NORMAN BEL GEDDES

MAGIC MOTORWAYS

RANDOM HOUSE

SAFETY, COMFORT, SPEED AND ECONOMY

2

IN LAYING out roads, certain basic principles are always followed. From the beginning of time, whenever people have tried to get from one place to another, they have kept these same basic aims in mind. The first is their desire for self-preservation; the second is their desire for a pleasant trip; the third is their desire to reach their goal quickly; and the fourth is their desire to spend as little money and effort on the way as possible.

Now, for self-preservation, read *safety;* for a convenient and pleasant trip, read *comfort;* for a quick arrival, read *speed;* and for a saving of expense and effort, read *economy;* and you have the four main principles which guide—or should guide—the modern road builder.

Although these aims or principles are very specific, their application with reference to road development varies with enormous latitude. A bird flying from one point to another, never swerving to right or left, is following the principles of safety, comfort, speed and economy as he sees them. On the other hand, a man in a forest, moving slowly, twisting first this way then that way, avoiding dangerous ledges and carefully going out of his way to pass around

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SAFE (IN THE ARMS OF JESUS)

Gandreau

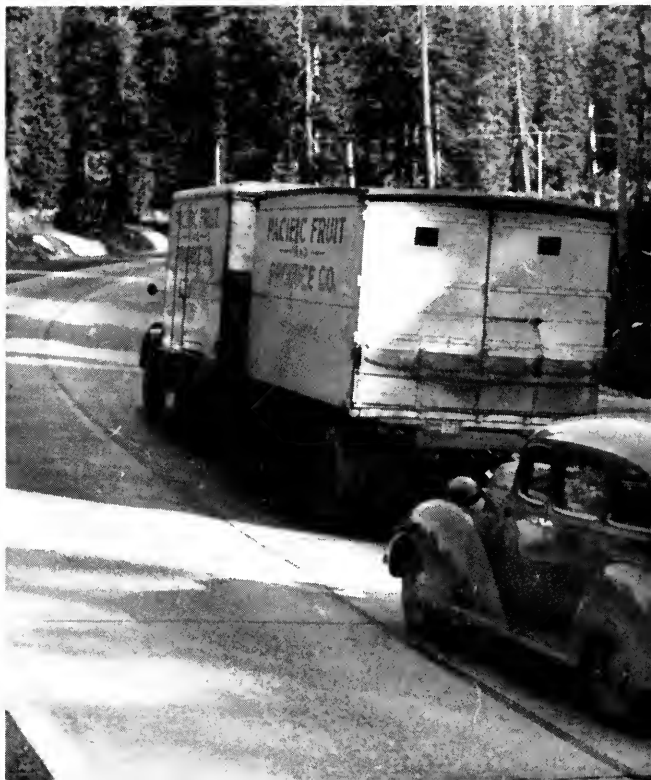
COMFORT (LOVES COMPANY)

SPEED (AND A YARD WIDE)

Acme

ECONOMY (IF YOU'VE NOTHING TO DO)

Portland Cement Assn.



obstacles, is applying the same principles as he sees them. Several factors enter into the situation, requiring, if not modification of the principles, at least different methods of carrying them out. The rate at which one is capable of moving, the characteristics of the terrain over which one must travel, and the purpose of the journey are some of these modifying factors.

A mountain goat, marvelously sure-footed, nonchalantly travels along the narrow edge of precipitous cliffs which a man must avoid. A cow, fat and lazy, meanders zigzag across a field which another animal would traverse in half the time. A sailboat tacks first north, then south, to reach a destination toward which a steamship can aim directly. Different types of vehicles require different types of routes, in order to achieve the same ends. What is comfortable in a slow vehicle may well be uncomfortable at a fast pace; similarly, a speed which is perfectly safe in one vehicle might be disastrous in another.

It follows from this that each type of vehicle should have its own specifically designed path. The cow has its gently winding path, the wagon its wider, straighter road, the train its railroad track, the ship its sea lane, the barge its canal, the airplane its beacon lanes. Sometimes it happens that a route which was originally intended for one purpose can be adapted to another, but generally the changes which are made in the route to facilitate this adaptation end by altering it beyond recognition. It is hard to realize, for example, that many of America's most important automobile roads originated as animal tracks.

When the first white settlers moved in to open up the Middle West, they did not have to build for themselves the roads which carried them out there. They used routes already there: Indian paths and buffalo trails. The American bison, heavy yet fleet of foot, tough and hard-traveling, had torn wide paths east and west, north and south, along the high ground linking the best grazing ranges and water holes. The bison migrated freely, his range extending from

the salt licks of Kentucky westward to the Rockies, and from the Cariboo Mountains at the northern end of Alberta, Canada, southward into Texas. The Vincennes Road, which runs slantwise through Chicago today, was originally tramped out by herds of bison bound west from Illinois to the prairies. The three great overland routes from the eastern part of the country to the Central West were also stamped out originally by bison: one, the route through Central New York which was later followed by the Erie Canal; two, the route through Southwestern Pennsylvania from the Potomac to Upper Ohio; and three, the great Cumberland Gap route into Kentucky. All over the world, in fact, man has taken over the routes of animals.

