mph	Top speed
1915 Stutz	131	2500	14.0	0.75	4.5	10.5	18.4 @ 83	110
1928 Miller 91	170	1750	10.0	0.70	3.0	6.7	15.0 @ 104	145
1933 Studebaker	192	2910	14.5	0.65	3.2	7.6	16.2 @ 90	135
1937 Sparks-Thorne 6	550	2250	12.0	0.65	2.8	4.3	12.0 @ 140	200
1956 Offenhauser 270	360	2000	11.5	0.60	2.7	4.6	12.6 @ 125	185
1962 Offenhauser 252	400	1900	11.0	0.60	2.7	4.4	12.3 @ 132	190
Typical NASCAR stock	450	3750	24.5	0.48	2.8	5.2	13.6 @ 111	165

LAST MONTH we opened this subject with a review of the performance evolution of the European Formula I Grand Prix race car. Now we're going to talk about the American track racing car; more specifically, the Indianapolis car. The fastest track cars in the country have always run at the annual 500-mile race and generally the same chassis rules have applied at Indianapolis as for the big-time AAA or USAC Championship professional racing circuit. So the engine displacements and weights of Indianapolis cars have been representative of our fastest cars. There has been little chance of some oddball "Formula Libre" car outgunning this Indianapolis machinery in recent years.

But there's still one big difficulty in translating the true performance of an American track racing car in terms of the familiar 0-30 mph, 0-60 and standing quarter-mile acceleration times: Most of these cars have used relatively crude 2-speed transmissions and harsh multi-disc clutches. Nothing more elaborate was ever needed on our fast banked speedways, where gear-changing was strictly confined to getting under way after a pit stop. The standing start has never gotten to first base in American auto racing. Consequently, the transmission-clutch combination used on these track cars is entirely unsuitable for quick standing-start getaway. The violent clutch action induces easy wheelspin, the overall gear ratio up to 60 or 70 mph is not optimum and quick gear shifting is not possible.

Thus, the following estimated acceleration figures for these cars carry allowances for this peculiar driveline situation. But I have given the Indianapolis car the benefit of the doubt. It's very hard to project 0-30 mph times for various combinations of engine, transmission, gear ratio, weight distribution, tire traction, etc. You may have some arguments about the times assigned these various types of cars, but I can't see any of them getting up to 30 mph in less than 2.7 sec. and that may be optimistic even for the hottest ones. (Why doesn't someone talk one of these Indianapolis car owners into taking his $30,000 investment out on a drag strip somewhere and proving all this speculation??)

Now let's start well back in Indianapolis history and see how a few typical examples might perform on the drag strip:

1915 Stutz

The 1915 Stutz Championship racing car appears as an example here because it was typical of a new breed of American car designed from the ground up for racing, to compete with the foreign Peugeots, Delages and Mercedes that were cleaning up on our tracks. (Most earlier U.S. race cars were modified production cars.) The new Stutz-Wisconsin racing engine had 4 cyl. and 296 cu. in., with 4 inclined valves per cylinder operated by a single overhead camshaft through roller rockers. The valve timing had zero overlap with 220° of duration! A single updraft carburetor was used. The engine was revved to 3500 rpm on the dynamometer (no small feat with a 6.5-in. stroke!) and developed a peak of 131 bhp at about 2900 rpm, running 5.0:1 compression ratio. The maximum rpm used in the 1915 Indianapolis race was 2700. The complete Stutz car weighed about 2250 lb. dry (this was a 2-seater, of course).

On the track the new Stutz proved to be virtually as fast as the best European GP cars, lapping the bricks at 91 mph. Gil Anderson started to pull away from the field in the first laps of the 1915 Indianapolis race, but unexpected tire wear dropped him to 3rd place at the finish (behind a Mercedes and Peugeot). Later in the year he won the opening 350-mile race on the big 2-mile Sheepshead Bay board speedway, averaging 102.6 mph. The actual top speed of the Stutz was about 110 mph. I wouldn't want to assign a 0-30 mph below 4.5 sec., though, so 0-60 would be over 10 sec. Terminal speed at the end of the quarter should have been about 83 mph with this weight and horsepower. The estimated elapsed time would be 18.4.

