

FWD

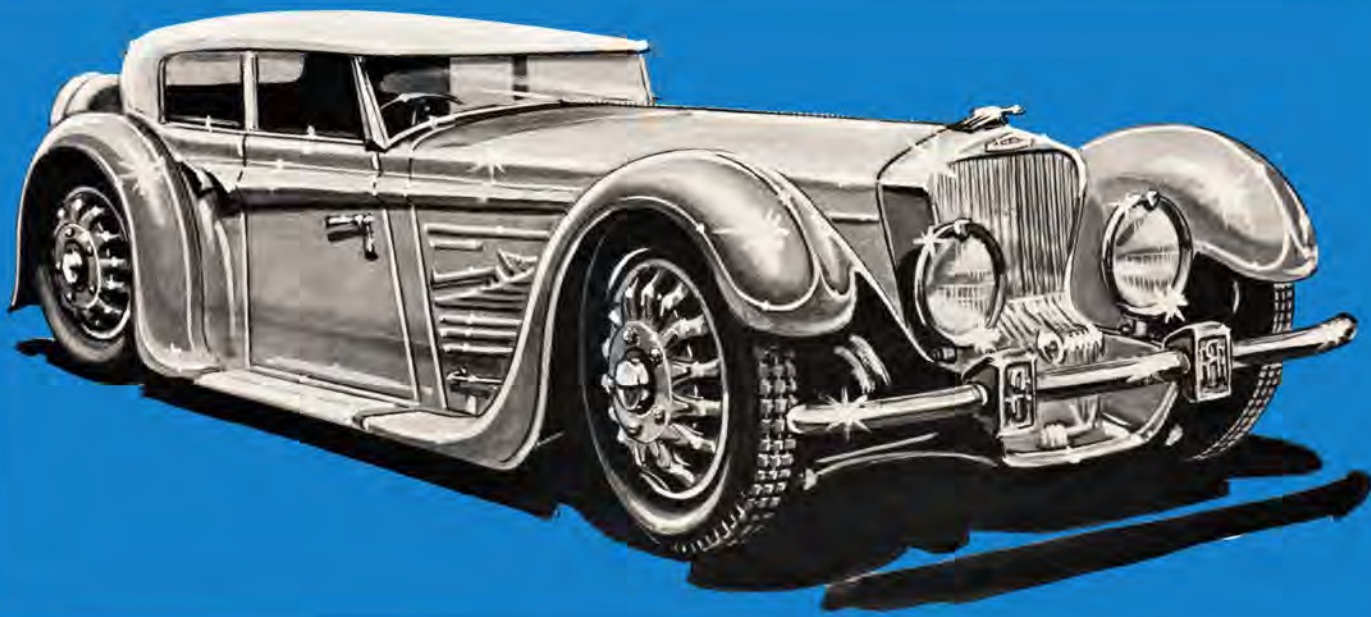
THROUGH THE YEARS

stable car by having the forward thrust pulling instead of pushing. Combining the engine, transmission, and final drive in one unit at the front gives a more compact and economical chassis layout. Finally, putting the mass of the engine over the driving wheels improves traction. These were all commonly acknowledged advantages 60 years ago.

But fwd cars have had a very checkered career throughout automotive history. And the reason has always been the same: The mechanism necessary to transmit power to front wheels that must swivel to do the steering has always been complex and expensive. It's interesting to see how different engi-

their weight on the front wheels. In 1922, Gregory formed a company to market his cars, but the depression of that year wiped him out.

About this time, the famous American racing driver, Jimmy Murphy, approached builder Harry Miller with the idea of a fwd race car for Indianapolis. He felt that the forward driving thrust, combined with the very low center of gravity gotten by putting the driver's seat down low (because of no rear driveshaft), would help performance on the fast, banked speedways. Miller's front layout used the de Dion axle, but there wasn't room to put the transmission between the engine and



by Roger Huntington

AUTO ENGINEERS have been intrigued with the idea of driving the front wheels of a car since the earliest days of self-propelled road vehicles. It's always been generally acknowledged that front-wheel drive (fwd) gives a more

(ABOVE) Radical Bucciali used front-wheel drive to fullest advantage for getting low silhouette. This 1933 effort, built for the Paris Auto Show, included a V-16 with aluminum block, 4-wheel independent suspension system, and an extreme drop in the rear frame section. Huge wheels accentuated ground-hugging lines, and since they were cast aluminum with integral brake drums, they did more than merely decorate.

neers tackled this problem down through the decades.

