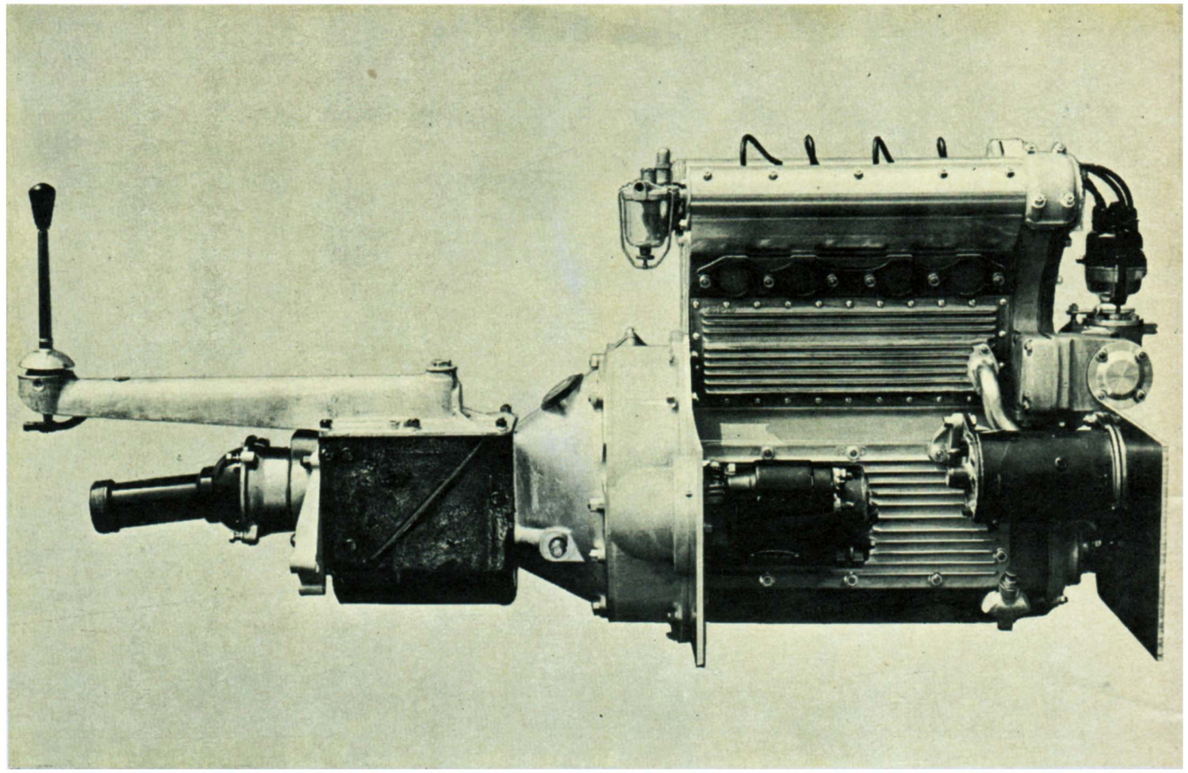
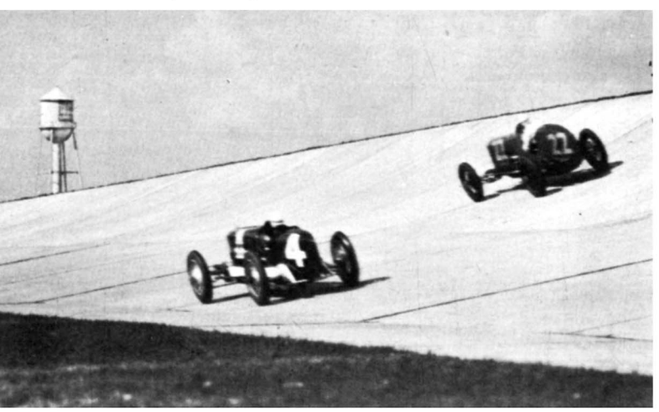


The 1500 Sports engine. Entire clutch housing and universal adapter are specially machined to fit MG TC gearbox.

AN AMERICAN THOROUGHBRED and HOW IT GREW

Photos by Griff Borgeson



Leon Duray and Norman Batton in two Miller 91's on the Packard test track. Duray averaged 148 mph for one hour here in 1927 setting an official AAA record.

