Tight cockpit is that of Novi. Note red line on tach is at 7500 rpm. Not to alarm drivers, boost pressure gauge is omitted.

RED-HAIRED Pat Flaherty, pole man in the 40th Indianapolis 500-mile race in the No. 8 John Zink Special, beat the field this year at a modest average speed of 128.490 mph over Sam Hanks in the No. 4 Jones & Maley Special.

How can you break records when the caution flag is out? There were no less than 11 periods, totaling 71 minutes, run at low speed under the caution flag this year. We've never seen anything like it. Seemed like the flag popped out if someone even fishtailed. It seems quite obvious that last year's tragedy triggered a further tightening of already stringent safety precautions at the Speedway . . . which is fine. They were just being plenty careful.

Actually, the long periods at low speed, plus the moderate air temperatures in the 70's, changed the entire complexion and strategy of the race. The big boys were planning an all-out sprint with the lead cars making three—maybe four—stops for rubber. These experts had their pit work down to such a beautifully-coordinated operation in the last few years that there's very little to be gained any more by taking it easy, saving tires and fuel, and making only one or two stops. The winning Zink crew, for instance, changed all four of Flaherty's tires and fueled the car in 39 seconds on one stop this year! With that kind of pit work there's no percentage in avoiding stops, since you'd have to cut your average back maybe four mph to increase tire life enough to save one pit stop.

The caution flag introduced another angle. With the cars averaging only 70 mph when the flag is out, it pays to stop during this period, so you lose a minimum of distance on the leader. That is, a 50-second stop would lose about a mile when the leader is averaging 70 mph — but two miles when he's boiling 140. There were plenty of chances to pit during caution periods in this year's race; everybody was doing it.

And then, of course, the lower average speed was an important factor in tire mileage. The leaders needed only two stops (or three sets of tires) to do the job at an average of 128 mph in 76° F. weather. Had the average been 135, as many of the railbirds were looking for, and the temperature in the 90's . . . well, who knows?

Indianapolis Inquest

Pat Flaherty piloting Zink special, waves his arm in victory as he crosses the finish line at Indianapolis Speedway. His average speed in the 500-mile race was 128.490 miles per hour.

World Wide Photo

NEW TRACK SURFACE

The new $100,000 resurfacing job they've done at the brickyard has made virtually a new track of it. All four turns, the two short end "chutes", and the ends of both main straights have been repaved with asphalt, making these sections smooth and level. The old track was downright *rough* in the turns. A driver had to just more or less cruise through them; any heavy foot on the loud pedal would break the car loose, and maybe start a spin-out. The best technique for taking the turns before was to go in fast, then get off the throttle all the way and coast through the turn on the overrun. You didn't dare open up again 'till the car was straight — so there was very little accelerating on the short 660-ft. end chutes.

Drivers can really play fast and loose with the turns now. The boys are now usually shutting off maybe 200 feet sooner coming off the main straights, entering the turns a bit slower — and then flooring it about half-way through. This lets them get up some real rpm in the end chutes, which is apparently where they're gaining most of their time. Average speeds through the southwest turn, as clocked by the Firestone engineers, are up a modest two or three mph. Highest clocked has been 137 mph to date. Anyway, I'd say the new surfacing is responsible for 80 percent of the increased speed we've seen this year — especially that jump from 143.79 to 146.06 mph in the official one-lap record.

TIRES

The smoother track surface at Indy has also made it possible for the Firestone engineers to do something they've wanted to do for several years — raise inflation pressures. They were well aware that their usual modest 40 psi pressure was costing them a good deal of potential lateral casing stiffness in the turns. The lower pressure also increased rolling resistance, and the added flexing of the casing contributed to heat build-up. But 40 psi was as high as they dared go on the rough track — otherwise the cars would be very touchy in the turns, would start to "skate" at the slightest disturbance. Now, with the smooth, level surface, they've been able to jump to 60 psi with one swoop. Stability in the turns is improved; the tires don't roll under much, keep the inside edge of the tread on the track — and you don't hear 'em squeal anymore.

