

STORY

OF

GENERAL MOTORS



*From the Progress of the Past...
the Promise of the Future*

STORY OF

GENERAL MOTORS

PUBLIC RELATIONS STAFF
GENERAL MOTORS
DETROIT 2, MICHIGAN

GOLDEN MILESTONE

In 1958 General Motors celebrates its Golden Milestone. It was on September 16, 1908, that incorporation papers were filed for the General Motors Company.

The automobile industry was a lusty infant at that time. It had made considerable progress since those experimental cars around the turn of the century, but its products were still in the transition from horseless carriages to automobiles as we now think of them. And they were still considered luxuries by most people; it had occurred to only a few that they someday might be basic transportation for the entire population—and to still fewer that they would completely revolutionize our ways of living.

Since that time General Motors has grown—as has the automobile industry and all of America. The pattern of events brought out in this booklet is typical of many successful manufacturing businesses that have grown from small beginnings through the efforts and skills of individuals working together in a system of free competitive enterprise.

This booklet necessarily deals with the past—the *first* 50 years. But the second half-century will see vastly greater changes and still more rapid scientific progress, and it is the future to which General Motors now looks.



IN THE YEAR 1893 the first successful gasoline car in America coughed and wheezed its way down a side street in the quiet town of Springfield, Massachusetts, to the great annoyance of the residents and the terror of their horses. This "horseless carriage" was built like a buggy, had a four-horsepower engine and ran very uncertainly—but it was the beginning of a great industry.

In the years since 1893 the automobile has progressed from a faltering buggy-like contraption to a safe, dependable and efficient vehicle for economical transportation. And as step by step the motor car has been improved, the industry itself has grown in social and economic significance.

The early development of the motor car came about largely through simple trial-and-error experimentation in the hands of men who had faith in the future of America and the service which the automobile could render. These experiments were carried on in a somewhat hit-or-miss fashion, judging by the standards of today, by individuals in basement and alley workshops, whenever and wherever they could spare a few hours from their daily tasks.



Long-term research had to be left for later years and other hands, for few people in those days cared or dared to invest money in research programs that might require years to complete. The whole industry was operating on a series of shoestrings, and no manufacturer could be sure that he would be in business the next year.

There was, in fact, good reason for this uncertainty concerning the future. More than 2,500 different

makes of motor cars have been produced in this country at one time or another. Yet of all these only a handful remains today. The selection of those companies that were to succeed down through the years was made by the public – by the buying public. It is axiomatic that if a business is to succeed it must, in the long run, give the public what the public wants at a price the public will pay. There has never been evolved a plan to build a successful business on any other basis. And this principle operated in the years gone by just as it does today.

General Motors was organized in 1908, but its roots go back to the very earliest days of the industry and even beyond—to carriage and wagon building, stationary engines and bicycle bells; to the days when men like R. E. Olds, David Buick and Henry Leland were experimenting and tinkering and forming their companies to make the "horseless carriages" about which everybody joked.



THE PIONEERING PERIOD 1892-1907

1892: R. E. Olds and His Engine

Cleveland defeats Harrison. Irate parents do battle with Nick Carter and the "dime novel" menace. "After the Ball" and "Daisy Bell" are leading song favorites.

Out in the quiet town of Lansing, Michigan, about eighty-five miles from Detroit, R. E. Olds had spent seven years in his father's shop working on stationary and marine gasoline engines. While he labored over these engines he dreamed of putting one on wheels, so that people could ride around easily, cheaply and rapidly. In 1892 young Olds took his savings and bought his father's interest in the business. He then tinkered and experimented for five more years before completing the first Oldsmobile in 1897.



1897: The First Oldsmobile

Klondike gold rush starts, while the folks "back home" hum "On the Banks of the Wabash" and Fitzsimmons ends Jim Corbett's ring rule.

This car looked much like a buggy, as was usual in those days. It had two seats holding four passengers, and the motive power was furnished by a five-horsepower gasoline engine that could propel the car, under the best conditions, at a speed of about 18 miles an hour. The driver steered by a tiller held in his left hand, and worked a lever with his right hand to control the speed. Today this first Oldsmobile is in the Smithsonian Institute at Washington, D. C.

1899: Price Becomes Important

Sir Thomas Lipton's "Shamrock I" defeated by the "Columbia" for the America's Cup. Puerto Rico, Guam and Philippines become parts of the United States.



When his first model ran successfully, Mr. Olds was encouraged to build, in Detroit in 1899, the first factory in America especially designed for the production of automobiles. He there started making a "deluxe" model that was priced at \$1,250, the price including such improvements as "cushion tires."

The car did not sell. People were skeptical about the future of the automobile—the horse still seemed to be a rather satisfactory means of transportation and twelve hundred dollars was a lot of money for a mechanical contraption that many thought might prove to be just a fad. Accordingly, Mr. Olds decided to give his public what they seemed to want—a car that was simple to operate and low in price. He threw away his plans and started all over again, working out a one-cylinder car that weighed 700 pounds and could be sold for \$650.

This car, the first to be built in commercial quantities, was likewise the first of the famous "curved dash Oldsmobiles" that were to bring fame to the organization and contribute to the establishment of Detroit as the automotive center of the world. In 1905 Oldsmobile moved back to Lansing, where the continued success of the automobile was to prove a strong factor in the commercial and industrial development of that community.



1901: On the Road to Success

McKinley assassinated. Theodore Roosevelt becomes President. Marconi sends first trans-Atlantic wireless signal from England to Newfoundland.

More than 400 of these little Oldsmobiles were sold in 1901. That was truly big production in those days, for there were then only 14,800 electric, steam and gasoline cars registered in the United States. No small part in achieving this record was played by a young mechanic named Roy D. Chapin, of Detroit, who later became Secretary of Commerce of the United States. Leaving Detroit in a curved dash Olds, and carrying with him practically another complete car in the form of spare parts, young Chapin drove to New York City over



almost impassable roads. In fact, it is said that one stretch of road was so bad that he forsook it entirely and used the Erie Canal Towpath.

In 1902 Oldsmobile produced 2,500 cars, an unheard-of figure for that time, establishing Oldsmobile as the pioneer of the new technique of quantity production which was to make the industry a leader in the creation and distribution of real wealth.

Three years later another Oldsmobile, "Old Scout," won lasting fame by making the trip from New York to Portland, Oregon, in 44 days, averaging 100 miles a day. Incidentally, this veteran car is still in running condition.

1902: Buick Enters the Field

Ping-Pong is played from coast to coast. Most popular song is "In the Good Old Summer Time." Cuba becomes a republic. Woodrow Wilson is elected president of Princeton University.



While Olds was making such rapid progress with his low-priced and dependable car, other engineers and designers were not idle. David Buick, who had already been active in the manufacture of marine engines, was one of many who decided that the automobile field held great possibilities for expansion. In 1902 he organized the Buick Manufacturing Company, located in Detroit. This organization produced the basic design from which the well-known Buick "valve-in-head" engine has been developed. In the following year the name of the firm was changed to the Buick Motor Car Company and the scene of operations moved to Flint, Michigan.

The Cadillac Car

The organization of the Cadillac Automobile Company, under the direction of Henry M. Leland, also took place in 1902. Mr. Leland entered the automobile manufacturing business in rather a round-about way. When the Oldsmobile factory in Detroit was destroyed by fire in 1901, Mr. Leland received orders for supplying that company's engine requirements. Later he developed an engine of increased horsepower, mainly through the use of larger valves and better timing, and interested the Detroit Automobile Company in his plans. The net result of this chain of events was the formation of the Cadillac Automobile Company, named in honor of Antoine de la Mothe Cadillac, the French explorer whose expedition established a settlement at Detroit in 1701.

1903: Cadillac Begins Production

Treaty signed with Panama covering construction of the Panama Canal. Dan Patch paces a mile in 1:57 $\frac{1}{4}$. "The Great Train Robbery," first movie with a "plot," is shown. The Wrights try their wings at Kitty Hawk.

Cadillac built one car late in 1902, and completed two in the spring of 1903. The first Cadillac gave little promise of what the car was to become in later years. It had a carriage body with a rear seat entered through a door at the back, patent leather mud guards, a buggy step and a one-cylinder engine that was cranked from the side. Such luxuries as kerosene lamps and a bulb horn were "available at extra cost."

The same year steering wheels began to replace tillers. Windshields were offered on some cars—a curtain with a celluloid window in the middle through which the driver peered. Oldsmobile, still growing fast, claimed first place in the industry with a production of 4,000 cars.



Trial and Error

Automotive proving grounds were unknown in the early days of the industry. There were none of the intricate scientific instruments and testing equipment now commonly used to study car performance. Engineering knowledge had not progressed that far.

So the street in front of the factory was the only test track and the customer's experience was the "proving ground." When an owner brought back or reported a car that had developed serious faults, the company engineers would gather around and figure out a way to solve the difficulty—if not in that car, then in the next one. Incidentally, many of those difficulties grew out of the fact that when the automobile manufacturers took away the horse and substituted a gasoline engine they at first left the buggy



body just about as it was, and simply strengthened the springs and installed a set of wire wheels supplied, in most cases, by a bicycle maker. The engines were often too heavy for the bodies, and breakdowns were frequent until the manufacturers learned to design an automobile and not a hybrid buggy.

1904-1906: Improving the Product

Theodore Roosevelt is elected President. In 1905 Gus Edwards writes "In My Merrie Oldsmobile." Panama Canal Zone added to the United States.



In 1906 Buick brought out a four-cylinder car and included a sliding gear transmission, providing greater ease of control for the driver and prolonging transmission life. These advancements in engineering were largely responsible for Buick's 1,400 sales that year. Front bumpers were added and vibrating horns came into limited use, replacing the old bulb horns that operated so weakly and erratically.

1907: The Automobile Becomes Established

By 1907 the automobile had established itself as a successful means of individual transportation, reasonably dependable and fast,



and not too expensive. All over the country blacksmiths were turning their shops into garages for servicing the motor cars in their communities. But factory service and authorized service stations were yet to come — the hardy motorist took his chances with any amateur mechanic he happened to run across, and repairs were made with the aid of such simple means as hairpins and baling wire. Tourists driving new model cars across country frequently put locks on the hoods to keep passersby from examining and tinkering with the motor at every stop.

The Oakland Car

About this time Edward M. Murphy, the owner of the Pontiac Buggy Company of Pontiac, Michigan, decided that the buggy business was a thing of the past and that he had better get into the growing automobile field while his business was still solvent. He organized the Oakland Motor Car Company in 1907, naming it after the county in which Pontiac is located. His car was a two-cylinder model, designed by A. P. Brush, who had been with Cadillac as an engineer.



BUILDING THE CORPORATION

1908-1919

1908: GM's Birth Year

Taft becomes the 27th President. A new song sensation, "I Hear You Calling Me," sweeps the country.

Incorporation papers of the General Motors Company, organized by W. C. Durant, were filed in New Jersey on September 16, 1908. Within the next few months Buick and Oldsmobile joined General Motors, and early in 1909 the Oakland Motor Car Company was added, followed by Cadillac in July. These four companies formed the nucleus of what is today General Motors Corporation.

In 1908 the Oakland company brought out a four-cylinder car that undersold all competitors and became famous as a champion hill-climber at a time when many cars had to enlist the aid of the farmer's horse on the steeper grades. About twenty years later Oakland was to introduce the Pontiac car. (See page 34.)

Cadillac Wins Dewar Trophy

It was also in 1908 that Cadillac won the Dewar trophy in London for developing interchangeability of parts. This award recognized one of the most important advancements in manufacturing that had taken place up to that time. Cadillac had succeeded in so accurately controlling the precision of its manufacturing operations that any two parts of the same type were identical and interchangeable. Unique then, this principle is now part of the regular shop practice of all car manufacturers, and is one of the basic elements in mass production. It has had more to do with making quality cars available to everyone than any single technical advance.*



*For more about precision in industry, see the booklet, "Precision, a Measure of Progress," available without charge from General Motors, Detroit 2, Michigan.

1910: Engineering Goes Forward

Halley's comet causes wide-spread excitement, and the end of the world is freely predicted. A new song hit, "The End of a Perfect Day," appears.

In the meantime, better and more dependable products were being made through engineering advances. During 1909 "one man" tops appeared, as well as electric headlights, and four-door bodies increased in popularity. In 1910 Cadillac placed the first quantity order for closed bodies in the industry, contracting for 150 bodies from the Fisher Body Company, and paved the way for the self-starter by installing a system of battery ignition. But in spite of all this, the automobile market was far from booming—in 1910 there were fewer than 500,000 cars and trucks in operation in the United States.

Saginaw Steering Gear Division

Up until this time, most auto manufacturers had few dependable sources of supply for the various parts that went into their cars. Too often they had to go into the open market and buy what was available regardless of its special fitness for the motor car. The first exclusive parts manufacturing organization to become affiliated with General Motors was the Jackson-Church-Wilcox Company, originally organized in April, 1908. This company manufactured automobile parts for Buick, and was purchased by that General Motors affiliate in 1910. Now operating as the Saginaw Steering Gear Division, its principal products are steering gears and linkages, universal joints, propeller shafts, and ball bearing screw and nut assemblies. This division was a pioneer in the field of power steering.

AC Spark Plug

In 1910 General Motors acquired a substantial interest in the Champion Ignition Company, which had been organized by W. C. Durant and Albert Champion two years before to manufacture spark plugs in Flint. Much later the purchase was completed, and in 1933 this organization became the AC Spark Plug Division. From its earliest days AC has played an important part in the development of improved spark plugs, as well as becoming a leading producer of such items as oil filters, air cleaners, intake silencers, gauges, speedometers, instrument panels and fuel pumps.

Testing Materials and Parts



In connection with the engineering developments of this period, it is interesting to note the following paragraph in the annual report of the General Motors Company, covering the period from October 1st, 1910 to July 31st, 1911: *"During the year much has been done to improve the quality of the materials, the standard of workmanship and the design of our motor cars. With this end in view the Company appointed a Director of Production and began to create a general staff of mechanical engi-*

neers, gasoline engine engineers, designers, production experts and other experts not attached to any particular factory, but whose advice and services would always be available, to advise with and assist the necessarily more limited staff of each individual factory. The Director of Production has created as a part of his staff what probably is the most complete testing laboratory or bureau possessed by any automobile company in the world, fitted with the best and latest apparatus for physically and chemically testing all the various kinds of steel and other metals and materials, as well as every finished piece entering into the construction of the automobiles turned out by our factories. This laboratory serves as an additional protection against costly factory mistakes and gives the purchaser of every one of our machines an additional guarantee not merely for his comfort, but to assure his safety."

1911: A Red-Letter Year

The "Mona Lisa" disappears from the Louvre. First transcontinental airplane flight takes 8½ hours, 2 minutes. "My Little Grey Home in the West" is a popular hit.

To handle an increasing volume of foreign sales, and to build up a broader market for GM products, the General Motors Export Company was formed in 1911. This was a consolidation of export departments of the various GM car divisions which, until that time, had been handling their own individual overseas activities.