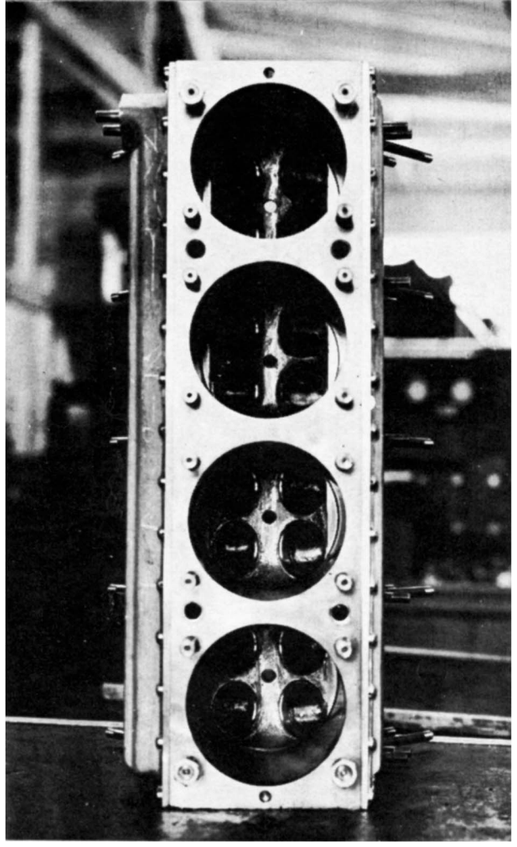
Four new Offies are coming from Meyer & Drake two are already cleaning house on road courses and two others are soon to hit the championship circuits. Here is Griff Borgeson's report on the new thoroughbreds and how they came to be.

BRIGGS CUNNINGHAM, a dedicated sportsman if one ever lived, spent years trying to conquer Le Mans with cast iron. With due respect for his efforts, many U.S. enthusiasts feel it's a national tragedy that the long costly experiment didn't begin with America's greatest thoroughbred engine instead of ending with it. Cunningham's new, gasoline-burning 180 cu. in. Offenhauser ran with tremendous promise at Le Mans last year until reportedly the synchro bronzes in its German gearbox wore out, and was forced to drive with transmission locked in high, which put an abnormal load on the engine and led to a burned piston. With that, Cunningham set down the torch he'd carried so long for the Made-in-U.S.A. label.

So far this is as close as the Offy has come to making a splash in big-time road racing. The reason is not that the light but lusty four-banger is short on performance or stamina. It's that few road-racing enthusiasts build a car around an engine, and when they do they almost invariably choose a cheap, mass-produced power plant that will keep costs down.

The price of a 270 cu. in. Offy is very close to that of a complete Mercedes-Benz 300SL. And you get a power plant developed to run on alcohol fuel. You still have to alter cams, pistons and induction system for gasoline, and the engineering, machining and testing cost more money. Even the recently-developed 91 cu. in. Sports Offy has been selling for something close to the price tag of a Jag XK140. Offy prices are perfectly justified, but it's not hard to see why specials builders aren't beating down the doors of Meyer & Drake's modest Los Angeles plant.

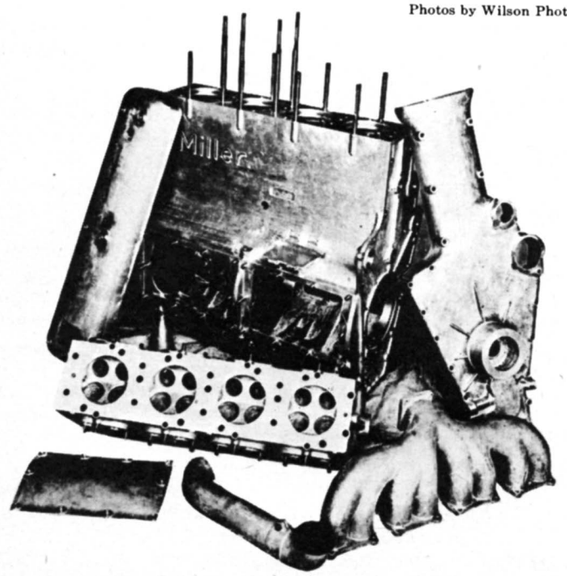
But in a quiet way – quiet largely because there are no commercial interests pounding the drum for Offy successes – a few believers in breeding, as opposed to brute brawn, have been finding out what these engines are able to do on road courses and on gasoline. George Beavis of Los Angeles, owner of the first of the four-cylinder 91's re-