TRANSCONTINENTAL ROAD ENGINEERS

The buffalo and Indian trails in America were useful and comfortable because both animal herd and native tribe usually sought out easy grades and direct courses. They laid their roads along high land, since forests there were thinner and winds tended to sweep the high trails clear of leaves in fall and of snow in winter. All primitive races travel close to the ridges, relying on the safety of the higher ground. This custom, in fact, is the origin of the term *highway*.

The buffalo is not the only animal whose roads have been followed through the centuries. While the cow is not generally thought of as a traffic expert, in her own way she too has been an outstanding highway engineer. From day to day the path that the cow follows from barn to pasture changes little. Once a path has been broken, the cow follows it year in and year out just because it is

Underwood & Underwood

there. Man of course does the same thing, through force of habit and reliance on precedent. The origin of many roads from farm to farm and from farm to village occurred in somewhat the following way. The cow path was never the shortest distance between two points, but it had the virtue of being a track and a well-worn one. So the farmer himself followed it down to his neighbor's house, and it soon developed into a footpath. Then, by clipping shrubbery and branches along its sides, he was able to ride his horse through it. One day he managed it with a horse and cart; from that it became a wagon road. It served him well. The road gradually extended from door to door toward the town's church, and in a generation it became Main Street. So it is that the cow laid out New York's Wall Street district years ago, and, farther north, Boston's Haymarket Square. As paths grew into wagon roads, this did not mean that they were rebuilt to take care of wheeled traffic. It simply meant that a certain number of wagoners had managed somehow to scrape their way through them.

Three centuries were given in America to this kind of gradual road development. Animal trails slowly became pack-horse routes. By 1750 three roads in Pennsylvania and New York were reported to be worn so broad that two pack-horses could meet and pass without danger to their loads. That was progress! Then the great wagon known as Conestoga made its appearance.

Gendreau

Above: LOCAL ROAD ENGINEERS

Below: WHEN "PLEASURE DRIVING" WAS YOUNG

And when it started bumping over the Alleghenies, the pack-horse trail received a diploma and became a road.

Again, that did not mean that the old route was changed. It had merely been cleared; tree-stumps and rocks still clogged it. To begin with, people then did not know how to construct a road for wheeled traffic. Nor did they have the capital or the organization to do the job. The stagecoach had been in use for fifty years before any real improvement in American roads was made.

GENTLE BRIDGES FOR GENTLE DAYS

Portland Cement Assn.

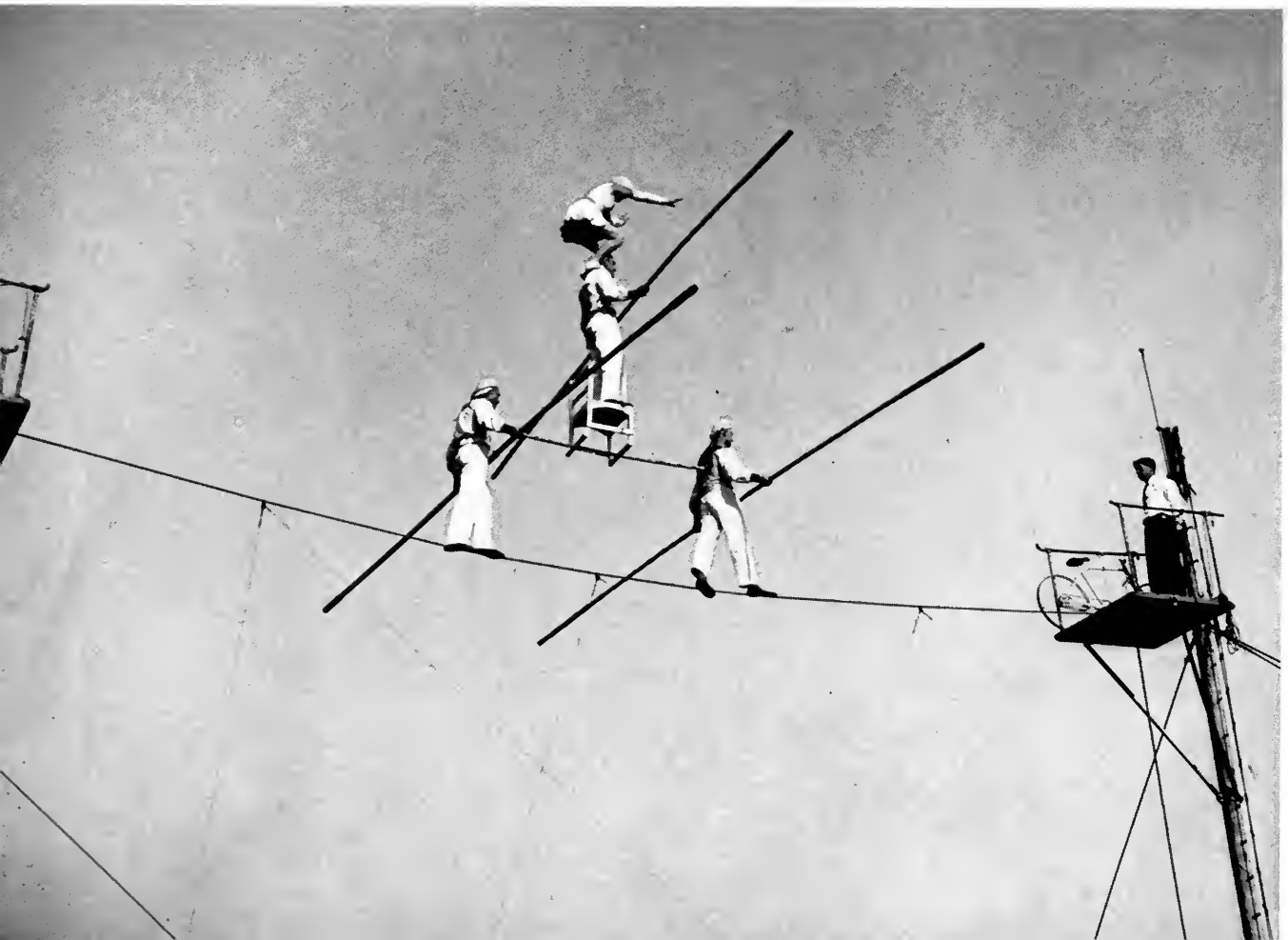
Instead of building new roads, the old ones were patched and widened here and there in their worst spots, and a few of them were surfaced. But whatever minor changes were effected, the basic technique of laying out the road remained the same: rutty tracks were informally widened by hacking away enough underbrush to give a right of way. This method had inherent difficulties, of course. When larger and heavier vehicles were introduced and sent over routes designed for foot-traveler or animal, the original advantages of the routes were lost. The history of the Boston Post Road illustrates this. This road, which was a major military channel during the Revolutionary War, to-