In the early days the Export Company shipped virtually complete vehicles to wholesale distributors abroad.

Later, in the early Twenties an overseas assembly plant program was developed and plants were opened in Denmark, Belgium, France, England, Germany, Poland, Argentina, Brazil, South Africa, Japan, New Zealand, Australia, Spain, Sweden, India and what is now known as Indonesia.

As time went on additional assembly plants were built in Mexico, Switzerland, Venezuela, Peru, Uruguay and Pakistan.

Vauxhall Motors Ltd. in England, manufacturers of Vauxhall passenger cars and Bedford trucks, was acquired in 1925. In 1929 an 80 percent interest was purchased in Adam Opel A.G. in Germany, manufacturers of Opel passenger cars and trucks, and the balance was acquired in 1931.

Subsequently, the responsibility for practically all activities outside the United States and Canada, including manufacturing, assembly, warehousing, sales and service, were combined into one division – General Motors Overseas Operations Division.



In November 1948, General Motors started production of the Holden automobile – the first motor car to be manufactured in Australia.

Since World War II, the manufacture and assembly of Frigidaire products has become an increasingly important activity in the following overseas countries: France, Brazil, Great Britain, Germany, New Zealand, Australia, South Africa, Argentina and Mexico.

Two important manufacturing centers of spark plugs and other AC Delco products are located in France and Great Britain.

Construction of facilities for the manufacture of commercial vehicles has recently started at Sao Jose dos Campos, Brazil.

Chevrolet Organized



On July 31, 1911, General Motors stock was listed for trading on the New York Stock Exchange, the first automobile stock on the "Big Board."

In the same year Louis Chevrolet, a racing driver who had designed a new car,

formed the Chevrolet Motor Company of Michigan in Detroit, with the aid of W. C. Durant, whose Little Motor Car Company, located in Flint, was to become the basis of Chevrolet when the company later moved to that city. In 1913 Chevrolet brought out the famous "Baby Grand" and "Royal Mail" models. Within a few years assembly plants were placed in operation in several cities, including Tarrytown, New York; St. Louis, Missouri; and Oakland, California. Through constant product improvement and a policy of maintaining low selling prices Chevrolet grew to assume a position of leadership in the field.

General Motors Truck

The thousands of GMC trucks on the highways today are direct descendants of one of the first gasoline-powered commercial vehicles to appear on the American scene. Their forebear was a 1902 Rapid motor truck. Its maker, the Rapid Motor Vehicle Company, joined General Motors in 1908. In that same year, GM also acquired the Reliance Motor Company in Owosso, Michigan. In 1911, these two companies were consolidated to form the General Motors Truck Company at Pontiac, Michigan. One year after that, in 1912, the familiar GMC nameplate made its first appearance on the highways.

Hitherto in many cases, trucks had developed along with the

infant motor car industry more as modifications of passenger cars rather than as specifically designed vehicles. But here were trucks engineered and built to meet the peculiar requirements of heavy duty transportation. Because they so efficiently served their purpose, they enjoyed immediate acceptance. By 1916, production was up to 4000 units per year; and the line included models ranging in capacity from 1 1/4 tons to 5 tons.

During the first World War, trucks exerted a profound influence in the mechanization of the Army. And GMC trucks played a leading role in that development when the Army adopted Model 16 as the standard for all 3/4 to 1 ton military duty. With the same ability for meeting trucking problems, the General Motors Truck Company continued to grow and expand after the war. Subsequently its product range was broadened to cover the entire commercial field . . . but that is a story in itself and is covered later in this booklet.



Kettering and the Self-Starter

Probably the outstanding event of 1911 was the installation by Cadillac of an experimental electric self-starter on one of its cars.

The self-starter, which was adopted as standard on all Cadillacs in 1912, had been a long time in the making. To the layman it probably seemed to come almost overnight, for the general public knew very little of the years of experimentation and study that had gone into perfecting this device that could start an engine without manual labor on the part of the driver. Charles F. Kettering who, before he retired, was to become Vice-President of General Motors and General Manager of the Research Laboratories Division, had been carrying on experiments with various automotive devices in Dayton, Ohio. Among his developments was a battery ignition system that Cadillac used. One day in 1910 he was talking with "Uncle



Henry" Leland at the Cadillac plant in Detroit when the conversation got around to the subject of hand cranking.

It seems that an old friend of Mr. Leland's had been injured while cranking a stalled car, and Mr. Leland was accordingly deeply interested in some device that would eliminate the possibility of such accidents.

Mr. Kettering had already done some work on an electric self-starter and said he thought he could build one that would work successfully. By the middle of February, 1911, he had installed a test model on a Cadillac and sent it to Mr. Leland in Detroit.

On the day of the final demonstration, some of the assembled onlookers indulged in a little good-natured ridicule of the idea, maintaining that such a "gadget" could not possibly turn the engine over against the compression in the cylinders. Kettering, answering that the best way to find out was to try, closed the switch—and the engine started.

The 1912 Cadillacs were equipped with this self-starter, for which they won the Dewar trophy for the second time.

The famous General Motors trade name, "DELCO," comes from this period. It is a contraction of the name Dayton Engineering Laboratories Company which was the company formed to manufacture the new electric self-starter.

1912: Expanding Markets

The "Titanic" sinks after striking an iceberg. New Mexico and Arizona become states. Wilson defeats Taft and Theodore Roosevelt. "When Irish Eyes Are Smiling" catches the public's ear.

The electric self-starter was an important milestone in automotive history. Until its development only a few brave and hardy women had ventured to drive a car. But with starting made simple and easy, women could operate automobiles with confidence. So the self-starter served to double the number of potential drivers, opened up an entirely new market by making available a new group of purchasers to the manufacturers of motor cars and immeasurably increased the field of usefulness of the automobile. Along with the introduction of the self-starter came the development of better batteries and generators, and these improved units in turn led to the increased use of electrical automotive equipment and accessories.

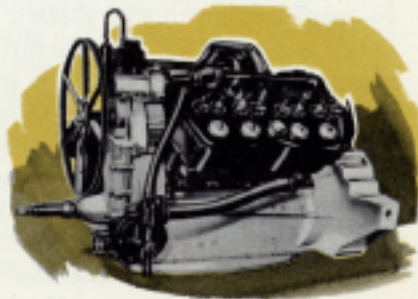


As the need arose, General Motors began producing lights, horns, generators and other items of electrical equipment for its own cars and those of other manufacturers.

1914-1917: The First World War

World War I starts in Europe. The Panama Canal is officially opened. The "Tango" and "Hesitation Waltz" are popular dances. In 1917, the United States enters the war. The Virgin Islands are purchased from Denmark.

The first high-speed V-eight automobile engine* was introduced in this country by Cadillac in 1914. (Later, in 1923, the General Motors Research Laboratories developed the 90° V-8 crankshaft, giving an inherently balanced engine.) The following year, 1915, Cadillac brought out tilt-beam headlights, a development which at that time



*For more about internal combustion engines, see the booklet, "A Power Primer," available without charge from General Motors, Detroit 2, Michigan.

constituted an important contribution to night driving safety.

With the entry of the United States into the World War, the facilities and experience of General Motors were made available to the Government. After extensive tests in Texas in 1917, the Cadillac car was adopted as a standard model for war use. Ambulances, trucks, Liberty aircraft engines and field kitchen trailers were among the many other products manufactured by GM and shipped overseas.

1918: Chevrolet and United Motors

First air mail service starts between New York and Washington. In November, the Armistice is signed.

Early in 1918 Chevrolet joined the General Motors family. From the time of its organization in 1911 Chevrolet had moved steadily forward, establishing assembly plants in strategic areas. In joining the Corporation it rounded out the General Motors line of cars to cover every price class. Chevrolet continued to progress and for years has been the leading producer of passenger cars in the industry.

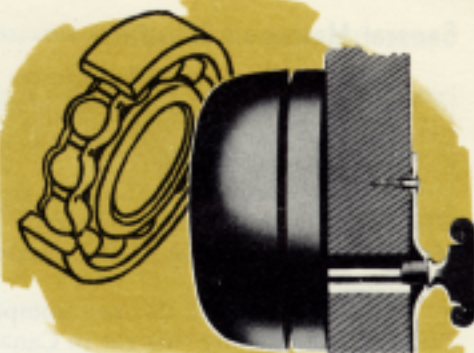
In the same year, United Motors likewise became a part of General Motors. This organization consisted of a group of companies closely related to the automobile business, including the Dayton Engineering Laboratories, Remy Electric, Klaxon, Harrison Radiator, Jaxon Steel Products, Hyatt Roller Bearing, New Departure and United Motors Service, Inc. United Motors Service today handles field distribution and service on the parts and accessories manufactured by accessory divisions of General Motors.

To the parts and accessory manufacturing companies mentioned above—that came into General Motors as parts of the original United Motors organization—have been added the facilities of such companies as North East Electric (now Delco Appliance Division), Guide Lamp, Inland Manufacturing, Moraine Products and Packard Electric. The operations of the accessory and parts group have further aided in providing a closer supervision over the manufacturing methods, quality and costs of such products.

Doorbells and Bearings

Two of the companies that formed the original United Motors group—New Departure and Hyatt—deserve mention both because of the important position they now hold in their industries and because their origins are of more than passing interest.

Around 1888, E. D. Rockwell and A. F. Rockwell, who ran a hardware store in Florida, invented a doorbell run by clockwork. They called it the "New Departure Bell" because it was unlike anything then on the market. In 1889 they organized the New Departure Bell Company in Bristol, Connecticut, to manufacture the doorbell and later added a bicycle bell that became very popular. In 1898 the brothers developed a device that would permit a bicycle to coast while the pedals remained stationary. The following year a brake was added, the famed New Departure Coaster Brake. In 1906 the company started the development and manufacture of ball bearings, and the New Departure Division has since become a leading manufacturer of ball bearings and steel balls.



In 1892 John Wesley Hyatt organized the Hyatt Roller Bearing Company to manufacture a heavy duty anti-friction bearing he had developed. R. E. Olds used Hyatt bearings in his first cars and Hyatt soon came to supply most of the automobile industry's roller bearing requirements. In 1895, Alfred P. Sloan, Jr. (now Honorary Chairman of the Board of General Motors Corporation), started his business career working as a draftsman with the Hyatt organization.

Harrison Radiator: Delco-Remy

Established in 1910, the Harrison Radiator Company in Lockport, New York, joined General Motors as one of the units of United Motors in 1918. Consistently playing a leading part in the development of automotive cooling systems, this division now produces radiators, heaters, air conditioning systems, defrosters and thermostats for automobiles, and heat exchangers for various purposes.

Another of the original United Motors group was the Remy Electric Company, which had been organized by the Remy brothers of Anderson, Indiana in 1896 and incorporated in 1901. Their early products were magnetos; later generators were developed. In 1926 Remy Electric became Delco-Remy.*

* For a simplified story of electricity and the automobile, see the booklet, "Electricity and Wheels," available without charge from General Motors, Detroit 2, Michigan.

General Motors in Canada

While the automobile industry was growing and expanding in the United States, similar developments were taking place in Canada. The year 1867 saw the beginning of a company that later was to be the basis of General Motors there. During that year, Robert McLaughlin manufactured his first carriage in a small Ontario town. His company grew and prospered, and in 1907 his son R. S. McLaughlin became one of the founders of the McLaughlin Motor Car Company, Ltd.

At its inception, this new company executed a contract with Buick to manufacture that car in Canada. In 1915, the McLaughlin

interests organized the Chevrolet Motor Company of Canada under an agreement with the United States Chevrolet organization, to produce Chevrolets in Canada. When the United States Chevrolet Motor Company joined General Motors in 1918, the two Canadian companies (McLaughlin Motor Car Company, Ltd., and Chevrolet Motor Company of Canada) merged to form General Motors of Canada, Ltd. The main factory at Oshawa is the largest automotive plant in Canada and engines are supplied from GM plants, one at Windsor, Ontario, and the other near St. Catharines, Ontario.

A separate General Motors subsidiary, The McKinnon Industries, Limited which was organized in 1878 and joined GM in 1929, contributes to the production of General Motors Canadian cars by supplying a number of major units such as front and rear axles, transmissions, engine assemblies, steering gears, along with shock absorbers, hydraulic brakes, fuel pumps, oil filters and car radios. It also makes ignition systems including spark plugs, starting motors, generators, distributors, ignition coils, voltage regulators, horns; and produces fractional horsepower motors for washing machine, refrigerator and oil burner fields as well as rotors and stators for hermetic units. Ball and roller bearings, castings and forgings are also manufactured. The McKinnon Industries plants are at St. Catharines and Grantham Township, Ontario.

General Motors is also represented in Canada by Frigidaire Products of Canada, Ltd., at Scarborough, Ontario. This operation became a separate division on December 31, 1941 and has since engaged in the manufacture of domestic electric refrigerators, electric ranges, food freezers, automatic washers, electric dryers, dishwashers,



commercial refrigeration apparatus and air conditioning equipment for Canadian customers.

In August, 1949, a new subsidiary—General Motors Diesel Limited—was established at London, Ontario, to take care of the increasing demand for Diesel-electric locomotives for all classes of railway service in Canada. This company now also produces Diesel-electric generator sets and distributes the smaller Detroit Diesel engines throughout Canada.

Coming of Age

By 1918 the automobile industry was generally established on a firm basis. Companies that had weathered the "growing pains" period of the industry were adopting a long range manufacturing philosophy of making products that people would buy and use—making them for a price that would reflect the maximum in value to the customer, and at the same time adequately compensate those who designed them, those who supplied the materials out of which they were made, those who built them, sold them, serviced them and those whose savings permitted all these things to be done. Improved tools, machinery and working conditions all contributed to more efficient operation, which in turn lowered the cost of the products, enabling more people to buy, and making more work to be done at better pay.



1919: Body by Fisher

"Dardanella" and "Hindustan" are the year's song sensations. The NC-4 makes the first trans-Atlantic flight.

Shortly after the first World War, the Fisher Body Corporation allied itself with the General Motors family. That organization had been founded eleven years before by Fred J. and Charles T. Fisher who were the eldest of the six Fisher brothers to become active in the automotive field.

The Fisher brothers, whose father had been a carriage builder in Norwalk, Ohio, had been trained by him in his craft. From that training, they realized that the buggy-type bodies then being supplied to the automobile makers could not withstand the stresses and strains imposed on them. So, on July 22, 1908, the two oldest Fisher brothers started their own factory in Detroit. Soon, the bodies they made won acceptance for their strength and durability.

But, the Fisher brothers also were aware that the open, touring-style body seriously limited the usefulness of motor cars. Failing to protect passengers during inclement weather, early automobiles usually were relegated to the garage for the winter months. So that automobile owners could have year-round use of their cars, the Fisher brothers pioneered the closed body. In 1910, they obtained from Cadillac the first volume order ever placed in this country for closed bodies.

