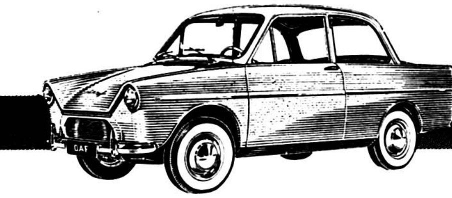

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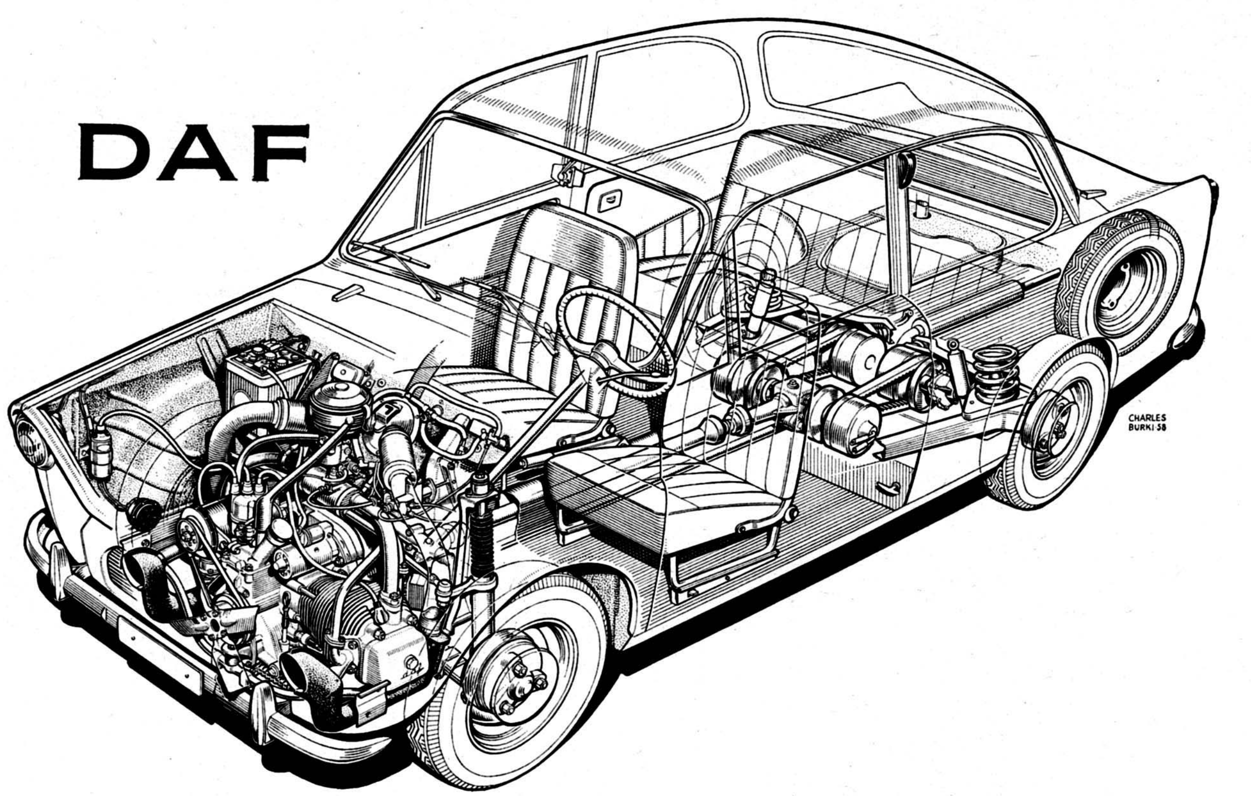


The DAF has an 81-inch wheelbase, a 46.5-inch tread, and weighs 1390 pounds. A maximum speed of 57 miles per hour and a fuel consumption rate of 40 miles per gallon are claimed. Within its 142 x 57 x 54.5-inch (length, width, height) over-all dimensions, it seats four people in relative comfort and carries 12.5 cubic feet of luggage. This cutaway drawing shows, among other things, the unusual three-lug mounting of the 12 inch-diameter wheels and the unfinned, unassisted 7 inch-diameter drum-type brakes; these would seem to be a bit small, even for this very light car. Also illustrated are the main elements of the radical but promising new Variomatic drive.

