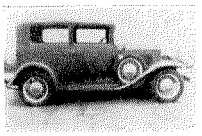
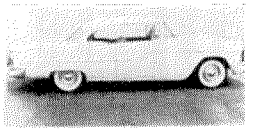
FROM HORSES



TO HORSEPOWER



by PETER KYROPOULOS

IN NOVEMBER, 1895, with all of *four* cars registered in the United States, a magazine called *The Horseless Age* made its bow to the public. In its first number, E. P. Ingersoll, Editor and Proprietor, wrote in his editorial:

". . . The appearance of a journal devoted to a branch of industry yet in an embryonic state, may strike some as premature. . . . But those who have taken the pains to search below the surface for the great tendencies of the age know that a giant industry is struggling into being here. All signs point to the motor vehicle as the necessary sequence of methods of locomotion already established and approved. The growing needs of our civilization demand it; the public believe in it and await with lively interest its practical application to the daily business of the world."

That is pretty good guessing, considering that there were only a number of more-or-less successful inventors playing around with automobiles. All wisdom sprang from Europe, where the automobile was developing into a rich man's toy.

The number of cars increased rapidly:

1895	4
1896	16
1897	90
1898	800
1899	3,200
1900	8,000
1910	468,500

In 1903 R. E. Olds made 4,000 Oldsmobiles, which sold for $650 each.

In 1902 the Ford Motor Company began to build cars. In 1903 it sold 1,700 cars ranging in price from $850 to $950. The total sale was $1,163,000.

In 1921 Ford made 933,720 Model T's and sold them for $546,049,449. The price was from $325 to $600.

Ford employment had risen from 125 in 1903 to 33,000 in 1921. By 1903 a new industry had been born, and with it a new way of life for the American people.

Between 1900 and 1955 there were a total of 1686 makes of cars. Of these, 18 are still on the market today.

About 67 million people in the U. S. have drivers' licenses. Of these, around 30 percent are women. We have 35 million families who own cars. These people are buying at the rate of 6 million cars per year.

In this country, as a whole, we spend about 10 percent of our national income on automobile transportation—or, in terms of car-owning families, about 12.5 percent. The wisdom of devoting this much money to the car is not under discussion. This is what people are doing.

Of course, not everyone buys new cars. The ratio of used to new car purchases varies between 1.5 and 2. The used car is the people's car. The person with the limited income can choose among a wide variety of cars at prices ranging down to $15 or $20. Efforts to sell small European cars as cheap transportation are not particularly successful as long as people can get a full-size car for less money. The German Volkswagen or "People's Car" is supposed to put the masses on wheels. In the U. S. the used car is the "People's Car."

The automobile is a package containing about 125,000 miles of transportation. Of this package a person buys whatever he can afford. The cost of new and used cars for the last four years is as follows:

New Cars	Million Buyers		Average Cost	Net Cost (less trade-in)
1954	4.3		$2,720	$1,730
1953	4.9		2,650	1,660
1952	3.6		2,680	1,560
1951	4.4		2,390	1,440
Used Cars		**Ratio Used/new**		
1954	8.6	2.0	800	600
1953	7.8	1.6	920	640
1952	2.2	2.2	950	700
1951	7.3	1.7	790	570

This table does not illustrate the *depreciation* of a certain car, but only the yearly variation of prices.

Depreciation as a function of car age goes about like this:

Years Old	% Depreciation
1	40
2	50
3	60
4	70
5	80

Just how long the useful life of a car can be is shown by the fact that, of the 10.2 million Chevrolets running around in 1954, about 135,000 were of 1936 vintage or older. For Ford the corresponding figures are 8.1 million and 376,000.

The life expectancy of cars has steadily increased over the years:

Year of Scrapping	1925	1935	1952
Average life of vehicle (yrs.)	6.5	8.3	14.3
Accumulated mileage during lifetime	26,000	42,000	125,000

Much has been said about the length of time a car should be kept. There is little evidence that it makes a great deal of difference in the first three years. A study of new car buyers in 1954 showed that all new car buying families kept their cars for 3.2 years, nearly independently of make, except for Cadillac and Lincoln owners, (largely in the $10,000-plus income group), who kept their cars for 2.4 years. Only 7.7 percent kept them longer than 5 years.

