THE ELMER A. SPERRY AWARD FOR 1963

THE ELMER A. SPERRY AWARD MEDAL

In the words of Edmondo Quattrocchi, the sculptor of the medal . . .

"This Sperry medal symbolizes the struggle of man's mind against the forces of nature. The horse represents the primitive state of uncontrolled power. This, as suggested by the clouds and celestial fragments, is essentially the same in all the elements. The Gyroscope, superimposed on these, represents the bringing of this power under control of man's purposes."

Presentation of the

THE ELMER A. SPERRY AWARD *FOR 1963*

to

EARL A. THOMPSON

With Citations to

RALPH F. BECK

WILLIAM L. CARNEGIE

WALTER B. HERNDON

OLIVER K. KELLEY

MAURICE S. ROSENBERGER

by

The Board of Award

UNDER THE SPONSORSHIP OF

The American Society of Mechanical Engineers
Institute of Electrical and Electronics Engineers
Society of Automotive Engineers
The Society of Naval Architects and Marine Engineers
Institute of Aerospace Sciences

At the SAE Automotive
Engineering Congress and Exposition
January 15, 1964
Cobo Hall
Detroit, Michigan

Purpose of the Award

The Elmer A. Sperry Award shall be given in recognition of—

"A distinguished engineering contribution which, through application, proved in actual service, has advanced the art of transportation whether by land, sea or air."

1963 Board of Award

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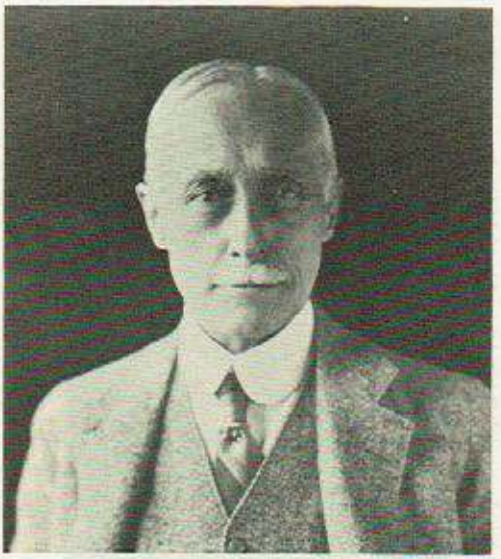


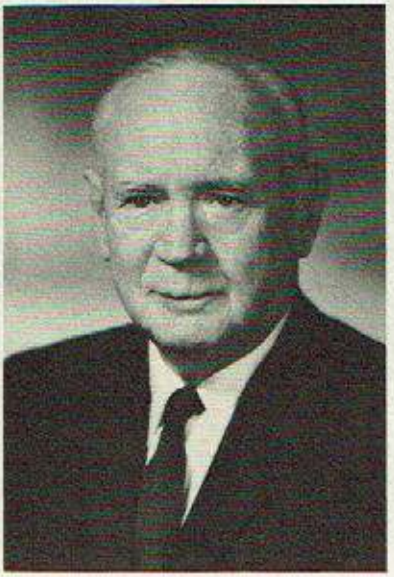
ELMER AMBROSE SPERRY

1860-1930

Founding of the Award

THE SPERRY AWARD commemorates the life and achievements of Dr. Elmer A. Sperry (1860-1930) by seeking to encourage progress in the engineering of transportation. Much of the great scope of the inventiveness of Dr. Sperry contributed either directly or indirectly to advancement of the art of transportation. His contributions have been factors in improvement of movement of men and goods by land, by sea and by air.

The award was established in 1955 by Dr. Sperry's daughter, Mrs. Robert Brooke Lea and his son Elmer A. Jr., and is presented annually.



EARL A. THOMPSON

AWARD CITATION

for the Sperry Award for 1963

" . . . FOR OUTSTANDING LEADERSHIP and genius exhibited in the design and development of the first notably successful automobile transmission capable of automatically changing drive ratio without perceptible relaxation of drive torque."

CERTIFICATES OF CITATION

for the Sperry Award for 1963

to

RALPH F. BECK for contributions in specifications, layout and design criteria leading to development of the first notably successful automobile transmission capable of changing drive ratio without perceptible relaxation of drive torque.

WILLIAM L. CARNEGIE for engineering contributions leading to development and production of the first notably successful automobile transmission capable of automatically changing drive ratio without perceptible relaxation of drive torque.

