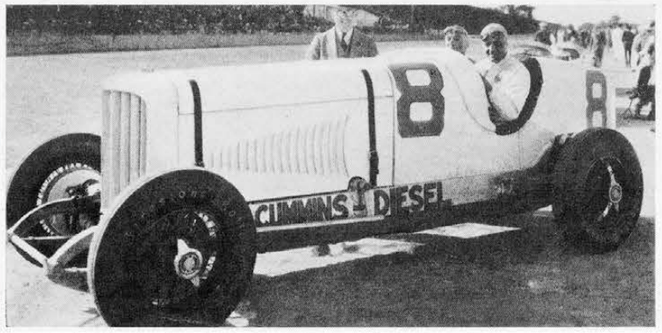
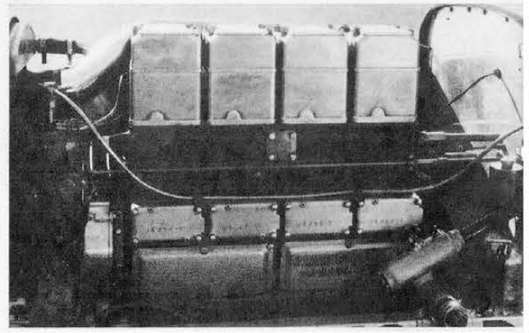
# CUMMINS AT THE BRICKYARD

***Four times diesels made the Indy 500, and four times they caused a furor with the officials or fans.***

BY KARL LUDVIGSEN

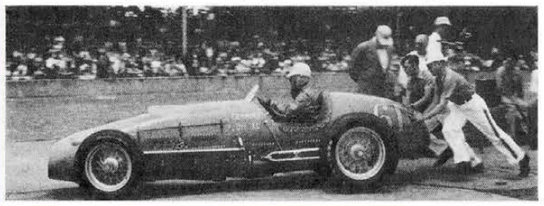


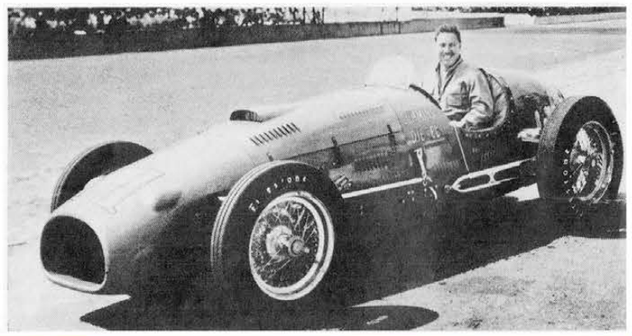

**FIRST INDY** outing for Clessie Cummins (standing) was with Duesenberg-built roadster driven by Dave Evans, with Thane Hauser as riding mechanic.

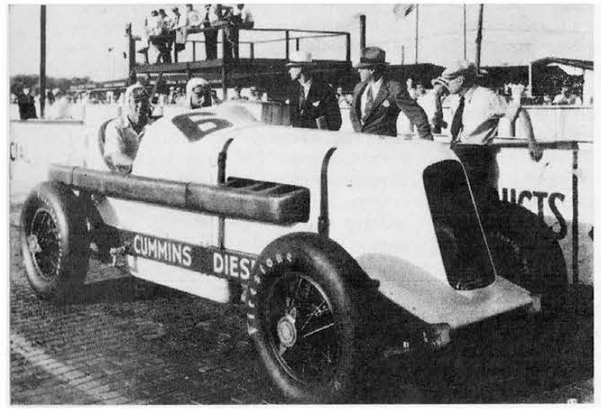


**MARINE-TYPE** Model U diesel was power for 1931 Indy attempt, and ran the 500 miles without a stop.

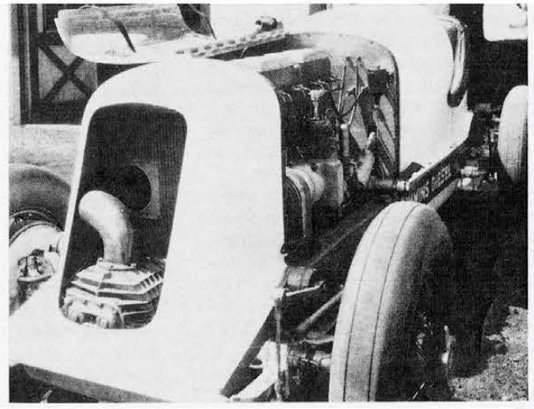
**JIMMY JACKSON** drove 365 practice laps trying to reach qualifying speed in 1950. Problems such as inadequate cooling cropped up; and that fixed, it became one of getting into the high 120s. Day after day mechanics fiddled, and Jackson pushed it. It finally qualified at 129.208, and went 130 miles (at up to 120 mph) before the supercharger failed.