Aside from the materialistic reasons for turning in cars, there are intangibles which make us decide. There are many good reasons, which we talk about, and the real reason, which we keep to ourselves.

This is illustrated by the story of the father and son discussing the son's girl friend. Father thinks she is okay, he guesses, but not very good looking. Sonny agrees, but "she is the best I can do with that car of ours."

Buying the car is not the whole story. AAA gives some average figures for *operating cost* in 1955.

Variable costs:		
Gasoline and oil		2.29 cents per mile
Maintenance		.74 cents per mile
Tires		.51 cents per mile
	Total	3.54 cents per mile
Fixed Cost:		
Insurance		$104.46 per year
License fee		16.83 per year
Depreciation		447.36 per year
	Total	$598.65 per year
	or	$ 1.64 per day

Scrutiny of these figures shows that, as far as the individual family car driver is concerned, fuel economy is a grossly overrated item. By changing from 15 miles per gallon to 20 mpg we only change the cost per mile from 8.3 to 7.8 cents per mile (based on 10,000 miles per year), a difference which is hardly worth all the bragging that it brings about.

Looking at fuel economy from the point of view of *natural resources*, rather than individual savings, we get a different picture indeed.

In 1954 the gasoline used by automobiles in the U. S. amounted to 13.5 billion dollars (including 3.5 billions in taxes). All central power stations and railroads paid a fuel bill of 1.5 billion dollars.

A fuel saving of 10 percent in the automobiles of the country saves more than the fuel cost of all central power stations and railroads.

The market for small cars

Exactly what it costs to build a car is shrouded in secrecy. However, a few interesting observations, bearing on the subject, can be made.

The sum total of raw material costs in a car is probably no more than $300 (body steel costs about 8 cents per pound). This cost depends on the size of the car. The labor cost in processing the material may be guessed to be of the order of 3 or 4 times that amount. It is not much affected by size, since it takes as long to build a small car as it does to build a large one. That is one of the answers to the question why we don't build a really small car: It would not be appreciably cheaper merely because it is small.

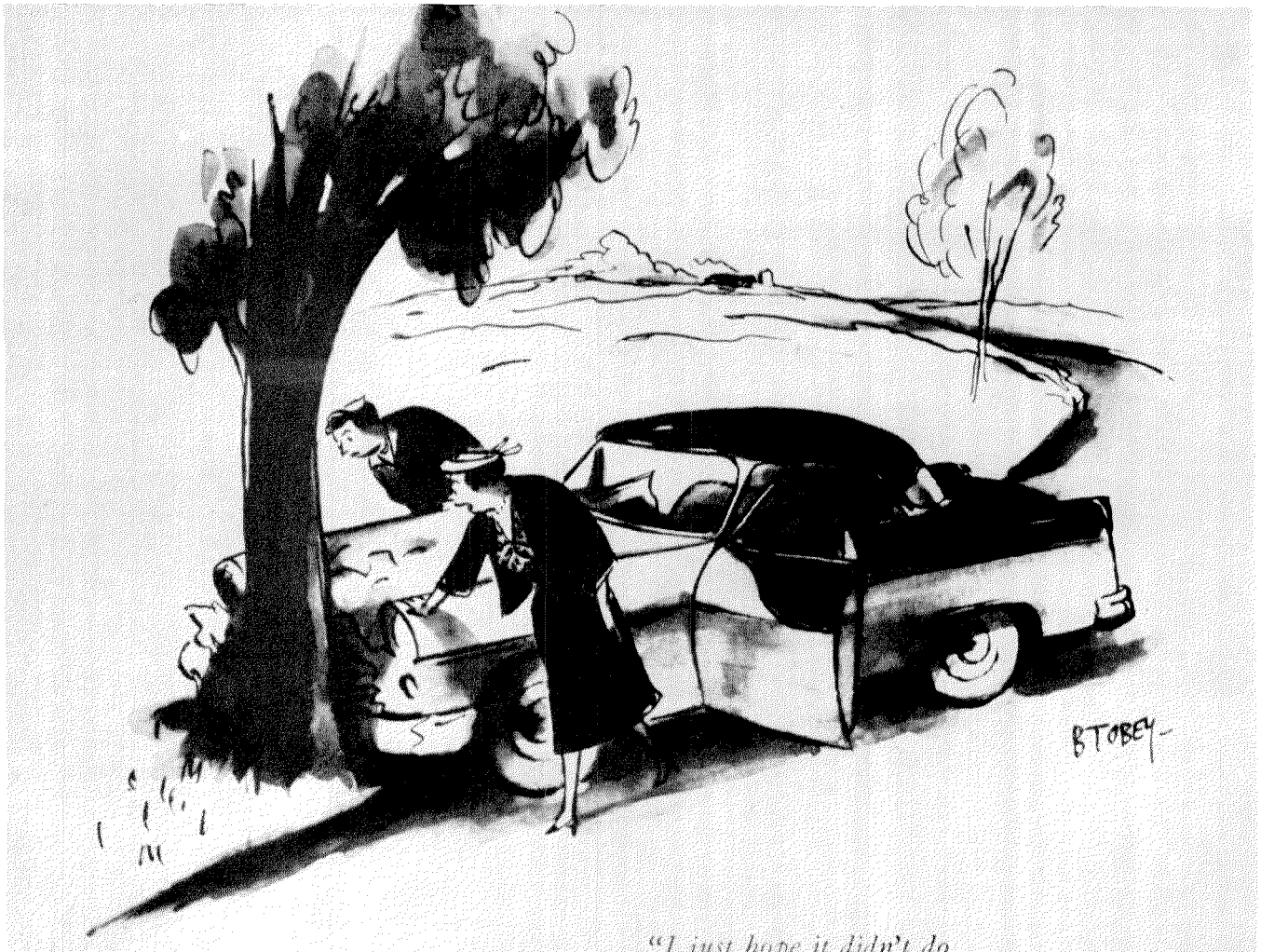
A true market for small cars simply does not exist in this country. If we think of the small car as a *second car*, the market is at once limited since only about 11 percent of the car-owning families own 2 cars. Most of these people do not buy two cars new, but keep the older one.