WALTER B. HERNDON for engineering contributions leading to development and production of the first notably successful automobile transmission capable of automatically changing drive ratio without perceptible relaxation of drive torque.

OLIVER K. KELLEY for outstanding design contributions and invention leading to development of the first notably successful automobile transmission capable of automatically changing drive ratio without perceptible relaxation of drive torque.

MAURICE S. ROSENBERGER for testing and evaluation leading to successful adaptation to the automobile of the first notably successful automobile transmission capable of automatically changing drive ratio without perceptible relaxation of drive torque.

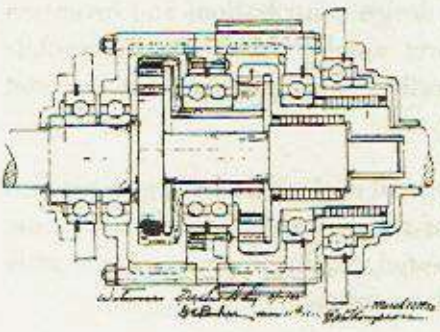
No Clutch Pedal

Ever since the horseless carriage became a reality, designers spent countless hours striving for a practicable means of eliminating driver difficulty associated with the need for shifting gears.

The recipients of the 1963 Elmer A. Sperry Award effectively reached this goal with the design of the Hydra-Matic transmission. It was the first fully automatic transmission capable of shifting gear ratios while engine torque was being delivered to the driving wheels as well as during periods of coast or deceleration.

Hydraulic couplings and torque converters had been used in automobiles and buses in the 1920s and early 1930s. Many experiments had been conducted with infinitely variable mechanical transmissions. Automatic mechanical up-and-down shifting at given speeds had been achieved. Variations of vacuum declutching, overdrives and free wheeling had been marketed—all with limited success. Mainly, these devices left something to be desired. Some were not fully responsive to the driver's will or a driver-actuated clutch was still required. Others simply had too many mechanical "bugs" to be commercial and still others detracted from the economy and performance of a vehicle.

The man principally responsible for the design concepts in the Hydra-Matic is Earl A. Thompson. Mr. Thompson was born in Elgin, Oregon on July 1, 1891 to Samuel and Ella Hartley Thompson. He was the fifth of eight children. Earl's father and mother had migrated to Oregon by covered wagon where they took up farming in the Elgin area. Earl's interest in mechanical apparatus is inherited, at least in part from his father who was skilled in the



Original Sketch of "Military Transmission"

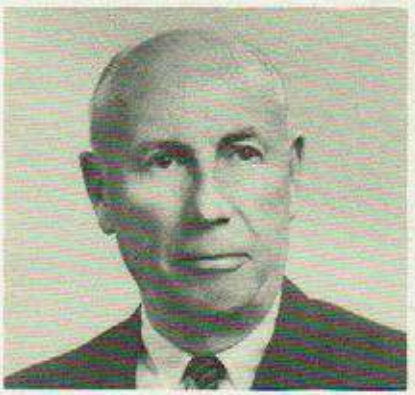
blacksmith trade. Samuel Thompson maintained a fully equipped blacksmith shop on his farm where he took care of all of his own equipment repair and also serviced his neighbors.

RALPH F. BECK

Earl moved with his family from Elgin to the Hood River area and finally to Gresham, Oregon where he completed his high school education. He attended Oregon State University where he majored in mechanical and electrical engineering. He became interested in the functioning of automobile transmissions while still a student. During a summer job as a chauffeur he applied his mechanical ingenuity to altering the transmission of a 1911 Pierce-Arrow so that he could achieve smooth shifting both up and down.

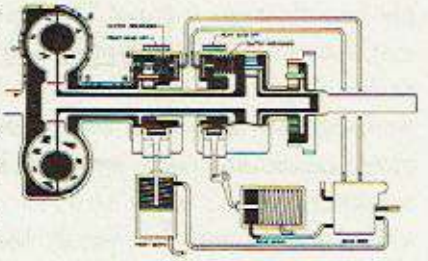
Earl Thompson began his career in 1912, when he formed a small company to wire buildings for electricity. His business prospered and he was able to branch out into more challenging engineering projects.