Keep in mind that the e.t.s quoted here are equivalent to manual stopwatch timing, to correspond with the 0-30 and 0-60 times. Since you generally start the watch before the car actually moves, and since the electric-eye drag strip times are tripped after the car is rolling, you can expect the quoted e.t.s here to be 0.2 to 0.3 sec. slower than the car would get on a drag strip.

1928 Miller 91

There has always been a lot of controversy about the performance of the fabulous little 91-cu. in. Miller and Duesenberg single-seater race cars that dominated big-time American racing in the late '20s. These cars were far lighter than any previous U.S. competition cars (1450-1550 lb.), had very low frontal areas (around 10 sq. ft.) and used superchargers, alcohol fuels and 8 cyl. to get the most out of the allowed 91 cu. in. On paper they looked wonderful.

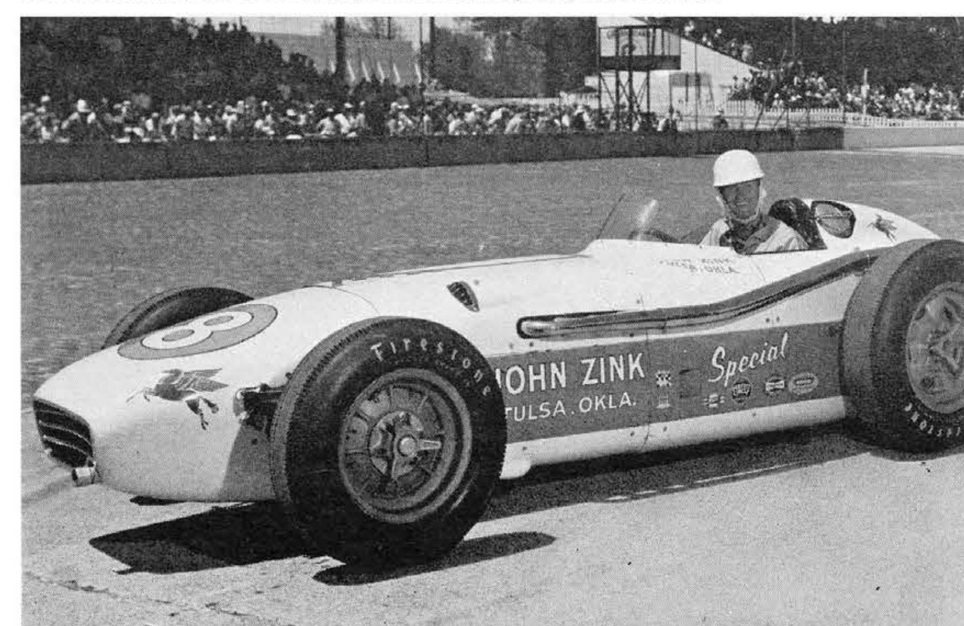
A lot of the confusion here is due to the fact that there were three backyard engineers, Frank Lockhart, Cliff Durant and Leon Duray, who were far ahead of the field in their development of the 91-cu. in. Miller. They were using 2-stage superchargers, intercoolers, high alcohol fuels, high mechanical compression ratios and wild valve timings to get anywhere from 50 to 100 bhp more than the average Miller. The standard engines would put out 154 bhp at 7000 rpm on benzol when they were brought out in 1926. This was with about 10 psi boost pressure from the supercharger. In the next couple of years the average engine was developed to about 170-188 bhp at 12-15 psi boost. But there is no question that Lockhart and Duray were getting between 220 and 260 bhp in the 7000-8000 rpm range with intercoolers and alcohol fuels. They were always the fast qualifiers at Indianapolis, with Lockhart finally putting the lap record up to an astonishing 124 mph in 1928. He set an AAA national speed record on Muroc Dry Lake with his Indianapolis car at 164 mph. This would have taken around 250 bhp. Lockhart lapped the Atlantic City 1.5-mile board speedway at 147.7 mph and Duray lapped the new Packard 2.5-mile concrete test oval at 148 mph! These cars must have had true top speeds near 160 mph. And Cliff Durant, working with his 2-stage superchargers, pulled 42 psi boost pressure at 6800 rpm. The engine was never on a dynamometer, but it must have produced nearly 300 bhp.