THE TRIM little DAF sedan is the latest product of the Van Doorne Automobielfabriek, a Netherlands concern which has previously constructed only large trucks and trailers. This progressive company is reaching for a share of the world automobile market with a Dutch-built passenger car, something that has been missing since the luxury-class Spijker went out of production in 1927. It is only fitting that a country which has been so long absent from the automotive scene should return with something dramatic—and Holland has, with its DAF 600, done just that.

At first glance there is little to distinguish the DAF from any of its contemporaries (except that it is more handsomely proportioned). Only careful scrutiny will show what a truly exceptional example of modern design it represents. The basic dimensions and form are arranged around a not-quite-minimal four-passenger seating package, and the mechanical components are simply tucked away in whatever space remains available. This is, of course, a much simplified account of the involved steps that must have led to the final form. We suspect that they must have done some deep soul searching before moving so far away from established design practice.

The Chassis

The chassis is constructed in a unit with the body, a method entirely in keeping with the best modern practice. Its main stress member is a central backbone, which carries the front suspension leaf spring at its forward end and terminates in a fork supporting the coil springs at the rear. A stressed underpan and transverse torque box transmit the loadings from the body proper into this central backbone. The engine appears to be hanging in space and is an easy reach from above or below. For the more difficult tasks, the removal of a few bolts allows the grille to come out, which exposes the entire engine.

The Suspension

The choice of suspension at the front of a car is largely determined by the suspension used at the rear. In this instance, a swing axle type of rear suspension is used; as this gives a rather high roll center and a strong oversteering effect, it was necessary to use a front suspension that would compensate with an understeering factor. The solution chosen is rather a happy one, giving a high roll center with a minimum of tire scrub. As may be seen in the illustration of the front suspension, there is a marked resemblance to the layout used on the English Ford. The main difference is in the substitution of a leaf spring for the A arms used on the Ford. This change does not materially affect the geometry or action of the suspension but it does allow a reduction in cost, weight, and the number of lubrication points. These bothersome grease fittings have, in fact, been entirely eliminated. (The only routine maintenance required of DAF owners is the periodic engine oil change.) This one excellent feature would, even if the rest of the car were quite ordinary, establish the DAF as a real pace-setter.

The steering is of the rack and pinion type, which is well known for the kind of precise control that it affords. The turning circle is not exceptionally small for a car with an 81-inch wheelbase; the DAF's 28-foot circle is reasonable, but compared to 27 ft for the 4-CV Renault or 24.5 for the Goggomobil, the Dutch people's car cuts rather a large circle. More steering lock would, however, necessitate even larger front wheel wells and a consequent loss of foot room.

The Body

Before assuming final form, the body was subjected to a series of wind tunnel tests. This does not mean that the entire body shape was formed from the results of air flow patterns established in the wind tunnel. The pressing need for economy of construction was given precedence over streamlining, which is after all of questionable value in a car of such a utilitarian nature and low potential top speed.

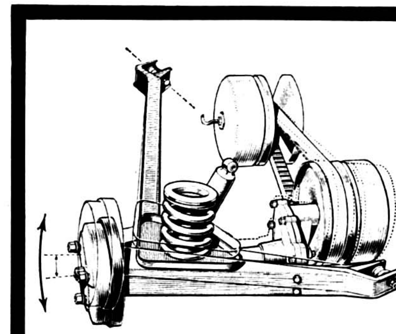
However, within the rather narrow boundaries imposed by financial considerations, there were some decisions to be made. After the preliminary work had been done in shaping the body around the basic transportation package, the only choice of any significance was between "fast back" and "notched-back" versions of the package. These had identical lower body shapes, and only the roof lines varied; the fast back's downward sloping roof gave a slightly better drag figure when the air flow was directed at the car from straight ahead, but with the wind coming from the side, the wind resistance showed a considerable increase. On the other hand, the notched-back version, while slightly less efficient heading straight into the wind, showed significant gains when the air flow came from the side.