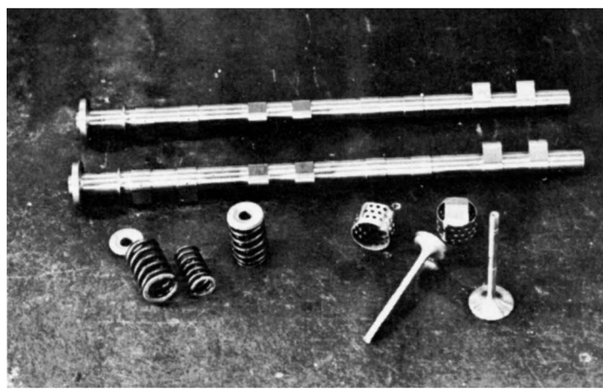


Looking through cylinder barrels in a 270 block. This is how the pent roof chamber in the cylinder head appears. Note four valves per hole.

By GRIFF BORGESON

Photos by Wilson Photo



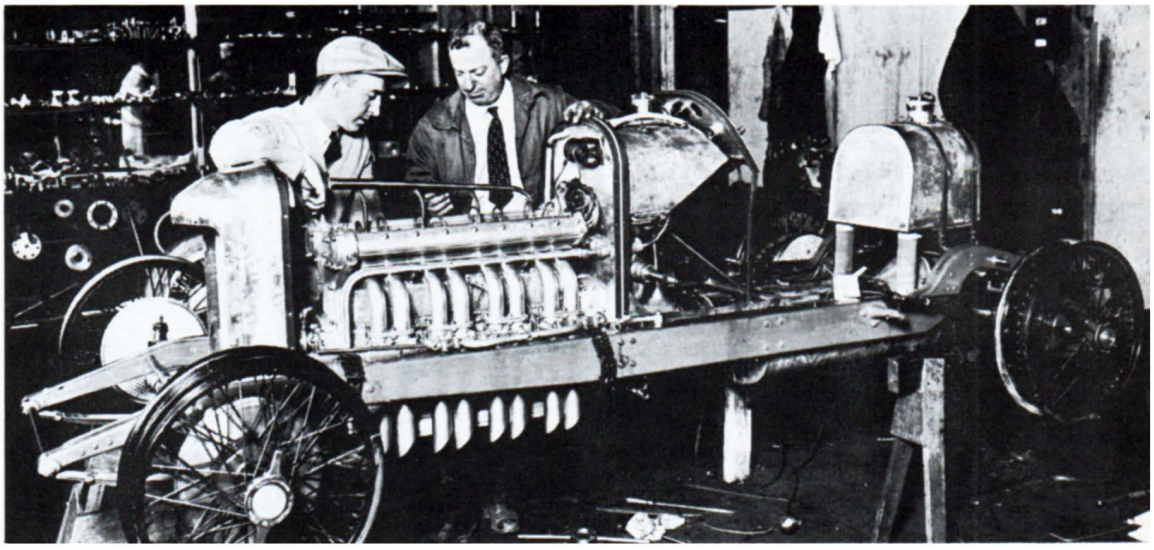


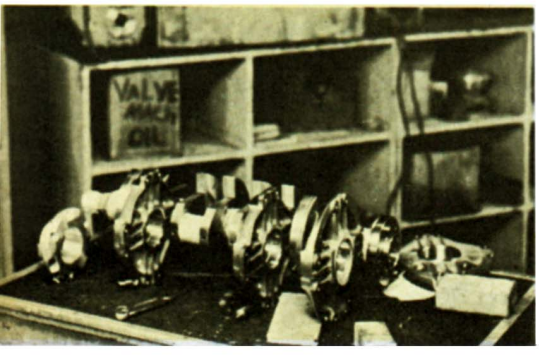
Offy's twin cams are identical for double valve arrangement. Valves, springs, and cup-type followers which fit over springs, below cams.