In 1913 the Opal Springs Water Company employed young Earl to install a station to pump drinking water from the free flowing Opal Springs into the small town of Culver and the surrounding valley country. This project was vital to the community and nearby ranchers since the arid valleys on the eastern edge of the Cascade Mountains could reach a steady supply of water only by drilling through 1000 feet of basaltic and glacial overburden typical of the area. The plans called for installing a water driven pump on the fast flowing Crooked River, a tributary of the Deschutes, and the



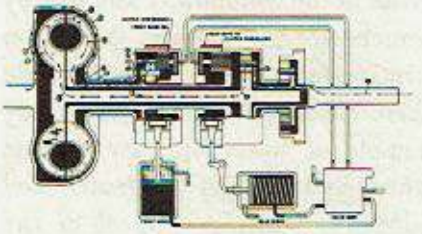
WILLIAM L. CARNEGIE

necessary piping to carry the water over the thousand foot valley wall to Culver. On studying the equipment and the plans, Earl told his employers that the pump, the best commercially available at that time, would not do the job. He was told that he had been hired to install the equipment and he was to leave the design to others. As he had predicted, the pump failed to function and it eventually burst. The Opal Springs Water Company was bankrupt.



NEUTRAL

Even at this young age, Earl displayed the tenacity, independence of thought, and drive which has so characterized his later achievements. He returned to Portland and after an arduous "selling" campaign, managed to raise $10,000 with which he purchased the Opal Springs water rights. Making use of his talent for entering uncharted fields, he designed what he believed to be an adequate pump. He took his drawings to the Portland Iron Works which cast and machined the complete rig. As a reflection on the economy of the times, it is interesting to note that the pump cost ten cents per pound, including all machining.



FIRST GEAR

The pump was installed. It operated successfully and continued to do so until 1929 when it was replaced by commercially available equipment to provide for additional capacity. The Opal Springs Water Company was operated by Earl Thompson until 1958 when it was taken over by the communities which it served.

Earl's interest in automobiles had not waned during his electrical

and water company projects. He was still convinced that the shifting of transmissions of that day could be vastly improved, and he set to work on the problem. He reasoned that there should be a means of mechanically synchronizing the speeds of the rotating drive and driven gears at the time of shifting so that the operator need not pause between disengagement of one gear and engagement of the next. He conceived the idea of interposing individual cone clutches between the clutch gears and drive gears to achieve such synchronization. He constructed an experimental model which showed great promise.

WALTER B. HERNDON

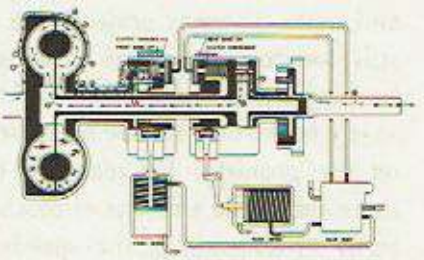
During this period, Earl and a fellow engineer also designed and constructed an infinitely variable hydraulic transmission which they installed on a crawler tractor. They were, however, unable to perfect the design due to a number of deficiencies, one of which was insufficient capital.

Armed with his drawings and data for his prototype synchromesh transmission, Earl took the train East in April 1922 to interest the automobile industry in his idea. Among those who showed some interest in the transmission was Ernest Seaholm, chief engineer at Cadillac. Although Earl spent over a month going from one factory and business office to another and talking to managers and engineers at all levels, the story he received was that there was no demand for a transmission which cost additional money. The auto manufacturers said that they and their customers were perfectly happy

OLIVER K. KELLEY

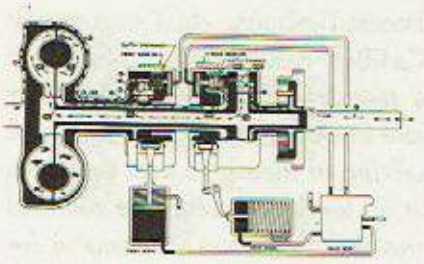
with the transmissions of that day.

On his return to Oregon, Earl reconstructed the transmission of a well known automobile incorporating his synchromesh principles. In September of 1923 he drove the car East from Portland to Detroit, a trip of ten days at that time. He stayed in the East three months and had audience with a wider field of responsible manufacturers; however, he was again unsuccessful at marketing the idea and he returned to Oregon to replenish his finances.