day is still the main artery between Boston and New York. Throughout the decades—first for horses, then for wagons, then for stagecoaches, then for fast carriages, and finally for automobiles and buses—it has been widened and rewidened and paved and repaved. But its development has always lagged behind the development of the vehicle, so that it has never been able to serve its purpose efficiently. When Sarah Kemble Knight rode from Boston to New York on it in 1704, it was so narrow that branches brushed her from both sides, and it was so difficult to traverse that it took her eight days to make the trip. Today, when 20,000 cars a day pass over it, they pile up in jams at its narrow bridgeheads, its frequent intersections and its sharp turns.

Early in the nineteenth century, people decided to do something decisive about getting better roads. A speculative fever of private road building hit the nation. In the State of New York alone sixty-seven companies sprang up, to build toll roads or turnpikes. A paved turnpike was laid down from

Ewing Galloway

SHORTEST DISTANCE BETWEEN TWO POINTS—



Philadelphia to Lancaster, at a cost of half a million dollars. The Federal Government stepped in and put up money for the Cumberland Road, a national turnpike that tied the Potomac to the heart of the West. Public enthusiasm ran high. Traffic increased.

The Cumberland Turnpike was the culmination of the movement. And it had a curious result. In the push to the West, New York State had been left behind. Accordingly, in order to get a foothold for trade, it set about building the Erie Canal. The Canal was a vast success. It beat the turnpikes at their own game. So the fever for building roads subsided almost as quickly as it had risen, and digging canals became the new national rage. The canal was popular because it was efficient. And it was efficient because it was a right of way built specifically for one means of transit, rather than a makeshift, second-hand adaptation.

