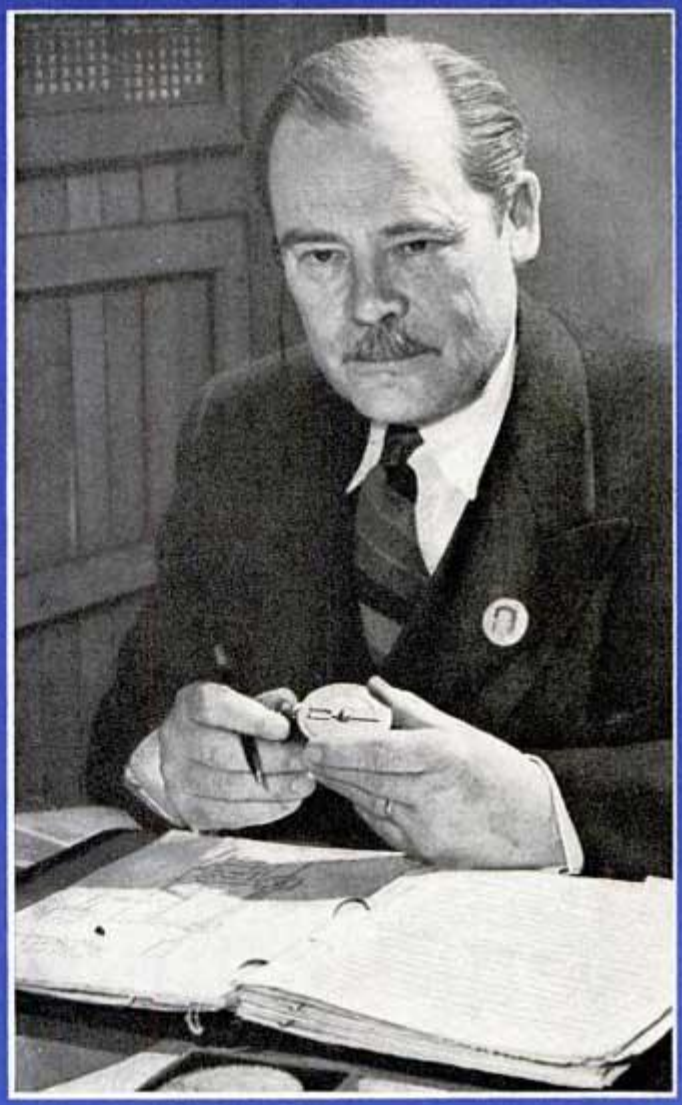
Dr. E.W. Alexanderson helped the Allies win the First World War, with his revolutionary inventions in radio and other fields. Now he is turning his new discovery, amplidyne control, to the job of helping beat the Axis



Inventor for Victory

By HERBERT ASBURY

THE story of the American career of Dr. Ernst Fredrik Werner Alexanderson, famous consulting engineer to whom radio probably owes more than to any other man except Marconi, is not a Horatio Alger yarn of the poor boy who became rich and famous. But it is a story of democracy at its best, and its beginnings afford a striking exemplification of the democratic spirit which impelled two great and busy men to listen to a young student who came to them with no other recommendations than a thirst for knowledge and a desire to work. Dr. Alexanderson believes that a great deal of this spirit still exists in the United States, but unfortunately industries have grown so enormous that personal contacts between plant officials and workers are no longer as easy as they once were. And in his opinion that is a great pity.

"Many inventions," he said in a recent interview, "would have been lost without it. When I began to work at General Electric, I found that an unknown young engineer

Dr. Alexanderson has a fondness for keys. In his right-hand trousers pocket he carries a generous bunch including can and bottle openers and a circular slide rule which was the first thing he bought in America

Radio richly repaid the inventor's labors in 1923 when his six-year-old son Verner was kidnapped. Broadcast descriptions brought about the recovery of the boy and the arrest of the kidnappers. The photograph below, showing Verner listening to the radio with his father, was taken just three days before the boy disappeared

could walk into the office of the Chief Engineer and vice president, Mr. E. W. Rice, and tell him about his experiments."

Once when Alexanderson asked Rice to come to the laboratories and witness a test with a magnetic amplifier which he hoped would make transatlantic telephony possible, another executive said to Rice:

"Why do you waste your time on such foolish dreams, when you have so many more important things to do?"

"If this young man thinks he has discovered a way to telephone across the ocean," replied Rice, "I think it is my duty to look into it."

Rice's faith was amply justified, for Alexanderson's device made ocean telephone service possible only a few years later.

Dr. Alexanderson comes of a long line of teachers, soldiers, poets, and lawyers, many of whom have been important figures in Swedish history. His father taught for several years at the University of Uppsala, one of the cultural centers of Scandinavia, and later held the chair of classical languages at the University of Lund, where the future scientist studied for a year after graduating from the Lund High School. Because of an aptitude for mechanics, young Alexanderson entered the Royal Technical University at Stockholm, graduating as a mechanical and electrical engineer. For a year of postgraduate work he attended to the Technical University at Berlin and studied under Professor Slaby, co-creator of the once-important Slaby-Arco system of radio communication.