SECOND GEAR

The early months of 1924 were spent in improving the designs and reconstructing his trial model. Earl also built three additional complete transmissions in the hope that he could interest some of the auto manufacturers in experimental applications. Later that year he again drove to Detroit for his third try. By this time he had made sufficient contacts to obtain permission to install his experimental transmissions on production model cars of two manufacturers. The engineers and management of one of the companies were very enthusiastic over the transmission; however, the president of the company was unable at that time to commit his company to the expense and risk of sponsoring the device. The company president then did something which is rather unusual in a highly competitive industry. He arranged a luncheon appointment with Fred Fisher, vice president of General Motors Corporation, a competitor, and strongly urged Mr. Fisher to use his influence in getting GM to sponsor Earl's device. Fred Fisher, warmed by his friend's enthusiasm, arranged



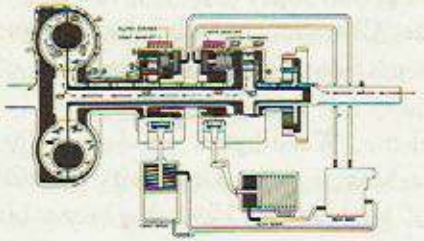
THIRD GEAR

an interview between Earl Thompson, Lawrence Fisher, managing director of Cadillac Motor Car Division and Ernest Seaholm. Cadillac was very interested and Earl was retained as a consultant while the transmission was perfected.

MAURICE S. ROSENBERGER

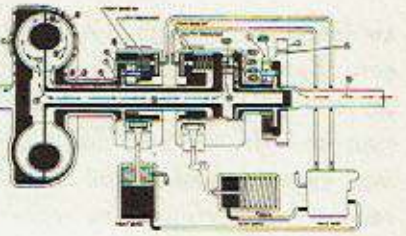
During the following three years, four more variations of the synchromesh transmission were designed and experimental models constructed; each one incorporating additional simplifications and reduced manufacturing costs. Earl had learned a lesson in his earlier design work which he put to good use in this effort as well as succeeding projects. The lesson was simply that expensive failures can be avoided through a cautious and painstaking engineering approach. He has since put this into a philosophy that it is easier to redo the drawing with an eraser than to try to erase red ink on the books.

Earl's synchromesh transmission reached production for the 1928 model Cadillac. The synchromesh principle is now applied to virtually all manual shift transmissions. Impressed with the capability Earl had displayed on the synchromesh project, Ernest Seaholm invited Earl to join Cadillac as assistant chief engineer which he did in 1929.



FOURTH GEAR

Earl was not satisfied that his synchromesh brainchild was the ultimate solution to the transmission problem. He had always been an intense student of any problem he undertook to solve. He was unwilling to abide by prior rejection of ideas or principles which had not been explored to his satisfaction. Thus he was familiar with



REVERSE GEAR

practically all available data pertaining to experimental work on automatic transmissions. He felt that it would be possible to develop a step ratio transmission in which shifting would be accomplished using hydraulic servo-mechanisms. Earl convinced Mr. Seaholm and Cadillac management that he had a practical approach to the long sought after transmission. Accordingly, early in 1932, Earl inaugurated his new project. The label on the door of the quarters assigned to the project read "Military Transmission" coupled with "Keep Out—This Means You". Such was security in the early '30s.

Earl was given a free hand in selecting his project team. His first two co-workers were designers Ralph F. Beck and Walter B. Herndon. Some months later the growing staff was augmented by William L. Carnegie and Maurice S. (Rosie) Rosenberger. In making his selections Earl was interested not only in the creative ability of his men but also in their experience in dealing with design, experimental and testing problems leading toward economical and practical production.

Ralph Beck came to Cadillac in 1925 from the Templar Motor Car Company of Cleveland, Ohio. He was born in Cleveland on July 7, 1894. He gained his auto engineering training with such companies as Rauch and Lang, Peerless, White, Chandler and Cleveland Motor Car Companies. Ralph designed the gear box for the first versions of the military transmission.

Walt Herndon was born in Spokane, Washington on August 20, 1906. He received a BSME from Washington State University in 1928 and an MSE from the University of Michigan in 1930. He began his working career at Cadillac in July 1928 as a tool designer. Walt designed the hydraulic controls for the early versions of the military transmission before leaving the project in midyear of 1933. However, he rejoined the Thompson team in 1939 and aided in perfecting the

production designs.