The next big step in American transportation came with the introduction

IS NOT ACHIEVED BY CURVES

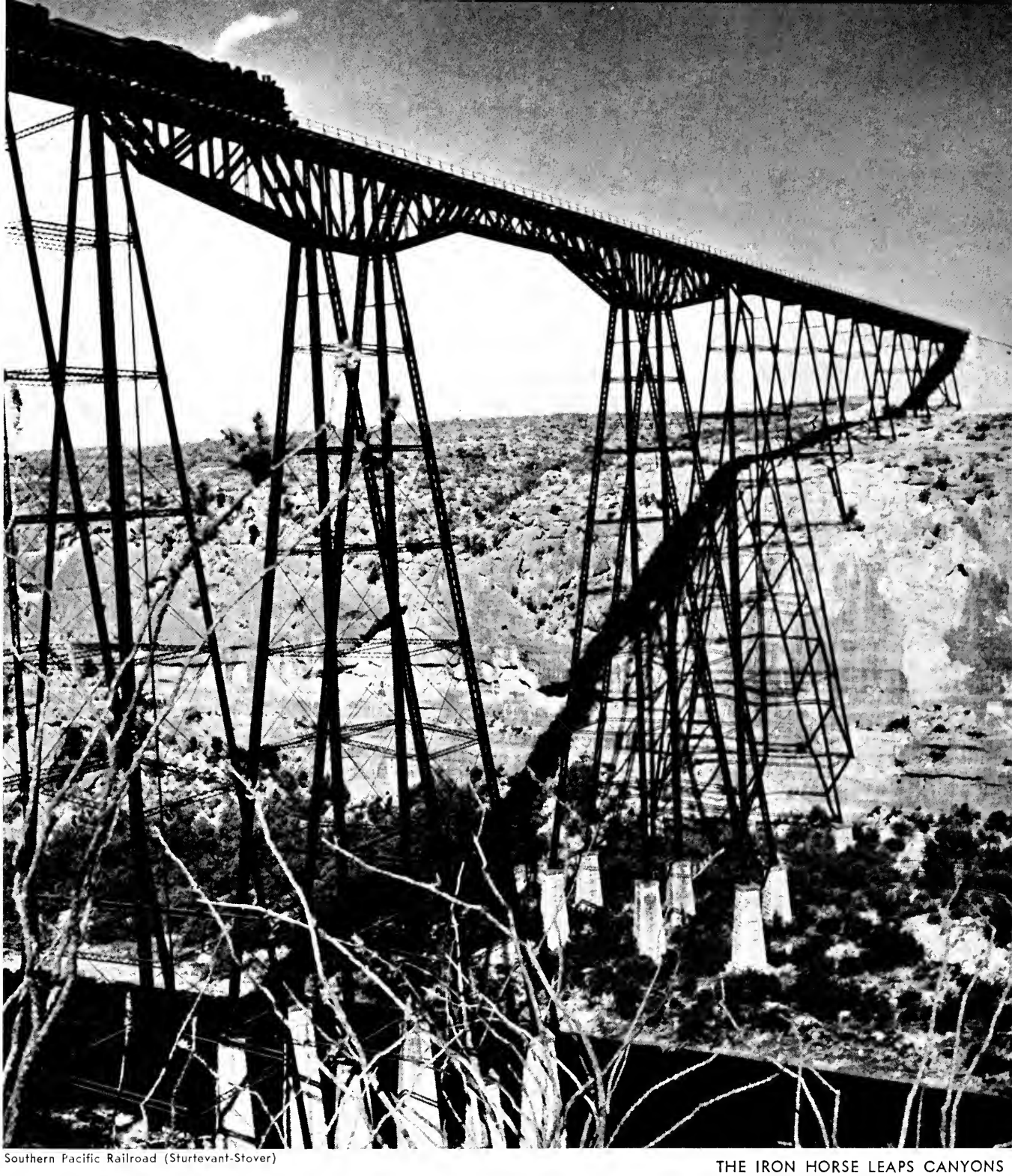
Portland Cement Assn.

THE IRON HORSE HAD AN IRON ROAD

Acme

of an entirely new vehicle: the locomotive. This proved to be efficient and popular also, and for the same reason: its builders estimated the needs and capacities of the new vehicle and designed a right of way for it accordingly. The first right of way for an American train was laid out on a dirt road because the train was horse-pulled. But very soon the railroad acquired a special track adapted to its own functions and its own speed. And the ultimate result of this intelligent approach to the problem is the safe, efficient and uninterrupted railroad travel of the present day. Not that this result was achieved immediately; haste in construction often made for waste and mismanagement. It took about fifty years for the railroads to overcome the first missteps of inefficiency and planlessness. But the fact remains that their basic technical approach was sound. The history of American railroads contains many valuable lessons for highway engineers.

Then, just before 1900, another new vehicle appeared. Along the Pumpkinville Pike in Indiana and similar horse roads in Massachusetts, Elwood Haynes and Charles Duryea were experimenting with the first "horseless carriages." These "gasoline buggies" did not look very promising at first, and were not taken very seriously. To say that the country did not recognize the auto for what it was is to understate the case. The country recognized the auto as a rattling piece of machinery that could be counted on to break down every