This Miller 300 cubic inch four-holer of 1916 followed Henri Peugeot practice closely, but used only one camshaft.

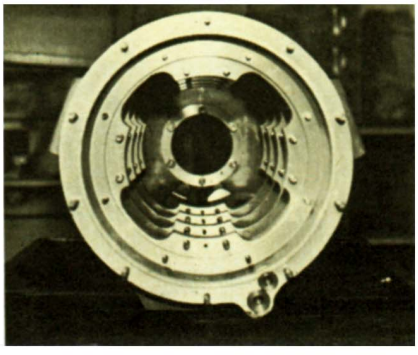
Jimmy Murphy (left) and Harry Miller (right) discuss assembling the Miller 122 in 1923. Carburetion is reminiscent of current dual throat.

Photos by Art Streib

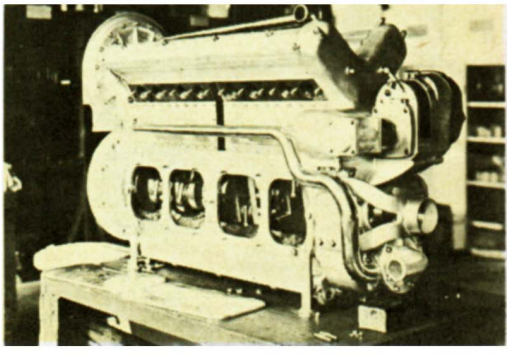




Crankshaft and webs. These webs bolt to crankcase bulkhead giving 360 degree support to bearings.



Sighting into the Offy barrel-type case from the flywheel end. Mains except front are carried in bearing webs.



One of the first Miller blown 91's Engines produced uncanny power and speed outputs.

leased by Meyer & Drake in 1953, is a one-man research institution dedicated to the development of the Sports Offy. He works closely with M & D, does his own mechanical work, builds his own chassis and bodies, races constantly. He and his Offy 91 have won the under-1500 modified class at Torrey Pines, Palm Springs, Santa Barbara, and have done it twice at Willow Springs. "I've worked with Offys for 16 years," Beavis says, "and I'm still sold on them. Their potential for road racing is just beginning to be guessed at."

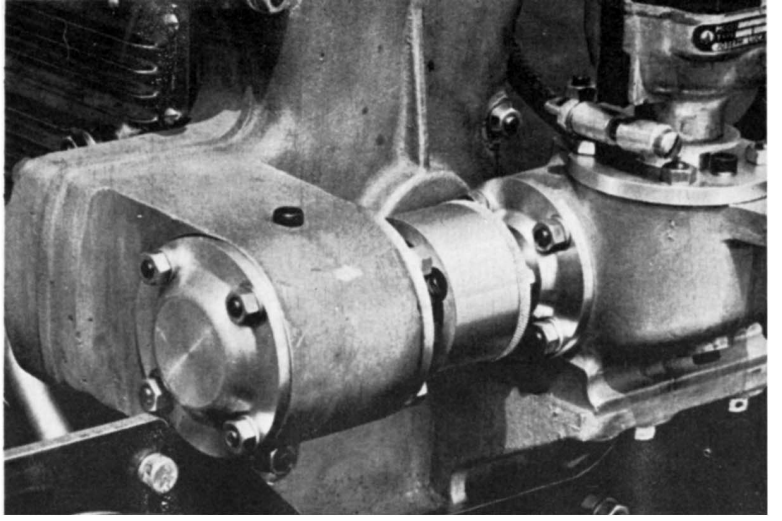
Beavis' faith in the Offy was nicely vindicated at Palm Springs in 1954. When he learned there was to be an event for competition cars of 2000 cc and under, he fitted the biggest crank and block he could get for his little Offy engine, bringing its displacement up to about 1750 cc. With this combination he easily won the two-liter race, almost lapping the second-place, bigger Ferrari Mondial.

Oil man Jack Hinkle of Wichita is another believer who wins races in his part of the world with his Offy 91 installed in a specially-designed Kurtis two-seater. There are a couple of other 91's on the coast: Dr. William Escherich's in an ex-Barlow Simca and writer Allen Le May's, in a Lotus. New combinations for getting the most out of these engines are being learned constantly. The success they eventually achieve will be mainly a function of the skilled man-hours (money, again) devoted to their development.