William L. Carnegie was born on July 12, 1900 in Detroit, Michigan. After a five year work period at Cadillac and Peerless Motor Car Company engineering departments he traveled west where he studied mechanical engineering at the University of California. He rejoined Cadillac in 1925 where he specialized in engine design and studies on infinitely variable transmissions. In 1934 he was assigned to work with the Thompson team on control and general development.

"Rosie" Rosenberger received his early schooling in Iowa where he was born on February 8, 1903. He attended Nebraska Wesleyan University a year and rounded out his formal education with night school courses in mechanical engineering. His first job at Cadillac in 1927 was motor repairman. His talents as a "bug hunter" were soon recognized and he was assigned to the test laboratory. There he eventually took on full responsibility for testing and analyzing the faults of the prototype automatic transmissions under Earl Thompson's direction.

The "Military Transmission" designs progressed from simple 2-speed units to 4-speed drives. Experiments with these designs confirmed in the minds of Earl Thompson and his associates that they were on the right development road. By 1935, although much had been accomplished, the automatic transmission designs were still far from commercial. Extensive testing of the various cars equipped with the experimental transmissions indicated that transmission durability could be achieved. However, the "bump" of ratio change, defined by the Thompson team as the "pleasability factor," was still considered to be objectionable. A means had to be found for more adequate controls in smoothing out the transition from one step gear ratio to the next.

Late in 1934 the country was still struggling to recover from the Great Depression. During this period, car sales reached a nadir by comparison to the sales of the past two decades. The expense of the automatic transmission work, while not excessive by today's figures, was keenly felt by Cadillac management. In the higher echelons of GM Management, a careful appraisal was made of the status of GM

transmission design efforts of that day. It was the conviction of Ormond E. Hunt, engineering vice president, that the Military Transmission Project was of broad GM Corporation interest. The decision was therefore to transfer the operation in January 1935 from Cadillac to GM Central Staff under the aegis of Mr. Hunt. Part of Earl's duties under the new Management were to determine out of all the transmission projects then being undertaken in the various GM divisions, which ones showed the greatest promise for early success.

Continued development of the Military Transmission under the new sponsorship was not without problems. Some influential and highly placed management officials felt that time and money was being wasted on a hairbrained scheme. However, Earl's overall concept of the problems, his unassuming modesty and his obvious convictions on the correctness of his approach won the support of Alfred P. Sloan, then President of the Corporation. As early as 1929, Mr. Sloan had voiced the opinion that it was essential for the advancement of the automobile to eliminate from the consciousness of the driver the need for shifting gears. He felt that Earl was well on his way toward reaching this goal. Another administration official who shared Mr. Sloan's and Mr. Hunt's enthusiasm for the project was Charles L. McCuen, then general manager of Oldsmobile Division. As chief engineer of Olds, he had followed the progress of automatic transmission and drive train problems closely. It was agreed that a full scale experimental program should continue until it was definitely known whether Earl Thompson's "Military Transmission" could become commercially successful.

Earl Thompson's small group, now housed in an uptown office building, worked with renewed enthusiasm to solve the remaining problems. Early in 1936 Oldsmobile began to take over Mr. Thompson's designs to prepare them for production. At this time it was a semi-automatic four speed planetary transmission requiring the conventional clutch pedal for starting and one manual shift from a two speed automatic low range to a two speed automatic high range. This shift was made under power without use of the clutch pedal.

This transmission reached the market in mid-year of 1937, in

Oldsmobiles and Buicks as a customer option. It continued as an Olds option until it was replaced by the Hydra-Matic at the start of production of 1940 model year Oldsmobiles.

While the "transition engineering" between Earl Thompson's group and Oldsmobile was taking place it was clear in Earl's mind that a satisfactory automatic clutch had to be developed for full exploitation of this drive principle.

In June of 1936, Mr. Oliver K. Kelley was transferred to Mr. Thompson's group from GMC Truck and Coach Division. Oliver Kelley was born in Finland. He was graduated from Chicago Technical College in 1925 and attended Massachusetts Institute of Technology to specialize further in automotive engineering. He came directly from M.I.T. to join Cadillac in January 1927 and worked under Earl Thompson on the production design of the Cadillac synchromesh transmission.

He transferred to GMC Truck and Coach Division in 1929 where he worked on transmission problems including air shift synchromesh bus transmissions, infinitely variable friction drives and development of hydraulic torque converter bus transmissions. His first assignment with Earl Thompson in 1936 was to develop a fluid coupling for automatic starting thus eliminating the clutch pedal.