With the passing of the years, Fisher Body supplied an increasingly large share of the General Motors requirements for bodies. By 1919, it became obvious that a closer relationship between the two companies would result in a more efficient operation. It was then that General Motors acquired a majority interest in the Fisher Body Corporation. Seven years later, in 1926, the minority interest was acquired and Fisher Body became a division of General Motors.

Among Fisher Body's contributions to better cars at low cost are: No Draft Ventilation, Unisteel Bodies, and Turret Tops. Today, Fisher Body operates 28 plants in 22 communities spreading employment opportunities over many sections of the country.



Ternstedt

Closely tied to the history of Fisher Body is that of the Ternstedt Division . . . producer of body hardware and fittings.

In April, 1917, Alva K. Ternstedt organized the Ternstedt Manufacturing Company in Detroit. It was to produce a newly-patented closed-car window regulator which was the first completely dependable device of its kind. Practically from the beginning, most of the output from this plant was taken by Fisher Body.

On May 1, 1920 Ternstedt became a subsidiary of Fisher Body. From a small one-product plant, it grew steadily until today it manufactures complete lines of automotive and refrigerator hardware, with plants located in Detroit and Flint, Michigan; Trenton, New Jersey; and Columbus, Ohio. In September, 1948 Ternstedt was made a separate division of General Motors.

Frigidaire

The year 1919 also marks the entrance of General Motors into a field until then relatively untried and untested. In 1916 the Guardian Frigerator Company had been organized as a venture in electric refrigeration. After two years of operation, it was virtually bankrupt, and much of its time was spent in servicing the limited number of refrigerators it had produced. However, General Motors saw the possibilities of a new industry, and acquired the business in March, 1919. The name was changed to Frigidaire, and in 1921 the manufacturing operations were moved to Dayton, Ohio, where the bulk of the electrical equipment production of General Motors was centered. Extensive redesigning of the product, plus exhaustive research in Frigidaire's own laboratories at Dayton, increased sales from year to year, until the name "Frigidaire" has become a household word.

How much research and improved manufacturing methods, combined with the development of new materials, have done for the user of electrical refrigeration is demonstrated by the fact that in 1921 the cheapest Frigidaire refrigerator cost \$714, while today one can be purchased for less than one-third of that amount. Nor is a lower price the only gain, for today's refrigerator contains many more features for the convenience



of the user, and operates many times more efficiently and economically. One of the more important advances in the refrigeration field is the development of a non-corrosive, non-inflammable and non-explosive low pressure refrigerant called Freon (dichlorodifluoromethane), developed in the Frigidaire laboratories with the assistance of the Research Laboratories of General Motors.

The activities of this division now extend far beyond refrigerators. Many American homes today are also served by Frigidaire electric ranges, automatic washers and dryers, food freezers, automatic dishwashers, food waste disposers, water heaters and other appliances, as well as a full line of residential heating and air conditioning equipment. Frigidaire is also a large producer of air conditioning equipment for business establishments and automobiles, and refrigeration products for commercial uses.*

Helping People to Buy

As a part of the broad program of bringing its products within the reach of more customers, General Motors considered that the



sale of its products to the consumer on a basis that would allow him to pay for them out of his income was a perfectly sound economic procedure. Because of this conception, the General Motors Acceptance Corporation was organized in 1919 to provide credit facilities not then generally available to dealers handling General Motors Products, and in turn to the public purchasing these products.

*For a simplified story of how a refrigerator works, see the booklet, "A to Zero of Refrigeration," available without charge from General Motors, Detroit 2, Michigan.

Central Foundry Division

In 1917, when the world was aflame with World War I, the Saginaw Malleable Iron Company was organized. General Motors was one of the new foundry's prime customers and in July, 1919, acquired the company, changing the name to the Saginaw Malleable Iron Division. This union led to rapid expansion and the development of ArmaSteel (ARrested MAlleable STEEL), a new casting material combining the qualities of malleable iron and steel. Castings of ArmaSteel are now widely used throughout industry.



In 1946, the division was renamed Central Foundry Division and expanded to include a new modern foundry at Danville, Illinois, producing both malleable iron and grey iron castings. In 1948, a third plant was constructed at Defiance, Ohio, equipped to produce larger grey iron castings such as engine blocks and heads. Headquartered at Saginaw, Michigan, Central Foundry Division has contributed much to the advancement of the casting industry through the development of modern production techniques and improved working conditions.



DEVELOPMENT AND DIVERSIFICATION 1920-1929

1920: Better Ways to Better Products

Women's suffrage and prohibition go into effect. Radio broadcasting begins to emerge from the experimental as KDKA broadcasts the Harding election.

General Motors early recognized that in no other way can continuing success be assured than to provide the maximum in quality, comfort and value to the buyer. This in turn indicated the necessity for adequate and organized research, especially since engineering departments busy with day-to-day problems could not be expected to undertake long-range research projects.

Accordingly, in 1920 the General Motors Research Corporation (now called the General Motors Research Staff) was established, using as a basis the Dayton Engineering Laboratories Company that



had come into General Motors along with United Motors in 1918.

Under the direction of Charles F. Kettering, the Research Staff, dedicated to the cause of scientific research, provided the needed facilities for making useful the ideas of men. An idea in a man's mind or a patent in his name is of small use in itself to the world at large; the idea or the patent must be brought to fruition through engineering research and scientific development, a process that frequently takes many years and perhaps millions of dollars. General Motors' attitude toward research, like that of the industry in general, has stimulated the work of many engineers, scientists and inventors throughout the nation by providing the resources, the facilities and the talent necessary to bring ideas into a useful form.

It should be mentioned in passing that in the beginning of any new method or new design there is always a large chance of failure. Practically any engineering advancement is at first a gamble. The public sees only the successful conclusion; it does not see the failures along the way, failures that cost money. Only adequate resources, plus a determination to seek better ways, permit an organization and an industry to take these chances of failure and develop new methods of production and explore the unknown ways of doing things better than they have ever been done before.

Results That Count

Through the years this policy of concrete encouragement to research has helped to add to the world's store of knowledge concerning the automobile, and has played its part in making cars better and lower in price. Many important advancements originated in the Research Laboratories; others which had been worked out in theory elsewhere, were here adapted to a practical use. The list is a long one, but a few of the more outstanding contributions had to do with Ethyl gasoline, which did much to permit the development of high compression engines with their greater efficiency and power; the Diesel engine development, resulting in a new type two-cycle engine that started new factories and brought efficient, low-cost Diesel power to the railroads and ships; gear studies, that contributed to better rear axles and transmissions, and reduced customer service troubles; harmonic balancers, making engines run more smoothly; chromium plating, for better protection of decorative metal parts; crankcase ventilation, minimizing engine troubles that might be caused by



corrosion; cold room studies, contributing to the establishment of standard low viscosity oil grades for winter use; Duco lacquer finishes, now used for many other things besides automobiles; intake silencers, for more quiet operation, and extensive studies having to do with such things as brakes, air flow, combustion, steels and bearings.

1923: A Better Finish for Your Car

"Couéism" arrives from France. "Yes, We have No Bananas" is heard everywhere. Coolidge becomes President when Harding dies.

One of the many interesting scientific achievements in which the Research Staff played a leading part was the development of what is known as "Duco" lacquer.

The problem of finishing an automobile body had long been an annoying one. To finish a fine car, such as a Cadillac, took 30 days—and even then the finish was not very durable. At any given time a large number of cars were drying in the paint shop, resulting in slower production and



consequently higher costs to buyers. Extensive research in the field of chemistry finally resulted in the development of a fast drying, hard and durable synthetic lacquer, produced from a base of cotton linters. Factory finishing time was reduced to a matter of hours. In 1923 this Duco finish was first used in production, on the Oakland car. Through this research effort automobile owners gained a better finish for their cars—one that is easily cleaned and highly resistant to deterioration and that protects the value of their investments by retarding appearance depreciation. In addition, Duco finish has made possible the use of a wide range of colors on standard production cars.

Moraine Products Division

Continuing its search for still other ways to improve products, the General Motors Research Staff also developed the Durex bearing. This was a bearing made of powdered metal compressed under tremendous pressure and heat-treated to give it strength. Because of its comparatively porous structure, such a bearing has remarkable lubricating qualities. In many installations, these bearings are impregnated with oil when they are assembled into the product and thereafter require no further lubrication for the life of the product.

To manufacture this product commercially, the Moraine Products Division was established in 1923. In 1942, the Delco Brake Division—which had originally started as the hydraulic brake department of Delco Products Division—was merged with the Moraine Products Division. Together they turn out a diversified line of products consisting of engine bearings, automatic transmission parts, porous metal products, hydraulic brake units and fluid, and a number of powdered metal parts such as bushings, gears, etc.

Inland Manufacturing Division

The year 1923 was also the birth year of another General Motors division which was to grow far beyond the original products it was formed to make. The Inland Manufacturing Division was organized to produce a steering wheel with a wood veneer rim, and in time became the world's leading producer of wood steering wheels. As scientific advancements in the utilization of rubber compounds progressed, the Inland organization concentrated its facilities on the exploration of this new field, and later on plastics. It now pro-

duces steering wheels, motor mountings, ice trays, brake lining, ball joints, foam rubber sealing strips and various other rubber and plastic products.

Brown-Lipe-Chapin Division

Also at this time, the Brown-Lipe-Chapin Company situated in Syracuse, New York became a full-fledged Division after having been connected with the General Motors Corporation since 1910. Originally established in 1895 to make a two-speed bicycle gear, it later turned to manufacturing spur and bevel gears that were very favorably received by the early car-builders.

Now, the Brown-Lipe-Chapin Division is engaged in producing hub caps, bumper guards, radiator grilles, die casting and miscellaneous chrome-plated parts. Besides the factory at Syracuse, another plant is located in Elyria, Ohio, to make the heavier bumper guards and do other work requiring large equipment.

1924: Proving in Advance

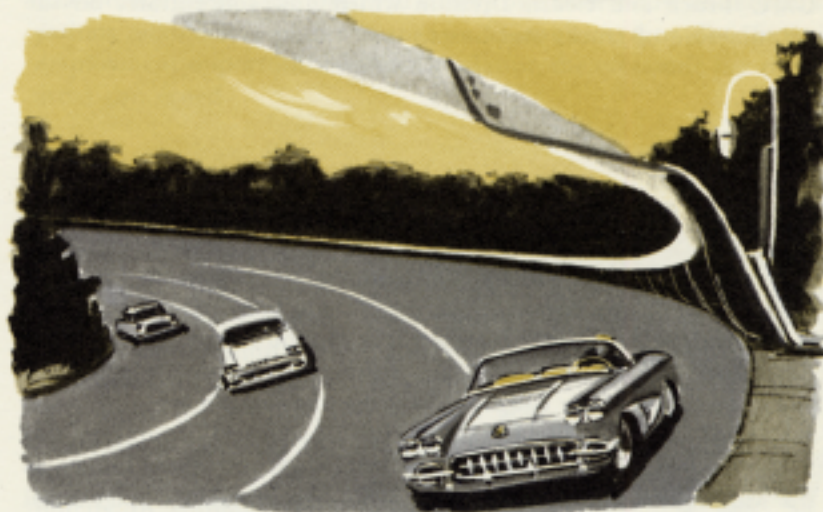
The crossword puzzle craze sweeps the country. Radio loud speakers blare "It Ain't Gonna Rain No More." U.S. Army airplanes fly around the world, take 175 days.

By 1924 it was apparent that adequate facilities for testing cars under actual driving conditions were necessary. Accordingly, a 1,268 acre site was purchased near Milford, Michigan, and the General Motors Proving Ground established. Miles of roads surfaced with various materials, a high-speed track, and numerous hills with a variety of grades provide exceptional testing facilities. In addition, complete repair shops and living quarters, a weather bureau, a sound laboratory and engineering offices are maintained. Experimental garages are operated by all the car divisions and others which use these facilities a great deal. Here new devices and new models are tested scientifically under all operating conditions. Cars of other manufacturers are also tested at the Proving Ground, providing data by which the cars of General Motors can be evaluated against other makes. About 180 million miles have been driven by test cars in this outdoor laboratory.

Later a proving ground specifically for military vehicles was

established adjacent to the original site, and in 1954 the purchase of additional land brought the total area at Milford to 3,875 acres.

Additional testing facilities were established near Mesa, Arizona, where 2,274 acres of land were purchased and a five-mile circular test track built. Known as the Desert Proving Ground, this



location permits the testing of cars under extremes of heat and dust.

General Motors also set up in 1954 a permanent Engineering Test Headquarters at the foot of Pikes Peak in Colorado.

Ethyl gasoline, already mentioned, was placed on the market in 1924, and four-wheel brakes, the result of long years of study of braking characteristics, made their appearance on Buick cars.

1925: Trucks, Buses and Taxicabs

The land boom in Florida runs wild. Dirigible "Shenandoah" crashes in Ohio. William Jennings Bryan dies.

Mention has already been made of the formation of the General Motors Truck Company. In 1925, this company was merged with the Yellow Cab Manufacturing Company to form an entirely new company known as the Yellow Truck and Coach Manufacturing Company. The original Yellow Cab Manufacturing Company had been organized in 1920 from the old Walden W. Shaw Livery Com-

pany of Chicago to produce taxicabs and later buses. By acquiring a large interest in the new Yellow Truck and Coach Manufacturing Company, General Motors broadened its investment in the commercial vehicle field. When the remaining interest was made available in 1943, General Motors accepted the opportunity to form the present GMC Truck and Coach Division which now concentrates on the manufacture of trucks and buses.

GEIC

The General Exchange Insurance Corporation was organized in 1925 to write the insurance covering products whose sales were financed by General Motors Acceptance Corporation. In the early days of GMAC the instalment buyer had not been required to carry insurance, but with the expanding use of motor cars, insurance became a necessity. Fire and theft insurance was originally provided, and several years later collision coverage was also offered.

In 1939, the General Exchange Insurance Corporation was augmented by the formation of a new GMAC subsidiary known as the Motors Insurance Corporation. This step broadened the overall financing insurance activity and gave more complete coverage to meet the insurance needs of automobile buyers and owners.

1926: The Pontiac Car

Byrd flies to the North Pole, and "talkies" reach the screen. The "Charleston" shakes the nation's dance floors.

With the 1926 model year the Pontiac car made its appearance, produced by the Oakland organization. This addition to the General Motors line was made in accordance with the Corporation's fundamental policy of building a car for every purse and purpose. At that time the Chevrolet was a four-cylinder car, and it was felt that a large potential market existed for a six-cylinder automobile selling at a price between the Chevrolet and the Oldsmobile. This soon proved to be a fact as Pontiac sales rapidly increased and eventually led to the concentration of the entire Oakland plant on Pontiac production.

Manufacturing and assembly facilities of the Chevrolet organization were expanded to provide for the growing popular demand for the Chevrolet car, a demand that was to be accelerated still more by the change from a four-cylinder engine to a six-cylinder engine in the 1929 models. Chevrolet was the first low priced car to take this step. Chevrolet's growth was followed closely by Fisher Body, both organizations establishing plants in many communities, thus distributing employment opportunities and stimulating the economic life of the areas concerned.