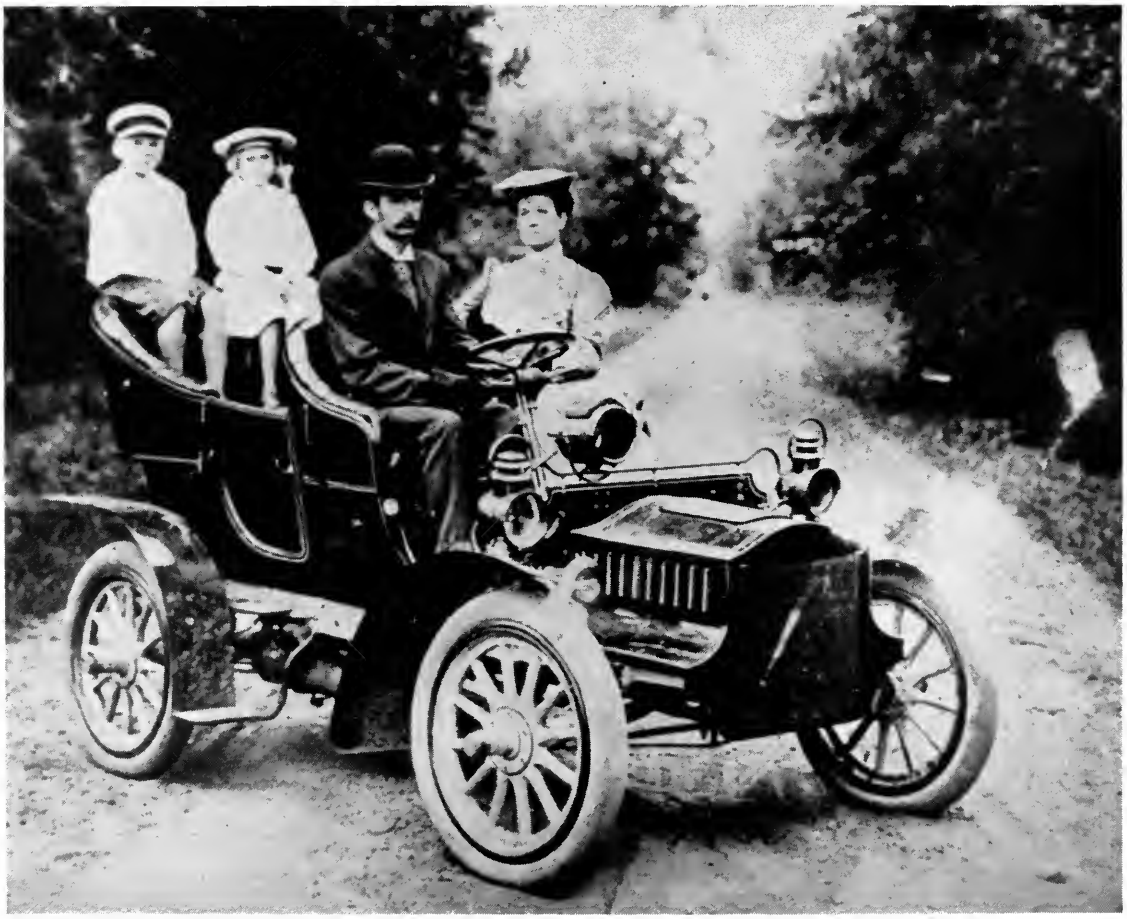
Southern Pacific Railroad (Sturtevant-Stover)

THE IRON HORSE LEAPS CANYONS

three or four miles. Nobody was going to build a new route for that. A special track had been built for the locomotive, but what had been good enough for the automobile's grandfather was considered good enough for it.

No one seemed to realize that a vehicle was developing which would revolutionize not only all transportation, but life in general. First of all, mechanical transportation was now for the first time being placed at the disposal of the individual to be used whenever he desired, whereas before that time all mechanical transportation had been designed for masses of people only. Secondly, the individual driver was now going to be able to travel two or three times as fast as he had ever traveled before.

THE HORSELESS BUGGY NOSED OUT THE HORSE Acme



All that three centuries of Americans had done in laying out, widening and brushing up roads suddenly became obsolete. Before this time, travelers had moved so slowly that it never really mattered whether their road was straight or not. No man or animal had ever struck directly across a range of mountains or a river when he could manage to travel around it. In the horse-and-buggy era, no great effort was ever made by road builders to alter or modify the natural character of terrain to reduce the distance between two points, or to smooth out large bumps and recesses. But this new vehicle was capable of high speed. In fact, its entire validity rested on its claim of speed. Curves and bumps that had never bothered the buggy forced the car to slow down. Roundabout routes whose delays had never mattered now harmed the straightaway effectiveness of the car. But this was not understood. The new car was pushed out on the old roads.

Take, as an illustration, the history of one of the world's most heavily traveled stretches of road, the sixteen-mile Detroit-Pontiac Highway. It was in 1817 that its right of way was first laid down, consisting of great logs rolled close together and filled in with clay and sand. By mid-century it had become a plank toll road for horses and buggies. In 1916 it was rebuilt for the automobile—that is to say, it was paved. But its width remained the same as it had been in 1817—a mere sixteen feet. Five years later an observer reported "forty-three automobiles stalled on Sunday afternoon on a stretch of the road badly shouldered by dirt and stones and with a menacing ditch at the side." By 1923 traffic on it had bogged down almost entirely. Then the Governor of Michigan started a piecemeal program of widening it to 200 feet. By 1938, 50,000 people used it every day with what at long last became a high rate of safety—its accident-death rate being less than one-third that of the nation as a whole. Ever since 1817, the State of Michigan had meant well. When it was time for teams and buggies, it built a road for teams and buggies. When it was

time for a railroad, it built a railroad bed. But when it was time for motor cars, it patched the road it had already built for another vehicle. It passed laws, hired policemen and set up traffic lights, but it didn't build a proper road for the automobile. What happened here, as well as all over the country under similar circumstances, was that the precept of "economy" overshadowed those of safety, comfort and speed. Three principles were sacrificed for one. But people found that that didn't work.