Pioneer among American engineers was Walter Christie, who filed his first patents in 1904. He used the simplest possible front-end layout. The 4-cylinder engine was placed crossways between the wheels, with the transmission behind the engine, driving to the wheels through very short U-jointed shafts. Several early Christie designs were fairly successful on the race tracks — but they were beasts to handle. They didn't get fwd off to a good running start.

In the early 1920s, a young Kansas City inventor named Ben Gregory developed a fwd car that used a de Dion axle tube to tie the front wheels together. The differential was in the center, with longer U-jointed shafts to the wheels. Then the transmission was behind the differential, with the engine in back of that. This layout handled a lot better and was better balanced than Christie's cars, which had over 70% of

differential. So he designed a special transverse gearbox in unit with the final drive. This worked fine, except it was impossible to shift when the car was rolling! Jimmy Murphy was killed before he ever drove the new fwd car, yet the car finished 2nd in the 1925 Indy race. It looked good. After that, fwd cars were fairly successful at Indy for the next 25 years (and were definitely the cars to beat during the "Blue Crown" days of the late '40s).

Developments in the passenger-car field weren't quite so decisive. In 1927, E. L. Cord decided to cast his lot with the fwd gimmick for a new semi-luxury car to fit between the booming Auburn and Duesenberg lines. He hired a brilliant young engineer named Cornelius Van Ranst to design the car, and the prototype was built in Harry Miller's Los Angeles shops. But from the start, there was a basic conflict between Cord and Van Ranst on the front-end layout. Cord wanted to put the transmission between the engine and differential, with

the radiator over the gearbox and a very long hood. Van Ranst said they couldn't get enough weight on the front wheels for good traction with the engine so far back. He wanted to put the transmission ahead of the differential, but with a shorter hood. E. L. Cord won out — needless to say — and the famous L-29 Cord came out with a 7-foot hood.

It was a beautiful car, but poor up-hill traction on gravel proved its weakness. Also, there was the problem of keeping grease in the front-end U-joints. The technology of designing lubricant seals was in its infancy in those days, and engineers didn't know enough about it to get effective sealing for long periods. The joints had to be checked every few hundred miles or the front end failed. Fwd was far from practical in

the design introduced by Cord in 1930.

About this same time, William Muller designed his famous Ruxton fwd prototype. He used much the same front-end layout as Cord, except a beam front axle passed under the differential instead of a de Dion tube in front. Also, Muller used a new ball-type constant-velocity U-joint instead of the usual double-knuckle (Cardan) joint. It was easier to keep grease sealed in this joint, because it had 2 overlapping cups that formed a sort of outer shell. (These constant-velocity ball joints had been invented in Europe in the 1920s.) The Ruxton design was probably technically superior to the L-29 Cord's. But the depression of the early '30s killed the market for higher-priced cars. Muller and Associates built only about 500 cars before they went under. Cord

stopped building L-29s in 1932, after about 4000 units.

Front drive started coming on in Europe in the late '20s and early '30s. The French Bucciali and Tracta were early examples, though only a few models of each were ever produced. The first successful mass-produced fwd car was the famous French Citroen of 1934. This car continued with only minor changes for 20 years. It marked a milestone in several ways, using the first modern unit body, torsion-bar front suspension — and the component layout for the fwd was far more practical than any of the earlier American efforts.

It was actually the layout that Van Ranst had wanted to use for the L-29 Cord — with the transmission ahead of the differential for better traction and a shorter powerplant length. With ball



(ABOVE) America's greatest fwd pioneer was Walter Christie, here poised at the wheel of his 1905 racing car. Crosswise 4-cylinder engine mounted atop enclosed drive system, with a huge radiator lying exposed just in front of the tiny cockpit.

(OTHER 3 PHOTOS) Frontmobile of 1917-18 used worm-drive differential, 4-cylinder engine. Column-mounted, remote-control gearshift worked by long shafts at side of block. Stepped frame was thin and put top of the cockpit level with fenders.