The "atmospheric" 180 Offy, a 1955 innovation, titillated many imaginations when Cunningham took it to Le Mans. Time for preparing – actually developing – the new engine was painfully short, yet Cunningham announced a dyno-yield of about 250 bhp before the race and the engine's performance during the event was encouraging to many and inspiring to quite a few. One of the encouraged or inspired ones is George Tilp of New Jersey who is inserting an Offy 180 in a Ferrari Mondial at this writing. It will be a car worth watching. This swap will be reported in a coming issue of SCI.

Just what are the odds in favor of the Offy winning a place as one of the world's better road-racing engines? One way of answering that is to judge this family of engines on the basis of past performances. In every field they have entered – midget, marine, dirt track and paved track – engines built in the Miller-Offy tradition have quickly established their domination. If they can do this where the requirement is "stand on it and turn left" it's hard to see why they should not do very well powering cars that also must turn to the right. And let no one tell you that the Offy is lacking in low-speed torque; its pulling power at low revs is one of its greatest virtues.

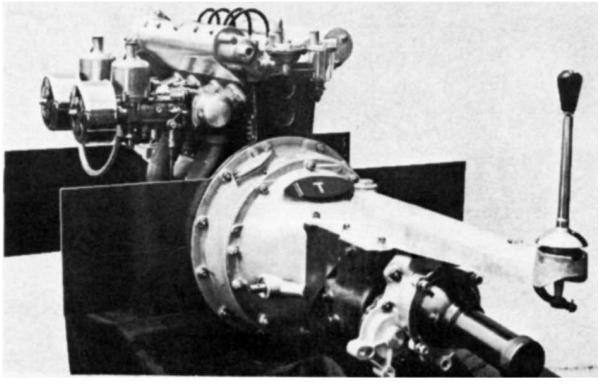
Another way of judging the Offy's promise as a road-racing engine is to consider its background. Is the design a flash in the pan or is it a product of great, sound, successful traditions? To answer that we present, for the first time in print, a graphic outline of Offy evolution.

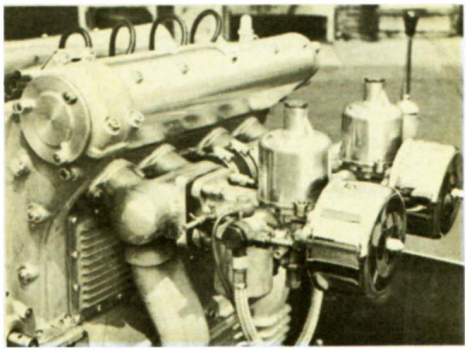


Lucas distributor sets in place of magneto. Ignitor is driven by gear drive train to crankshaft.

Photos by Bob Rolofson

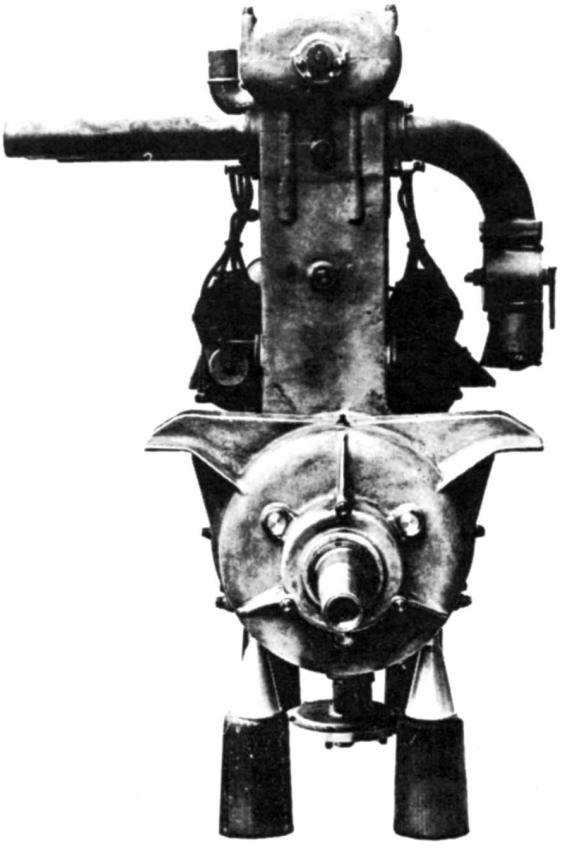
RIGHT: Rear adapter for universal had to be specially made. Engine is mounted by flat stock to fit chassis.