General redesign of the production semi-automatic began at this time. Incorporation of a planetary reverse gear replacing the sliding gear arrangement and the evolution of the four stage split torque fluid coupling which eliminated the clutch pedal, combined with a new hydraulic governor and pressure modulator system for automatic control produced the necessary elements of a fully automatic passenger car transmission which was given the name Hydra-Matic (Hydraulic-Automatic). This was truly an advanced design and although highly complex, its reliability and pleasability were proven on numerous experimental models which were tested under all conceivable highway and traffic conditions. It was judged to be ready for production release in 1939 and the newly formed Detroit Transmission Division was given the responsibility to manufacture it.

In 1939, Earl Thompson left GM to begin his own business. He

agreed, however, to serve as a consultant during the critical period of early production when multitudinous manufacturing problems had to be solved and the talents of many manufacturing experts had to be re-channelled to appreciation of new precision requirements. William Carnegie was appointed chief engineer of the infant division, Ralph Beck and Walt Herndon became staff engineers, "Rosie" Rosenberger became experimental engineer and Oliver Kelley became assistant chief engineer.

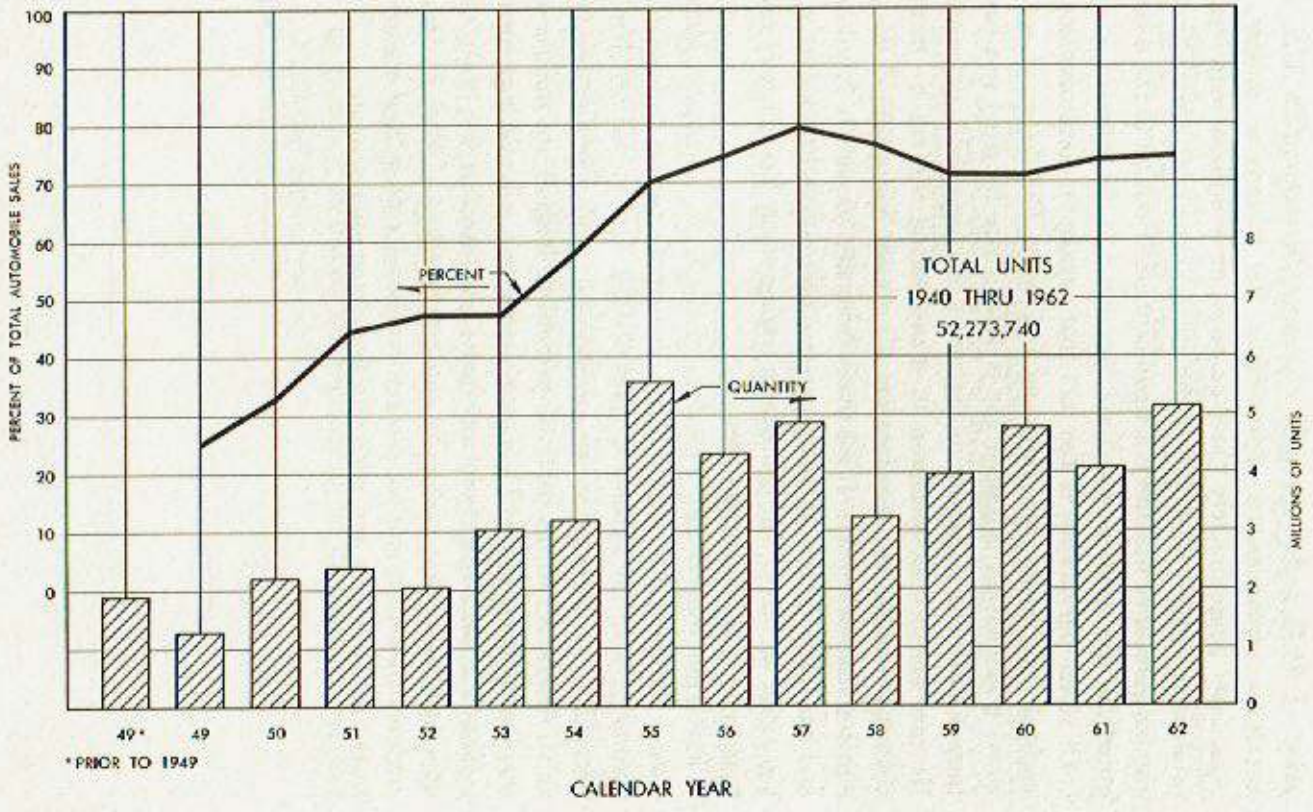
Mr. McCuen's early faith in the development and his willingness to sponsor the transmission led to its exclusive application on the 1940 model Oldsmobile. In spite of the extra cost, public response was enthusiastic. Twenty five thousand units were sold in that first model year. A year later Cadillac joined Oldsmobile in the use of the Hydra-Matic. This led to early wartime adaptation of the Hydra-Matic in Cadillac engine powered light tanks, built by Cadillac. Hydra-Matic was also used extensively in armored cars and troop transports. This confirmed the ruggedness and reliability of the design.