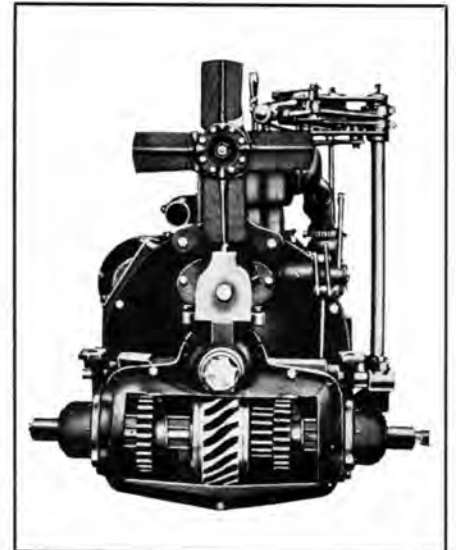
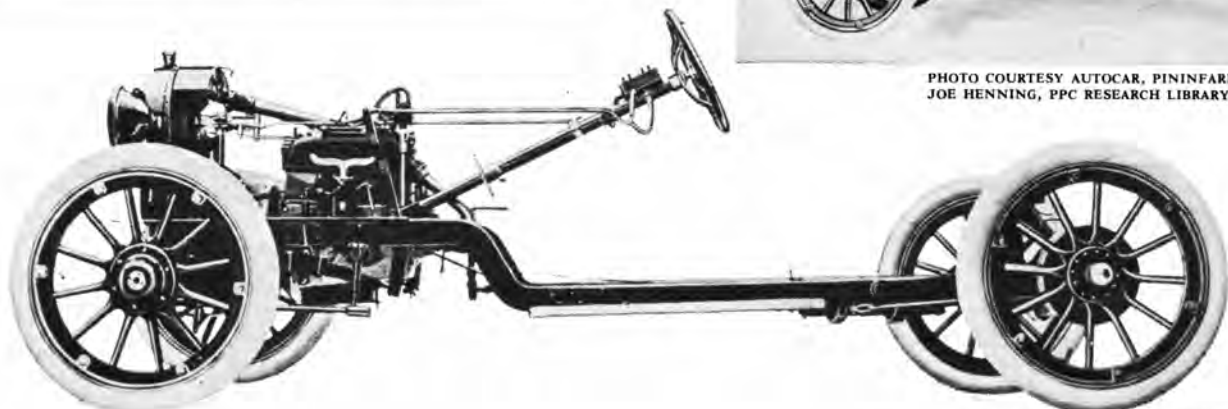


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FWD THROUGH THE YEARS

U-joints, the whole design worked out very well for a utility car — at least in Europe, where car owners expect to give their cars careful maintenance. (You see, the joint sealing problem was still there.) Later European fwd cars like the German Adler, Dkw, Belgian Imperia, etc., generally used this same front-end layout.

And so did E. L. Cord's 2nd fwd effort in 1936 — the famous Model 810 coffin-nose Cord. The shortcomings of the L-29 had left their impression, and the new 810 was actually a very sophisticated design. It used a front-

mounted, electric-shifted 4-speed transmission, trailing-arm front suspension with a cross-leaf spring, ball U-joints, a short V-8 engine, and a unit body. The cars were beautifully styled in and out, had brilliant performance for that day (over 110 mph with supercharger), rode well, and handled better than most other U.S. cars of that day.

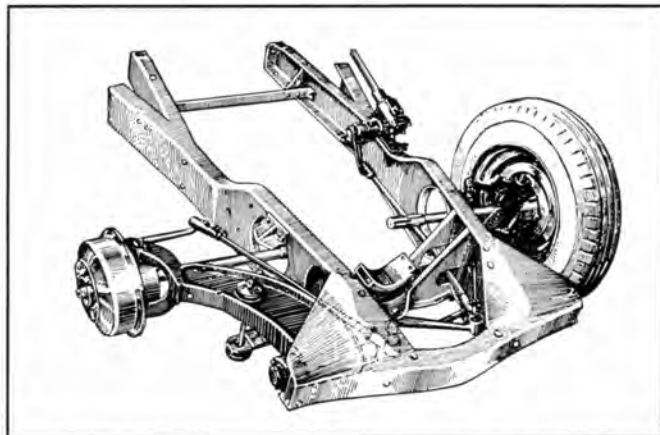
Unfortunately, this radical new Cord failed because of financial difficulties and engineering bugs. And perhaps the worst part is that many of the technical faults weren't related to the fwd principle at all. The transmission was weak,



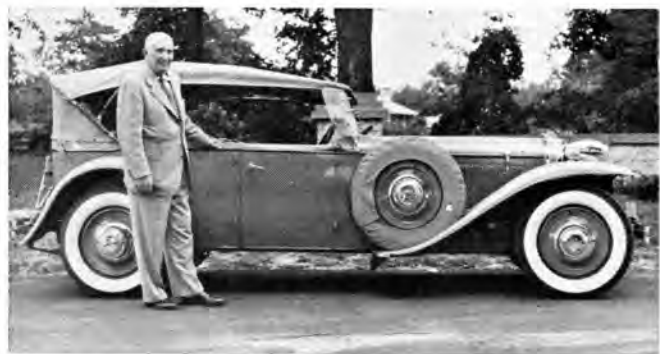
Classic era's coveted L-29 Cord incorporated gorgeous styling with advanced engineering, but car wasn't without drawbacks.