Intake is controlled by two side-draught SU carburetors bolted to a log-type manifold. Webers are optional.

Front view of the Miller 300 cu in of 1916. The block offset on the crankcase was an Henri Peugeot touch. Note straight through porting.



These are the main bloodlines of America's greatest racing engine. Its stamina and power stem from all the thoroughbred strains listed here and its present high degree of refinement is the result of four decades of the applied experience of literally hundreds of anonymous experts . . . talented practical engineers like Tommy Milton, Frank Lockhart and Jack McGrath. That the Offy's potential for road racing is untapped is absurd. To Americans who are investing in costly foreign iron, we'd like to recommend a homeward look. A racer with a pedigree full of champions is worth betting on.

As we go to press the Indianapolis Motor Speedway announces that competition in the 1957 500-mile race will be limited to cars with engines no larger than 255 cu. ins., or 164 cu. ins. supercharged. Unfortunately these reductions from the currently permissible 274 and 183 cu. ins. are too small to justify the redesign of existing engines – something the 270 admittedly could stand. Sleeving, new blocks or new crankshafts will suffice to bring present engines within the new Indianapolis formula.

However, there is a strong element among owners of Indianapolis machinery that sees this change as one step in a series that will bring the Indianapolis formula into exact agreement with the F.I.A. international formula in 1960. If this transpires a new, modern Offy certainly will be designed and produced. Meanwhile, the familiar four-banger will keep hammering away, doing its eternally effective job.

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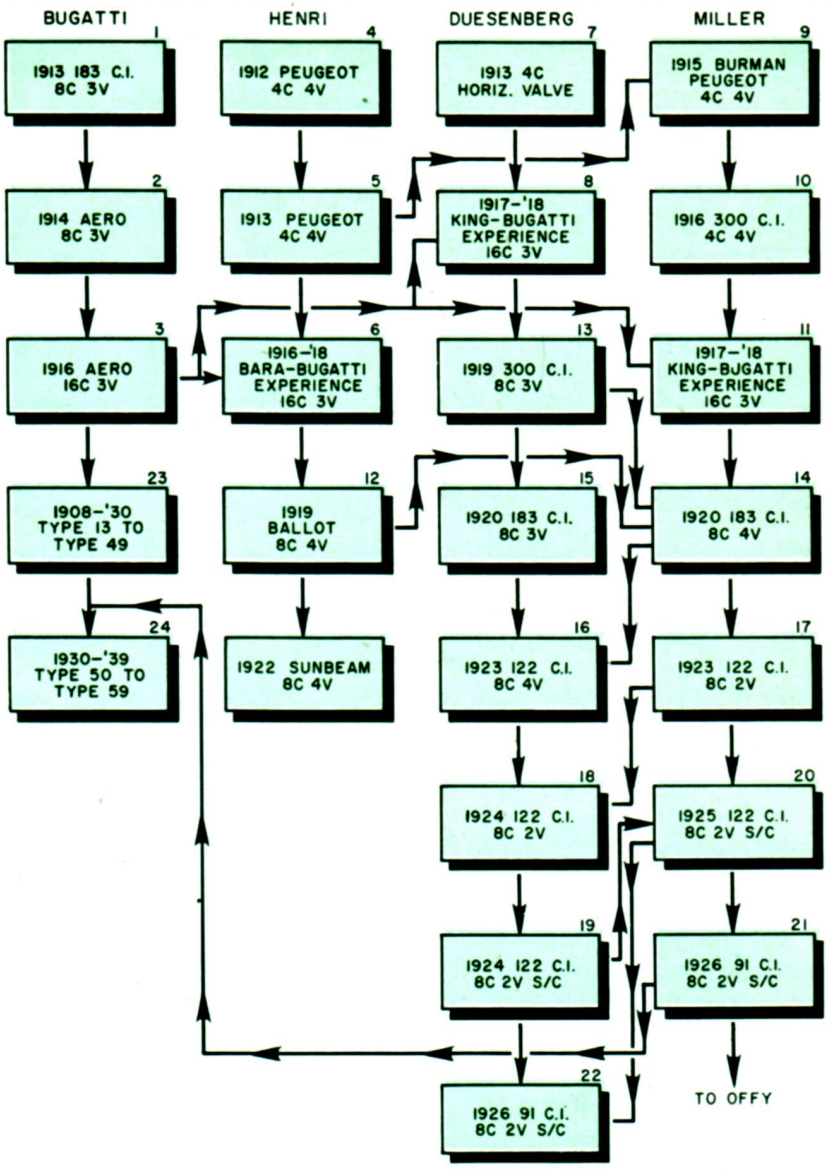
CHART I – THE ROOTS