But the average Miller 91 on the U.S. racetracks in the late '20s was not that strong by any means. Our figure of 170 bhp at 7000 rpm wouldn't be far from it and Indianapolis gearing was such that 6800 rpm was seldom exceeded. Assuming a gross weight of 1750 lb. (dry weight plus 250 lb. total load), 4.50:1 axle gearing and 10 sq. ft. of frontal area, the top speed was around 145 mph. (These cars generally lapped Indianapolis well under 120 mph.) The 0-30 mph time might have been around 3 sec. flat and the car should have pulled from 30 to 60 in about 3.7 sec. more. The standing quarter would have been about 15 sec. flat, with a terminal speed of 104 mph. Note that this performance was well beyond that of the average European GP car of the late '20s. The 1928 Type 35 Bugatti discussed last month turned the quarter in 16.2 at 92 mph—and this was with a full 4-speed gearbox. The supercharger was the key. America was well ahead of Europe in supercharger development

1933 Studebaker Indianapolis Car

The stock market crash in 1929 was destined to have a profound effect on big-time American auto racing. AAA officials quickly got their heads together and formulated a new set of rules for the 1930 season that attempted to give the little guy with in- ▶

PAT FLAHERTY won the 1956 Indianapolis in the Zink Special, at 128.490 mph.



CIRCUIT IN QUARTERS

expensive stock-based equipment a fighting chance. It was also hoped that the Detroit manufacturers would sponsor teams. Essentially, they banned superchargers, allowed displacements up to 366 cu. in., limited engines to 2 valves per cylinder and 2 carburetors, and stipulated some minimum weight limits. As it turned out, the special Miller and Duesenberg racing engines kept winning; but everybody had more fun—and Detroit did get interested.

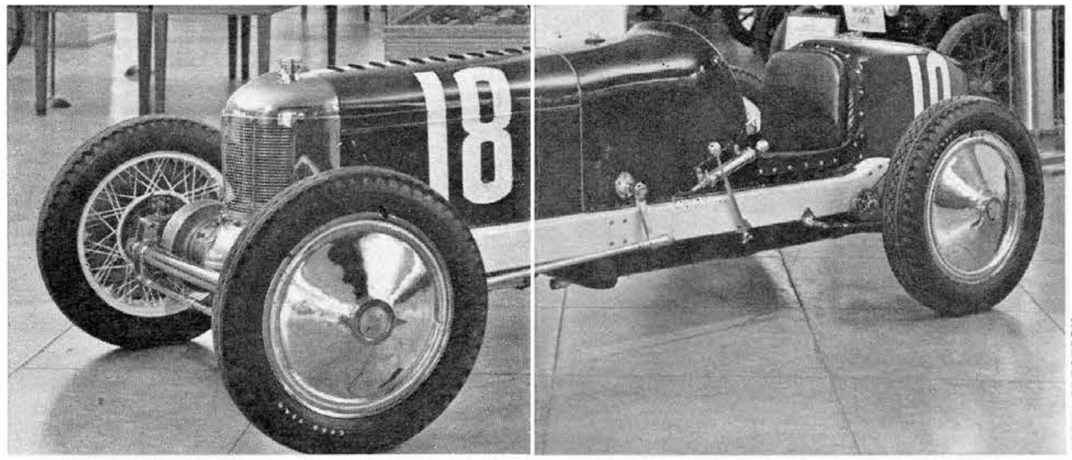
A typical Detroit entry during this period was put out by the Studebaker Corp. for the 1933 race. The car was built around an essentially stock President Eight chassis and mildly modified 337-cu. in. flathead engine. Wheelbase was shortened to 103.5 in. and new streamlined 2-seater bodies fitted, which cut the dry weight to 2660 lb. and frontal area to an estimated 14.5 sq. ft. New 2.92:1 rear end gears were cut. The engines had 7.5:1 compression, four Stromberg carburetors (the 2-carburetor rule had been changed by then), magneto ignitions, special camshafts; and they were said to put out 192 bhp at 4000 rpm on benzol fuel.