However, Firestone still has problems. At least six crashes occurred that have been blamed totally or in part on tire failure. In some cases, a tire literally exploded, something virtually unknown at Indianapolis in recent years. The nature of the failures has not been completely established, but tests are now underway at Akron to find out what went wrong. Chunks of broken wheel flanges and bits of shredded tires were gathered by the Firestone crews after the race for scrutiny. Several reasons have been advanced for the blowouts, if such they were; tread separation is one theory, chipped wheel flanges are another and high track temperatures (112° F. immediately after the race) are yet another tentative reason. Henry Richards, Firestone public relations man, puts it this way: "We just don't know yet. If it was our fault, we'll be the first to admit it. We'll find out in Akron just what did happen."

CHASSIS DESIGN

It looks like Frank Kurtis has really found the "formula" for the brickyard with his Series 500 chassis. Every new car built for the race this year — including three out of the Kuzma shops and one each by Lesovsky and Watson — employed his general layout with only minor modifications.

The formula is simple: You use solid "beam" axles front and rear with transverse torsion bars, set ahead of the front axle and behind the rear. The very long spring base gives a good ride and solid handling in the turns. The beam axles give a high roll axis for minimum lateral weight transfer. The control arms for the axles are a form of "Watt's link" arrangement, formerly used by Mercedes-Benz and Gordini. This cancels caster variation with wheel deflection (and torsion bar adjustment). Engines are either offset to the left or slanted, so as to get the drive line on the left side and allow the driver to sit low on the right. This not only biases the weight to the left, but lowers the center of gravity — to give more even weight balance on all four wheels under centrifugal force in a turn. Oh, there's a reason for everything . . . and apparently it's going to be tough to improve radically on the highly developed Kurtis layout.

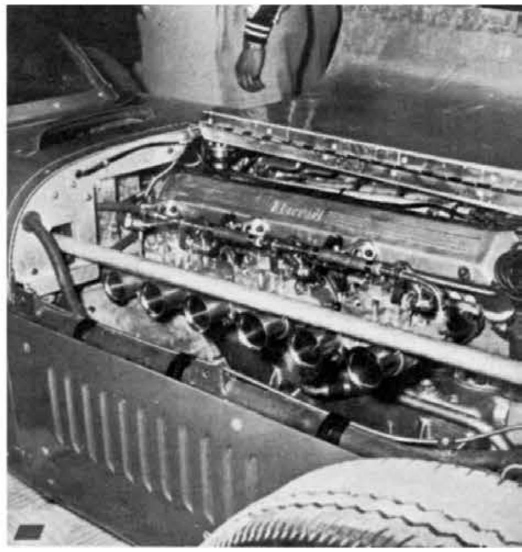
If there could be said to be any new trend in chassis design this year, it would be toward lighter weight. Those Kurtis "roadsters" aren't as light as they look. They'll generally run 1850 — 1900 pounds dry. A. J. Watson has knocked 200 pounds off that figure with lighter frame design, some magnesium body panels, and a single-piece fitting that acts as both control arm and torque link in front. This is the Zink car that Flaherty won with. It was definitely quick accelerating, too, and cornering was superb. Watson is an extremely clever young man.

THE OFFBEAT CARS

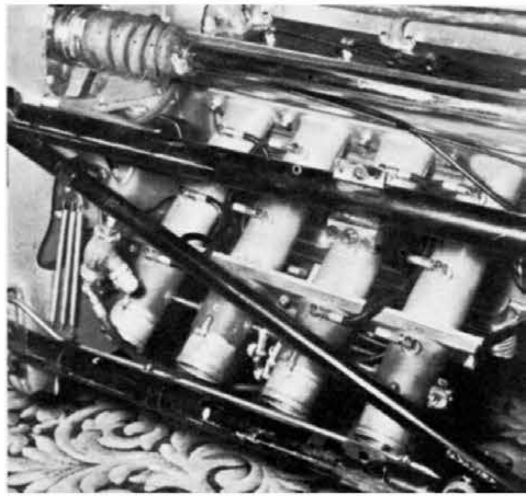
Seems like there's less and less "offbeat" iron at Indy every year. I can remember ten years ago when you

(Continued on page 56)

Agajanian car was exhaust tuned by Frank McGurk. Tuning was too efficient, scavenging intake. It was replaced.



Ferrari just after arrival at track with Weber carbs set for gas. Bardahl crew argued for and got alky.