The sales figures bear this out. In 1954 the sales of Volkswagen and MG were, respectively, 6344 and 3454, or a total of about 10,000 cars. This compares with a total sale of 6.6 million cars. Only .15 percent of the car buyers wanted a small car. Even if we double that figure to allow for people who bought the other smaller cars, it is not enough for any manufacturer to be attracted.

Incidentally, the total *import* in 1954 was 34.5 thousand or roughly .55 percent of the total cars sold in the United States.

Chrysler built an experimental austerity model by eliminating such things as chrome trim and bumpers, insulation, dual tailights and other items not absolutely necessary. The running gear was left untouched. By their own report they wound up with the "worst, noisiest, most uncomfortable, ugliest automobile you ever saw." The saving was $150. For years buyers have favored the "de luxe" models. They would rather buy the lower priced car with extras than the higher priced one without them.

This discussion would not be complete without some data on taxes. While inflation has doubled the car price,



"I just hope it didn't do anything to the horsepower. Fred's so proud of that."

the total taxes, direct or hidden, on a car have quadrupled. In 1939 a resident of Michigan paid $143 in taxes on a car which sold for $1000 delivered, or 14.3 cents on the dollar. In 1952 the respective figures were: $583 on a car delivered for $2000, or 29.1 cents on the dollar.

Since we are on unhappy subjects, let us take a look at the accident rates. Needless to say, we should prefer to do without the 35,500 traffic deaths which occurred in 1954. If we look at the pertinent statistics, however, we find that we are doing better than we used to.

Year	Registration (Millions)	Miles Travelled (Millions)	Traffic Deaths	Deaths per 100 million vehicle miles
1927	20	159,000	25,800	16.3
1953	46	550,000	38,300	7.1

Cars have *increased* by a factor of 2.3, miles travelled by a factor of 3.5, traffic deaths by a factor of 1.5, deaths per 100 million miles have *decreased* by 53 percent.

Summing up a lot of data we can say:

Almost 40% of the deaths occur on weekends.

Saturday is the most dangerous day of the week.

Drivers under 25 years of age are involved in more than their proportionate share of accidents.

Three out of five deaths occur during the hours of darkness.

Ninety-five percent of the vehicles involved are in good mechanical condition.

"No matter the price, no matter how new, the best safety device in the car is you."

The same conclusion is reached in a study concerning the effect of horsepower on highway speed.