Acceleration and speed performance weren't bad at all. Cliff Bergere qualified one of the five '33 cars at 115.6 mph. The top speed should have been somewhere between 130 and 135 mph with the 2.92 axle gears. The 0-30 mph time could hardly have been better than 3.2; but 0-60 (using the standard 3-speed transmission in the President chassis) might have been around 7.6, with the quarter mile at 16.2 e.t. and a 90-mph terminal speed. This performance would be just about the equivalent of the strong power pack street engine available these days.

1937 Sparks-Thorne

This was undoubtedly one of the two or three fastest-accelerating cars ever to run on the Indianapolis track. Unfortunately, the engine was only legal for one year, so it never reached its full potential development. This is the way it happened: By the mid-'30s the Detroit manufacturers had lost interest in fighting the Millers with big-inch stock-based engines. Small dohc 4-cyl. Millers of well under 300 cu. in. were dominating. At this point, the AAA officials opened the door to supercharged engines, in hopes of attracting some European GP cars, while still retaining the 366-cu. in. limit! The result was inevitable. Millionaire Joel Thorne commissioned Art Sparks (now of ForgedTrue piston fame) to design and build a big dohc 6-cyl. engine with over 350 cu. in. and a 15-psi supercharger. It was very impressive, and even when the AAA put the 1937 Indianapolis race on premium pump gas the new car still had tremendous performance potential on paper.

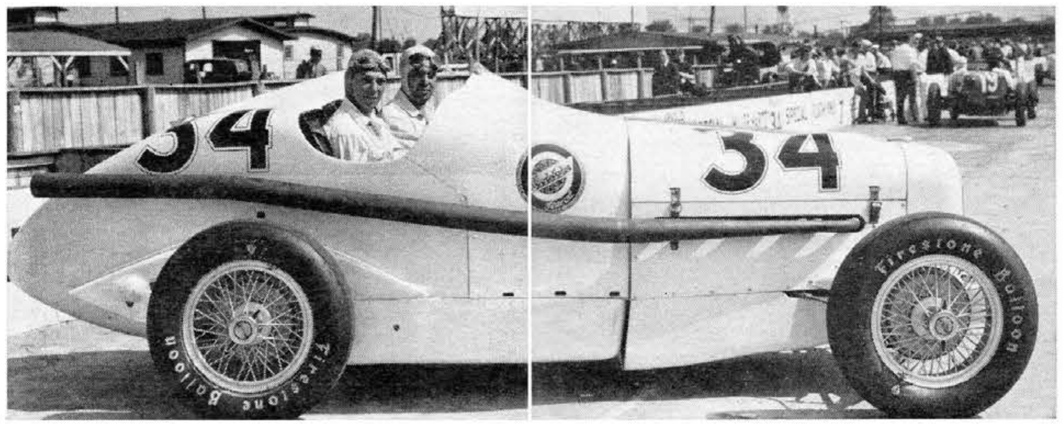
Apparently this huge Sparks-Thorne engine was never on a dynamometer, but the peak output has been estimated at 550 bhp at 5000 rpm on pump gas! Bore and stroke were 2.875 x 4.75 in., giving a total displacement of 337 cu. in. This output would represent a bmep of 258 psi, which is not out of line with this valve layout and 15 psi supercharge. The maximum rpm of 5000 may seem low for such a wild engine, but don't forget that 4.75-in. stroke. This gave tremendous internal friction, and lowered the peak rpm. The car was geared ridiculously high for the Indianapolis track and I understand that it never approached 5000 rpm in normal operation.