Almost at the very start of the automobile era, however, there was one interesting exception to this type of highway treatment. In 1906, William K. Vanderbilt II and some cronies who wanted to motor to their Long Island homes at forty miles an hour without scaring horses and infuriating the public, acquired a fifty-mile strip of land 100 feet wide down the island from Flushing to Lake Ronkonkoma. On it they built a two-lane wriggling ribbon of concrete and macadam, on which no carriages were allowed. Because they did not wish to slow down every few hundred yards for a crossroad, they bridged every intersection—which was a brand-new idea. A speed-limitless playground for millionaires was only part of this conception. The important thing about this road was its recognition of the fact that the automobile, in order to function at its best, needs a right of way as free from obstacles as a railroad track.

The career of this Long Island Motor Parkway is interesting. Built at a cost of about $7,000,000 ($140,000 per mile), its original toll charge of one dollar per trip in each direction could not keep it from being a financial failure. Non-millionaire drivers, although enjoying the route as being safe and comfortable and speedy, were aware that instead of being economical it doubled their driving costs over those forty miles. In 1937 the road had to be abandoned. In this way, the lesson that a road must follow all four principles of safety, comfort, speed and economy indivisibly was again pointed out. And at

the same time it taught another lesson: that unless an idea is thought through in all particulars, it soon grows obsolete. Private enterprise had spent a lot of money on this road, and proved the point that other existing roads were not properly designed for the motor car. When it was first built, the Long Island Motor Parkway was the country's most advanced road. But nevertheless, even its designers did not fully appreciate the possibilities of the automobile. Curves on the Parkway were too sharp, there were too many of them, the road was too rolling, and it was too narrow.

Gendreau

ONE-WAY CAPACITY ON GRAND CENTRAL PARKWAYS

The gentlemen who built the Parkway might have had more success if they had listened to the wise advice of W. W. Crosby, who urged in 1903 that, before building a road, a traffic census should be taken to determine in advance how much traffic the road would be required to carry. Again in 1914, Engineer S. Whinery urged that roads should be considered in the light of traffic conditions twenty years in the future. This advice also went unheard. The nation's roads still weren't designed for the future at all. They were improved piecemeal to answer immediate needs.

This failure to heed advice led the country to the highway crisis of 1924, when the number of cars on the road reached over seventeen and a half million and motorists came earnestly face to face with the traffic menace. Progressive young engineers wanted to relieve congestion by replanning the whole road system, but public and officials decided differently. They widened the old roads. They set low speed limits on them. They put up thousands of traffic lights. The old ideals of safety, speed, comfort and economy were now being interpreted to read "go slow." It was a far cry from the day when Mr. Vanderbilt had interpreted them to mean "go fast."

COUNTING TRAFFIC AUTOMATICALLY

Acme

While the science of road design was thus being held back, the technique of policing and traffic lights was going forward. In the early nineteen hundreds the major duties required of traffic officers were stopping runaway horses and directing parades. As the automobile began to crowd existing roads and no relief in the sense of newly designed highways was in sight, the policeman grew into a major highway figure. He was stationed in the thick of traffic, and began to require assistants to unsnarl the tangled cars. He resorted to signals, whistles, hand and semaphore devices. In 1924 a series of inventions began dotting the country with various systems of mechanical traffic regulation. Although this represented a contribution to safety, it violated the aims of comfort, economy and speed because it was hit-or-miss, restrictive rather than corrective. What was really needed was a properly designed highway system that would make a maze of traffic lights unnecessary.

Today, with a tremendously multiplied volume of traffic, there is an even greater need for such a highway system. The millions of square miles that make up this country's land, all of its industries, its social development, are all completely dependent on the flow of its traffic—the life-blood of the nation. The medium through which this national life-blood is pumped should be an efficient circulatory system of arteries and veins, instead of three million miles of haphazardly improved routes laid out for the different needs of gold-seekers

in California, of missionaries in the Southwest, fur traders and explorers in the Northwest, covered-wagon pioneers in the Great Plains, buffaloes in the Middle West and Indians in New England. Our highway "system" affects the life of each hamlet, city and farm in the United States, and yet it is still regarded as a local matter, to be tinkered with from time to time by state, county and municipality, as if the blood-stream came to a stop at the boundary line.


Ewing Galloway

It took years to get the automobile out of the horseless-carriage stage. The inevitable conclusion is that highways will have to go through the same upheaval—sooner or later. And it can be done more safely, comfortably and economically if it is done soon. But what has been done so far on the highway, instead of the required upheaval, is a slow process of adaptation which doesn't work. Mr. R. E. Toms, Chief of the Division of Design of the Federal Bureau of Public Roads, once said that twenty years from now motoring will still not be "radically different" from what it is today, that "the familiar two-lane highway is here to stay," and that "you won't see any sweeping changes in highway design for years to come." He says this in spite of the fact that another official in the same Bureau, Mr. H. S. Fairbank, recently admitted that "no single section of our nationwide system of interstate highways was built for the express use of the automobile." Mr. Fairbank made this statement in 1938, when there were 30,000,000 cars on the road, and when experts were estimating that the next twenty years would double that number. He said this ten years after the installation of the first

James M. Doolittle

FABLE OF THE SNAIL—

Acme

AND THE MOTORIST

cloverleaf intersection in the country, after the completion of many "superhighways," "freeways," "skyways" and the like, with all their improvements, and still he was able honestly to say that our highways not only are lagging, but are obsolete.