The highest-powered vehicles, while driven more frequently in the high speed ranges, are not driven at any greater maximum speeds than the lower-powered cars, except perhaps for those under 100 horsepower.

The vehicles with from 100 to 130 horsepower are driven as fast as any vehicle of any horsepower. It would appear that the critical factor in determining highway speed is still driver skill and not the vehicle.

It seems quite certain that many people get into trouble by going 45 mph when they should be going 15. All attempts to develop safety devices are good, but they cannot substitute for a sensible driver.

Engineering, styling and psychology

The development of the automobile shows three distinct phases:

(1) Gadgeteering and invention: During this period, we were happy if a car would run and take us places with reasonable certainty.

(2) Production development: We took advantage of the economy of mass production to keep the cost of the end-item down to a point where everyone could afford to own it. Cars evolved from luxury items to necessities.

(3) Now, development is concerned with refinements rather than with dramatic changes. Utility is taken for granted. The factors which control the purchase of a car are considerations such as comfort, appearance, riding qualities, quietness, and a host of intangibles, mostly of a psychological nature.

An anomaly

Among the many products of modern technology, the automobile has a unique position. It is the most complex and expensive piece of equipment which is built to be operated by people with a minimum of skill. A failure may well endanger the life of driver or innocent bystander. The car, once sold, has to live with its owner or driver, and has to be self-sufficient and foolproof. For this reason, the automobile is committed to a multitude of compromises which, at times, do not seem reasonable or sensible. We train pilots to fly airplanes. If they fail to become proficient they are fired. Here the equipment dictates the requirements of the operator.

Many of us are emotionally entangled with this piece of machinery. The first car, the first *new* car, the first scratch on the new car, are all highly important to a man. More so to men than to women, I think. There are a multitude of jokes and cartoons about automobiles. In 1915 there was published a collection of jokes about the Model T, complete with the Ford-owner's prayer: "The Ford is my automobile, I shall not want another one. . . ."

The car in the driveway is a measure of social stature to many people.

What did you pick that one for?

What makes a man decide on a car? Engineering features? Styling? His wife's opinion?

Fred may be fond of the horsepower (in the cartoon on page 19), but it is likely to be only his second reason.

People give the following reasons for their preferences:

1. Economy (low price, good trade-in, low maintenance, etc.)
2. Performance
3. Appearance
4. Construction
5. Comfort
6. Reputation
7. Dependability
8. Special features (automatic transmission, power steering, etc.)
9. Safety

This lineup shows that people are cost conscious. They value performance more highly than appearance. The car's reputation does not seem to matter much. Cadillac and Chevrolet rank about equally in this item. This shows that the term "prestige car" implies owner-prestige rather than car prestige.

Dependability is one of the things which people expect and take for granted—whence the low rank. Only those who have survived an accident, the imaginative and the extremely timid have in the past worried about safety, which ranks lowest on the list.

One thing is clear: in the buyer's mind engineering and styling are not separated clearly into compartments, nor are they in the manufacturer's mind, as far as I can see.

Why doesn't Detroit do it?

A detailed discussion of engineering details does not belong here, since we are concerned with the broader aspects. One question, however, needs to be answered: How does the U. S. car compare with European cars? The typical argument goes like this: Why doesn't Detroit put out fur-lined brake drums, since they have been so successful on European sports cars? (You may substitute any of your pet details for the fur-lined brake drums without changing the story).

During the last few years it has become fashionable to denounce the American automobile with a fervor usually reserved only for political and religious controversy.

A comparison of the differences and discussion of details can be found in recent literature. *Differences* there are, but a division into good and bad is not possible because so much boils down to a matter of taste. The differences arise chiefly from background and motivation.

In Europe the automobile has not developed into a necessity and a household appliance. It has largely remained a hobby item, used part-time for business. For this reason, sports cars are common in Europe. Economic limitations and traditional taxation of automobiles based on the "soak the rich" philosophy have produced what can be called the European utility car, such as it is.

Laurence Pomeroy, editor of the British magazine *Motor*, has summarized the situation most succinctly:

"Western Europe has a population slightly greater than that of the U.S.A., but is divided into 14 main national units, all of which restrict trade across their frontiers by quotas and fiscal devices. These are imposed primarily to preserve local employment and to conserve a pool of skilled labor upon which survival may depend in case of war.