Group Insurance

In December, 1926, the General Motors Group Insurance Program was set up. Both the employe and the Corporation contribute toward the cost. In 30 years of the Program's existence, it has paid out more than 362 million dollars to employes and their beneficiaries.



Protection under the program has been improved and broadened from time to time. As revised in 1955, it provides life insurance, lump sum payments in case of accidental death or dismemberment, weekly payments in case of sickness or accident for up to 26 weeks, payment of life insurance in monthly instalments in case of total and permanent disability, and continuation of a portion of life insurance after age 65, even if retired. Since 1950, General Motors also pays half the cost of coverage for the employe and his family under hospital, surgical and medical expense insurance plans.

More than nine out of ten eligible employes participate in the Corporation's insurance program.

Health and Safety

Along with the economic protection afforded by these insurance plans, General Motors also set up extensive facilities to guard workmen against occupational disease, to protect their general health, and to promote safety on the job. This activity grew from a one-man



operation to the point where, today, professional medical staffs of 160 physicians and more than 800 registered nurses, technicians and staff members sustain the health of employes throughout the various divisions. At the same time, a highly trained corps of ventilation engineers, industrial hygienists and safety directors devote their full time to devising safe and healthy working conditions. For its achievement in improving its safety record, General Motors has received since 1942 twelve awards of honor from the National Safety Council.

Training for Advancement

Besides the more direct methods of helping employes achieve security, General Motors also provided a means for them to prepare for more responsibility. It was during World War I that the sudden and acute need for trained men served to focus attention on the value of "know-how" not only for individual advancement but for industrial progress as well.



As a result of this emphasis on the value of education and training, an evening school sponsored by the factory employes in Flint was organized in 1919. Its original purpose was to provide spare time courses to meet the training needs of employe groups and plant organizations. In 1920, this educational activity was extended to cover fore-

man training. By 1924, full-time Cooperative Engineering courses were added to develop qualified employes for more responsible positions by giving them broad practical experience together with thorough academic training.

In 1926, the school officially became a part of General Motors and is now known as General Motors Institute. As this educational activity continued to expand, a Dealer Cooperative Training Program was established to prepare young men for positions of responsibility with dealerships and distributors of GM products. Following that, a Cooperative Business Administration course was added to train young men in those phases of General Motors operations.

Students enrolled in cooperative programs have been selected from applications received from all parts of the United States and Canada by GM units that participate in the program. They have followed a program that alternates periods of work at their GM unit with classroom and laboratory study at the Institute. Beginning in 1945, graduates of the four-year programs have been eligible for a Fifth-Year Continuation Program of directed work experience and project studies leading to Bachelor's Degrees.

Several expansion programs have resulted in a total building area of 300,000 square feet. Continuous improvement in classroom and laboratory facilities has provided for the highest quality of engineering and allied technical fields of education.

In addition to the cooperative programs, a large number of special courses have also been conducted to meet the specific needs of General Motors divisions and dealers. In recent years enrollment in the cooperative programs has reached between 2,500 and 3,000. Each year more than 34,000 other individuals have benefited through management, technical, and distribution training programs. The Institute faculty and staff also have provided advisory services to the training and educational needs of the divisions. Thus the Institute has acted as a central training service in a vast program by which General Motors develops people for their own and the Corporation's advancement.

1927: Modes and Motors

Lindbergh flies the Atlantic solo. Holland Tunnel opens for traffic. Mississippi floods make 600,000 homeless.

Mention has been made before of how the early-day problems of the automobile industry were chiefly concerned with building cars that would run. As time went on these problems were solved and the motor car became a reliable and economical means of transportation. Accordingly, both the engineers and the public began to think more



about the appearance of their cars. At the same time, improvements in manufacturing processes, particularly in the forming of sheet metal, made it possible to design more pleasing automotive contours, and gradually to get away from the angular, box-like bodies typical of the industry in the mid-twenties.

General Motors led in recognizing the growing consciousness of automobile styling with the establishment of the Art and Color Section (now known as the Styling Staff) in June, 1927. From its beginning, this group has acted as a central design staff for the car divisions of the Corporation. Later, in 1934, the activity was expanded to embrace the field of industrial design, notably that of the new Diesel streamlined trains then coming into use. The Styling Staff maintains separate design rooms where the exterior styling of the various General Motors cars are worked out independently of one another. Its work also extends to colors, color combinations and automotive interiors, in addition to the styling of many other General Motors products, and the creation of exhibits and displays.

1928: Research and Diesels

Hoover defeats Smith and tours South America. The Graf Zeppelin reaches America. The "bunion derby" races from Los Angeles to New York.

During their work on anti-knock fuels, the Research Laboratories became interested in the Diesel engine, and in 1928 started on a long trail of experimentation with this type of engine. Diesel engines were nothing very new, but the ones in use were so heavy that they had been limited to certain applications where weight made little difference. As a result of the work of the Research Laboratories, the modern two-cycle Diesel was developed commercially and the weight per horsepower reduced to a point where these Diesel engines became practical for many new uses. Other improvements, especially in the fuel injector system, markedly increased their dependability and efficiency.

In connection with this program, General Motors had had some dealings with the Winton Engine Company of Cleveland. This company was a small manufacturer of four-cycle marine Diesels and

gasoline engines. It had been a successful business but lacked capital for necessary expansion and research. Its stockholders recognized this and in 1930, faced with the depression, offered General Motors the opportunity to purchase it. This later became the Cleveland Diesel Engine Division, which now produces principally large marine Diesel engines.

By 1935 the GM Diesel engine had made such progress with the railroads that the Electro-Motive Division was established, carrying on the name of the Electro-Motive Company of Cleveland, a small producer of gasoline-electric railcars which had been acquired by General Motors in 1930. A new plant was erected at La Grange, Illinois for the mass production of Diesel-electric locomotives, and



thus began a new industry and a new product which eventually supplanted the steam locomotive. This division now also produces large Diesel-electric stationary and mobile power units and oil drilling rig units.

The Detroit Diesel Engine Division began operations in 1938, producing Diesel engines for industrial, marine and oil field installations as well as for trucks, coaches, tractors, and all types of portable and stationary applications, and Diesel generator sets.

These three divisions now manufacture a complete line of Diesel engines in sizes varying from a two-cylinder 40 horsepower model up to 16 cylinder engines generating 3,500 horsepower.

Delco-Remy, Delco Products and Guide Lamp

Late in 1928, the Delco-Remy Corporation (a consolidation of the original Dayton Engineering Laboratories and Remy Electric

**For more about Diesel engines, see the booklet, "Diesel, the Modern Power," available without charge from General Motors, Detroit 2, Michigan.*

Company of Anderson, Indiana) was reorganized into three groups. The Remy Electric Company in Anderson was given the name Delco-Remy. It continued to manufacture units for starting, lighting, and ignition systems as well as horns, locks, and storage batteries. Among other technical advances, it pioneered the 12-volt electrical system for passenger cars in 1953.

The Dayton plant of the original Delco-Remy Corporation became known as the Delco Products Division. This division manufactures hydraulic shock absorbers, electric actuators, fractional and integral horsepower electric motors, electric generators, and garage door operators.

The third new unit was Guide Lamp Corporation, a consolidation of the Guide Motor Lamp Manufacturing Company of Cleveland and the lamp business previously carried on by Delco-Remy. In the annual report for that year, the following comment appeared relative to the organization of Guide Lamp:

"This step will make for better safety factors in driving automobiles at night, which is a most important consideration."



Later the Guide Lamp Division was instrumental in developing the Sealed Beam type of headlight which is mentioned later in this booklet.*

1929: Assisting Dealers With Their Finances

Byrd flies to the South Pole. Einstein announces a new theory combining relativity and electricity. An automobile speed record of 231 miles per hour is set by Seagrave at Daytona Beach.

In 1929, General Motors Holding Corporation, now known as the Motors Holding Division, was created for the purpose of furnishing capital to dealers holding a General Motors franchise, in such amounts as might be necessary to adequately capitalize the dealership.

* For a story of the progress in automobile headlighting, see the booklet, "Optics and Wheels," available without charge from General Motors, Detroit 2, Michigan.

To qualify for such investment, the dealer must satisfy the Division as to his experience, capacity and character and be in a position to personally invest at least 25% of the total capital required. When Motors Holding makes its investment, it requires the dealer to agree to use all his available profit toward the retirement of its interest, thus assuring the dealer's full ownership of the business as quickly as the profits will permit.

The following three categories represent typical circumstances where the Motors Holding Division furnishes capital to a dealership:

1. To supplement a prospective dealer's capital resources to enable him to establish a new dealership.
2. To recapitalize an existing dealership in order to strengthen the company's financial position and thus enable the dealer to take full advantage of the market.
3. To enable a dealer to buy out inactive partners or to move efficiently reorganize his capital structure.

Many strong dealerships have been developed over the years by the Motors Holding Plan. It represents an important aid to "small"—and not so small—business.

Allison Division

The Allison Engineering Company was established in Indianapolis in 1913, and for years was concerned primarily with the development of various types of internal combustion engines. On the death of the owner in 1928, the business was offered to several companies, but General Motors was the only one which would agree to keep the organization intact, and in 1929 Allison became a part of the Corporation. At that time it was almost entirely an experimental engineering organization, and the acquisition was actually an extension of GM's research and development activities.

Under General Motors leadership, Allison concentrated on developing a 1,000 horsepower liquid-cooled aircraft engine. This Division's efforts met with spectacular success in 1937 when it pro-



duced the first 1,000 horsepower engine ever to pass the rigid Army Air Force acceptance tests.

When war started in Europe, the production and building program at Allison was accelerated to meet not only our own defense needs, but also to fill urgent war orders from the British, French and Chinese as well. By the time of Pearl Harbor, Allison had a smooth-running production organization already prepared to meet the wartime demands for high-powered plane engines. It also had developed a special sleeve bearing that was capable of withstanding the critical loads developed in powerful aircraft engines.



Since World War II, Allison engine activities have been concentrated on the development and production of turbo-jet engines for the military, and prop-jet engines for military and commercial aircraft. In addition, this division produces aircraft propellers, transmissions and torque converters for heavy-duty vehicles, precision bearings, and Diesel locomotive parts.

Delco Appliance Division

The North East Electric Company, which had been organized in Rochester, New York, in 1908, was a manufacturer of automobile electrical equipment. In 1929 its owners were faced with the necessity of spending a substantial sum of money to modernize their plant and production equipment, and rather than doing this they offered the company for sale to several organizations. General Motors purchased it and later it was consolidated with the Delco-Light Company, eventually becoming the Delco Appliance Division. This division now manufactures automatic oil and gas-fired heating and air conditioning equipment, electric water systems, fractional horsepower electric motors, and several items of automotive equipment.

PROGRESS IN A CHANGING WORLD

1930-1940

1932: Packard Electric

U. S. sees total eclipse of sun. Hoover and Roosevelt campaign. Los Angeles plays host to Olympic games.

The Packard Electric Company of Warren, Ohio, was a supplier to General Motors of wire products. It had been founded in 1890 as a producer of lamps and transformers, then developed the Packard automobile, but in later years concentrated on the manufacture of electrical cable and allied products. In 1932 the management undertook negotiations to sell and General Motors purchased the company. First operated as part of Delco-Remy, it became a separate division in 1940.

In July 1943, the Sunlight Electrical Division was combined with the Packard Electric Division. The former had been a part of General Motors since 1933, making fractional-horsepower electric motors for household appliances.

1933: Results of Research

The Eighteenth Amendment is repealed. "Century of Progress" opens at Chicago. N. R. A.'s Blue Eagle soars over the land. The U. S. dirigible "Akron" is lost at sea.

1933 saw the culmination of two more adventures into the realm of research. After prolonged tests, including wind tunnel experiments and tests under actual road conditions, No Draft Ventilation was introduced by Fisher. This system of controlling drafts within the interior of the car has since become familiar to motorists everywhere. The same year independent front wheel suspension (popularly known as Knee-Action), using coil instead of leaf springs, was introduced on General Motors cars and won immediate acceptance by virtue of its improved riding and steering qualities. These advancements, like so many others, were the result of long months of study and testing, experimental cars having been driven many thousands of miles at the Proving Ground and on the public highways before the designs were finally put into production.

Customer Research

As a result of the large scale operations and world-wide distribution of modern business, producer and consumer began to be more widely separated, so that keeping a business sensitively in tune with requirements of the ultimate consumer became increasingly important.

A central staff conducting market surveys of various types had been maintained by General Motors for a number of years. In 1933 this activity was further expanded along more specialized lines by the establishment of a special department known as the Customer Research Staff, whose prime purpose is the study of the preferences of automobile owners. In a sense, the Customer Research Staff might be called a "Proving Ground of Public Opinion," finding the facts concerning the attitudes of the practical motorists toward various aspects of design, merchandising and service. It operates in close



cooperation with the Research Staff, the Styling Staff, the Proving Ground and the various divisional engineering, sales and service organizations. Information on motorists' preferences is obtained largely through questionnaires, of which upwards of 2,000,000 have been distributed yearly.

Viewed broadly, Customer Research is much more than a survey activity. A message to stockholders, dated September, 1933, emphasized its fundamental importance as follows: "To discuss Customer Research as a functional activity would give an erroneous

impression. In its broad implications it is more in the nature of an operating philosophy, which, to be fully effective, must extend through all phases of a business—weighing every action from the standpoint of how it affects the goodwill of the institution, recognizing that the quickest way to profits—and the permanent assurance of such profits—is to serve the customers in the ways in which the customer wants to be served."

1934: The Dealer Council

Dionne quintuplets born. The Army flies the mail and the Philippines get promise of independence. Drought hits the West.

Late in 1934, a plan of far-reaching importance, designed to broaden and give direction to the relationship between General Motors and its dealers, was placed in operation through the creation of the General Motors Dealer Council. The membership includes dealers comprising each line of General Motors cars and trucks, both from large cities and the smaller cities and communities, giving consideration to the geographical spread across the country. There is a separate group for the large cities and another for the other cities; each of these groups contains nineteen dealers and the membership is changed each year, thus bringing together new dealers and fresh viewpoints. There is also one separate group of dealers from Canada. The Dealer Council meets periodically with General Motors executives for an informal round table discussion of topics and problems of interest and benefit to the nationwide dealer group and to General Motors management in formulating and maintaining policies in connection with the sale of cars and trucks. In addition, each of the Car and Truck Divisions has somewhat similar meetings with a group composed of its own dealers.

1935-1937: More Opportunities for Jobs

Chain letter craze at its height. Edward of England abdicates. Franklin D. Roosevelt starts new term. The "Hindenburg" burns at Lakehurst.

Early in 1935 General Motors started on a new program of plant modernization and construction in widely separated sections of the country, a continuation of its policy of decentralization. One advantage deriving from this policy is the spreading of employment and other economic benefits over many communities.