Bruce Crower's special intake tubes were designed to cool intake, improve fuel density. Tubes frosted!

(Continued from page 55)

The rugged crankshaft consists of six identical disks interconnected by main and big-end bearing pins, all case or induction hardened. The shaft is carried in four similar SKF single-row ball bearings. Tolerances on the inside and outside diameters of these bearings satisfy stringent requirements in order to keep the radial play to a minimum for quiet and smooth operation. Bearing seats are made to tolerances as close as .019 mm. The big ends of the connecting rods ride in a double row of cylindrical roller bearings which make contact with the hardened surfaces of the crank pins. To eliminate any transversal movements in the central parts of the crankshaft, as well as clatter arising from high frequency torsional vibration, a torsional vibration damper was added to the crankshaft. And it's a good thing too; for without it, the engine, in time, might very well vibrate itself into a pile of metallic dust. As it is, some slight vibration can still be felt at idle speed.

It's no more of a fuss to start this engine than it is to start any four cycle plant. The choke is pulled out, and the engine cranked. In warm or cold weather starting procedure is the same. However, a good spin of the engine is required before the cylinders begin firing. The reason for this is that compression must be built up within the crankcase before the cylinders can scavenge enough fuel-air mixture for proper firing.

Once the three barrelled mill has started, a disturbing schizoid note bursts from the exhaust. It sounds as if the cylinders are exploding at will with absolutely no regard to any firing order. But once the throttle is cracked, the tiny engine quickly settles into a soft hum. The exhaust system with its two mufflers, one mounted transversely adjacent to the engine, and the other on the right side at the rear of the car, helps keep the erratic sounds to a tolerable level.

Carburetion is by a Solex AI of the down-draught type fed by an electric fuel pump. The gas tank holds almost ten gallons to which must be added approximately 1½ quarts of oil, necessary for lubrication in any two-stroke engine.

The engine is mounted well ahead of the front drive and connects to the three speed gearbox through a dry disk clutch. Power is transmitted to the gearbox, which also sits forward of the front axle, through a free-wheel. The size of the gearbox was made shorter in the 93 by transferring power directly from the drive shaft to the pinion shaft for first and reverse. Length, then, has been kept to a minimum by transposing power to only two gears on the pinion shaft; the forward gear being used for first and third, the rear for second and reverse. Second and third both have synchronizers which can be beaten by a rapid shift. First is engaged by a dog clutch which has a large clearance, and reverse is engaged through a sliding-gear.

With the free wheel in play, it is possible to shift up through the gears without declutching, but we found the use of it ineffectual. The high rpm, two-stroke engine takes forever to wind down after the gas pedal has been released, and the free wheel doesn't ride free until the rpm's have simmered to an idle. We did find, however, that with the free wheel locked out, it was possible to shift from third to second without the usual double clutching. According to the 93's designer, Gunnar Ljungström, this was not part of the design, and if such is the case, it is purely accidental.

The gear shift lever is mounted on the steering wheel and the shift positions are the same as those on standard Detroit machinery. It seems obvious that the car was designed with an eye toward the American market. And why not? It makes an ideal second car for the average American family. It's safe, economical and versatile. Though small in size, it is roomy enough in the interior to transport four people with a modicum of comfort.

The Lockheed hydraulic brakes are more than adequate to provide a reasonable margin of safety in time of emergency. In ten successive stops there was some fade, but the finned drums dispersed the heat in a matter of minutes, and full stopping power was thus quickly restored. Although engineered so that the front brakes take the brunt of the momentum, it is the back brakes that will lock in abrupt deceleration. This is due mainly to distribution of weight: fifty-eight percent of which rests on the front wheels, and forty-two percent on the rear with the driver aboard.

Instruments can be read quickly and easily at any speed. Those who travel extensively and on occasion find themselves lacking lodging for the night can without too much difficulty rearrange the seats to make a comfortable overnight bed.

Such is the story of the SAAB 93. With its price now fixed at $1895, the car should prove to be the answer to light, fast and economical (34-38 mph) for some of America's economy-car-minded public. With its distributorship growing rapidly throughout the country, it shouldn't be long before the 93 becomes America's newest naturalized automotive citizen.