" . . . the need of an automobile for personal transport is less in Europe than in the United States and the possibility of purchasing and operating an automobile is likely to be permanently lower.

"In practice more than 90 European cars out of 100

are purchased with company funds, but used for both business and pleasure.

"Companies . . . may endow their senior executives with expensive and exotic types of cars which will be regarded as the fruits of office . . . or they will seek to provide employees with transport at the bare minimum of cost.

"Outside America, there have . . . been few developments in motor roads. . . . In France under 100 miles of new road have been built since the war and in England expenditure has been almost entirely confined to the erection of 'Danger' and 'No Parking' signs."

These sentences have been quoted verbatim. They clearly illustrate the different background of European design and production.

European cars possess national characteristics. The majority are cheaper to build and to operate. They are smaller, lighter and narrower. Their road-holding ability is good on poor roads. Their performance is generally poor; they are noisy and uncomfortable.

In appearance, European cars are related to American styling. The Italians have rather enthusiastically accepted many American characteristics. The French and British have resisted American influence but are yielding. The Germans have developed along lines of their own, characterized by mechanical originality and lack of traditionalism.

European production figures are as follows:

Production of Passenger Cars in Europe (1953)

United Kingdom	520,000
France	360,000
Germany	355,000
Italy	133,000
Total	1,418,000
(United States	6,116,918)

Principal Manufacturers

United Kingdom	5
France	5
Germany	3
Italy	1

There are 36 small companies among the total of 50 European car manufacturers. In the U.S., there are only 6.

Production varies from 100 to 100,000 cars per year year for these manufacturers, and there are approximately 120 distinctly different designs.

A similar variety cannot be economically produced by the 6 U. S. manufacturers, nor has there been a sufficient demand. Driving in the U. S. is not a sport but transportation.

*Last, but not least, there is also this perennial ques*tion to be answered: "Why doesn't Detroit do it?" Many things have been tried on experimental cars (for instance, rear engines, two-stroke engines, independent rear wheel suspensions, to name only a few). If such innovations have not been put into production, there is generally a reason which may not be apparent to outsiders and which is rarely publicized.

In general, it has not been economically successful to be different merely for the sake of being different.

A look into the crystal ball

C. F. Kettering suggests this method of predicting the future of automotive engineering: "Considering all *the factors, use the best extrapolation* you can, *push* it as high as you can, and, if you live to see it accomplished, you will be amazed that you missed it so far."

Here are some of my extrapolations:

Gas turbines are here to stay; will find their most suitable use in trucks, buses, military and earth-moving vehicles, perhaps in racing and sport cars. They will be supplemented by such devices as free piston gas generators and may appear in compound powerplants, together with gasoline or Diesel engines, to supply short bursts of high power.

Nuclear power could become an attraction if a small reactor can be built. With it the reciprocating steam engine may return from its somewhat undeserved oblivion.

The electric car may come in for some attention for short haul service. We have learned a few things about batteries and should be able to produce an acceptable vehicle.

With the increase in super-highway mileage we will need automatic steering. The car might be rolling along a beam produced by a buried cable. Once on the beam, the driver would push the control out of the way and relax. There will have to be proximity warning devices and emergency over-rules but, all in all, this is not very complex. It will take a lot of the monotony out of long distance driving; people can doze without wrapping themselves around trees.

These things are probably from 10 to 20 years off.

In the immediate future we will see more power, levelling off around 450 hp, the upper limit of what the two rear wheels can comfortably transmit.

Gasoline injection will appear in one form or another —may well turn out to be a fad, rather than a real step forward.

Compression ratios will go up and so will gasoline octane numbers. I am guessing at 15 to 20.1. Why not Diesel? Because at any compression ratio the spark-ignition cycle has a higher thermal efficiency than the compression ignition cycle of the same compression ratio. (Note to the readers who like to write to the editor: Before you break into loud snorts of indignation over this one, consult an elementary thermodynamics text.)

The possible gains in performance (acceleration, fuel consumption) from lightweight construction may well come in for some attention. This calls for more than a "material substitution program." It will require a lot of re-designing of components and development of aluminum die-casting of large parts.

In any event, there are not going to be any dull moments.