The Engine

The DAF's engine is much the same as the rest of the car in its clever and basically sound design. But the engine drawings allow very little margin for error in manufacturing. Where the presence of poor materials and workmanship would only make the rest of the car look shabby, they would completely ruin an engine of this type.

At first, the DAF engine appears to be nothing more than a 2-cylinder version of the air-cooled Volkswagen unit. It is, in fact, a little more than that. To be sure, the bore and stroke, along with the overall layout, are almost identical. Yet there are detail design differences, some of which the Volkswagen engineering staff might do well to study. One of the differences that immediately caught our eye was the placing of the cam followers. Both engines use a single cam lobe to operate the intake or exhaust valves of opposing cylinders. This is logical enough, as it cuts in half the total number of cam lobes needed on the camshaft. The trouble is encountered when one tries to position the cam followers, because the pushrods cannot be placed on a vertical parallel with the cylinder bores. The cam followers, then, must be placed for one of three solutions: They can run at something less than the 180° separation needed to give symmetrical valve timing; they can use an asymmetrical-type follower to effect a symmetry in timing; or the designer can simply not attempt to hold the pushrod and follower on the same axis, and just run them at an angle. The first placement mentioned is quite out of the question; a lack of symmetry in valve timing between 2 opposing cylinders of the same engine would constitute a sort of mechanical civil war (or war between the cylinders, for our Southern readers). This might not break the engine, but it would make for very erratic running. The second alternative is the one chosen by Volkswagen; it gives symmetrical valve timing but an extremely asymmetrical loading of the cam followers, and this has limited the valve acceleration rate that may be used. The designer of the DAF used the last solution; it can be argued that the angle between pushrod and cam follower might induce abnormal wear, but in actual practice the loadings are quite small. When Porsche began making its own crankcases, it immediately adopted an arrangement similar to that used in the DAF.

Other touches that we like are the use of aluminum cylinders with iron liners in place of the plain cast iron parts used on the VW, and the larger valves and im-



The rear suspension can be classified as a swing axle, but its low, diagonal pivot mounting minimizes the oversteering effect usually present in suspensions of this type. The rubber pivots require no lubrication.

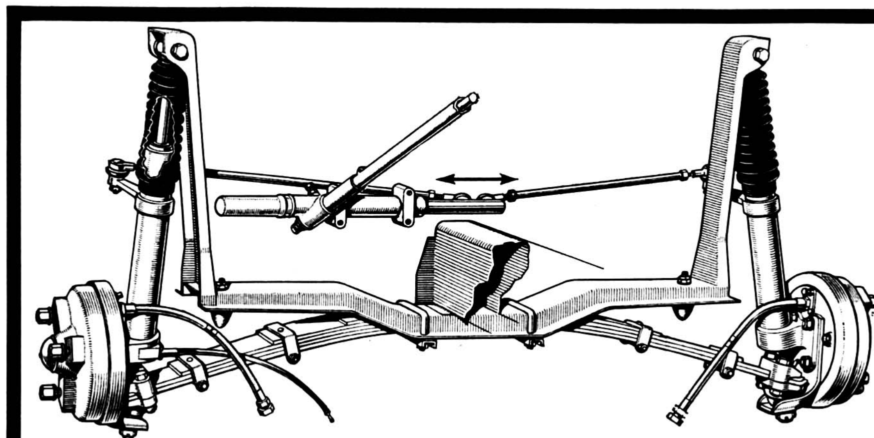
proved valve cooling. The sum of all these small improvements gives a slightly higher specific power output than that of the Volkswagen, but the over-all effect will be much the same. The guiding principle for designers who want reliability is to use a very short stroke and turn the crank slowly. Perhaps it is unfair of us to single out the VW for comparison; however, we were struck by the basic similarity between the two. Since the DAF or any other small car must inevitably be compared to the VW, by potential owners, it might as well be compared in concept. The Volkswagen comes off surprisingly well for a car whose basic layout was decided upon a full decade ago.

The Transmission

From the engine, the drive goes through a centrifugally actuated clutch and is taken to the transmission cum final drive via the central backbone. The drive is carried by a driveshaft with vibration dampers at each end; such careful attention to shock damping is much in evidence throughout the car.