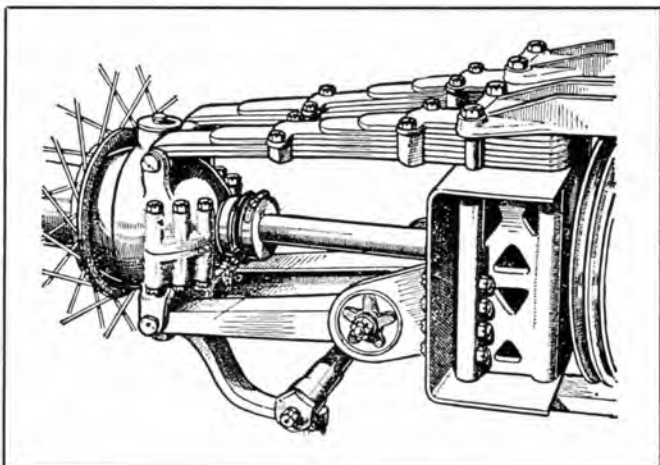
One-off, Miller-engineered, boat-tail speedster used blown V-8 (325 hp) and fwd. Total height with top up was 4 ft., 10 ins.



Late Cord had massive trailing arms carrying wheels, with leaf spring running across. Transmission stood ahead of differential.



Wealthy gentlemen with taste for innovations could buy Ruxton in 1931 — one of the most practically engineered of fwd autos.



Early fwd drawing shows ball joint, rubber seal, inboard drum.

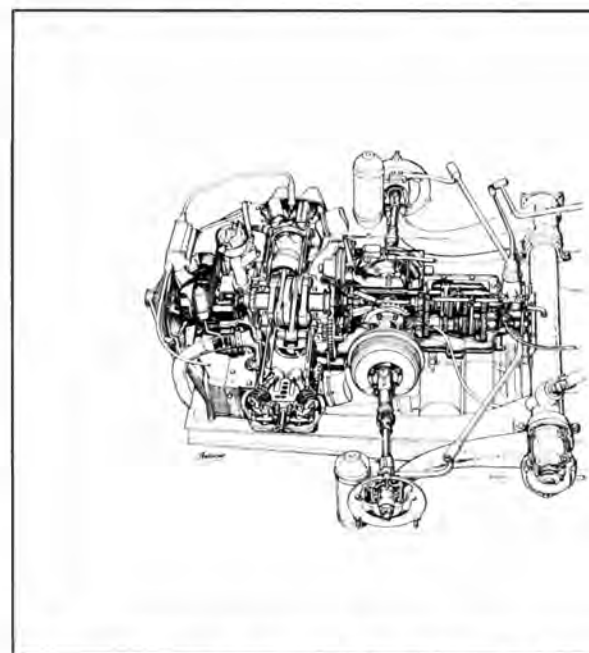
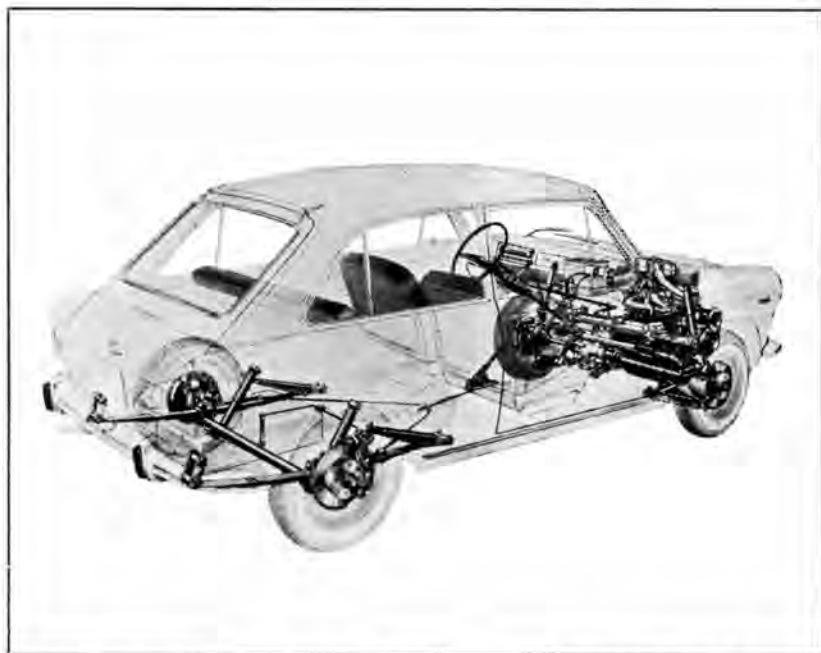
Cords had engine cooling problems, body shake problems, and many other little things. And, admittedly, the front-end U-joints had to be lubricated frequently, there was a peculiar front-end wobble on acceleration, etc., etc. There were bugs. Everything seemed to gang up on the Cord — and fwd again got a black eye in this country.