Since World War II, all U.S. automobile manufacturers have developed automatic transmissions suited to their various lines of cars. It is significant to note that subsequent designs of automatic transmission in automobiles have all employed the principle inaugurated with Hydra-Matic, i.e., the capability of changing drive ratios without relaxation of torque by use of hydraulic servo-mechanisms actuating internal systems of clutch bands and clutch plates.

Although the thirteen-millionth Hydra-Matic transmission was produced in 1963, the size of the automatic transmission contribution to the motoring public should not be judged alone by the success of the Hydra-Matic. The automatic transmission is favored by a large majority of the U.S. motoring public, regardless of car make. Automatic transmissions are also rapidly becoming popular in the rest of the world.

The chart on the facing page shows the numbers and percentages of U.S. made cars equipped with automatic transmissions during each calendar year from 1949 to the present. Note that in 1957, 79.9% were equipped with automatic transmissions. Based on an average

U. S. MAKE AUTOMOBILES EQUIPPED WITH AUTOMATIC TRANSMISSIONS



price of $190 each, the total customer investment in U.S. made automatic transmissions approximates 9.9 billions of dollars. This represents approximately three-quarters of a million man years of productive employment. Thus the inventiveness of Earl Thompson and his associates was and is a significant contribution to the economic growth of the country.

Of equal significance is the fact that automatic transmissions have made driving easier, less fatiguing and safer. The driver of an automatic transmission equipped car is safer since he need not concern himself with shifting gears in the midst of congested traffic patterns. He can devote full attention to maneuvering the car by means of steering, braking and accelerating. The easy operation of the automatic transmission has aided many who are physically handicapped and has made drivers of many persons who may otherwise have been too timid to drive. The automatic transmission has actually created a wider market for automobiles.

Earl Thompson is now President of the E. A. Thompson Manufacturing Company which specializes in manufacturing hydraulic valve lifters. As with the automatic transmission, Earl solved problem after problem in perfecting the design, precision and manufacturability of valve lifters. All of his past and present colleagues are unanimous in their appreciation of Earl Thompson's ability to teach and lead engineers.

The first successful fully automatic transmission is a truly unique development made possible by the combination of Earl Thompson's engineering genius and persistence combined with a loyal engineering team and the vision and faith of a farsighted management.

Previous Elmer A. Sperry Awards

1955 to WILLIAM FRANCIS GIBBS and his ASSOCIATES for development of the U.S.S. United States.

1956 to DONALD W. DOUGLAS and his ASSOCIATES for the DC series of air transport planes.

1957 to HAROLD L. HAMILTON, RICHARD M. DILWORTH and EUGENE W. KETTERING and Citation to their ASSOCIATES for the diesel-electric locomotive.

1958 to FERDINAND PORSCHE (in memoriam) and HEINZ NORDHOFF and Citation to their ASSOCIATES for development of the Volkswagen automobile

1959 to SIR GEOFFREY DE HAVILLAND, MAJ. FRANK B. HALFORD (in memoriam) and CHARLES C. WALKER and Citation to their ASSOCIATES for the first jet-powered aircraft and engines.

1960 to FREDERICK DARCY BRADDON and Citation to the ENGINEERING DEPARTMENT of the MARINE DIVISION, SPERRY GYROSCOPE COMPANY, for the three axis gyroscopic navigational reference.

1961 to ROBERT GILMORE LETOURNEAU and Citation to the RESEARCH AND DEVELOPMENT DIVISION of the FIRESTONE TIRE AND RUBBER COMPANY for high speed, large capacity, earth moving equipment and giant size tires.

1962 to LLOYD J. HIBBARD for application of the ignition rectifier to railroad motive power.