NATIONAL ACADEMY OF SCIENCES
OF THE UNITED STATES OF AMERICA
BIOGRAPHICAL MEMOIRS
VOLUME XX—FOURTH MEMOIR

BIOGRAPHICAL MEMOIR

OF

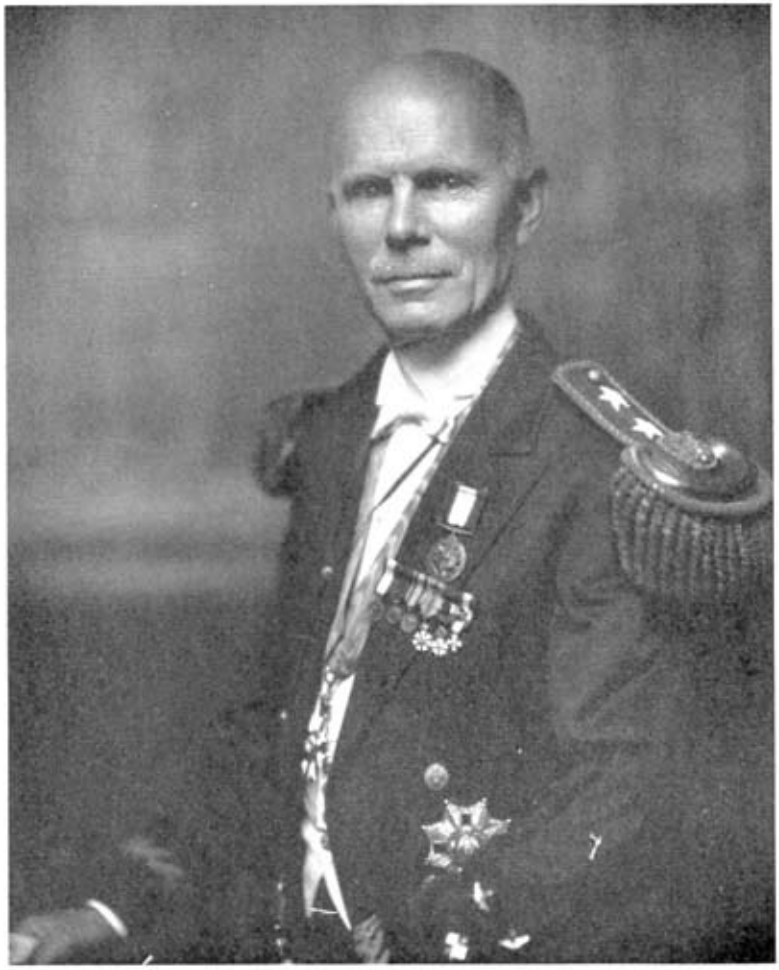
GEORGE OWEN SQUIER

1865–1934

BY

ARTHUR E. KENNELLY

PRESENTED TO THE ACADEMY AT THE ANNUAL MEETING, 1938



George O. Squier

GEORGE OWEN SQUIER

1865–1934

BY ARTHUR E. KENNELLY

George Owen Squier was a remarkable combination of American soldier, applied scientist, inventor, and engineer, as well as an army administrator and an outstanding Chief Signal Officer.

He was born at Dryden, Michigan, March 21, 1865. His parents were Almon Justice and Emily Gardner Squier. He entered West Point Military Academy at the age of eighteen, and passed through his four years cadetship training with distinction, graduating in 1887. In after years he used to say that at one time in his West Point career he accidentally fell half an hour behind in the routine of his studies, and that it took all his efforts during the remainder of his course to catch up with the schedule. He held the West Point course in high esteem and regarded the incident as an index of its precision. He often told interesting anecdotes of West Point cadet life, illustrating the *esprit de corps* which the institution develops among United States Army officers.

On graduating from West Point in 1887 Squier was appointed a Second Lieutenant in the 3rd Artillery Corps. His training in that branch of the service showed him the importance of accurate scientific knowledge in ballistics and ordnance engineering. He, therefore, took up the study of those subjects, by entering Johns Hopkins University at Baltimore as a graduate student, specializing in mathematics, physics, and ballistics. He became a fellow of Johns Hopkins in the academic year 1891-1892, and received there his Ph.D. degree in 1893, his graduating thesis being on the subject of chemical effects due to magnetism.