1. In 1913 Ettore Bugatti built a straight-eight engine, using two of his four-cylinder blocks on a common crankcase. A single overhead 57 camshaft operated three vertical valves in each cylinder.

2. This led to a 250 bhp straight-eight aircraft engine of similar layout. This was probably the first production in-line eight, and was made under license from Bugatti by Delaunay Belleville in France and Diatto in Italy.

3. This, in turn, led to an aircraft engine made up of two straight-eight blocks and crankshafts with a single crankcase. The vertical blocks were parallel to each other and the crankshafts were geared together like the rotors in a Roots blower.

4. Ernest Henri, a Swiss engineer, broke the existing molds for racing engines when he designed the 1912 grand prix Peugeot. For the first time he combined in a single engine the following features: four vee-inclined valves per cylinder in pent-roof combustion chambers; overhead camshafts; separate intake and exhaust camshafts. This engine had a split crankcase and the camshafts were driven by a vertical shaft and bevel gears.

5. For 1913, Henri improved this engine in many ways. Two important changes were the adoption of a barrel-type crankcase and camshaft drive by means of a train or tower of spur gears. The design was so successful that within a year it was being imitated by almost all builders of European racing engines.

6. In 1916 the Bara Cie. of Levallois, France, began building item #3, the Bugatti Twin Eight. Henri was employed by Bara and was exposed there to the straight-eight concept.

7. Fred and August Duesenberg had been building high-performance four-cylinder engines. Some of these had two, some had four horizontal valves per cylinder. The Duesenbergs contracted with the American Can Company to build a production car around their engine at that firm's plant at Elizabeth, N. J.

8. The Bugatti 16 was built under license at the same New Jersey plant. It was known in the U. S. as the King-Bugatti, for Charles B. King, engineer in charge of the project. The Duesenbergs were not active, official participants in the project but were able to observe it at first hand.

9. In 1915 Bob Burman, "King of Speed," blew up his 1913 Peugeot engine. Harry Miller of Los Angeles, manufacturer of racing carburetors, undertook to reconstruct practically all the Peugeot parts. This was Miller's first engine job. The machine work and much of the engineering was done by his chief mechanic, Fred Offenhauser.

10. In 1916 Miller designed and built his first engine from scratch. Like the Peugeot he had come to know so well it had four valves per cylinder in pent-roof chambers, gear-tower cam drive, and barrel crankcase. For simplicity, Miller used a single camshaft. One of these engines powered Barney Oldfield's historic Golden Submarine.

11. Miller was awarded a contract to build the carburetors and fuel pumps for the King-Bugatti. He and Offenhauser set up a plant in New York City for this purpose and participated actively in the twin-eight aircraft engine project.

12. As soon as World War I ended, Henri designed a 300 cu. in. racing car for Ballot. It combined Henri-Peugeot design with Bugatti's straight-eight principle. Piston or cup-type cam followers were used in the Ballot engine.

13. Just as quickly after the Armistice the Duesenbergs left the American Can Company and designed a new race car. The engine was highly original but reflected strong Bugatti influence. It, too, was a straight-eight with a single camshaft. However, its three valves per cylinder were slightly inclined and the cylinder heads were detachable. The long crankshaft ran in only three main bearings in a barrel case; cam drive was by shaft and bevel gears.

14. In 1920 Miller, who had just added engineer Leo Goossen to his team, built his first straight-eight. It reflected Peugeot, Bugatti, Ballot, and Duesenberg influence. The Miller 183 had four valves per cylinder in pent-roof chambers, actuated by dual overhead camshafts driven by a gear tower. It used a three main-bearing crank in a barrel-type case. Fred Offenhauser got the idea for the cup-type cam followers when he sneaked a peek under the cam covers of Ralph de Palma's Ballot. The Miller 183 inaugurated the series of engines that produced the Offy.