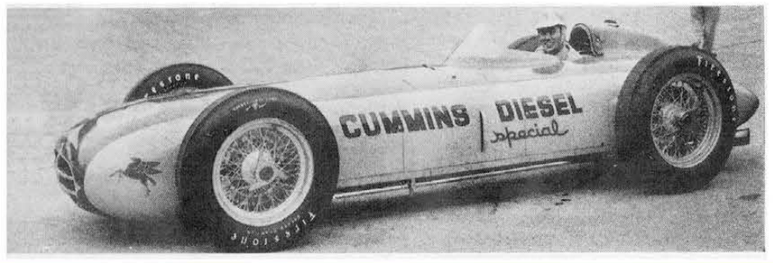





**A DUESENBERG** chassis was used again in 1934 for matched set of racers pitting 2-stroke diesel vs. 4-stroke.



**LARGE** Roots-type blower mounted ahead of radiator was used on both versions (4-stroke above) of '34 cars.




**LAST run before the rules were irrevocably loaded against diesels, was in 1952. Frank Kurtis built the car and Freddie Agabashian was the driver. It was 10 mph faster than the Cummins car two years previously and won the pole. While 1950 car had been overcooled, Kurtis overreacted and overcooled this one. Low snout sucked rubber from the track into air inlet, fouling the turbocharger. It went 177 miles before leaving the race.**

"IT HAD SO MUCH power we unquestionably will reduce the displacement advantage conceded. . . ." Sounds familiar, doesn't it? That's what the Indianapolis Establishment was saying about the turbine engine before they saddled it with new limits after its near-victory at Indy in 1967. But the quote is no less than 15 years old, a statement by Wilbur Shaw when he was managing the Speedway. He said it after the Cummins Diesel Special nailed down the pole position for the 1952 race, after which the Establishment decreed that diesels had to be the same size as other piston engines. The move ended for all time the chance of building a diesel that could be competitive at Indy.

The reasoning behind the diesel cutback from 402 cid to 335, effected in 1954, was on far flimsier evidence than the recent turbine limitation. To be sure, the Cummins racer had qualified on the pole, but it never held the lead in the 1952 500. The start was a ragged one, behind a too-slow pace car, which handicapped the relatively heavy Cummins Diesel with Freddy Agabashian at the wheel. It was only eighth into the first turn and ninth at the end of the first lap.

After 25 miles the low red and yellow Cummins had moved up to sixth, running at 129 mph versus the leader's 133. At 50 miles it was in fifth, running faster than the 1951 record speed, and it held that position through 100 miles. At 115 miles Agabashian pitted for a minute for two new tires. Rubber was known to be the big car's weak point. Its fastest qualifying lap had been the first one, at 139.104 mph, and each successive lap had been slower and slower, for an average of 138.010 mph, as a result of tire wear. After qualifying, one tire was worn right through to the casing.

Agabashian pressed on, but on lap 71, after 177 miles, his car began to smoke heavily, and he pitted. Inspection showed that dirt and rubber from the track had clogged the impeller blades of the engine's turbocharger. This choked the air supply and enriched the mixture, causing the dark smoke. Though the car was still raceable, the crew felt it would probably be flagged off, so they retired it at that point.

As a racing performance this was not too impressive—certainly not enough so in retrospect to warrant a diesel size cutback. But on the other hand the Cummins Engine Co. was the only firm that both could, and would, build a racing diesel. And by any standards their 1952 entry was an impressive automobile. Together with the Fuel Injection Special of the same year, it was the predecessor of the next decade of Frank Kurtis and A. J. Watson "roadster" Indy car designs.

Most striking was the amazing lowness of the 1952 Cummins. It was said that without its headrest the car could have been run upside-down, which was substantially true, with its low silhouette and huge 18-in. wire wheels. Its svelte profile was achieved by laying the big in-line 6-cyl. diesel engine over on its right side, absolutely flat, with the drive line running along the left-hand side of the car, 8.25 in. to the left of the centerline. This provided a 150-lb. left-hand weight bias, a relatively new idea on the postwar Indy scene.