The transmissions (plural, to be absolutely correct) are placed on either side of a casing containing a group of three bevel gears. These serve two functions: first, they provide a right-angle drive to the twin transmission units; second, they can be shifted back and forth to act as a reverse gear. We were unable to tell from the information available but it would appear that this car, like the old steamers, will go just as fast in reverse as it will go forward. The "Variomatic," as the DAF transmission system is called, is a pair of V belts and four automatically adjusting V-groove pulleys. The drive is duplicated for each rear wheel, so we shall describe only one side.

The drive pulley consists of two halves which, by sliding closer or further apart, vary the pulley's effective diameter; the rear or driven pulley acts in exactly the same manner—but directly out of phase. Thus, if we move the two halves of the drive pulley far apart and the halves of the driven pulley closer together, we have a reduction gearing. By reversing this procedure the ratio will progress slowly past the point of unity and ultimately become an overdrive. As (in actual practice) the drive is taken through an additional set of conventional reduction gears before it



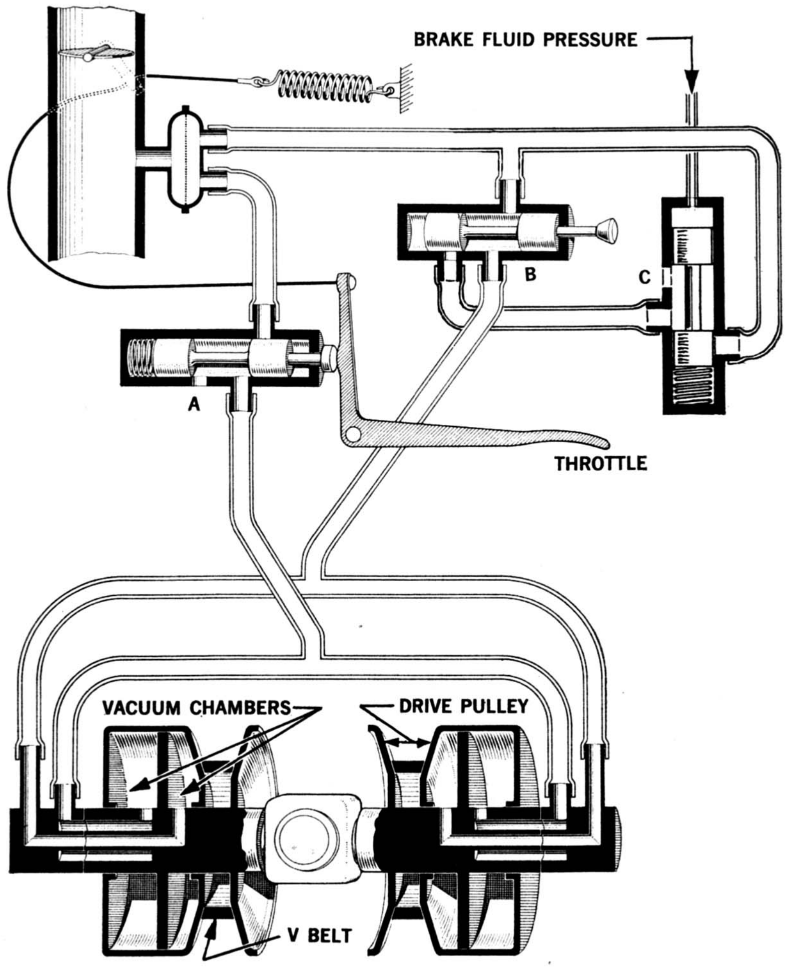
The DAF's front suspension and steering gear, along with part of their supporting structure, are shown here. This very distant relative to the sliding pillar suspension first appeared on the French Cottin-Desgouttes in 1927 in very much the same form as shown here. On a heavier car, the unsupported ends of the spring would be subject to serious deflections under hard braking. The cable leading from the right front spindle is a speedometer drive.

goes to the wheels, the DAF's gearing varies from 20:1 for starting to a 4.4:1 ratio for fast highway cruising. The ratios, which are infinitely variable between the two extremes, are determined by a vacuum chamber and by centrifugal flyweights on the drive pulley. The accompanying illustrations show how the depression (vacuum) is controlled by the throttle setting and brake. The rear or driven pulley is spring loaded so that the belt tension remains constant. There is a selector for reverse gear and a little push-pull control for engine braking on long downgrades.