While in Berlin young Alexanderson read a book with the forbidding title of "Alternating Current Phenomena," by Charles P. Steinmetz, the great hunchbacked wizard of the General Electric Company, and was so impressed that he decided to go to America, where such men as Steinmetz and Thomas A. Edison were at work. In 1901 he landed

Dr. Alexanderson finds an interested audience for a new marvel. The inventor, third from left, shows a two-color disk for color television with a standard receiver. Spectators are Dr. P. C. Goldmark of CBS, General Electric Board Chairman Philip D. Reed, G. H. Payne of Federal Communications Commission

at New York, and the next day went to East Orange, N.J., hoping to catch a glimpse of Edison, but never for a moment imagining that he could actually talk to the great inventor. In the class-bound Europe with which he was familiar, such a thing would have been beyond the bounds of reason. But the gatekeeper at the Edison plant took his visit as a matter of course, and was very friendly.

"Can't get you in now," he said, "but stick around till six o'clock. The old man will be down then and you can talk to him."

And to Alexanderson's amazement, the "old man" stopped and spoke to him at length. Emboldened by his good fortune, the boy went to Schenectady a couple of months later, called at the home of Steinmetz, and was promptly admitted. He was somewhat shocked when he saw Steinmetz, but as soon as the wizard began to talk Alexanderson was no longer aware that his idol was a little hunchback, clad in a black bathing suit and crouched over a table with a huge cigar in his mouth. Steinmetz questioned the young man closely and learned of his abilities and ambitions, and a close friendship sprang up between them at once.

Alexanderson was then at work as a draftsman for the C. & C. Electrical Company in New Jersey. In February, 1902, he was hired by General Electric on Steinmetz's recommendation, and became a frequent visitor in the latter's laboratory. The next year Alexanderson took the famous G. E. test engineering course. In 1904 he became a member of the company's engineering staff, designing generators under the direction of Steinmetz. His work was brilliant from the beginning, and when he went to Sweden on a visit in 1906 Swedish industrialists urged him to stay. But his father advised him to return to America, predicting that Europe was doomed to revolution and destruction, and declaring that the new world offered the only hope for the survival of a capitalist civilization. Young Alexanderson heeded his father's counsel and upon his return to the United States immediately took out naturalization papers.

When Dr. Alexanderson first came to America radio, or wireless, was a crude business of dots and dashes transmitted by inefficient crashing sparks. If a listener

equipped with earphones managed to pick a few intelligible signals out of the jumbled air, it was a thing to be wondered at. Today you simply press a button or turn a switch, almost instantly get the particular broadcasting station you want, and listen in ease and comfort to voices and music from the distant corners of the earth. This scientific miracle, so commonplace that it arouses no more astonishment than a rainstorm, is due largely to the genius of Dr. Alexanderson, in particular to his system of tuned radio-frequency, which made possible the modern selective receiver, and to his invention employing a high-power vacuum tube for relaying and for modulation.

But Dr. Alexanderson's contributions to radio broadcasting represent only a few of his achievements; he has made vitally important discoveries and developed inventions in virtually the entire field of electricity with the exception of illumination. In addition to radio, his patents cover principally television, railway electrification, high-frequency alternators, motors, and power transmission, but in these categories they range from an electric locomotive to an amplifier, and include telephone relays, antennas, picture-transmission apparatus, synchronous and thryatron motors, and a system of electric ship propulsion. Various ways of controlling and multiplying electric power have also been devised by Dr. Alexanderson, and some of these are expected to help relieve the power shortage feared as a result of the war production program. Several of his discoveries were embodied in the electrical equipment of the aircraft carrier *Lexington* and the battleship *New Mexico*.

Radio came into its own largely as the result of Dr. Alexanderson's work during the first World War, and he may do as much this time for television, ship propulsion, power transmission, or any of a dozen related fields in which he holds 289 patents, granted to him since 1905 at the rate of one about every seven weeks. Incidentally, Dr. Alexanderson looks upon war not as a spur to invention, as it is popularly supposed to be, but as a period of urgent necessity which provides both incentive and opportunity for the application of principles already known and the development of devices already in the inventor's mind. That is what he did in the first World War, and what he and other scientists are doing now.

Dr. Alexanderson's first real opportunity in America came when Professor Reginald A. Fessenden, a pioneer radio experimenter, asked the General Electric Company to build a high-frequency alternator of 100,000 cycles. Since no generator had yet been built to operate at frequencies above a few thousand cycles, the idea was considered fantastic by every one save Fessenden, Steinmetz, and Alexanderson, to whom Steinmetz turned over the job without comment. After two years of hard work, during which time several experimental models were constructed and discarded, Alexanderson produced a practical alternator of 50,000 cycles, which was installed in Fessenden's broadcasting station at Brant Rock, Mass. With it Professor Fessenden was able, on Christmas Eve of 1906, to put the human voice on the air for the first time in history. It was this machine, the famous Alexanderson alternator, that assured reliable transatlantic radio communication.