He was then appointed a First Lieutenant in the 3rd Artillery Corps and an ordnance instructor at the United States Artillery School in Fortress Monroe, Virginia. At this school he developed instruments for measuring the recoil of guns in action and the velocities of their projectiles. These researches were embodied in several papers and in a book written jointly with Dr. Albert Cushing Crehore—"The Polarizing Photo-chronograph".

At the outbreak of the War with Spain in 1898 Dr. Squier

sought service in the Signal Officer Volunteers and entered with the grade of Captain. In this service he was sent to the Philippine Archipelago, in 1900, where he commanded the cable ship *"Burnside,"* and laid a system of submarine cables between strategic points in the islands. He rightly concluded that the number of infantry men required to maintain effective garrison control over the islands could be greatly reduced by an extensive network of cable and wire communication, terminating in army headquarters. After the war he was appointed to the United States Signal Corps, first as Captain, later as Major, and finally as Chief Signal Officer in the California district.

It was during this period that he took up the study of army cable and radio communication, publishing several papers in this field. Major Squier discovered that a growing tree could serve as a receiving radio antenna if a nail were driven into it fairly high up and a wire brought down from the nail to the receiving instrument on the ground. As a corollary to the proposition that trees and their branches have sufficient conductance to serve as radio antennas, he showed that forests, shrubs, and vegetation generally act as partially absorbent media for radio waves passing over forest land areas.

He also made a study of aviation, then in its early stages of development. In 1908, Major Squier was the first passenger taken up into the air by the aviation pioneer, Orville Wright, in the latter's early form of airplane at Fort Myer. Twenty years later, the two men met in Washington to compare their aviation experiences; the first passenger thus comparing notes with the world's first aviator.

From the earliest days of the Wright brothers' flying machine Squier recognized the immense military importance of the airplane. A large part of his work as Chief Signal Officer was directed toward improving the range, power and effectiveness of this arm of the service as a separate branch of the military art. He succeeded in bringing the American military airplane into the front line of effectiveness during the World War. He foresaw that the bombing airplane would become a mighty engine of destruction in future wars.

In 1911 Squier was granted several United States patents for

transmitting telephone messages over cabled telephone conductors, using high frequency alternating current generation and the modulation of this impressed inaudible tone through the use of a microphone transmitter. This carrier frequency principle has since proved of great service in both wire and wireless telephony. Squier gave to it the name of *"wired-wireless"*. This invention added greatly to his fame as a scientist and engineer. General Squier also contributed a number of inventions for military service, notably a *"quick-aid" kit* for Army and Red Cross first-aid work.

From 1912 to 1916, Lieutenant Colonel Squier was a military attaché to the United States Embassy at London, where he made a special study of European military aviation and where the British Army authorities gave him special facilities for investigation. He was a close observer of the British technical radio and aviation activities during the first two years of the World War. He furnished an extensive report to the United States War Department of these activities. The United States Ambassador to Great Britain at that time, Walter H. Page, wrote a glowing account in his memoirs of Colonel Squier's services in London. Recalled to America in May, 1916, Squier was put in charge of the United States Signal Service as Chief Signal Officer. He organized and administered the electrical communication service between the American Expeditionary Force in Europe and its base in America, using for that purpose electrical communication of all types by radio, cable, and wires. This service continued until two years after the war. He was raised to the rank of Brigadier General in 1917, and from May 20, 1916, to May 20, 1918, was in charge of the Army Air Service, later receiving the distinguished service medal (D. S. M.) for his services.

General Squier was technical adviser to the American delegation at the International Conference on Electrical Communications in Washington during 1920. In 1921 he represented the State Department at sessions of the International Conference on Electrical Communications in Paris, and in the same year was an expert assistant to the American delegation at the Conference on Limitation of Armament, held in Washington.