Prokop

Indy Inquest

(Continued from page 47)

might've seen anything from an Offy to a flathead Mercury on the pit iron. Today it's the brave and foolish man who would try to bust the Offy-Kurtis combo with anything new. And the chances would be a thousand-to-one against him. Let's face it: For the amount of money available to build special racing cars in this country, the Offy-Kurtis combo is just about perfect. A new car like this will cost you about $30,000. How are you going to build anything different for less than ten times that much which would have even a 50-50 chance to beat it?

Undoubtedly this year's rear-drive Novi had the best chance of the last five years. They took the old supercharged winfield V-8 engine (originally designed in 1941) and put them in more or less conventional Kurtis chassis (SCI-August 1956). The Winfield engines don't weigh appreciably more than the 270 Offy, so the resulting combination theoretically gave handling and cornering comparable to the conventional cars of nearly equal weight – while still retaining the fantastic acceleration that only 600 to 650 horses in a 1900-pound car can give! It looked good on paper . . . and it went when they got it out on the track.

Russo's "Vespa" job was far and away the fastest car on the track this year. He could wind up to 185 mph in about half the length of the main straightways, then had to shut off immediately to slow down to 130 or so for the turn. (Admittedly the blower rotor has a considerable flywheel effect.) His best lap speed in practice was 146.6 mph. He could blow off the Offys on the straights as if they were anchored. When he went by O'Conner on lap 11 of the race, there was no hope of catching him on speed alone.

But then the old "problems" began to show up. The blown engine gulps down a gallon of alcohol every lap, which forced Russo to lug some 300 pounds more fuel than the others. The added weight, plus the beating the treads took when transmitting over 600 hp, was too much for the rubber. The right rear tire blew on the 22nd lap, putting Russo into the wall and out of the race. (No injury or extensive damage to the car.) What he might've done but for the blow-out . . . well, let's hope Lou Welch brings his new Novis back again next year. The weather man cheated the second job of a chance to qualify on the sec-

(Continued on page 58)

(Continued from page 56)

ond weekend, so he could have a double whammy ready. (Incidentally, mechanic Jean Marcenac is doing some wonderful things with these big blown engines these days. He is using a compression ratio in the range of 13:1 with nearly 40 psi boost pressure – which is as brave as I've ever heard. The engines are still red-lined at 7500 rpm, and they gear the cars to come out of the turns about 5800.)

FERRARI

The Ferrari-Kurtis (Bardahl-sponsored) didn't have a chance from the beginning. Farina never got the car out on the track 'till ten days before the race, and they had only seven days before qualifications closed to tune the engine, adjust the chassis, and get Farina worked in. There just wasn't time. Farina's best lap in the car was an unimpressive 133 mph.

There was been a great deal of interest in this European assault on Indy, and in all fairness to the equipment, I must emphasize that poor organization had as much to do with the dismal showing as anything else. For one thing, and for some crazy reason, the car came from Italy less than two weeks before the race set up for pump gas – with three duplex side-draft Webers and 10.3 to 1 compression ratio. No decision had been made as to whether to try to run on gas or alcohol (though they had a set of Hilborn "alky" injectors ready to slap on). This resulted in a big hassle: Farina and the Italian mechanics wanted gas, and the Bardahl men wanted alky. No spare cylinder block or crank came with the car. If they cracked the crank . . . poof. There was no agreement on rpm limits. The Italians insisted on limiting rpm to 5800-6000. The Bardahl boys knew the Offys were turning 6000, and wanted to run the Ferrari over 6400. The language barrier was the finishing touch. To put it mildly, nobody knew what the other guy was talking about.

Well, to make a long story short, they went 'round and 'round. Finally Farina walked out in a huff, spouting Italian like a steam engine. By then, time was running awfully short. The Bardahl mechanics took over, put in a lower gear ratio and threw on the alky injectors, and put rookie Earl Motter in the cockpit. He got the car up to 136 mph. But that was it. The chassis wasn't right, the compression ratio was too low. They never attempted to qualify it.

The fiasco is especially regrettable because I understand Enzo Ferrari was interested in marketing models of this engine for American track racing if the sponsors could place the car higher than fourth in the race. This is bound to discourage him. The engine looks pretty good on paper, too.