The appropriation for the reorganization, readjustment and



expansion of the manufacturing facilities of the Corporation amounted to \$50,000,000 at that time, and it was supplemented in 1937 by an additional \$61,725,000. During this period new plants were built or acquired in 17 communities.

On the 1935 General Motors cars, the all-steel Turret Top appeared, the result of long research by the Fisher Body Division. Giant presses were designed and built expressly for this purpose, and special steels developed. Safer, more durable and better looking, the all-steel Turret Top eliminated the annoying maintenance

problems of the old style fabric coverings.

Alfred P. Sloan, Jr., who came to General Motors as Vice President in 1918* and was elected President of the Corporation in 1923, was elected Chairman in May, 1937 and William S. Knudsen, formerly Executive Vice President, became President.

Delco Radio: Rochester Products

With the increasing demand on the part of the motoring public for automobile radios, General Motors in 1936 undertook to supply a portion of its radio requirements. The Delco Radio Division was formed and manufacture started in Kokomo, Indiana. From a small beginning it has grown to be a large producer of automobile radios and has also been instrumental in developing various technical advances in this field. Through its extensive research program, it has become a large producer of transistors and was one of the first to utilize them in car radios.

The story of the Rochester Products Division emphasizes the importance of flexibility and versatility in meeting changing conditions. In 1937, it was decided to build a second plant for the Delco Appliance Division in Rochester, New York. This new factory was opened in 1938. The following year, it was accorded divisional status

*Mr. Sloan was President of United Motors when that group of companies joined General Motors in 1918.

as the Rochester Products Division. It manufactured more than 120 products, including instrument panels, shock absorbers, horns, generators, ignition coils, air cleaners, starting motors, and hydraulic brake cylinders.

But just a few years later, even before Pearl Harbor, the Rochester Products Division was 100 per cent converted to the manufacture of war products, a few of which were similar to their former peacetime products, but most of which were entirely new. Like all the other GM divisions, it played a vital role in the war effort . . . a story that is covered later in this booklet.

At the conclusion of the war, the Rochester Products Division was called upon to begin the development of fuel devices, and it is now producing carburetors, fuel pumps, and steel tubing for fuel, oil and hydraulic brake lines. In 1956, when General Motors introduced fuel injection systems on certain models in the 1957 Chevrolet and Pontiac lines, Rochester Products cooperated in the development of the system and established the facilities for production of fuel injection units. The division also manufactures locks, cigarette lighters, and steel tubing for the refrigeration industry.

1938: The Dealer Relations Board

As a further step in implementing the management philosophy expressed through the formation of the General Motors Dealer Council in 1934, a Dealer Relations Board was established early in



1938, consisting of ranking officers of General Motors under the chairmanship of the chief executive officer. The basis of the Dealer Relations Board was this fundamental policy: "The policy of General Motors Corporation shall be to respect scrupulously its obligations and to discharge them justly—always observing the rights of the Corporation, as well as respecting in equal degree, the equitable rights of those with whom it may be dealing. This might be termed a Policy of Equity."

The Board provided an opportunity whereby any dealer holding a General Motors Selling Agreement had the privilege of an executive review of any administrative decision or policy in which that dealer felt he had been unfairly treated. In all such cases General Motors dealt entirely on a basis of equity.

In 1956, the General Motors Dealer Relations Board was superseded by the General Motors Dealer Relations Umpire. A retired U. S. District Court judge was appointed as the Umpire to adjudicate appeals by dealers from decisions of General Motors Divisions.

1939-1940: Increasing Comfort and Safety

During this time research and engineering continued to make important advancements in their fields. 1939 saw the results of several long-range engineering programs. One of these was the Hydra-Matic Drive, introduced by Oldsmobile on the 1940 models. This device, a combination of a fluid flywheel with an automatic transmission, eliminates the clutch and shifts gears automatically providing greater ease of control and increased flexibility in handling. The Detroit Transmission Division was organized to provide specialized facilities for the production of Hydra-Matic type transmissions, which were also made available on certain Cadillac 1941 models.*

The "Sealed Beam" headlamp, introduced on the 1940 models, was the result of extensive study and experimentation undertaken jointly by the automobile industry, lamp manufacturers, highway officials and other interested groups, and was adopted as standard equipment by practically all car manufacturers. Briefly, the "Sealed Beam" headlamp consists of a sealed unit that maintains its peak efficiency throughout the life of the lamp and eliminates the need for any attention by the owner except aiming.

Another important contribution to greater safety was made the same year with the introduction of a new safety plate glass as standard equipment. The plastic inner layer of this glass gives a greater binding power and also tends to cushion the force of impacts.

* For more about power transmission in automobiles, airplanes and boats, see the booklet, "Power Goes to Work," available without charge from General Motors, Detroit 2, Michigan.

Aeroproducts Operations

In 1940 Engineering Products, Inc., was an experimental engineering organization engaged in developing a new type variable pitch propeller with hollow steel blades. Unable to obtain capital to go into commercial production, the owner approached General Motors and a sale was concluded. Located in Dayton, Ohio and renamed Aeroproducts Division, this organization was active during the war in aircraft propeller development and production for the military, and after the war for military and commercial use. In 1952 it was consolidated with the Allison Division.*

Mr. Wilson Becomes GM President

In June, 1940 Mr. Knudsen resigned as President of General Motors to become a member of the Advisory Commission to the Council of National Defense. Mr. C. E. Wilson, who had been Executive Vice President, was named President.

In 1946 the Board of Directors announced a modification in the responsibilities of top management. Mr. Sloan continued as Chairman of the Board, but more of his responsibilities were delegated to Mr. Wilson, who was designated chief executive officer.

Retirement Program

General Motors inaugurated a program in 1940 to help salaried employes provide for their retirement. As amended in 1950 and 1955, this program contains both contributory and non-contributory features and provides retirement benefits in relation to salary and length of service. Benefits are over and above those the employe receives from Social Security. More than 97% of all eligible salaried employes are participating in the contributory part of the Program.

In 1950, General Motors put into effect a pension plan for hourly-rate employes. Financed entirely by the Corporation, this plan as amended in 1955 provides retirement benefits according to length of service. Benefits are over and above those the employe receives from Social Security.

As of the end of 1956, there were 15,652 former employes receiving retirement benefits under the Hourly-Rate Employes Pension Plan and 4,073 under the Salaried Program.



WORLD WAR II 1941-1945



In 1941 Europe was at war and Hitler had overrun most of the continent. The United States was not yet directly involved, but industry was feeling the effects in various ways. The Allies were ordering military supplies in what then seemed to be astronomical quantities. Under the National Defense Program, contracts from our own military forces were flowing faster and faster. In the first three-quarters of 1941 General Motors deliveries of military materials totaled almost \$250 million.

But this military production was all in addition to civilian production. It was a "guns and butter," situation. It was guns and butter — until Pearl Harbor. The Japanese attack in December changed that overnight. Peace time production lines quickly ground to a halt. Then came the job of tearing out the machinery, and tools, and equipment to make room for war production. Those few machines that could be modified for war time tasks were reconditioned and renovated. A survey of the nation's machine tool needs revealed that some of the machines could be used by other manufacturers in their war programs. Those machines were sold even though the Corporation realized that when it came time to replace them at the end of the war, they probably would be difficult to obtain. Some of the more specialized equipment was stored away for the duration. But much of the non-usable equipment had to be scrapped . . . there simply wasn't enough time or space to safeguard it against the weather.

Meanwhile, the armed services were figuring their needs and "freezing" designs so that they could be mass-produced. Shortly after Pearl Harbor, a flood of war orders was issued to industry. For many months the Corporation's tool-making facilities and the entire machine tool industry had been working at capacity building the special machines and tools so essential for volume production of war materials. As fast as they were completed, new machines were moved into the factories. New assembly lines were established. New contracts were accepted day after day . . . oftentimes with preliminary work starting on them even before the formal papers were signed. As fast as it was humanly possible, General Motors completely revamped its factories and embarked on a new and hitherto untried program.

This was the period when the expression "know-how" was on everyone's lips. It was a broad term but it came closest to defining one of the most important contributions that a company like General Motors had to offer to the war effort.

Factories could be built. Machines could be bought. But to actually do the job required people . . . men and women who had experience, technical training, skill, and aptitude . . . in other words, "know-how." Industry had that "know-how" and it was destined to prove that the system it had built up under free American enterprise could out-produce by far that of any foreign nation, friend or enemy.

At the very beginning, General Motors established several definite policies on war contracts. One was to take such contracts on



a fixed price basis wherever possible, rather than on a cost reimbursement basis. Another was to make price reductions, even on delivered products, as cost reductions materialized. A third was to limit voluntarily its percentage of profit on sales of war materials to approximately half what it had been on commercial products in the last peace time year, 1941.

Another quite definite policy was that of seeking the more difficult production contracts. It was felt that the Corporation's organization, facilities, and experience could be used to the best advantage on the larger, highly technical jobs. This policy was followed throughout the war.

In following this policy, General Motors served as prime contractor on many though by no means all of its war projects. As a prime contractor, that meant that General Motors delivered the final product and was responsible for its performance and quality even though the Corporation alone may not have manufactured all the component parts.

It was natural and inevitable that GM serve in that capacity on many contracts because of the very nature of its organizational structure. The whole corporation consisted of a number of separate divisions who were specialists in various fields. They worked together without lost time or wasted effort because they spoke the same language and used the same measuring stick so to speak.

In addition General Motors had, throughout the years, developed a close working relationship with thousands of independent companies, large and small, who supplied parts and services for GM products. Sub-contracting had always been a means of gaining the benefits of specialization and it was to prove as invaluable in war as it had in peace. More than 12,000 outside companies acted in this capacity. General Motors' previous experience of teamwork with suppliers made it possible to utilize the facilities of many of these smaller companies who might not otherwise have been able to contribute their share to the war effort because their engineering resources or manufacturing facilities were insufficient to handle a complete job.

Another philosophy General Motors lived up to throughout its war program was that of contributing more than just production. The Corporation felt that it was not enough to merely duplicate war products by the millions. All the Corporation's engineering talent too was applied to the jobs at hand. In thousands of cases it was found that redesigning would improve the products, save critically short materials, or minimize the need for hard-to-get machines.

The Corporation also "followed through" beyond the end of the assembly line. A well-organized training service cooperated with

the Armed Forces in setting up training schools and preparing training materials. At these schools, military personnel were given intensive training in the use and maintenance of General Motors war products. And other technical men traveled all over the world as field representatives observing GM-built equipment in action on the fighting fronts and helping to maintain it in first-class condition.

In its all-out war effort General Motors built war products ranging from tiny ball bearings to 30-ton tanks. Guns and ammunition were high on the list. Four divisions built 30 caliber and 50 caliber machine guns. Other divisions made the 30 caliber M-1 car-



bine and still another developed and built the vicious little M-3 sub-machine gun.

Big guns too were produced in quantity. The famed Swiss-designed Oerlikon 20 MM anti-aircraft cannon was re-engineered to conform to American mass-production techniques . . . a job that many experts said couldn't be done because it had been originally designed for hand-production by highly skilled craftsmen. Later, the same GM division that built the Oerlikon produced quantities of the 40 MM Bofors cannon which was the largest automatic weapon used by the Allied forces. GM also made 75 MM cannons, the 20 MM cannon that put terrific fire-power in the noses of our war planes, and the big 90 MM anti-aircraft cannon that reached up toward the stratosphere to bring down enemy bombers flying at high altitudes.

Seven GM divisions turned out huge quantities of projectiles and cartridge cases in numerous sizes and types. The ammunition program included the highly intricate fuses for the blockbuster bombs. It also included the extremely complex aerial torpedo. In this one unit alone, over 5,000 delicate parts were packed into a narrow round steel package less than 20 feet long.

A high degree of mobility is one of the prime requisites of modern warfare and General Motors leadership in the vehicular field helped put the Army on wheels. Ambulances and buses served in personnel transportation. Thousands of 4 x 4 and 6 x 6 trucks with their all-wheel drives served as the "pack-mules" of the Army. Other thousands of trucks were equipped with special bodies to act as mobile repair shops, kitchens, communication centers, and supply depots.

General Motors-vehicular war products also included combat vehicles. The Stag-hound was designed and produced for the British Army. It was a heavily armored, twin-engine, combat car riding on huge tires to probe enemy lines on scouting and reconnoitering missions. The "Duck" was to make a name for itself in amphibious invasions all over the world. Equally at home on sea or land, it forged the connecting link between invading fleets off shore and the beach heads.

And then of course there were the tanks that spearheaded the United Nations offensives. Three GM divisions built these tanks with others helping in the project by supplying sub-assemblies such as power trains, automatic transmissions, etc. These were tanks that were a far cry from the lumbering old predecessors of World War I. Powerful engines and automatic transmissions enabled drivers to maneuver their heavy vehicles over rough terrain with ease, and they

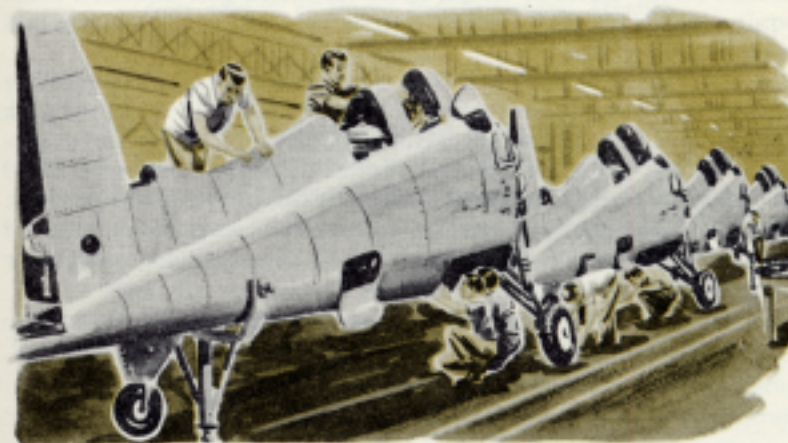
no longer had to stop almost completely in the midst of battle to change gears. And a new type of armor plate with welded construction gave tank crews a maximum of protection.

About 40% of GM's dollar volume of war products was in aviation items. Even though the Corporation already was turning out quantities of its liquid-cooled Allison engines, two divisions built huge new factories to manufacture the Pratt and Whitney radial en-



gine. When jet engines were developed, General Motors pioneered mass production on them too, but the war was to end before they could get into combat.

It was the same with propellers. In addition to the development and production of its own AeroProducts propeller, General Motors also manufactured thousands of the Hamilton-Standard propeller.



Undoubtedly, the Corporation's outstanding role as a sub-contractor was in its output of major sub-assemblies for the B-17 Flying Fortresses, the B-24 Liberators, and the B-29 Super-Fortresses. These included such units as wings, landing gear struts, nacelles, etc. But General Motors also built complete airplanes as well. A temporary GM division known as the Eastern Aircraft Division was organized to consolidate a number of the company's East Coast plants to manufacture complete fighter planes and torpedo bombers for the Navy.