GRIFF BORGESON

1929 MILLER front-drive was driven by Leon Duray, restored by Griff Borgeson.

STUDEBAKER SPECIAL driven by Tony Gulatto finished seventh in 1933 race.



But the car certainly would move. Driver Jimmy Snyder lost no time in breaking the 130-mph lap-speed barrier at Indianapolis. The car wasn't fast through the turns, but would accelerate wildly when coming out of them. Mechanics often check acceleration by going up in the timing tower on the front straight, sighting on a big tree at the edge of the NW turn and clocking the e.t. from that point to the starting line. The distance is roughly 2300 ft. and the average modern Offenhauser takes between 10.5 and 11.0 sec. to cover the distance. The 600-bhp blown Novis clock in the very low 10s, or even 10 flat. The Sparks-Thorne car reportedly made it in 9.8! This would work out to an average speed of 160 mph. Assuming that the car came off the turn at 125 mph or so, it would really have to haul to cover the next 2300 ft. in 9.8 sec. The peak speed reached at the shut-off point may have been between 180 and 190 mph. I have corroborated this with the planimeter on an estimated acceleration curve for the car. By measuring the area under the curve between the 125-mph point and the time line 9.8 sec. later, the area does indeed figure out pretty close to 2300 ft., and the curve at this point shows just under 185 mph. Of course this is all estimated performance, but my curves are based on a horsepower figure of 550 and a gross vehicle weight of 2250 lb. (scaled up from the published dry weight of 1993 lb.). The car could have done it.

How about standing-start acceleration? This was pretty impressive, too. The 0-30 mph time was probably around 2.8 sec., with average tire traction and unfavorable gear ratio, but it should have pulled from 30 to 60 mph in about 1.5 sec. The standing quarter would have had an e.t. of 12 flat and a 140-mph terminal speed. Top speed was near 200 mph. This acceleration is almost as strong as that of the 1937 W.125 Mercedes-Benz we discussed last month. The brutal mid-range torque of the big 337-cu. in. would have helped a lot with the crude 2-speed transmission. That's why we doubt that the latest 170-cu. in. Novi Indianapolis cars (as reworked by the Granatelli boys) could match its quarter-mile e.t., although the terminal speed of the Novis should be higher. This engine is now said to produce nearly 700 bhp and the cars weigh well under 2000 lb.

But the Indianapolis buffs will never forget the fabulous Sparks-Thorne Six.

The Modern Indianapolis Car

Our latest Indianapolis cars are beginning to approach the performance figures quoted above for the Sparks-Thorne. They're a lot lighter, aerodynamically cleaner and the effective horsepower of the classic Offenhauser engine has been pushed to unbelievable peaks, mostly through camshaft design, fuel injection and use of pure methanol fuels. A typical 270-cu. in. Offenhauser of the late '30s would put out about 300 bhp at 5000 rpm on alcohol-benzol. By the end of the 270 era (1956) Jack McGrath's pacesetting engine showed 362 bhp at 6000 rpm and today they obtain 400 bhp at 6500 from the smaller 252-cu. in. units.

