

### Charles F. Brush.

The development of the arc light and the arc lighting system in this country probably owes more to Charles F. Brush than to any other man.

Charles Francis Brush was born in Cuyahoga County, O., March 17, 1849. His father, Col. Isaac E. Brush, was a manufacturer in New York who went to Ohio in 1846. His mother was Della Wisner Phillips. Both parents descended from old lines of American families. The boy obtained his early education in the public schools and was graduated from the high school in Cleveland.

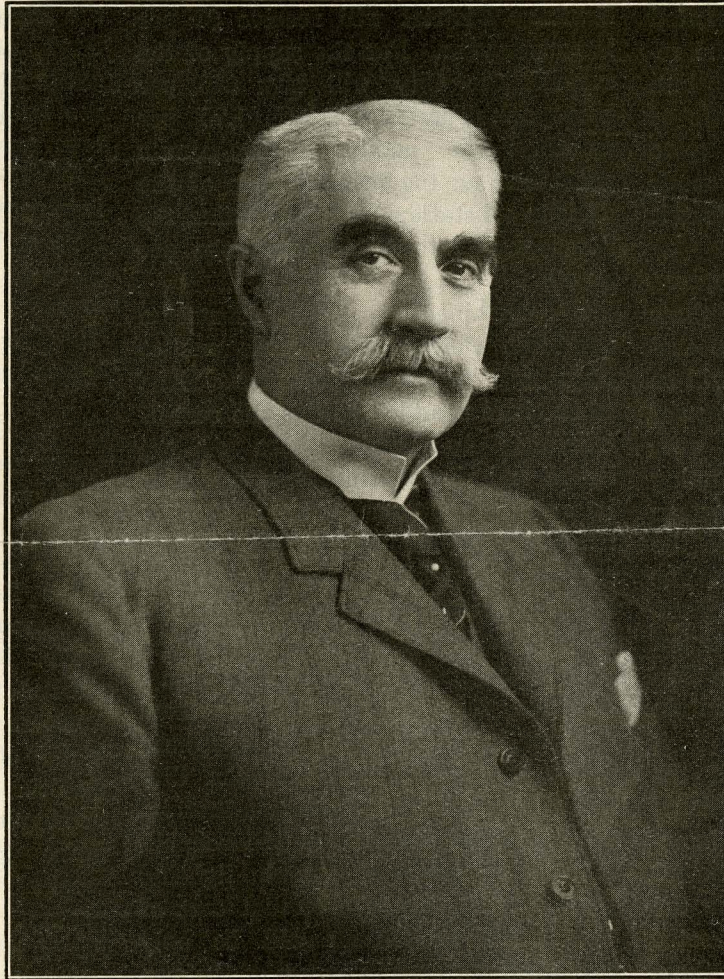
While still at school he became interested in electrical apparatus, and constructed static machines, induction coils, and small motors, and at graduation wrote an essay on the dynamo and arc light based upon Wilde's experiments in London. He then went to the University of Michigan, and was graduated as a mining engineer in 1869. A post-graduate course brought him the degrees of M. S. at this University, and Ph. D. at Western Reserve University. The latter conferred upon him the degree of LL. D., and Kenyon College conferred a similar honor in 1903.

Dr. Brush soon turned his attention exclusively to electrical matters and as early as 1876 had designed a dynamo which was constructed under his own direction. This pioneer machine was exhibited at the Paris Exposition in the United States Historical Exhibit. In 1877 he introduced the compound field winding for constant potentials. This idea, now so generally applied in electric lighting, was first used in plating machines.

Turning his attention to the arc lamp, Dr. Brush developed both a practical apparatus for regulating a lamp and a high-potential dynamo for series lighting. The first plant of this kind was installed in Boston in 1878. After that the work developed rapidly and has ever since been a growing industry. Among other things, Dr. Brush introduced the copper plating of car-

bon electrodes, which simple invention brought him large royalties.

In 1881, the Brush Electric Company was incorporated and capitalized at \$3,000,000, a very large figure for those days. About ten years later the General Electric Company was formed and absorbed the old company, and the works were removed from Cleveland to Schenectady. In the meantime other corporations had been formed in various parts of the world to introduce the Brush apparatus and system.



CHARLES F. BRUSH,  
Pioneer Inventor in Electric Arc Lighting.

The storage battery has also received considerable attention from Dr. Brush, and as a result of his efforts considerable improvement in the manufacture of lead plates was effected.

In 1881 Dr. Brush was decorated by the French Government as a chevalier of the Legion of Honor, and in 1889 the American Academy of Arts and Sciences awarded him its Rumford medal.

Dr. Brush is a member of the American Institute of Electrical Engineers; the National Electric Light Association; the Franklin Institute; the Amer-

ican Philosophical Society; the American Chemical Society; the Archeological Institute of America; the American Historical Association, and a fellow of the American Association for the Advancement of Science. He is a life member of the British Association; of the American Society of Mechanical Engineers; of the Cleveland Chamber of Commerce, and of the Ohio State Board of Commerce. The Union, University, Country, Mayfield, Euclid and Golf Clubs of Cleveland, and the University Club of New York all number him among their membership. He is president of the Winous Point Shooting Club; of the Cleveland Arcade Company, and of the Linde Air Products Company. He is a trustee of the Western Reserve University; Adelbert College; University School, the Cleveland School of Art and the Case School of Applied Science. He is a vestryman of Trinity Cathedral, and a member of the Sinking Fund Commission of Cleveland. He has served as president of the Chamber of Commerce and of the Union Club.