Perhaps the most effective though least dramatic role of any GM war product was that played by the General Motors Diesel engines. They found numerous jobs to do on land, but where they really made a name for themselves was on the sea. Global warfare required huge fleets of ships and landing craft—and a great majority of all but the bigger vessels were powered by one or more GM Diesels.

They could pack a tremendous amount of power in very little space. That was a vital factor in submarines because of cramped quarters but it was equally as valuable a feature in supply vessels because it left more room for cargo. Then too, Diesel dependability and fuel economy permitted far flung naval operations. Even small landing craft could cross the ocean under their own power . . . com-

pletely equipped and ready for battle. It has been said that without the GM Diesel engine the whole strategy of amphibious invasions would have had to be entirely different.

Guns, tanks, planes, trucks, engines—these were the large items, but they give only a hint of the magnitude of General Motors war production job. Thousands and thousands of smaller, less spectacular products helped swell the tremendous output—products like helmet liners, blackout lamps, bombsights and gun directors, radio equipment, Navy deck houses, electric controls, generator sets and many, many others.

All in all, at war's end General Motors had produced military equipment with a dollar value of more than 12¼ billion. At the peak the rate was \$12 million per day. As the nation's largest single producer of war materials, General Motors delivered one-fourth of all the airplane engines, tanks and armored cars built in this country; almost one-half of all the machine guns and carbines; two-thirds of all the heavy trucks; and three-fourths of all Diesel engine horsepower used by the Navy.

The 65 Army-Navy "E" pennants flying over GM plants symbolized these accomplishments. It was truly a record to be proud of.



THE POST WAR PERIOD

1946-1952

1946-47: Reconversion

First meeting of United Nations' General Assembly. League of Nations is dissolved. Women's clothes take on the "new look."

V-J Day was the beginning of a new period of General Motors progress. The first few months were almost a repetition of the activities of three and a half years before, but this time the war equipment went out the back door as the peace time production machinery moved in the front.

There had been some preliminary planning for reconversion, and the Government had encouraged a controlled amount of civilian production after the end of the European war. But with the collapse of Japan in August, 1945, the need for war material came to an abrupt end. Literally overnight, billions of dollars worth of war contracts were terminated. The major problem was a speedy return to peace time pursuits with a minimum interruption of employment. There was urgent need for full-scale production to meet the pent-up demand for all kinds of goods at home and abroad.

By the end of 1945 most of the war time machinery and the



mountains of materials and partially completed work had been removed from the plants. Some of the original equipment, which had been stored for the duration at the beginning of the war, was reconditioned for use. New equipment was purchased to replace that which had been sold. Long before, contracts for parts and materials had been awarded to outside suppliers so that they too would be ready to produce just as soon as everything was set.

It was a mammoth job efficiently carried out, and some cars and other civilian products were coming off the assembly lines within a few months of V-J Day. But strikes—both in General Motors and in major supplying industries—and shortages of materials slowed down the volume production of automobiles. It was the end of 1946 before production began to approach prewar numbers, and for several more years material shortages held production below the hoped-for levels.

In General Motors, reconversion did not mean simply getting plants back in the shape they were in 1941. The postwar program was carefully planned for expansion and improvement. It included the organizing and balancing of existing production facilities, new machines and equipment, and completely new plants. Much of it was aimed at improved working conditions for employes such as new cafeterias and better medical facilities. The result was a more efficient production plant with the capacity needed to meet the growing demands of the country.

In this immediate postwar program, extending for nearly three years, approximately 700 million dollars was spent. This was solid evidence of faith in the country's future at a time when many were wailing of the coming postwar depression.



Diesel Equipment: B-O-P Assembly

Part of this expansion program was a new plant in Grand Rapids, Michigan for the manufacture of Diesel fuel injectors. The manufacture of this critical, high-precision device had been an important part of General Motors Diesel engine program from the very beginning, and for some years had been carried on in the Detroit



Diesel Engine plant. With the war time expansion of Diesel production, this activity was moved to Grand Rapids and given divisional status on January 1, 1944 as the Diesel Equipment Division. Since that time their precision manufacturing capabilities have been extended to include such products as hydraulic valve lifters and fuel nozzles for jet engines.

Prior to the war two plants—one at Southgate, near Los Angeles and one at Linden, New Jersey—were assembling Buick, Olds and Pontiac cars from parts made in the factories of each of these divisions. Immediately after the war in 1945 the Buick-Oldsmobile-Pontiac Assembly Division (commonly called B-O-P) with headquarters in Detroit, was formed to expand this activity. A war plant in Kansas City, Kansas was leased, and construction begun on three new plants in various parts of the country which could be best served by this means. These were at Atlanta, Georgia; Framingham, Massachusetts, and Wilmington, Delaware. In 1953 the addition of another at Arlington, Texas, brought to seven the number of B-O-P plants engaged in the assembly of these three cars. In this way sections of the country remote from the main plants of these divisions can be supplied with cars more quickly and efficiently.

1948: Labor Agreements

Berlin airlift thrills the nation. Whittaker Chambers—Alger Hiss fill the headlines, while Al Capp's "schmoo" is the fad of the year.

In May, 1948 General Motors and the unions representing various groups of its plant employes concluded agreements containing features unusual at that time. The agreements were to extend for two years, and the feature exciting the most interest was the wage formula, which had two principal parts. First, in addition to his base rate of pay, the employe received a cost-of-living allowance which was to be adjusted quarterly in accordance with changes in the Consumers' Price Index issued by the U. S. Bureau of Labor Statistics. Thus wages were geared approximately to cost-of-living.

Second, and more unusual, there was to be an annual increase of 3 cents per hour in the base rate. This was called an improvement factor.

It was felt that this wage formula would carry out the following objectives:

1. To protect the buying power of an hour's work of employes against changes in consumer prices by periodically adjusting the wage level for changes in the cost of living during the life of the Agreement.

2. To improve the buying power of an hour's work so that over a period of years employes would be assured of an improving standard of living.

During the life of the two-year agreements the wage formula helped to provide a solid foundation for good labor relations. It was incorporated, with some changes, in the five-year agreements of 1950 and the three-year agreements of 1955.



1949: Engineering Progress

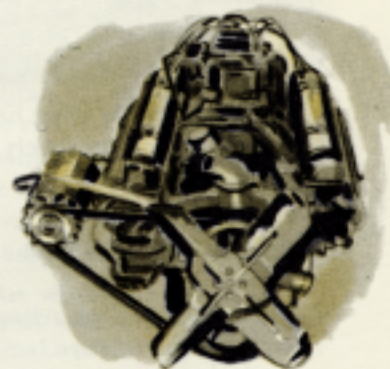
Canasta craze sweeps the country. "South Pacific" opens its astounding run and "Some Enchanted Evening" is heard everywhere.

For several years after the war, the accent was on production. The most important thing was to produce as many new cars as quickly as possible to make up for the years of no production. Thus there were no major changes in design immediately, but the engineers were hard at work and the results soon began to show.

The trend to automatic transmissions continued. The Hydra-Matic, which was already in use by Oldsmobile and Cadillac, was offered by Pontiac on its 1948 models. In the same year Buick made available on one line of its cars its Dynaflo automatic drive, and in 1949 it was offered on all Buick models. This was a hydraulic torque converter which furnished a smooth change through an infinite number of ratios instead of a step-by-step change of gears. And in 1950 Chevrolet introduced the Powerglide, which was similar in principle to the Dynaflo. Now General Motors, the pioneer of automatic drive, could supply this feature on any make of its cars.

Cadillac and Oldsmobile introduced their 1949 models with new engines featuring higher compression than had been used in production cars up to that time. Though individually and separately developed, both engines were V-8's of the overhead valve type, with greater power, better fuel economy and less weight. They were brand-new engines designed with an eye to the future. They took full advantage of the best in anti-knock fuels commonly available, and were readily adaptable to even higher compression with its higher efficiency as the continuing progress in fuels permitted.

Styling did not lag behind engineering during this period. The new body designs featured greater glass area throughout—wider windshields of curved glass, narrower pillars, wider rear windows. The public acclaimed them for appearance, convenience and safety. In 1949 General Motors introduced a completely new body model which was immediately dubbed the "hard top." This was a two-door car with the style and lines of a convertible but with a rigid steel top.





First introduced on three lines, it was quickly made available on all GM cars and immediately began to account for an appreciable percentage of sales.

1950: Fabricast Division

The big year for television, with Milton Berle riding the crest. New York hires rain-makers to relieve the water shortage.

The Allison-Bedford Foundry, at Bedford, Indiana, which had been operated for several years by the Allison Division, was made a separate division in August, 1950. Known at that time as the Bedford Foundry Division, its name was changed after a short time to the Fabricast Division. It specializes in sand cast, permanent mold and die cast aluminum castings and other non-ferrous precision castings.

Korea

This year, 1950, was a year of high production. The added capacity and improved facilities provided by the huge postwar capital investment program were put to good use. Demand for automobiles was high and materials were in better supply than at any time since 1940.

In June hostilities flared in Korea, and the country was once again on a war basis. General Motors gave complete cooperation to the Government in defense planning and stood ready to undertake whatever production jobs the armed services were prepared to assign to it. Those it did receive had first call on all of the technical knowledge and facilities of the organization. But for several months there were few military projects at the production stage, and the demand for civilian items had increased still further due to fear of scarcities and higher prices. As a consequence car pro-

duction remained high throughout most of the year, and ended with record sales of 3,812,163 cars and trucks produced by GM plants in the United States and Canada.

In December a state of national emergency was declared and the military production tempo picked up. Early in the next year all 34 manufacturing divisions in the United States were participating in the defense program. Some defense orders were for military items which GM was already making, such as aircraft propellers, bombsights, Diesel engines and Allison jet engines. Others were for products identical or similar to those made for civilian use, as trucks, ball and roller bearings and electrical equipment. But the largest percentage were for strictly military items unlike any the Corporation made in time of peace. Some of the major contracts of this nature were for light and medium tanks, fighter planes, Sapphire jet engines, radial aircraft engines, shells and rockets.

This was a period somewhat similar to the beginning of World War II. It was the tooling-up or make-ready stage that must precede every mass production program. And this time the objective was not to produce immediately great quantities of arms, but rather to produce enough for our defense forces and in addition to create capacity which could expand production quickly in case of all-out war. Thus actual deliveries of military items did not rise abruptly, but they were substantially in line with Government schedules, and reached a peak in 1953.

With the cessation of hostilities, military production was cut substantially, falling steadily from a figure representing 19 per cent



of total GM sales in 1952 and 1953 to 5 per cent in 1956. Production has continued on any items requested by the Government, and a great deal of research and development work on defense projects is constantly in progress.

Civilian products continued to be manufactured throughout this period. For a time the quantity was reduced due to allocations of certain strategic materials, and prices were controlled, but the production of cars and other peacetime articles did not stop. It was recognized that short of all-out war it was necessary to maintain the dynamic economy from which our strength largely derives.

1951-52: Suggestion Plan

General MacArthur comes home. Reports of flying saucers abound. General Eisenhower elected President.

For many years, some General Motors divisions had carried on suggestion plan programs, and during World War II this was made Corporation-wide. Due to its success from the standpoint of both employe and Corporation, it was continued, and effective January 1, 1951 it was revised to pay higher maximum awards.

An employe submits his idea in writing, and if it is adopted he is given an award. The amount is dependent on the value of the suggestion, and where possible is based on the actual savings it realizes. The maximum is \$2500, payable in U. S. Savings Bonds.

In the first fifteen years of operation, 1,781,633 suggestions have been submitted, of which 420,484 have been adopted. Awards have totaled \$20,425,076.

Better Highways Awards

General Motors had long been interested in the highway problem. Working in many fields and through various organizations, it played an active role for many years in combating this increasingly complicated situation. In 1951, through the cooperation of GM dealers everywhere, the "Let's Get Out of the Muddle" motion picture was shown to more than 400,000 people, and the booklet containing the text of the film was distributed to nearly 800,000.

As the next step in this continuing campaign to overcome our highway and traffic problems, General Motors announced its Better Highways Awards contest in the fall of 1952. This was an essay contest on the subject, "How to Plan and Pay for the Safe and Adequate Highways We Need." The prizes offered totaled \$194,000, the first prize being \$25,000.

There was a wide variety of opinion expressed in the essays but practically all agreed on one point—that it was necessary to arouse the public in order to make any highway program successful. And that was one thing the contest helped to do. In addition to the 44,000 actual entrants, thousands more had some contact with the contest, and still more heard about it and came to realize that here was a problem about which something could be done.

General Motors is continuing to show in various ways its active interest in this field.



PEACE AND PROGRESS

1953-1957

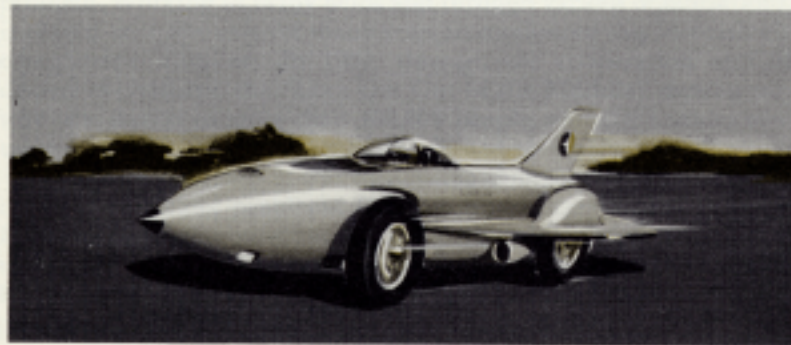
1953: "Dream Cars"

Stalin dies. The third dimension shakes the movie industry, and the Yankees win their fifth consecutive World Series.

The best way to try out a new idea in engineering or styling is to build a model incorporating it and see what it looks like and how it works. This has to be done eventually, and sometimes it pays to build a full-size model at an early stage even though it is certain that many of the features in it will never be used commercially.

This was the thinking behind the building in 1951 of the two cars, XP-300 and Le Sabre. These were completely unorthodox models from the ground up, based on no existing car. Completely new styling, new type of supercharged engine, novel suspension and drive systems, many small details not found on production models—these were truly experimental laboratories on wheels. The public response was enthusiastic, and it was not long before some of these new features were available to the motorist in production cars.

The "dream cars," shown in connection with the introduction of the 1953 and 1954 models, were built with somewhat the same idea in mind. More orthodox mechanically, they gave the stylists a chance to show their new ideas to the public in dramatic futuristic forms ranging from sports cars to sedans to station wagons. Bodies of



plastic reinforced with glass fiber made it possible to produce special forms without the terrific die expense of metal bodies. They were made strictly for experimental and exhibit purposes, but one—the Chevrolet Corvette sports car—so took the public fancy that it was put into limited production in 1953.

At the other extreme was the Firebird I. This was the first gas turbine automobile ever to be built and tested in the United States. Both body and engine were built only for the proving ground and test track, and there was little in it which could be of commercial use immediately, but as part of a long range research program it was invaluable.