Automobile travel is less efficient in this respect than any other form of travel. Automobile roads are the only transportation routes which are not systematically planned in accordance with the needs of the vehicles which use them. At sea, for instance, sea lanes are planned for ships. There is nothing haphazard about sea traffic. Guesswork has been reduced to a minimum. The "Great Circle Track," the shortest steaming route between Nantucket Light and Bishop's Rock, England, has been carefully divided into traffic lanes. Ships inform each other by radio of bearing and speed. The channels and aids to navigation have been designed not for the vessels of another day, but for the ships that use them now. In air traffic, too, there is similar planning. Control towers at airports eliminate confusion and congestion. Traffic going in opposite directions is kept apart by regulations allocating it to separate altitudes. The result of this planning is that after a ship has cleared its harbor, or after a plane has climbed to its ceiling, each can proceed to its destination along the best and shortest possible route, without fear of interruption. It can go practically in a straight line. Neither ship nor plane has to use a right of way inherited from some ambling predecessor.

The problems of the railroad are more closely analogous to the problems of the automobile than are those of ship or plane, because both car and train have to travel over land and therefore are subject to inevitable interferences and barriers. But, unlike the highway, the railroad does not give in to this difficulty meekly. In places where financial economy might seem to call for a roundabout route, elaborate engineering is nevertheless usually decided upon to cut through the barrier and

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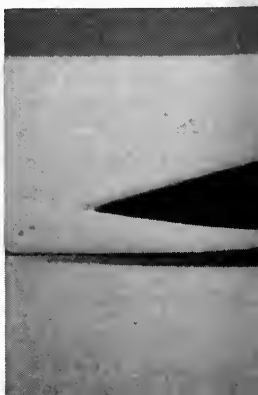
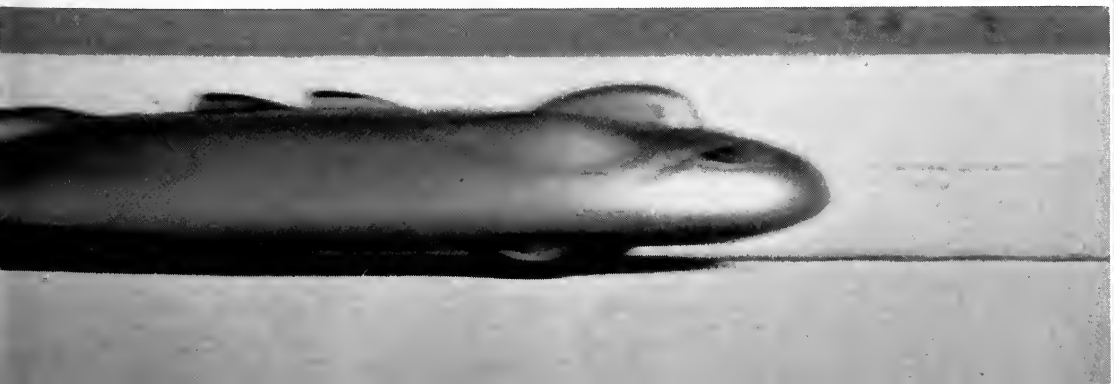


give a direct route, producing greater economy in the long run. The result is that railroad tracks are a great deal straighter than highways, and that the train, although inherently a clumsy vehicle, is able to travel with far greater comfort, safety, economy and speed than the car.

The present-day automobile functions in competition with high-speed airplanes and locomotives. If there is to be any justification for its existence, it must match them in efficiency. To do this, it is not enough to build an efficient automobile—the route is as important to the vehicle as thread is to a needle. An automobile may be capable of high speed, but when its road prevents it from using that speed in safety and comfort—because of steep grades, sharp curves, dangerous intersections and aimless winding—it is powerless. Therefore, before re-routing, re-designing or improving an old highway, or before laying out a new one, the route should always be examined not from the viewpoint of tradition or habit, but with a conscious regard for today's automobile traffic. In the days of the horse and buggy, economy was never thought of in terms of time saved or fuel saved. But today that economy is vital, and the elimination of every unnecessary mile or hazard counts.

A properly designed highway follows the most direct route that is available from one point to another; it obeys the old geometric axiom that a straight line is the shortest distance between two points. That is a simple, perhaps obvious, statement, and yet if it were really carried out in practice it would completely transform our highway system. It is the first guiding principle that should be considered before any high-

MAN IN FLIGHT—BY JOHN COBB



BIRD IN FLIGHT—BY BRANCUSI

Museum of Modern Art

way is constructed, before the first plans for it are made.

Chinese road builders purposely place many turns and twists in their roads, because they believe that evil spirits fly along them and that if the roads are crooked enough the evil ones may miss one of the turns, fly off and get lost. Do American road builders also believe in evil spirits? Judging from their handiwork, the answer is yes. Actually, however, the explanation is of course not so simple. The three main obstacles which stand in the way of proper highway design today are: first, the difficulties of acquiring a right of way; second, the pressures and pulls that influence the planning of the route; and third, the terrain over which the route must pass. These three factors have acted as stumbling blocks to all road building organizations, whether Federal, state or municipal. But must they be stumbling blocks for all time to come?