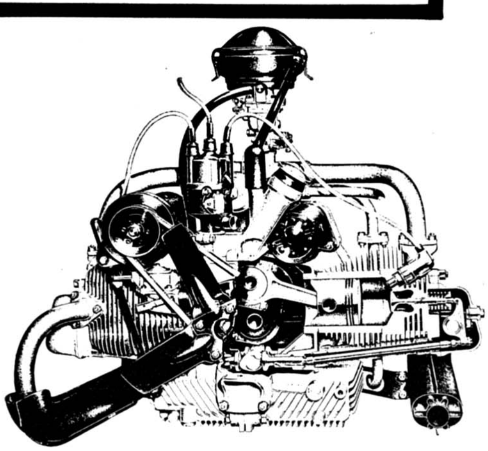
There have been persistent rumors of trouble with the drive belts, which the makers claim to be unfounded, and certainly the position of the belts, exposed to the mud and dust under the car, looks a little vulnerable. However, if they can make this transmission work reliably, they will have really come up with something. It selects just the right ratio for the conditions encountered, is absolutely smooth and jerk-free in its operation and, as a bonus feature, it doubles as constant-velocity universal joints for the rear axles and is a limited-slip differential!

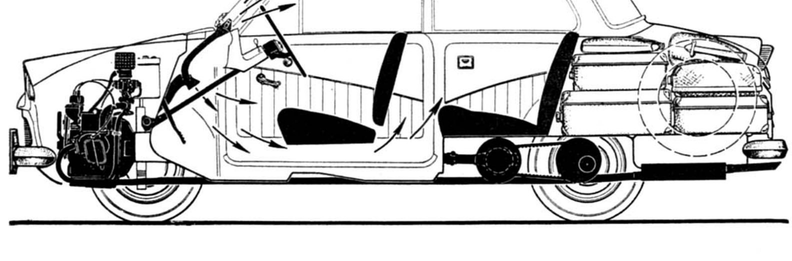
In General

Many of the mini-cars that have appeared on the market are of doubtful value here in America. The DAF appears to be exactly what is needed for the urban driver, the commuter and the suburban housewife, due to the ease of maintenance and the automatic transmission. We shall know before too long, because after many delays (which gave rise to most of the transmission rumors) the car has now reached the production stage.



Above is the control system for the DAF's Variomatic transmission, shown in schematic form. Valve A is throttle actuated. When open, it admits manifold vacuum to the outer vacuum chambers; when closed, it vents the outer chambers to atmospheric pressure. Valve B is normally vented through valve C to atmospheric pressure but is shown here in its alternate position, which gives a downshifting effect when descending steep grades. Valve C serves the same function as valve B but works automatically when the car's brakes are applied. When starting from rest, the V belts will be located in the positions shown, down in the bottoms of the pulley grooves. As the car accelerates, the constantly increasing manifold vacuum, working in conjunction with the centrifugal flyweights (not shown in diagram) forces the pulley halves closer together. This occurs gradually as the car's road speed increases. If a constant full throttle is used, the transmission will move into its final ratio of 4.4:1 just as the car reaches its top speed. While climbing hills or in accelerating to pass, the transmission will automatically adjust, through its balancing of manifold vacuum and centrifugal weights against V belt pull, to the exact ratio needed for any combination of speed and load. In addition, there is a manual control (valve C) that provides a downshifting action by directing manifold vacuum to the inner vacuum chambers. This is also provided automatically any time the brakes are applied, the amount of downshifting being proportionate to the braking effort with a limiting factor to avoid over-revving.





ENGINE SPECIFICATIONS

Horizontal-opposed, air-cooled, 2-cylinder 4-cycle with pushrod-actuated overhead valves. Light alloys used extensively in design.

Bore and stroke	3 x 2.5 inches (76 x 65 mm)
Displacement	36 cubic inches (590 cc)
Brake horsepower	22 (SAE @ 4000 rpm)
Compression ratio	7:1
Oil sump capacity	2.1 quarts