Dr. Brush was married in 1875 to Mary E. Morris, and has three children—Edna, Helene and Charles Francis, Jr.

### Wireless Experiments from a Balloon.

An ascent in a dirigible balloon was recently made at Brentwood, England, by Lieutenant M. M. Maitland and A. de Mowbray Bellairs, for the purpose of testing a newly invented portable wireless apparatus. An altitude of 7,000 feet was reached, and the experiments are said to have demonstrated an advantage over the ordinary stationary equipment because of the greatly increased height.

### Electric Hoists for Nevada Mines.

A Goldfield, Nev., report states that a 250-horsepower electric hoist will be installed at the Clermont shaft of the Goldfield Consolidated Mining Company, and that the Mohawk and Laguna shafts will each have a 150-horsepower electric hoist in the near future.



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~~Institution of Electrical Engineers (Great Britain), Societe Francaise des Electriciens (France), Association Suisse des Electriciens (Switzerland), Associazione Elettrotecnica Italiana (Italy), Koninklijk Instituut van Ingenieurs (Holland), Verband Deutscher Elektrotechniker E. V. (Germany), Denki Gakkwai (Japan), Norsk Elektroteknisk Forening (Norway), and Elektrotechnicky Svaz Ceskoslovensky (Czechoslovakia).~~

### Some Leaders of the A. I. E. E.

Charles Francis Brush, Charter Member of the Institute, scientist and Edison medalist for 1913, was born at Euclid, Ohio, March 17, 1849, both of his parents coming from old American families. His grammar and high school education was obtained in the public schools of Cleveland from which he was graduated at an early age. While still at school, he became intently interested in electrical apparatus and, in true boy fashion, experimented with his own construction of static machines, induction coils and small motors: His graduating essay, in fact, was on the dynamo and arc light, based upon the Wilde experiments in London. In 1869 he was graduated in mining engineering, from the University of Michigan, returning for a postgraduate course which won for him his M. S. degree, followed by a Ph. D. from the Western Reserve University. This latter university also conferred upon him an honorary degree of LL. D., as did also the Kenyon College in 1903.

It was in 1860 that the Italian, Paccinotti, made a great discovery in electricity, but it was destined to remain buried in the archives of Italian libraries until a young Belgian by the name of Gramme reinvented the dynamo electric machine. Doctor Brush, then a young man just out of college, was one of the first to realize the value of this "neucleus" and to undertake further the history of its evolution and application with variation and improvement. By 1876 he had designed a dynamo—constructed under his own supervision—a pioneer machine to be exhibited at the Paris Exposition in the United States Historical Exhibit. In 1877 he introduced the compound field winding for constant potentials now so generally applied to electric lighting; its first use was in connection with plating machines. At the Charitable Mechanics' Fair in Boston, (1878), an exhibit of greatest historic and scientific interest, was displayed the earliest form of what afterward became the world-famous Brush arc light machine. His, too, was the great invention of the differential arc lamp, the construction and operation of which included the principle making it possible to operate lamps in series instead of in parallel. He also developed another apparatus of great significance,—the automatic cut-out, permitting each lamp to cut itself out of circuit should trouble arise or the carbon burn out. This was looked upon as one of the greatest inventions of the era—conceded by even Doctor Brush's contemporaries in the same field of develop-

ment. From that time on it was a rapidly growing industry. Copper plating of carbon electrodes was also introduced by Doctor Brush and yielded large royalties. In 1881 the Brush Electric Company was incorporated and capitalized at \$3,000,000. Approximately ten years later when the General Electric Company was formed, it absorbed this company and the works were removed from Cleveland to Schenectady, but in the meantime, through the formation of other corporations, the Brush apparatus and system were being introduced. The storage battery problem was also receiving considerable attention from Doctor Brush, and as a result of his effort, great improvement was accomplished in the manufacture of lead plates. By Doctor Brush, also, was devised the ingenious system of charging storage batteries from an arc light system and the subsequent subdivision of light, demonstrating that it was possible to run incandescent lights on an arc light circuit. In 1881 at the International Electrical Exposition in Paris there was exhibited by the English Brush Company as one of the most interesting features, a certain Brush apparatus. In this year, also, Doctor Brush was decorated by the French Government as Chevalier of the Legion of Honor; in 1889, the American Academy of Arts and Sciences awarded to him the Rumford medal, bestowed by both the Royal Society and the American Academy of Arts and Science, "for the most important discovery or useful improvement on heat and light." Doctor Brush is a corporator of the Case School of Applied Science, trustee of the Western Reserve University, Fellow of the American Academy of Arts and Sciences; member of the Physical Society, the American Philosophical Society; Fellow of the American Association for the Advancement of Science; Life Member of the British Association, Ohio State Board of Commerce, Cleveland Chamber of Commerce (of which he was also president 1909-10); The American Society of Mechanical Engineers; member of the Archeological Institute of America, the American History Association, the National Electric Light Association, the Franklin Institute, the American Chemical Society, the Royal Society of Arts; Fellow of the American Geographic Society and the N. British Academy of Arts.

~~The strong, steady growth of power consumption throughout the United States started out in January of this year at about the same rate of increase shown by both 1925 and 1926. During January the country used 6,714,000,000 kilowatt-hours of electric energy to light its homes and streets, to operate its industries and to do the thousand other things that electricity does. This is 10 per cent ahead of January, 1926 and that month was 10 per cent in advance of January, 1925.~~

~~This year water power started out a little stronger than it did in 1926. In January, 35 per cent of the country's electric energy was generated by the force of falling water and the balance by fuels.~~