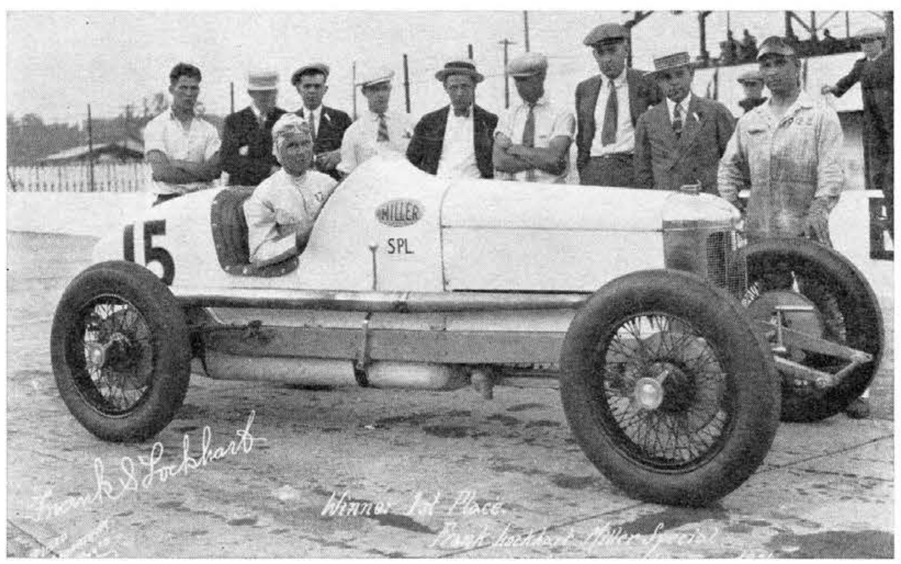
What this has done for acceleration performance is shown in the comparative table at the start of this article. The latest 252 Offenhausers should get up to 60 mph in about 4.4 sec. under good conditions, even with race gearing (generally around a 3.6:1 axle ratio) and the standing quarter should be about 12.3 e.t., with a 132-mph terminal speed. Ultimate top speeds, of course, are never reached on the short Indianapolis straightaways. The best cars sometimes reach over 170 mph down the back stretch, but many cars that can lap above 145 mph don't do this. Speed through the turn is vital to a high lap average. But a modern Indianapolis car with 11 sq. ft. of frontal area and an honest 400 bhp available should reach 190 mph if it could wind up tight with the right gear ratio.

Jack McGrath was invited to demonstrate his 270 Offenhauser Kurtis roadster on the new 4.7-mile Chrysler test track at Chelsea, Mich., in June, 1954. His best lap speed with about 350 bhp available was 179.39 mph. He said he could have gone a few mph faster on a smoother surface; as it was, he had to feather the throttle on the bumps up high on the banking and finally the jerking broke his crankshaft. The true top speed of his car was perhaps 185 mph, so the latest 400-bhp cars should do 190.

Just to keep the story complete, let's take a quick look at the performance of a typical late NASCAR Grand National stock racing car. We know what the Super/Stock counterparts will do on the drag strip; but what could we expect from one of these cars as set up for long-distance track racing; with a slightly detuned engine, no special traction modifications in the chassis, fast axle ratio, etc.? For this one we'll assume a gross weight of 3750 lb. and an honest engine output of 450 bhp at 5500 rpm. (Some S/S drag strip cars gross less than 3500 lb. and put out 500 bhp or more.) On this basis the 0-30 mph time should be 2.8 sec., with 0-60 in 5.2, and the standing quarter at 13.6 e.t. and 111 mph terminal speed. The poor 0-30 time with the fast axle ratio has hurt the e.t., but the trap speed is still good. The true top speed should be about 165 mph.

Some of the NASCAR cars have been said to reach just over 170 mph on the back stretch at Daytona and we know Tom Grove clocked a 2-way average of 165.44 mph at Bonneville last fall with the Melrose Missile S/S Plymouth, before taking it to Indianapolis for the NHRA Nationals drags. This was with 2.93:1 rear-end gears. With 4.56s at Indianapolis, he turned e.t.s in the high 12s at 111-113 mph. So a top speed of around 165 mph for these cars isn't too far off. ■

FRANK LOCKHART amazed the racing world with the performance of his '26 Miller.



FASTEST LAP in 1937 was achieved by Jimmy Snyder in the 6-cyl. Sparks Special.