New President

Mr. C. E. Wilson resigned from General Motors in January, 1953 to become Secretary of Defense in President Eisenhower's Cabinet. He was succeeded as President and chief executive officer by Mr. Harlow H. Curtice, then Executive Vice-President and earlier General Manager of the Buick Motor Division.

Euclid Division

General Motors acquired on September 30, 1953 the Euclid Road Machinery Co. of Cleveland, Ohio, manufacturers of heavy off-the-road vehicles. On January 1, 1954 this became the Euclid Division. Its principal products are extremely large rear dumps and bottom dumps, self-powered scrapers, log haulers and crawler tractors.

Parade of Progress and Motorama

The spring of 1953 saw the start of the postwar Parade of Progress. This was a traveling science show—a caravan of 44 vehicles including 12 Futurliners, which were special exhibit vans with sides that opened to reveal displays or to form lecture platforms. A unique tent seating 1200 people was used for a science stage show and motion pictures.

The first Parade of Progress went on the road in 1936, and continued until 1941, being completely redesigned once. The post-war Parade was discontinued in the middle of 1956. Altogether more than 20 million persons viewed this demonstration of the importance of research and technology.



A similar exhibit on a smaller scale is Previews of Progress. This is a science stage show, using portable equipment, written especially for high school audiences. Starting in a small way, this was expanded until there were eight units operating in the United States and fourteen overseas.

Another type of exhibit which also points to technological progress is the General Motors auto show. Beginning in 1929 and almost every year thereafter until the war, a special showing of GM products and other exhibits was held in New York at the time of the national automobile show. This was revived after the war, and in 1953 the GM Motorama went on tour for the first time. A dramatic display of production models and special cars, research and engineering exhibits, stage and fashion shows, the Motorama attracted capacity crowds in the larger cities from coast to coast.

Training Centers

A further step was taken in 1953 to help dealers provide better service to their customers. This was a program to set up a chain of Training Centers across the country, the first of which was opened in Detroit in September. The centers are used to give training courses to mechanics employed by authorized General Motors dealers to keep them up to date with improved service methods and technological advances. The Training Centers are also used to train dealer personnel in sales, merchandising and management.

1954: Fifty Millionth Car

Four-minute mile run finally achieved. McCarthy-Army hearings monopolize the headlines. Color TV becomes a reality.

The year 1954 brought a milestone in General Motors history. On November 23, at Flint, Michigan, the 50 millionth automobile produced by General Motors in the United States rolled off the assembly line. It was a 1955 model Chevrolet hard-top, finished in gold and with all the brightwork, inside and out, of a matching golden color.

A simple ceremony was held at the plant as the car was completed, followed by a huge parade through downtown Flint and a luncheon for 1500 business men and civic leaders of Flint and Detroit. While this was the focal point, it was by no means all. Civic luncheons were held in 65 cities from coast to coast, to which the program of the Flint luncheon, including the speech of Mr. Curtice, was carried by closed-circuit television. On the same day General Motors plants across the country held Open House, and more than a million people responded to this invitation to see a GM plant in operation.

This celebration was for an event unequaled in the world's industrial history. No accomplishment like the building by General Motors of 50 million cars was ever before achieved. It symbolized what can be done in an economy that encourages free enterprise and was a tribute to the employes, dealers, suppliers, shareholders and countless others without whose aid such a job for millions of customers could never have been accomplished.

Support of Higher Education

For many years General Motors has supported higher education in various ways—the operation of General Motors Institute; through scholarships; grants to colleges; and other special projects. In 1954 plans were made to expand this support, and early in 1955 a three-part program was announced.

Under the first part, the College Plan, 300 four-year undergraduate scholarships will be awarded each year by 178 colleges and universities. The National Plan provides more than 100 scholarships, awarded on the basis of competitive examinations, with the winners permitted to select any accredited college. In both cases there are no restrictions on the field of study. The Foundation Plan makes available unrestricted financial support to certain college foundations. When this program is fully operative, General Motors' annual contribution to higher education will exceed \$5,000,000.

1955: General Motors Powerama

Merger of AFL and CIO. Salk polio vaccine proven effective and nation-wide inoculations scheduled. Davy Crockett is the idol of the younger set.

Commemorating the production of GM's 100 millionth Diesel horsepower, the General Motors Powerama received national acclaim in the fall of 1955. Covering a million square feet on the Chicago lakefront, this "World's Fair of Power" was visited by more than 2 million people in less than a month. It featured a great variety of applications of GM Diesel and gas turbine power, including full-scale, operating oil well drilling rigs, earthmoving equipment, saw mill, jet-powered airplanes and many others.



One of the most popular exhibits was the Aerotrain. Two of these lightweight, low-cost trains were built by General Motors for testing by the railroads in actual service. Produced by Electro-Motive, they were revolutionary in appearance and construction, but utilized many proven components such as the air suspension and coach construction used by GMC Truck and Coach in its buses.

Savings-Stock Purchase Program

In October, 1955 a savings-stock purchase program for salaried employes was put into effect. This program provides that a salaried employe with one or more years of continuous service may save a maximum of 10 per cent of his base salary and cost-of-living allowance. Half the employe's savings is invested in Government bonds and half in GM common stock. General Motors contributes \$1 for each \$2 of employe savings, with the Corporation contribution invested entirely in GM common stock. All dividends received are invested in GM common stock and all interest received is invested in Government bonds. A provision is included which guarantees the return of the employe's savings.

The participant elects each year one of two plans. Under one

plan, classes mature at the end of the fifth year following the year in which the class is formed, at which time the employe receives the GM common stock, Government bonds, and any cash to his credit in the class. Under the other plan, classes which have been in effect five or more years mature when the employe retires or leaves General Motors.

At the end of 1956, 86 per cent of the eligible salaried employes were participating. Trustees for the Program in both the U. S. and Canada received employe savings aggregating more than \$56 million.

Engineering and Safety

During the period 1951-55, engineering advances continued at a rapid rate. All five lines of passenger cars were powered with high compression V-8 engines. A 12-volt electrical system replaced the old 6-volt type. Power steering and power brakes, with their increased control and ease of handling, were made available on all lines.

Completely new body designs with panoramic windshield and still greater glass area contributed to increased safety and convenience of driving. Comfort under all conditions the year around was enhanced by air conditioning and heat absorbing glass, offered throughout the line from Cadillac to Chevrolet. The four door "hard top," first introduced by General Motors, was acclaimed by the public and gave signs of completely replacing the conventional sedan.

Outstanding engineering changes also extended to commercial vehicles. GMC Truck and Coach Division produced a fleet of Sceni-



cruisers, a dual-level bus with many new features for comfort and efficiency. Among these features was the Air Suspension Ride, introduced the previous year on some GMC coaches and later adapted also to heavy trucks. Special automatic transmissions were also incorporated into trucks in this period.

In the same field, an experimental gas turbine bus was built by the Research Staff. This was actually a mobile laboratory, built for the purpose of investigating the possibilities of the gas turbine in heavy-duty commercial vehicles.

Many engineering developments are aimed specifically at increased safety, and many others are equally important in that respect though not so direct. In 1955 General Motors developed a safety door lock which would not allow the doors to fly open in case of an accident. Because of the safety feature it was put into production as soon as thorough tests had been completed, even though it was in the middle of a model year. Padded instrument panels were offered on all cars as standard or optional equipment, and seat belts were also available on all lines. All GM cars were equipped at the factory with directional signals.

In addition to such obvious devices, however, General Motors spends millions of dollars on other activities just as important to the safety of the motorist and the public. Proper design of parts, thorough testing in the laboratory, at the Proving Grounds and on the road, plus efficient manufacturing techniques and careful inspection have reduced mechanical failure to a minimum. Greater visibility and improved lighting have eliminated many driving hazards. Better control of the car has resulted from careful attention to brakes, steering and suspension units. Automatic transmissions contribute directly to safety, and the increased reserve horsepower available in present day engines reduces danger in passing other cars, crossing at inter-



sections, entering traffic and in many other situations. These are just a few examples of a broad policy which has been expressed by Mr. Curtice—"No element of vehicle design is of greater concern to us than safety."*

General Motors promotes traffic safety in many other ways. These include broad distribution of driver education materials, cooperation with dealers in lending training cars to high schools and substantial support of national safety organizations and programs.

*For more about automobile safety, see the booklet, "Engineering Safety into Today's Cars," available without charge from General Motors, Detroit 2, Michigan.

Supplemental Unemployment Benefit Plan and GM Income Security Plan

Under the 1955 collective bargaining agreements with certain unions representing GM hourly-rate employes, provision was made for supplementation of state unemployment benefits. These supplemental benefits, like the state unemployment benefits, are financed solely by General Motors.

For non-represented and certain other represented hourly-rate employes, the GM Income Security Plan provides for GM to contribute to a trust fund five cents for each hour for which covered employes receive pay. An individual account is established for each employe from which he may make withdrawals during layoff. The balance is payable upon retirement or upon any other separation which breaks all seniority with GM.

1956: General Motors Suppliers

Eisenhower landslide for second term. Egypt seizes Suez Canal. Don Larsen pitches perfect game in World Series, and Grace Kelly weds Prince Rainier III.

A new survey of GM suppliers showed that General Motors was dependent on 26,000 other firms, small and large, for services, materials and parts that go into its products. For this, General Motors pays out each year approximately half of every dollar it takes in in sales.

The great majority of these 26,000 suppliers were small firms. Eighty-nine per cent had less than 500 employes, and 64 per cent employed fewer than 100 persons. They were located in every one of the 48 states and the District of Columbia.

More than 60 per cent of the suppliers surveyed had done business with GM for more than five years. For 37 per cent the association was more than 10 years old, and over 1,100 suppliers had counted GM among their customers for more than 30 years.

General Motors could not operate without these small firms, and they in turn need General Motors or some other larger company to help them market their products. The progress of large and small businesses is necessarily mutual.

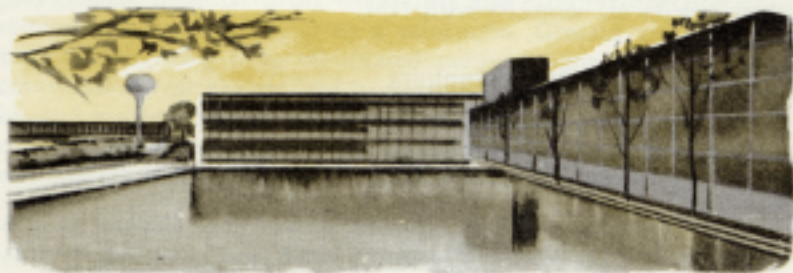
Mr. Sloan Retires

In April, 1956, Mr. Alfred P. Sloan, Jr., resigned as Chairman of the Board of Directors. He was succeeded by Mr. Albert Bradley, Executive Vice-President.

Mr. Sloan had been Chief Executive Officer for 23 years, from 1923 to 1946, and as the Board of Directors stated in announcing his resignation, "his analysis and grasp of the problems of corporate management, his great vision and rare good judgment laid the solid foundation which has made possible the growth and progress of General Motors over the years."

GM Technical Center

The GM saying, "More and better things for more people," is largely dependent on the long-established policy of continuing technological improvement—of seeking and developing new ideas for better products and improved methods of manufacture.



An important milestone in this search was the completion of the General Motors Technical Center. This extensive area north of Detroit is now the focal point for all the central research and development work of the Corporation.

The first group of buildings was completed in 1951, housing the central Engineering Staff. Several buildings for the Research Staff followed closely, and then complete facilities for the Styling and Process Development Staffs. There are also various service and utility buildings, making this a self-contained unit of extensive, up-to-the-minute facilities for advanced technical operation. The contemporary architecture plus the artificial lakes and beautifully landscaped grounds have made the Technical Center as noted for its appearance and design as for its functional excellence.

The formal dedication in May, 1956, was attended by nearly 5,000 scientists, educators and industrialists. There were also special meetings in principal cities, viewing the ceremonies at the Technical Center on a closed television circuit, and Open House was held at GM plants across the country. This event marked the beginning of a new era of accelerated progress in research, engineering and design.

Adjoining the Technical Center are the Fisher Body engineering and administration buildings and the Chevrolet Engineering Center, comprising design and test facilities unmatched in the automobile industry.

1957: New Horizons of Research

More trouble in the Middle East. Rock-and-roll still popular with teenagers. Asian flu sweeps the country.

The introduction of the new 1957 models brought to the attention of the public some features previously unknown on passenger cars in this country. The Cadillac Eldorado Brougham, in addition to its advanced styling and novel body construction, incorporated an air suspension system instead of steel springs. "Riding on air" had been the object of intensive research for some time. Used first on buses, then trucks, its success in the passenger car field was immediate, and the next year saw it offered on other General Motors cars.

Fuel injection, replacing the conventional carburetor system, was another GM first, being made available by Chevrolet and Pontiac. This was the result of a cooperative effort by these two divisions, the central Engineering Staff, and Rochester Products.

Several important experimental projects were disclosed during 1956 and 1957. Firebird II was a "dream car" in outward appearance, but was also experimental mechanically, being powered by a gas turbine of new design. This power plant differed from that in Firebird I in that it included a regenerator—a special type of heat exchanger—which heats the incoming air and cools the exhaust, thus giving higher efficiency and better fuel economy. In early 1957 it was announced that a similar gas turbine had been installed in a large Chevrolet truck, for extensive testing to determine the possible advantages of such a power source for heavy duty work.

Closely akin to the gas turbine is the free piston engine. In the spring of 1956 the XP-500 was introduced, the world's first automobile powered by a free piston engine. Strictly an experimental car, it afforded the Research Staff a great deal of valuable information on a type of power plant which many people thought might well be the engine of the future.

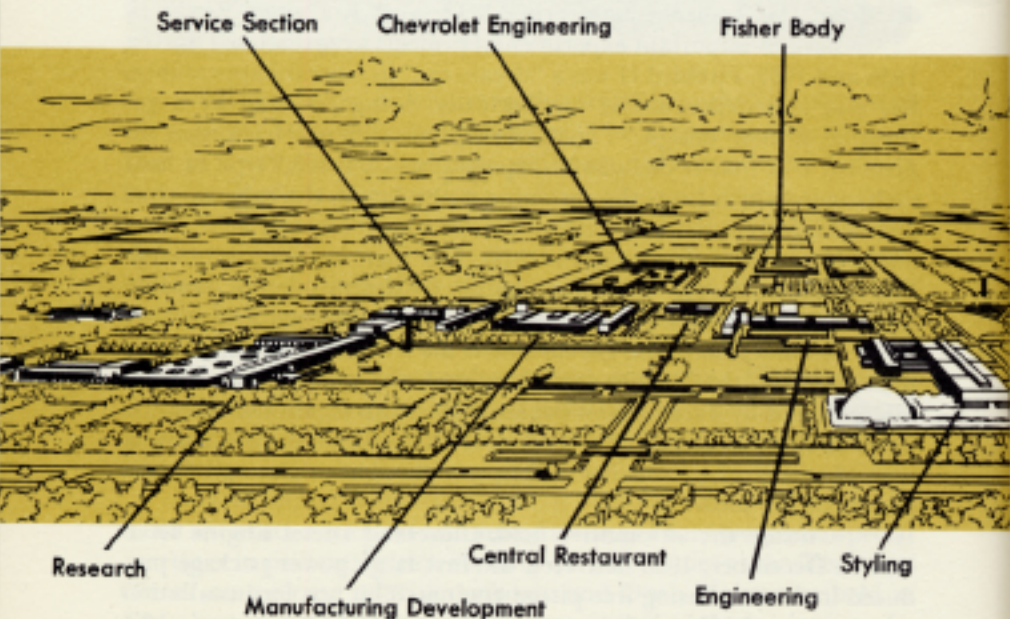
Outside the automotive field, Cleveland Diesel Engine Division in December, 1956 delivered the first large power package produced in America using free piston engines. This was for installation on a converted Liberty Ship, and produced 6,000 horsepower at the propeller.

