WILLIAM STANLEY AND ELECTRIC POWER DISTRIBUTION

The electric transformer has no rotating parts and it only hums quietly on a pole in the back of your lot; yet even in its simplicity it is vital to the network of electrical power transmission and distribution throughout the world. To be economical, electricity must be transported over large distances at high voltage and relatively low current, so as to minimize the losses due to heating of the conductor. In some cases, it is desirable for transmission voltages to approach one megavolt. Yet such high voltages are intolerable within generators, the limit being about 25 kV or less.

At places where the electricity is used by consumers, say in a home, for reasons of safety the voltage must be reduced finally to 120/240 volts. It's the job of a transformer at generating stations to first raise the voltage before transmission, and then for other transformers, in smaller versions, to lower the voltage for entry into homes. The first person to show that this could be done in a practical way was William Stanley: the place was Great Barrington, MA, and the time was the evening of March 20, 1886. “A gala night was made of the event. The streets and stores were crowded with people who came to see history in the making. Finally the whole system was turned on and ... they rejoiced with Stanley over the success of the demonstration.”[1]

Who was William Stanley?

Stanley worked for George Westinghouse in Pittsburgh, Pa, during the years 1884 and 1885. He had gained a reputation for his work on incandescent lamps. While with Westinghouse he became convinced that electricity should be distributed by alternating current, and not by direct current as was advocated by Edison. Knowing of the work in Europe on converters (transformers) by Gaulard and Gibbs, and others — Westinghouse had bought patent rights — Stanley thought that he could do a better job. Health problems however implied that he leave Pittsburgh, and so with some financial help from Westinghouse, he moved to Great Barrington, a place where he had spent a good part of his childhood. There he set up a small laboratory and by early spring of 1886 had an alternator installed in an abandoned mill on the edge of the town. At the mill the voltage was first stepped up to 3000 volts and then back down to 500 volts. This exercise was apparently to show it could be done because actual transmission to and through the town was at 500 volts. "... two No. 6 wires were stretched down the main street of the village and fastened to insulators nailed to the elm trees bordering the sidewalks.... The length of the line from the center of town to the laboratory [mill] was about 4000 feet. After the wiring had been completed, a half dozen transformers were installed in the cellars of the buildings to be lighted. The units were housed in wooden boxes and kept locked on the premises. Facilities were extended to light thirteen stores, two hotels, two doctor's offices, one barber shop and the telephone and post offices. The lamps were 150, 50, and 16 candlepower sizes [about 350, 125, and 40 watts]. In the laboratory's new power plant, two 50-light and four 25-light transformers were installed. The generator in the laboratory produced current at 500 volts [and probably at 133 Hz]. This voltage was transformed up for transmission and then back down again for lighting service.... The original Great Barrington plant continued to operate...
successfully until the summer of 1886 when, so it is said, an attendant dropped a screwdriver into the generator which thoroughly ruined that pioneer machine and required the rebuilding of a greater portion of the equipment.[1] "Then [Stanley speaking] on a wet night a leak from our 500 [volt] primaries set fire to the side of the shed. While I publicly mourned with the townspeople I secretly exulted. Finally I sold that engine without a guarantee."[2]

George Westinghouse, although a little skeptical at first, adopted the system and by the summer of 1888 his company had installed over 100 central stations. Further, the Westinghouse company was chosen to light the 1893 World's Columbian Exposition in Chicago with alternating current. Sixty thousand lamps were utilized. Next was the hydroelectric generation of power at Niagara Falls in 1895, alternating current at 25 Hz. It was not many years before DC was left far behind.

Another New Yorker!!

William Stanley was born in Brooklyn on November 28, 1858. The family soon moved to Great Barrington. When Stanley reached college age it was expected that he would go to Yale as had many Stanleys before him. He lasted there but one semester, wrote his family that he had had enough, and went to NYC in search of a job. [3] A succession of jobs followed, none of which were to his liking until he was hired by Westinghouse in 1884. The historic experiment with AC transmission followed in 1886, as was described above, and by 1890 Stanley decided to do it alone, setting up the Stanley Electric Manufacturing Company in Pittsfield, Mass., (January 1, 1891) and Stanley Laboratory. He enlisted Cummings C. Chesney and John F. Kelly. The much able trio designed and sold the SKC system of electric power generation and distribution; naturally the technology was based on alternating current. They pioneered in high voltage transmission and by 1902 had an installation in California operating at 60,000 volts. In 1895 the Laboratory was absorbed by the Stanley Company, and in 1899 the control was gained by Roebling Sons Company of Trenton, NJ. In 1903 the General Electric Company bought a major interest in it and by 1907 the Pittsfield Works (e.g., Stanley's original manufacturing plant) was fully integrated into the GE Company. Stanley went along with GE and became an active member of its influential Advisory Research Laboratory Committee, while pursuing his own interests, such as invention of an all-metal "thermos" bottle. He received 130 patents and was awarded the Edison Medal from the AIEE in April of 1912. He died May 14, 1916. Pittsfield has a business park named after William Stanley.

Charles Steinmetz on William Stanley

Charles Steinmetz, probably the most respected engineer of the time, had this to say of Stanley's work: "The solution of that problem was the most important thing that had yet been done in electricity. It was solved by a man unknown to the public. William Stanley, by his invention of the transformer, made possible the economical long-distance transmission of power."[3]

For further reading (taken from Wikipedia):


* Mel Olken is a Life Fellow of the IEEE and the Editor-in-Chief of the IEEE Power & Energy Magazine. He has been active in the IEEE affairs for a long time. This year the Region 1 of the IEEE has honored him with the William Terry Service Award for his Outstanding Lifetime Service to the IEEE and Region 1.
THE ORIGINAL TRANSFORMER BUILT BY WILLIAM STANLEY IN 1885.