Matching the drive line offset was the design of the Conze quick-change rear axle, of the usual open-tube construction. The Cummins chassis and body were the work of Frank Kurtis, showing his characteristic flair for style and creativity. He used suspension elements from his 3000 series racing cars. Radius rods located the rear hubs and Ford-based parallel wishbones formed the independent front suspension. Torsion bars provided the springing for all four wheels.

Also derived from the Kurtis 3000 was the Cummins' frame, a truss-type tubular structure fully as deep as the body. The driver was naturally offset to the right, his seat a scant 4 in. above the bricks. The aluminum body, so wide that depressions in the sides were needed to provide an adequate steering lock, was tested in a wind tunnel at the University of Wichita and found to have very low drag.

With a 103-in. wheelbase and front and rear tracks of 56 and 58 in. the Cummins was not small, nor was it light, with its 750-lb. engine. It weighed 2480 lb. dry and some 3100 lb. at the starting line.

The '52 diesel engine was a further development of the special racing engine used in 1950, which in turn was derived from the JBS-600 Cummins truck diesel. Some magnesium castings replacing aluminum helped take almost 100 lb. off the 1950 engine weight, and brought the racing version to an amazing *half* the weight of the stock 1545-lb. JBS-600.

The most important engine change for 1952 was the replacement of the former Roots supercharger by an exhaust-driven turbocharger. Made by Schwitzer-Cummins, the unit was of a type being developed for truck use. It was mounted at an angle ahead of the engine, fed by exhaust gas from dual manifolds, and it provided a supercharge pressure ranging from 11 psi coming out of the turns to a peak of 20 psi at 4300 engine rpm.

The turbocharged Cummins was noticeably quieter than the other 1952 entries, also noticeably smokier when it was started up, an operation that required the insertion of the electric starter in a special aperture in the car's cowl. Its output was 380 bhp at 4000 rpm, at a time when the Indy Offys were producing some 340 bhp. It delivered this on ordinary Number 2 diesel oil, on which it delivered 8 mpg from its 50-gal. tankage.

Cummins attempts at Indianapolis actually spanned 20 years, beginning in 1931. Their creator, Clessie Lyle Cummins, as a 22-year-old, had been a member of Ray Harroun's crew for the ▶

# CUMMINS

continued

first 500 in 1911 (Harroun won). But it was as a 44-year-old that his own first effort hit the Brickyard. Cummins, however, had already built something of a reputation for speed for his diesel engines. In 1930, he powered a Packard with a 2300-lb. 4-cyl. engine, drove it to Daytona, Fla., and set official two-way times on the Beach at 80.389 mph over a five-mile distance.

Cummins found his record was a great help in publicizing his products especially for future truck applications. He decided to build a more professional record breaker for the 1931 attempt at Daytona. Cummins enlisted the aid of an expert, Fred Duesenberg, to construct his 1931 car. Cummins himself and Augie Duesenberg put the car together in December, 1930, basing it on a Model A Duesenberg chassis with a handsome Indianapolis-style body. The previously used Model U engine was retained, but given a more open exhaust system and an air inlet through an aperture in the radiator to provide some ram intake effect at speed.

The beach was very bumpy at Daytona for the Cummins run, but Cummins set a satisfying new average of 100.755 mph on February 7, 1931.

Special arrangements were made with the Indianapolis Speedway management to admit the diesel as an engineering entry, to be the 33rd car in the 1931 field provided it could qualify at 70 mph or better. It was, however, barred from winning any prize money, in view of this special consideration. Cummins carefully picked his team for what he intended to be a non-stop demonstration of diesel durability. As driver, he chose the experienced Dave Evans, and as riding mechanic he selected Thane Houser, who personally carried out most of the chassis tuning for the race.

New lower-rate springs were made for the Duesenberg chassis and fitted with dual Gabriel dampers. The radical plan to run the race non-stop led to special interior padding for Evans and Houser.

A special Model U engine was built for the car with a bore of 4.375 in. to bring its size to 360.8 cid, within the 366-cid limit. Aluminum pistons were fitted, in place of the production cast iron parts. The complete car was heavy, at 3389 lb., but it was not the heaviest starter at Indy that year. It was the slowest qualifier, as expected, but well above the minimum at 96.871 mph. The quickest car, for comparison, was a Miller-Hartz at 116.080 mph.