Allison, previously concentrating on military usage of its engines and propellers, broke into the commercial field with its powerful prop-jet. Six airlines specified these engines, with delivery to start in 1958.

General Motors also extended its work in the field of atomic research in this period. Radioactive isotopes and their many uses had been under study for some time, and now a Nuclear Power Engineering Department was established as part of the Research Staff. One of the first projects was a study made for the Army covering the application of nuclear power to the propulsion of an off-the-highway cargo-carrying "land train." Several GM divisions were active in this study, as well as in other nuclear projects.*

General Motors research and engineering have also made important contributions in the medical field. In cooperation with medical people, there were developed the Mechanical Heart, the Centri-Filmer for purifying vaccines, the Photoelectric Oxyhemograph and the Electro Stethograph.

Thus research in General Motors has broadened its horizons, while still adhering to the basic formula, *More and better things for more people.*



* For a story of all types of power, from wind and water to the atom, see the booklet, "The Story of Power," available without charge from General Motors, Detroit 2, Michigan.

NEW FRONTIERS



The automobile industry truly has come a long way since that day in 1893 when the first successful horseless carriage made its appearance. Within a generation, it had brought a marked change in the pattern of our lives. Back in 1908, the year GM was founded, automobiles were considered as luxuries and rich men's toys. Less than 200,000 vehicles were registered in the United States . . . and even those few were limited in their use. Drivers seldom ventured beyond the city limits because of the lack of good roads.

Today there are over 65,000,000 vehicles registered in this country alone. That's enough to give every man, woman, and child a ride at the same time. A vast network of highways, totaling over 3,000,000 miles, covers the length and breadth of the land. Now, instead of being a luxury available to only a comparatively few wealthy people, automobiles are practically standard equipment in the possessions of a typical American family.

And it is a possession that has come to be even more a necessity than a pleasure. Through the use of automobiles and trucks, farmers now find it much easier and quicker to get their produce to city markets where they can get a higher price for their labors. At the same time, city dwellers can now live out in the suburbs where there is more elbow room and fresh air to raise families; yet they still can commute conveniently to shopping centers and their jobs.

Whereas the last generation had to be content to stay pretty close to home, it has become an American custom to pile into the family car and go out to the lake for a picnic or start out on a pleasant drive after Sunday dinner. Today, it is a common sight to see out-of-state license plates on any highway in the country. Surely, there can be no doubt but what the automobile has had much to do with extending our horizons and making our nation as closely knit as it is today.

Looking at it from an entirely different viewpoint, the automobile industry has had an important bearing on the economic development of the country. When the industry was just beginning, back in 1904, only about 90,000 people were engaged in building

both carriages and automobiles. Today direct employment in automobile production is about nine times that figure. And besides these people who directly gain their livelihood from the automobile industry, there are millions of others who also earn their income from some activity connected with the automobile. Service station operators, oil refinery workers, truck operators, road-builders, and many others, all have jobs that exist primarily because of the automobile. It has been estimated that one out of every 7 persons employed has a job because of the automobile industry.

It is easy to see how the automobile industry has created thousands of job opportunities and contributed immeasurably to our higher standard of living, but we are apt to overlook the underlying factors that made all this possible. It was more than just an accumulation of inventions on internal combustion engines, and pneumatic tires, and electric headlights. Interchangeability and mass-production* are the two basic manufacturing techniques that were combined for the first time by the automobile industry and they are the real reasons that the average wage-earner today can afford to own a car. Without them, every single car would have to be laboriously built by hand and its cost would be so great that only the wealthy could pay the



price. But by concentrating a workman's talents on turning out thousands of units all exactly alike and through the use of power and special tools, cars can be and are built by the millions. And since these techniques of interchangeability and mass-production require fewer man-hours to make each item, workers can produce more, thereby earning more, and at the same time the price can be brought within the reach of millions of customers.

* For the story of what mass-production has meant to this country, see the booklet, "American Battle for Abundance," available without charge from General Motors, Detroit 2, Michigan.

In view of the tremendous strides made by the automobile industry over the past 50 years and the way it has influenced our lives, one can't help wondering what its role will be in the future. Of course everyone would like to know what the new car models will be like five or ten years from now. But that is impossible to predict—other than that each new model will be an improvement over its predecessor. It has become axiomatic that sound automotive development is evolutionary rather than revolutionary.

However, that is comparatively unimportant. The main point is that the story of the automobile industry as typified by General Motors is a classic example of how everyone can benefit when men, money, methods, materials, and machines are brought together in a healthy atmosphere of competition and incentive. And there is no reason to believe that day is over. Some people have been saying for years that the automobile industry has passed its prime, that the market was saturated, that there was no use making big plans for its future. But they were the people who didn't realize that we were living in an expanding economy.

General Motors is looking forward to the beginning of its second 50 years with the expectation of even greater changes and more opportunities of every kind. There are already indications in some directions of the scientific and technological progress which can be expected, and there are also the developments in fields still unknown which are bound to come. With horizons broadened by research, and confidence in the future, the long-term trend must be upward.

As Mr. Curtice has put it, "The old frontiers of geography have disappeared, but their place has been taken by frontiers in science and industry whose horizons are limitless. Never have the opportunities for progress been greater than they are today."



MILESTONES OF PROGRESS

1867 - - - Carriage manufacture begun by the McLaughlin Carriage Company in Canada. This company later became General Motors of Canada, Ltd.

1890 - - - Olds Gasoline Engine Works organized, located at Lansing, Michigan.

1892 - - - Hyatt Roller Bearing Company formed at Harrison, New Jersey.

1893 - - - Pontiac Buggy Company incorporated at Pontiac, Michigan.

1894 - - - R. E. Olds starts to build his first gasoline car.

1895 - - - Henry M. Leland forms the Leland & Faulconer Manufacturing Company, predecessor of Cadillac, in Detroit.

1897 - - - The first Oldsmobile produced and the Olds Motor Vehicle Company organized.

1899 - - - Olds Motor Works began construction of first factory devoted especially to automobile production, in Detroit.

1900 - - - First national automobile show.

1901 - - - Olds Motor Works produces famous curved-dash runabout. One of these cars was the first light car to make the trip from Detroit to New York.

1902 - - - Organization of the Cadillac Automobile Company.

1903 - - - 1,895 one-cylinder Cadillacs sold in first year of production. Improvements included canopy tops, windshields, and radiators in the front.

1904 - - - Straight-eight engine, shock absorbers, pressure lubrication, automatic carburetors introduced.

1905 - - - Ignition locks make cars harder to steal. Cadillac starts production of four-cylinder models.

1906 - - - Buick made its first four-cylinder engine. Front bumpers, vibrating horns and drop steel frames among the year's advancements.

1907 - - - Oakland Motor Car Company organized at Pontiac, Michigan.

1908 - - - Fisher Body Company organized. September 16, General Motors Company organized. Buick and Oldsmobile join General Motors. Left-hand steering and baked enamel finish introduced.

1909 - - - Oakland and Cadillac join General Motors. Electric generators, electric headlights, four-door touring car bodies, instrument panel oil gauges, and demountable rims appear.

1910 - - - Harrison Radiator Co. organized at Lockport, New York. GM purchases interest in Champion Ignition Company, which later became AC Spark Plug Division. Closed bodies offered as standard equipment for the first time by Cadillac.

1911 - - - Chevrolet Motor Company of Michigan and General Motors Export Company organized.

1912 - - - Cadillac pioneered in adopting electric self-starter as standard equipment. Won Dewar Trophy for second time for this contribution—the greatest of the year. General Motors of Canada organized.

1914 - - - Cadillac first in this country to build a V-type, eight-cylinder, high-speed engine.

1915 - - - Tilt-beam headlights introduced on Cadillac.

1916 - - - United Motors Corporation organized.

1918 - - - Chevrolet Motor Company joins General Motors. United Motors Corporation joins General Motors; bringing with it several organizations, including Hyatt Roller Bearing, Dayton Engineering Laboratories, Remy Electric, New Departure, and Harrison Radiator.

1919 - - - Formation of General Motors Acceptance Corporation. Fisher Body Corporation and its subsidiary, Ternstedt Manufacturing, join General Motors. General Motors Building begun in Detroit. General Motors Institute opened at Flint, Michigan. Frigidaire Corporation acquired by General Motors.

1920 - - - General Motors Research Corporation formed. Harrison Radiator produced cellular radiator from ribbon stock.

1922 - - - Balloon tires introduced.

1923 - - - Alfred P. Sloan, Jr., named president of General Motors. Compensated crankshaft (balanced with counterweights) introduced. Four-wheel brakes introduced by Buick on its 1924 models. Duco lacquer finish standard for Oakland production. First commercial sale of Ethyl gasoline, developed in General Motors Research Laboratories.

1924 - - - General Motors Proving Ground placed in operation at Milford, Michigan.

1925 - - - Yellow Truck & Coach Manufacturing Company organized, with General Motors Truck as a subsidiary and General Motors Corporation holding a large interest. Cadillac installs crankcase ventilation.

1926 - - - Pontiac car introduced by Oakland. Safety glass and adjustable front seats appear. Delco-Remy formed, producing starting and ignition equipment, batteries, and horns, at Anderson, Indiana. Delco Products Corporation organized, manufacturing hydraulic shock absorbers and fractional horsepower electric motors at Dayton, Ohio.

1927 - - - Chrome-plating used on Oldsmobile.

1928 - - - Cadillac introduces synchromesh transmission. Guide Lamp Corporation formed, producing automobile lighting equipment. Chevrolet changes from a four-cylinder to a six-cylinder engine for its 1929 models.

1929 - - - North East Electric Company of Rochester becomes part of General Motors. Frigidaire manufactured the first room air conditioner.

1930 - - - North East Electric merged with Delco-Light to form Delco Appliance Corporation, manufacturing farm power and lighting plants, fans, oil burners, etc. Electro-Motive Company of Cleveland acquired by General Motors.

1932 - - - Packard Electric Company, producing automotive starting, lighting, and ignition cable, joins General Motors.

1933 - - - No Draft Ventilation built into all Fisher bodies. Two-cycle Diesel engine introduced. Knee-action—individual front wheel suspension by means of coil springs—first installed on General Motors 1934 models.

1934 - - - Two-cycle Diesel powers first streamlined train. Dealer Council organized.

1935 - - - Electro-Motive Corporation erected plant at La Grange, Illinois, for the production of Diesel locomotives. Southern California Division organized at Southgate, California, for assembly of Buick, Oldsmobile, and Pontiac cars. First all-steel single piece stamped top (Turret Top) introduced by General Motors on 1935 models.

1936 - - - Delco Radio Division established at Kokomo, Indiana to produce radio sets.

1937 - - - Winton Engine Manufacturing Corporation, acquired in 1930, becomes Cleveland Diesel Engine Division of General Motors, producing special large marine Diesel engines. Detroit Diesel Engine Division organized for the production of small Diesel engines. Automatic transmission introduced on Oldsmobile.

1938 - - - Dealer Relations Board organized.

1939 - - - Rochester Products Division organized. Sealed-Beam headlights adopted by the industry. Oldsmobile introduced Hydra-Matic Drive on its 1940 models. Motors Insurance Corporation organized.

1940 - - - General Motors completes its 25,000,000th car. Aeroproducts Division acquired at Dayton, specializing in the development and manufacture of airplane propellers. Retirement plan for salaried employees adopted. General Motors began defense production.

1941 - - - Defense Bond payroll deduction plan adopted. Civilian production curtailed. Pearl Harbor.

1942 - - - Civilian production halted completely. General Motors converted 100% to all-out war effort.

1943 - - - Production lines turned out more than \$3½ billion worth of war materials. Diesel Equipment Division formed to manufacture unit fuel injectors.

1944 - - - General Motors employment reached war time peak—averaged 477,072 for year.

1945 - - - General Motors began reconversion to civilian production. Buick-Oldsmobile-Pontiac Assembly Division formed.

1947 - - - Train of Tomorrow introduced to the public.

1948 - - - GM makes 2-year agreement with labor unions incorporating cost-of-living wage adjustments and annual improvement factor. Buick introduced Dynaflo automatic transmission. Cadillac and Oldsmobile brought out new high compression engines. General Motors begins production of the Holden car, first Australian-built automobile.

1949 - - - Allison announced its turbo-prop engine. General Motors introduced the "hard top," a sedan with the lines of a convertible. General Motors Diesel Limited established at London, Ontario, for production of GM Diesel-electric locomotives for Canada.

1950 - - - Chevrolet introduced Powerglide automatic transmission. The Allison-Bedford Foundry becomes the Fabricast Division.

1951 - - - First group of buildings completed at GM Technical Center near Detroit.

1952 - - - Power steering offered on three lines of General Motors cars. Autronic Eye automatic headlight dimmer introduced by Guide Lamp. General Motors announces Better Highways Awards contest.

1953 - - - Harlow H. Curtice becomes President of General Motors. Air conditioning and power brakes introduced on several GM cars. General Motors acquires Euclid Road Machinery Company, manufacturer of heavy, off-the-road vehicles. Chevrolet Corvette sports car put into limited production. First of a series of nation-wide Training Centers opened in Detroit.

1954 - - - New body designs, featuring panoramic windshield, introduced as a General Motors "first." General Motors celebrates the building of its first 50,000,000 cars in the United States.

1955 - - - The number of GM shareholders crossed the half-million mark, and climbed to 565,408 by the end of the year. Sales from all GM plants were 5,030,994 vehicles—a new high figure. The Powerama commemorated the production of GM's 100 millionth Diesel horsepower.

1956 - - - Formal dedication of GM Technical Center, housing Research, Styling, Engineering and Process Development staffs. Frigidaire produced its 20-millionth refrigerating unit. Transistor-powered car radio produced by Delco Radio.

1957 - - - Cadillac announced Eldorado Brougham—first American passenger car with air suspension. Fuel injection offered by Chevrolet and Pontiac on some 1957 models.

1958 - - - General Motors celebrates Golden Milestone, its Fiftieth Anniversary.

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