The much-publicized Belond and Sumar streamliners made their second appearance this year, with only minor modifications. They're just not working out. The whole theory of chopping 30 percent off your wind resistance looks good on paper . . . but a circular track presents other unusual problems The body is wide: it shrouds the wheels. It's next to impossible to judge accurately the angle of the front wheels and axis of the car in relation to the track. This is vital in cornering.

It would take weeks of practice on the track to get used to it. An average driver can lap generally five mph faster with the fenders stripped off the Sumar . . . which doesn't give much encouragement for leaving them on. Neither the Sumar nor Belond qualified this year, either with or without cowling. I still believe though – and so do many old hands at Indy – that streamliners are the coming thing. It might be ten years . . . but wait and see.

WHERE DO WE GO FROM HERE?

Watching from the grandstand, it might look as if there are no fields left to conquer when it comes to getting speed out of the Offy-Kurtis combination. Don't kid yourself. They're trying new gimmicks every day.

This year, for instance, saw the first attempt to use "tuned" exhaust at Indy. This is old stuff in Europe, but we've barely touched it over here. Mechanic Frank McGurk, California Chevrolet hop-up specialist, was behind it. (The car was the No. 98 Agajanian Spl. . . . Parsons up). It was a crude attempt, actually. He didn't calculate for any particular diameter or length of pipe, but merely wanted to see what would happen if you used a separate pipe for each port, all exactly the same length (six feet in this case). The other cars were using a single tailpipe.

Well, it didn't go. Parsons' best lap speeds were in the range of 136 to 140 mph. When they whipped the "organ pipes" off and replaced them with conventional headers and tailpipe the speed immediately jumped to 144. There is reason to believe now that the deal may actually have been too efficient in scavenging exhaust gasses. That is, with the Hilborn injector system you literally pile up a blob of raw fuel at the intake valve during three of the four strokes. Then, during the overlap period when both intake and exhaust valves are open, you're liable to lose a good chunk of the fuel out of the exhaust side. It is thought that McGurk's tuned exhausts might actually have been sucking the mixture lean.

Mechanic Bruce Crower, young California hot rodder heading the Helse team (No. 57, Bob Christie up), had a chute layout for his injectors. He had tubes, 13 inches long, extending from his intake ports. Instead of having one large nozzle spraying in all the fuel near the valve, he had three smaller nozzles equally spaced along the length of the tube. The theory was that the finer fuel droplets distributed over a long column of air would promote more complete vaporization of the alcohol outside the cylinder. The latent heat would then chill the mixture, increase its density, and give a mild super-charging effect. It apparently worked, too . . . because there was heavy frost on the tubes when the car came in off the track. How much it did for horsepower is not known. Christie said he had enough punch to break loose at 140 mph in the end chutes. Best lap speed was 143.1 mph.

They're slowly learning how to use nitromethane in the Offy engine around the brickyard. When the jiggle juice first came on the scene a couple of years ago, there was an epidemic of broken cranks, burned pistons, and rods here and there on the track. They learned the hard way that they were running the stuff too lean and with too much compression ratio (as any California drag strip artist could've told 'em). The correct air-fuel mixture ratio for nitro is 1.7:1. Now you see compression ratios down around 10:1 when using alky-nitro mixtures around 80-20, and air-fuel proportions are very rich. Result: Some 420 hp at 6000 rpm out of 270 cu. in. They don't all use nitro by any means. Many still consider it much too touchy to risk in an $8000 engine. I'd say the "wets" and "drys" are about equally divided among the hotter cars this year. Often it's the team with the deficient chassis that can't get through the turns who have to resort to the heavy 30 percent nitro mixtures to qualify . . . sometimes with expensive results.

Incidentally, a few even pack a little nitro in the race itself. Ray Crawford (No. 49) had a gimmick where he could squirt a shot of nitro into the injectors whenever he wanted it by merely pressing a foot pedal.

Oh yes . . . it's a far cry from the late '40s when Lou Moore used to put his Blue Crown front-drivers in first and second place year after year – using gasoline fuel, one pit stop, and steady driving at a pre-determined average. Today it's a 500-mile sprint race – foot in the firewall all the way, 6000 rpm gearing on the straights, anywhere from two to four stops for rubber, and no hesitation in using a little nitro if they're getting too close. #