Other important inventions developed by Dr. Alexanderson during the war included the multiple-tuned antenna, the antistatic receiver, and the magnetic amplifier. The amplifier had established the practicability of transatlantic telephony as early as 1915, but it attracted little attention until February 22, 1919, when the Alexanderson high-frequency alternator, magnetic amplifier, and multiple-tuning system made possible the first two-way conversation, between the station at New Brunswick and the steamship *George Washington*, 900 miles at sea, carrying President Wilson to the Peace Conference. Dr. Alexanderson's discoveries in radio paid him an unexpected dividend in 1923, when broadcast descriptions of his kidnapped six-year-old son were instrumental in recovering the boy.

Since the World War, discoveries and inventions have come from Dr. Alexanderson's laboratory with extraordinary rapidity. The patents describing his various devices and systems fill several large volumes in the General Electric library, and just to list them would require many pages of POPULAR SCIENCE MONTHLY. A few, however, should be mentioned, among them the electronic amplifier, the directional transmitting antenna, radio altimeters, studies in the polarization of radio waves which made possible effective radio direction finders, and a tuned radio-frequency system which provided selective tuning.

Dr. Alexanderson also did much notable pioneer work in television and in the transmission of pictures by radio. On June 5, 1924, he transmitted *(Continued on page 204)*

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the first facsimile message across the Atlantic, a hand-written greeting to his father; and in 1927, using high-frequency neon lamps and a perforated scanning disk, he staged the first home reception of television at his own home in Schenectady. A few months later, on January 13, 1928, he gave the first public demonstration of the new wonder. In recent years Dr. Alexanderson has devoted himself largely to the power applications of the electronic science, such as power transmission with direct current. But he has also found time to design single-phase motors for railway electrification, to make important contributions to radiant energy guiding systems for aircraft and automatic steering of both air and water craft, and to develop countless applications of vacuum tubes in power transmission, rectifiers, inverters, and frequency chargers.

As far as public knowledge is concerned, Dr. Alexanderson's career stopped short with the invention of the amplidyne, an extremely sensitive and powerful system of amplification and automatic control, which he, with M. A. Edwards and others of the General Electric Consulting Engineering Laboratory, developed about the time that the United States began to think seriously of rearming. Like so many discoveries which have been adapted for war, the amplidyne was designed for peacetime use, specifically in steel mills and other plants requiring delicate control of continuous operations. Long before the Japanese attack upon Pearl Harbor, however, it had been successfully applied to the firing of antiaircraft guns, which must be subject to split-second control if they are to hit airplanes traveling at more than 400 miles an hour. Dr. Alexanderson himself has said that the amplidyne can be used for "almost anything" that moves under power, a generalization which would obviously include torpedoes, airplanes, tanks, and other war machines. The details of all actual and possible applications of the amplidyne, as well as of the work now under way in Dr. Alexanderson's laboratory, are military secrets.

Dr. Alexanderson is utterly unlike the popular conception of a scientist; he resembles a successful business executive more than he does a man who devotes his life to exploring the secrets of electricity and frolicking in the higher branches of mathematics. He looks ten years younger than his 64, and though his hair is thinning he still has plenty of it, and neither it nor his little

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close-cropped mustache is as gray as his age would lead a visitor to expect. His eyes are brown and alert, and in them there is an expression of quizzical kindness which has reminded many people of Thomas A. Edison. He wears a sack suit by preference, and although his trousers are not always perfectly pressed, the general effect is one of neatness and precision. He reads a great deal, knows what is going on in the world, and likes to discuss it; and he possesses the rare knack of being able to describe his own work in terms so simple that even the average man can sometimes understand what he is talking about. He walks two miles to work every morning in the winter, and in summer labors diligently at his favorite hobby, sailing on Lake George, in upper New York. It used to be considered unsafe to sail on this narrow, gusty body of water, but the tradition died in 1928 when Dr. Alexanderson brought over a North Sea pilot boat and sailed it all one summer without mishap. Now Lake George has a yacht club with 30 boats, and Dr. Alexanderson is as proud of having been its first Commodore as he is of the many honors bestowed upon him for his scientific achievements.

One of the most peculiar things about Dr. Alexanderson is the fact that he is not in the least peculiar. Although he is a bit absent-minded, he is a man of remarkably few idiosyncrasies. In fact, the only trait he possesses that might be called an idiosyncrasy is his apparent liking for keys. In his right-hand trousers pocket, on the end of a largish chain secured to his belt, he carries a bunch of keys and appliances, including can and bottle openers, as big as a grapefruit. And attached to the key ring is the first thing that Dr. Alexanderson ever bought in America, a circular slide rule somewhat larger than a silver dollar, which he picked up in a New York shop the day he landed. It is the only one of the kind he ever saw, and it is his most prized possession. When he wishes to use it, or to select one of his numerous keys, Dr. Alexanderson yanks the whole bunch from his pocket with a flourish. It usually falls to the floor with a considerable clank, and he hauls it in hand over hand as if it were a pickerel.

Dr. Alexanderson's greatest ambition is to contribute materially to the defeat of America's enemies. But he also has another though minor ambition. He would like to meet Greta Garbo.

"But I suppose," he said, "she's pretty hard to meet."

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