General Squier was notable for his swiftness of judgment, resolute courage, and earnestness of purpose. His wiry, erect bearing and purposeful demeanor marked him at once as a military officer. He was ever punctual and precise in all engagements, while cheerfully putting late arrivals at their ease. He used to say that one of the many gifts of radio to the world was the radio announcer's habit of broadcast punctuality, even to the extent of ruthlessly cutting off a broadcast in the middle of a word. General Squier was a hard worker, facing every task with cheerfulness and courage. He never married, but was a family friend in numerous homes. With the aid of his sister, Mrs. Mary Squier Parker, who survived him, he built a "country club for country people" at his birthplace, Dryden, Michigan, where he succeeded in giving summer country associations to many of his friends and fellow townspeople. The Club has daily drawn hundreds of persons during the summer months, for recreation in games, boating, swimming, and other sports. This Club was one of General Squier's favorite hobbies. After his retirement from the Army in 1924, he frequently spent his winters in Florida and the other seasons in Washington and Dryden. Wherever he went, General Squier brought brightness and enjoyed popularity. His staff was enthusiastic in its praise and esteem for him.

Numerous honors were bestowed on General Squier both in this country and abroad. He was a Commander of the French Legion of Honor, a Knight Commander of St. Michael and St. George in Great Britain, a Commander of the Order of the Crown of Italy, and a member of the Royal Institution of Great Britain. General Squier held membership in the National Academy of Sciences, the American Philosophical Society, and was a fellow of Johns Hopkins University. He also received an honorary degree from Dartmouth College. General Squier was a life member and fellow of the American Institute of Electrical Engineers. He received from the Franklin Institute, the John Scott Medal in 1896, the Elliott Cresson Medal in 1912, and the Franklin Medal in 1919.

He died at Washington, March 24, 1934, at the age of 69.

PATENTS

Patent no. 620,746, March 7, 1899. Means for impressing semicycles of electromotive force on electric circuits. (With A. C. Crehore.)

Patent no. 625,647, May 23, 1899. Alternating current range and position finder. (With A. C. Crehore.)

Patent no. 655,203, August 7, 1900. Telegraphic transmitter and receiver. (With A. C. Crehore.)

Patent no. 669,149, March 5, 1901. Capillary electrometer for relay purposes. (With A. C. Crehore.)

Patent no. 698,260, April 22, 1902. Transmitting intelligence. (With A. C. Crehore.)

Patent no. 698,261, April 22, 1902. Submarine-cable telegraphy. (With A. C. Crehore.)

Patent no. 711,941, October 28, 1902. Submarine-cable telegraph. (With A. C. Crehore.)

Patent no. 782,181, February 7, 1905. Wireless telegraphy.

Patent no. 823,206, June 12, 1906. Telegraph transmitter. (With A. C. Crehore.)

Patent no. 851,071, April 23, 1907. Automatic telegraphy. (With A. C. Crehore.)

Patent no. 980,356, January 3, 1911. Multiplex telephony and telegraphy.

Patent no. 980,357, January 3, 1911. Multiplex telephony and telegraphy.

Patent no. 980,358, January 3, 1911. Multiplex telephony and telegraphy.

Patent no. 980,359, January 3, 1911. Multiplex telephony and telegraphy.

Patent no. 1,044,502, November 19, 1912. Method and apparatus for detecting and observing forces. (With A. C. Crehore.)

Patent no. 1,233,519, July 17, 1917. Telegraphy. Mayfair, London, England.

Patent no. 1,281,684, October 15, 1918. Electric signalling. (With L. W. Austin and L. Cohen.)

Patent no. 1,289,668, December 31, 1918. System of electric signalling. L. Cohen, Inventor, assigned one-half to Geo. O. Squier.

Patent no. 844,314, February 19, 1907. Apparatus for regenerating electrolytes.

Patent no. 855,221, May 28, 1907. Electrolytic diaphragm and making same.

Patent no. 939,966, November 16, 1909. Method of molding articles.

Patent no. 941,605, November 30, 1909. Packing material.

Patent no. 942,699, December 7, 1909. Method of making insoluble products of phenol and formaldehyde.

Patent no. 942,700, December 7, 1909. Condensation product of phenol and formaldehyde and method of making the same.

Patent no. 942,808, December 7, 1909. Abrasive composition and method of making same.

Patent no. 942,809, December 7, 1909. Condensation product and method of making same.

Patent no. 942,852, December 7, 1909. Indurated product and method of preparing same.

Patent no. 949,671, February 15, 1910. Method of indurating fibrous and cellular material.

Patent no. 954,666, April 12, 1910. Varnish.

Patent no. 957,137, May 3, 1910. Container for food products.

Patent no. 982,230, January 24, 1911. Coated object and method of making the same.