In retrospect, that first year was the most successful Indy run that Cummins ever had. Evans and Houser rode through with no stops just as planned, covering the 500 miles in 5 hours, 48 minutes for an 86.170-mph average. This placed them 13th out of 15 finishers. They burned 31 gal. of fuel, thus obtaining 16 mpg.

In these still early days of the diesel there was open dispute (no less heated today) between the proponents of the two-stroke and the four-stroke cycles. Both camps were represented on the engineering staff at Cummins. Clessie decided to test both premises by building engines of both types, as similar otherwise as possible, and racing them both at Indy.

The engines were fours, with bore and stroke equal at 4.875 in. Both had side-mounted camshafts operating two overhead valves per cylinder through pushrods and rockers. Both were equipped with a large Roots supercharger, crankshaft-driven and mounted ahead of the radiator. Cummins said that only 5 to 8 bhp were needed to drive the blower on the four-stroke engine, far less than the 35 to 40 bhp required by the blower on the two-stroke, which also had a scavenging function to perform. Both cars used Duesenberg chassis, and weighed just under 3200 lb.

Dave Evans drove the four-stroke Cummins, qualifying it at 102.414 mph. Though the two-stroke car didn't arrive at the track until the very last minute, Stubby Stubblefield succeeded in qualifying it faster at 105.921 mph. They were the two slowest cars in the field, but they were in the race. So little had the two-stroke run that it was a surprise after the start to find that it had severe vibration periods that massaged Stubblefield and his mechanic, Bert Lustig, and shook the exhaust pipe loose. Later the vibration jarred the top radiator hose free, spilling most of the coolant.

While the two-stroke was having its problems, Dave Evans and Jigger Johnson were rolling smoothly with the four-stroke Cummins. After a planned pit stop at 81 laps, required by the mandatory 15-gal. fuel tanks in 1934, Evans stripped the transmission gears with the hefty torque of the big diesel as he accelerated out of the pits. The two-car test was effectively ended, through no fault of the powerplant; and Evans relieved Stubblefield, who was also being slowed by clutch problems. The two-stroke staggered to a finish, 12th and last to cross the line at an average of 88.566 mph. On the surface it seemed a victory for the two-stroke, but a post-mortem at Columbus convinced Cummins that it could most usefully devote its limited resources to further improvement of the four-stroke.

Clessie Cummins took one of his Indy cars to Daytona in early 1935, the two-stroke chassis fitted with the four-stroke engine. "Wild Bill" Cummings took the wheel for yet another record attempt, which resulted in a 137.195 mph average on March 2. By that time, in the late Thirties, Cummins was concentrating on building and selling the excellent engines it had developed for commercial vehicles. The company was not to go back to Indy again until 1950.

There were several good reasons for this reawakening of racing interest when Cummins did come back. Diesel participation at Indy was strongly encouraged by new rules for 1950 that allowed four-strokes 402.68 cid and two-strokes 274.59 cid, supercharging being permissible for both types.

Cummins entered a car because he wanted to publicize the new JBS-600 engine, which was to go into limited production in July, 1950. Early in January of 1950, Cummins started actual engine development. One of the first steps was the use of a four-valve cylinder head from an early experiment, replacing the normal JBS two-valve head and adding 40 bhp right away. Bottom-end changes allowed the bearings to live at the new peak speed of 3600 rpm, 1100 rpm faster than standard. To permit the use of a larger Roots-type supercharged, the 1934 engine layout was adopted, with the blower driven from the nose of the crankshaft. Compression ratios of 11.5 to 15.5:1 were tried, the final choice being 14.5:1.

Fairly early in the program, the Cummins engineers obtained an impressive 300 bhp from the 401 cid (4.125 x 5 in) diesel six. Next they developed a dynamometer test program which they believed would simulate Indianapolis operating conditions, accelerating and decelerating the engine under full load between 2800 and 3600 rpm for a gruelling six hours. With this successfully surmounted, they turned their attention to weight reduction from the JBS engine's normal 1500-lb. mass.