In just the last few years, fwd has seen a flowering in Europe for smaller economy cars. We're all familiar with the modern DKW, Saab, Lancia, Taunus, Citroen, etc. — with the usual front-mounted transmission or the engine

ahead of the wheels and transmission behind. Both layouts do the same thing. But the radical new principle introduced by the British Motors Corp. and designer Alex Issagonis in 1959 — where the 4-cylinder engine mounts crossways and the transmission is combined in the *crankcase* — is perhaps the best plan of all for small cars. This further reduces hood length and allows that much more usable passenger and luggage space. These new BMC Mini cars (Austin and Morris) have set a pattern that's being copied around the world for small cars today. It's begin-

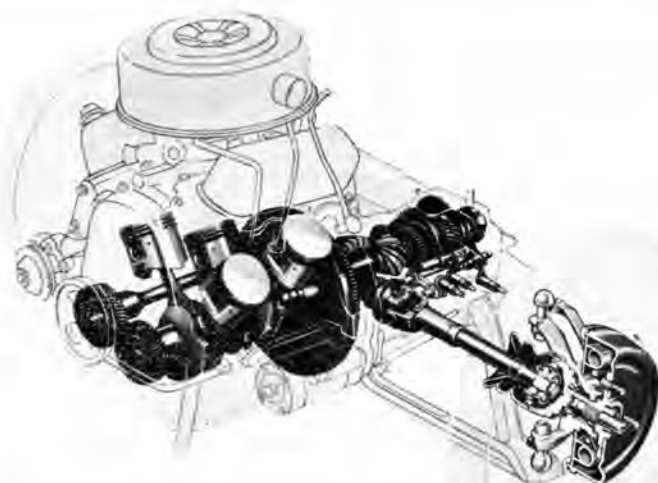
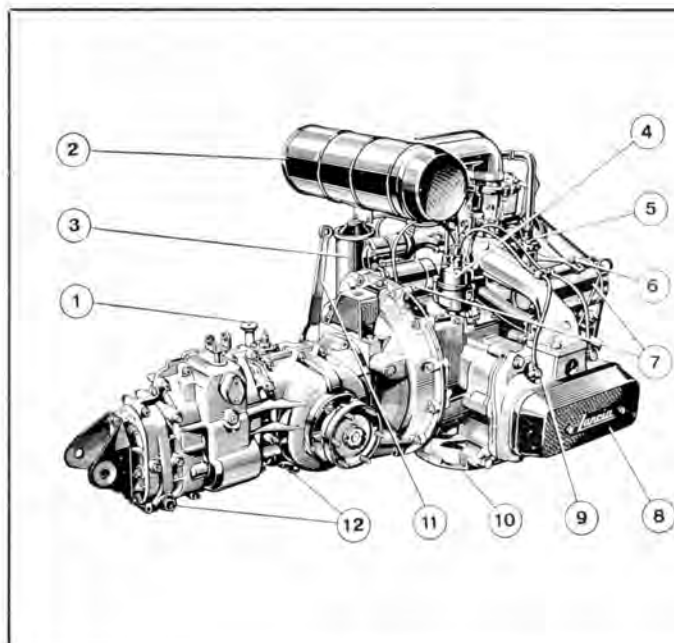
ning to look like fwd might be the most practical layout of all for very small economy cars.

But now, here's the new Olds Toronado. This is anything but a small car. In fact, it's the first full-sized fwd car since the 1937 Cord. Is fwd as practical for this type of car as for the modern European economy jobs? Have Olds engineers solved the technical problems that have always bugged fwd cars in this country? Are there enough advantages in fwd for full-sized American cars to start a trend? We think so. Time will tell. /MT



Typical, modern European layout uses crosswise engine, gearbox on left, differential behind. This is the Autopianchi sedan, and BMC has similar plan.

Citroen 2-CV places air-cooled 2-cylinder mill horizontally for an extreme in compact design.



LANCIA FLAVIA (LEFT) AND FORD TAUNUS USE SIMILAR LAYOUTS, WITH ENGINE AHEAD OF FRONT AXLE. TAUNUS SHOWS DOUBLE CARDAN JOINT.