Patent no. 1,018,385, February 20, 1912. Varnish.

Patent no. 1,019,406, March 5, 1912. Composite cardboard.

Patent no. 1,019,407, March 5, 1912. Method of uniting objects.

Patent no. 1,019,408, March 5, 1912. Wood-finishing.

Patent no. 1,037,719, September 3, 1912. Varnish.

Patent no. 1,038,475, September 10, 1912. Process of making insoluble bodies derived from phenol alcohols.

Patent no. 1,054,265, February 25, 1913. Antifriction device.

Patent no. 1,057,211, March 25, 1913. Impregnating wood and products thereof.

Patent no. 1,057,319, March 25, 1913. Impregnated wood and preparing the same.

Patent no. 1,083,264, December 30, 1913. Sound record.

Patent no. 1,085,100, January 27, 1914. Protective coating composition.

Patent no. 1,088,677, March 3, 1914. Infusible condensation product of metacresol and formaldehyde.

Patent no. 1,088,678, March 3, 1914. Infusible condensation product.

Patent no. 1,133,083, March 23, 1915. Phenolic condensation product.

Patent no. 1,146,045, July 13, 1915. Process for making insoluble bodies derived from phenol alcohols.

Patent no. 1,156,452, October 12, 1915. Insulating composition.

Patent no. 1,160,362, November 16, 1915. Method of making a plastic body.

Patent no. 1,160,363, November 16, 1915. Waterproof object or article.

Patent no. 1,160,364, November 16, 1915. Machine element.

Patent no. 1,160,365, November 16, 1915. Paper-like product and method of making the same.

Patent no. 1,187,229, June 13, 1916. Process of making condensation products of phenols and formaldehyde.

Patent no. 1,187,230, June 13, 1916. Reaction product of hexamethylenetetramin and phenolic bodies and method of making same.

Patent no. 1,187,231, June 13, 1916. Phenolic condensation product and method of making the same.

Patent no. 1,187,232, June 13, 1916. Process for making insoluble bodies derived from phenol alcohols.

Patent no. 1,190,845, July 11, 1916. Process for organic synthesis.

Patent no. 1,200,692, October 10, 1916. Hard-rubber composition.

Patent no. 1,213,144, January 23, 1917. Organic insulating composition.

Patent no. 1,213,726, January 23, 1917. Impregnated coil and method of making the same.

Patent no. 1,216,265, February 20, 1917. Insulating composition.

Patent no. 1,216,266, February 20, 1917. Insulating composition.

Patent no. 1,217,115, February 20, 1917. Phenolic condensation product and process of making same. (With Gotthelf.)

Patent no. 1,233,298, July 17, 1917. Matrix.

Patent no. 1,259,472, March 19, 1918. Composition containing phenolic condensation products.

Patent no. 1,259,473, March 19, 1918. Process of molding articles.

BIBLIOGRAPHY OF GEORGE OWEN SQUIER

Electro-chemical effects due to magnetism. Thesis (Ph.D.) Johns Hopkins Univ.; Amer. Journ. Sci., vol. 45, June, 1893.

(With Albert Cushing Crehore.) Note on a photographic method of determining the complete motion of a gun during recoil. Journ. U. S. Artillery, vol. 4, no. 4, Fort Monroe, Va., Artillery School Press, 1895, pp. 7, pls. 2, diagrs.

(With Albert Cushing Crehore.) Experiments with a new polarizing photo-chronograph, applied to the measurement of the velocity of projectiles. Journ. U. S. Artillery, vol. 4, no. 3, Fort Monroe, Va., Artillery School Press, 1896, pp. 409-452, pls. 14, diagrs. Afterwards included in the authors' work "The Polarizing Photo-chronograph," New York, 1897.

(With Albert Cushing Crehore.) The polarizing photo-chronograph. Being an account of experiments at the U. S. Artillery School, Fort Monroe, Va., in developing this instrument. Originally appeared in Journ. U. S. Artillery, vol. 4, no. 3. New York, J. Wiley & Sons; London, Chapman and Hall, Ltd., 1897, pp. 150, ill., diagrs.

(With Albert Cushing Crehore.) Tests of the synchronograph on the telegraph lines of the British Government. A report to the Postmaster General of the United States. Philadelphia, 1898, pp. 34, ills., diagrs. Printed from advance sheets Journ. Franklin Inst., vol. 145.