Aluminum castings replaced iron for major parts like the block and head and also for as many minor brackets, pipes and covers as possible, effecting an impressive reduction to 840 lb. There were no reliability problems with the light alloy version, but its output fell off some 30 bhp, which was recovered through combustion development and the use of solid aluminum pushrods in place of the usual hollow steel parts.

On April 4, a chassis arrived in Columbus from Kurtis-Kraft Inc. of Los Angeles. Frank Kurtis had built for Cummins a special version of his 3000-series chassis with 4 in. more room in the engine bay for the big six,

increasing the wheelbase from 100 to 104 in. Front suspension was independent, the rear axle a Conze quick-change, and the brakes the early Goodyear discs.

At Cummins, the engine was installed, with its Auburn clutch and Cadillac three-speed gearbox, and the car painted a bright green at the express request of its driver, 38-year-old James A. Jackson.

On May 1, the Cummins became one of the first cars to take to the track in 1950. The Indy railbirds spoke in awe of the car's rumored $50,000 price tag, but gave it only an outside chance to qualify. They were very nearly right.

One of the first problems was found to be inadequate cooling. A larger radiator was fitted and a new nose cowling made with a larger air inlet and two bulges to clear the corners of the radiator. Now the problem was speed. The diesel was running at only 120 mph while the early quick qualifiers were above the 130 level. On Monday, May 14, Jackson reached 124 mph. During the following weekend, with the qualifying average at better than 130, the Cummins could do no better than 126. Jackson was clearly unhappy about this, his only 1950 racing ride, and there seemed to be no chance to get the diesel into the field.

Little attention was paid the green Number 61 race car when it began a qualifying attempt on Saturday, May 26. Weren't they just going through the motions? But the car was running at better than 128—and they waved Jackson off. That was a big improvement in speed, but did they think they could do *better* than that? His next time out Jimmy ran the four full laps, turning the best one at 129.534 and averaging 129.208 mph to startle the Speedway crowd by putting the diesel in the field.

Where did they get the extra speed? While the first engine had been running at the Speedway, a second one had been built and developed further at Columbus. Detail changes raised its test-bed power to 320 bhp at 4000 rpm, with a smoky exhaust. This was enough of an improvement to warrant putting it in the car, which was done on May 22. When the new engine was run at the track it ingested more air, from the ram effect provided by the scoop-type entry to the front-mounted blower, and this cleaned up the exhaust entirely and raised the output to a calculated 340 bhp—just enough to do the job.

Staying in the field was even more nerve-shattering than getting in. The Cummins was the slowest of the first 33 qualified cars, and Jackson sat nervously on the "bubble" all day Sunday as many potent cars, including two Novis, made repeated but unsuccessful attempts to qualify. None was able to dislodge him, and a diesel was able for the third time to start the 500 from the very back row.

After the qualifying drama the race was an anticlimax for Jackson and Cummins. They had hoped to run the race at an average of better than 121 mph, which would have brought them well within the first 10 at the finish. Jackson started out at 110 and was gradually increasing speed by 2-mph increments. At the quarter-distance mark of a planned one-stop run he was moving at 120 mph and had advanced halfway through the field to 16th place.

At the 130-mile point, the green paint took its toll. Jackson heard a clatter under the hood, felt a sudden vibration, and steered the Cummins down the pit lane. The mechanics found that the supporting flange for the engine's vibration damper had failed, allowing the damping mass ring to fall and spin around the shaft drive to the supercharger. Only five minutes were needed to make the decision to retire the car and begin the sad push to Gasoline Alley.

Cummins now regards the racing cars as "only incidental to our company's development," which in the financial sense is certainly true. But the publicity they generated helped keep Cummins afloat in some stormy Depression waters, and the engineering know-how they created is still manifest in the high-speed Cummins diesels of today. ■

PAINTING, pages 38-39, commemorates the 50th anniversary of Cummins Engine Co. It was done with a few obvious winks to historical (but not technical) accuracy by famed motoring artist Peter Helck.

**NEGLECTED 1931 Indy Diesel rested in a building behind the Cummins plant until recently. Cummins agreed to restore it to original condition. First step, at right, was to separate the Duesenberg body from chassis so dents could be worked out and cockpit repaired. Chassis, meanwhile was put into pristine condition, below, and Cummins technical staff rebuilt engine.**
**Original suppliers came through with new or rebuilt parts, including new tires. At press time, it was scheduled to run (not race) again as a preliminary to the 1969 500.**