15. Duesenberg's engine for the 183

Growth of the Thoroughbred

cu. in. formula was a scaled-down 300. It perpetuated some weak points of design, including detachable cylinder heads and Y-shaped rocker arms that were prone to break.

16. Duesenberg's first engines for the 122 cu. in. formula used a top-end design evidently inspired by the Miller 183, with four valves per cylinder, dual overhead cams and gear tower drive. The three main bearings and detachable cylinder heads were retained.

17. But Miller's engines for this formula had a very new top end. They featured two valves per cylinder in combustion chambers that were, perhaps for the first time, truly hemispherical, rather than prism-shaped. And Miller made the wise change to five main bearings.

18. Duesenberg, thanks to the convenience of detachable heads, entered the 1924 122 cu. in. season with both two-valve and four-valve heads, both of obvious Miller inspiration.

19. One of the great "scoops" of racing history was when Duesenberg sprang the centrifugal supercharger at Indianapolis in 1924 and walked away with the race. Dr. Sanford Moss of General Electric Corp. was credited for design and development of the blower.

20. The Miller team instantly plunged into supercharger research and by early 1925 all Miller 122's were blown.

21. For the 91-inch supercharged formula that began in 1926 Miller engines were essentially scaled-down 122's.

22. Duesenberg's 91 was now very similar to the Miller pattern. Duesie finally adopted a five-bearing crankshaft and integral cylinder heads.

23. During all these years, Bugatti had continued to use three and, rarely, four vertical valves per cylinder in blocks with integral heads. In 1929 Leon Duray took two Miller 91's to Monza, blew one of them up while leading the race, swapped both cars with Ettore Bugatti for three of the latter's touring machines.

24. In 1930 Bugatti introduced his Type 50, with an engine that was traditional except for its top end, generally regarded as having been Miller-inspired. However, Bugatti continued to use finger-type cam followers instead of cups. This layout was perpetuated on all subsequent Bugatti models.

25. The evolution of the Offy family of engines now can be seen clearly. Distinct forerunner of the classic Offy midget was the engine with which Harry Hartz won the 1932 Indianapolis race. It was basically a Miller 91 without supercharger and with bore and stroke blown up to give doubled displacement.

26. The 97 cu. in. midget of 1934 was essentially the Hartz 183 cut in half.

27. The 91-inch Sports Offy was a slightly modified Offy midget.

28. Miller's line of marine racing engines began in 1926, when Gar Wood commissioned a 310 cu. in. power plant for Junior Gold Cup and 340 Hydroplane competition. This was basically a scaled-up Miller 122.

29, 30. For racing in the 151 cu. in. Hydroplane class, Miller cut the 310 in half. For Gold Cup racing he multiplied the 310 by two, making it a V16, still with barrel crankcase.

31. For 91-cu. in. hydroplane competion the track-racing 91 was directly converted to marine use.

32. Car owner and race promoter Bill White had confidence in the low-speed torque of a good four-cylinder engine. He and Miller's team converted a marine 151 to track use, increasing its displacement to 183 cu. ins. At Indianapolis in 1930 this Offy four-banger came within an ace of winning, held second place all the way.

33. With this encouragement, a 200-cu. in. four was designed from scratch for track racing.

34. The 200 was enlarged to 220 in 1932. In 1948 the 220 was given the big 270 Offy's huskier crankshaft. The 220 still is absolutely unchallenged in dirt-track racing.

35, 36. Out of the 220 were derived the 176 and 180 blown engines of recent years. These are potentially capable of leaving the unblown 270 in their dust. Again, money is needed for their development.

37. Out of the above came the unblown 180 which, with very little development, was run by Cunningham at Le Mans in '55. Its potential is excellent; it's a stronger, smoother engine than the 270 which, if anything, is over-developed.

38. In 1934 Fred Offenhauser, who had taken over the company, was asked for an engine to beat the 220. He scaled up the 200 to 255 cu. ins.

39. In 1937 this engine was enlarged to become the 270, rarely-challenged ruler of big-time professional racing in the U. S. #