Fortunately, against the piecemeal school of highway construction which generally prevails, there are those students of traffic engineering who can be referred to as "forward-looking men." There have been many who sensed that all was not well with the method of American highway development. Perhaps the credit for the first piece of functional traffic engineering in America should go to Colonel Stephen H. Long, an army engineer, loaned to the Baltimore and Ohio Railroad. This man designed and built a new type of truss bridge which carried the Baltimore-to-Washington roads *over* the railway tracks. Colonel Long named the overpass in honor of Andrew Jackson, then President of the United States. The date was 1830. It was the first attack on the grade crossing.

There were other men who also realized what had to be done. Jay Downer, as Engineer and Executive Secretary of the Bronx Parkway Commission, developed a forty-foot, four-lane highway, eliminated grade crossings, and protected the route from side encroachments. Dr. John A. Harriss did pioneer work on coordinated traffic light systems. Carl Fisher planned the Lincoln

Highway. Fritz Malcher advanced the "steadyflow" system of traffic. Robert Moses, New York's Commissioner of Parks, has built miles of parkways and the city's Elevated Express Highway.

Various states, too, have seen the alarm signals. New Jersey built the first cloverleaf intersection. Michigan has built highways on the "freeway" principle. Pennsylvania is building a toll highway which will pierce the Alleghenies with nine tunnels, reach heights of 2,500 feet at grades never more than 3 per cent, and maintain a constant highspeed flow with no maximum speed limit, by means of lane segregation, cloverleafs and long sight-distances.

In short, there are a few good roads in America. But not one of them is a patched-up hand-me-down. If we want safety, comfort, speed and economy in travel we must build it into our roads. We must build roads that are literally, not figuratively, motor roads.

There is one famous right of way in America which has recently been built with these ends in view. Its builders had the advantage of starting from scratch, without the heritage of stagecoaches and horses and buggies to establish precedent, and the success of their venture has proved the desirability of starting from scratch. We are speaking of the Hudson River's Holland Tunnel.

Actually, there are two tunnels, one in each direction. Thus traffic moving in opposite directions is completely segregated, visually and physically. There is no cross traffic.

PATTERN FROM AN AIRPLANE—BY ROBERT MOSES WEST SIDE HIGHWAY, NEW YORK
N. Y. C. Park Dept.

Even cars driving in the same direction are required to keep in separate lanes, so that there is no weaving in and out and no sideswiping. Cars are not allowed to stop. All cars must drive at a constant, uniform speed. Each car must keep a standard safe distance behind the car in front of it. The tunnels are always patrolled—not by roaming traffic cops, but by officers so posted that they can see any mishap or failure and report it at once. A wrecking crew is always on call to remove immediately any disabled vehicle. There is no danger of any car striking a pedestrian, for pedestrians move on separated elevated walkways. The margin of guesswork has been reduced by thorough scientific planning. What such planning means comes home to us when we learn that in this one-and-three-quarter-mile tunnel a fatal accident has occurred only once in 47,000,000 motor vehicle miles. If these conditions could be applied to America's entire highway system, our annual automobile death toll, instead of 32,000 lives, would be less than 6,000.

The case of the four gospels of safety, comfort, speed and economy seems to be one of "many are called, yet few are chosen." No one has dared deny these transportation ideals. Many have heeded their soundness. But relatively few have carried them out. Since these words get more lip service on our highways than actual observance, one cannot do better than repeat and redefine them, hoping to drive them home.

SEGREGATED, REGULATED SPEED IN THE HOLLAND TUNNEL

Port of New York Authority

Port of New York Authority

SIMPLE MECHANISM FOR ELIMINATING FLAT TIRES

By safety is meant the safe guiding of the individual along the highway, not necessarily the features which make that safety. By comfort is meant a high degree of ease—though not the ease which is represented by travel in a well-upholstered seat behind a soft-purring, high-powered engine through a jungle of roadhogs, football crowds, bumps, detours and glaring headlights. Comfort must be built into the highway as well as into the automobile. Speed is of course the time it takes to travel, and is achieved not only by building fast-moving automobiles but by laying out highways along the shortest possible distance between two points. Economy must be achieved not only in the financial sense, but in a broader scientific sense: the economy of time and energy as well as of money. And finally, each of these four principles, in order to function fully, has to be combined with the other three. A highway which follows one of these goals at the sacrifice of the other three cannot be an efficient motorway. It may be called a highway—for that term, after all,

CEILING ZERO

Emanuel M.

means nothing more than that the road is laid along high ground. But it is not a motorway—for that word means a right of way explicitly designed for and adapted to the uses of *motor* traffic.

The aim of highway engineers in the twentieth century should be to construct motorways instead of highways. It is an important task, and an inspiring one. It means pioneering, traveling over uncharted territory instead of following in the well-worn paths which tradition has laid down. But just as the horse and buggy have been replaced by the motor car, so must the highway be replaced by the motorway.