Elementary principles of the alternating current. Compiled as guide to the lectures upon this subject to the class of student officers, U. S. Artillery School, Fort Monroe, Va. Artillery School Press, 1898, pp. 26, diagrs.

American Pacific cable. Independent, vol. 52, Feb. 8, 1900, pp. 359-362, map. Sci. Amer. Suppl., vol. 49, Feb. 17, 1900, pp. 20186-20188; Feb. 24, 1900, pp. 20195-20197.

Influence of submarine cables upon military naval supremacy. Sci. Amer. Suppl., vol. 51, Apr. 20, 1901, pp. 21156-21158.

"Team-work" in war. Abstract of a lecture delivered at the U. S. Signal School, Fort Leavenworth, Kansas. U. S. Cavalry Journ., July, 1906.

Field equipment of signal troops. Infantry and Cavalry School, Leavenworth, Kansas, 1907.

The present status of military aeronautics. Appendix I. U. S. Signal Corps specification for heavier-than-air flying machines. 2. U. S. Signal Corps specification for dirigible balloon. 3. Bibliography. Journ. Amer. Soc. Mech. Eng., vol. 30, 1908, pp. 1571-1642. Reprinted (abridged by author) in Annual Report of the Smithsonian Institution, 1908, pp. 117-144, ill.

Advantages of aerial craft in military warfare. Aeronautics, vol. 2, 1908, pp. 17-18.

What mechanical flight means to the army. Harper's Weekly, vol. 52, Nov. 21, 1908, pp. 11-12.

Aerial locomotion in warfare. The military possibilities of the aeroplane and airship. Sci. Amer. Suppl., vol. 67, Jan. 2, 1909, p. 7.

Recent progress in aeronautics. Science, vol. 29, Feb. 19, 1909, pp. 281-289.

Ships in the air and water. Sci. Amer. Suppl., vol. 67, Feb. 6, 1909, p. 83.

(With Albert C. Crehore.) Note on oscillatory interference bands and some practical applications. Reprint No. 150, Bull., Bur. Standards, vol. 7, no. 1, Sept. 1, 1910, pp. 12.

Multiplex telephony and telegraphy by means of electric waves guided by wires. Prof. Paper, Signal Corps, U. S. Army, War Dept. Doc. 390, 1911, pp. 102, ill., diagrs. Reprinted Jan. 1919.

(With Albert Cushing Crehore.) Waves of pressure in the atmosphere recorded by an interferometer barograph. Washington, Apr. 18, 1911, pp. 6, ill.

Multiplex telephony and telegraphy by means of electric waves guided by wires. A paper presented at the twenty-eighth annual convention of the American Institute of Electrical Engineers. Proc. Amer. Inst. Elec. Engrs., May, 1911, pp. 857-905. Reprinted in the Annual Report of the Smithsonian Institution, 1911, pp. 133-153, ill.

Multiplex telephony and telegraphy. Sci. Amer. Suppl., vol. 72, 1911, pp. 4-6, 20-22, 36-38, 52-53.

Important advance in telegraphy. Cable signaling system of G. O. Squier. Literary Digest, vol. 52, Apr. 29, 1916, pp. 1216-1217, portrait.

Electric waves directed by wires. Sci. Amer. Suppl., vol. 72, Dec. 16, 1911, pp. 398-399.

Multiplex telephony. Outlook, vol. 97, Feb. 11, 1911, pp. 294-295.

Aeronautics in the United States at the signing of the armistice, November 11, 1918. An address before the American Institute of Electrical Engineers, New York, 1919. Presented at the 345th meeting, American Institute of Electrical Engineers, New York, Jan. 10, 1919.

Unification of communication engineering. Sci. Amer., vol. 127, Aug. 1922, p. 85, portrait.

The easy course in home radio. Edited by Major General George O.

Squier. New York, 1922, M. H. Ray and The Review of Reviews Co., 7 vols., ill. (incl. portraits), diagrs.

The easy course in home radio. Edited and approved by Major General George O. Squier. New York, 1924.

Multiplex telegraphy and telephony. Letter from the Secretary of Commerce submitting in response to Senate Res. 149, a report concerning the discovery of multiplex telegraphy and telephony and the extent to which this system is now used. Senate Doc. 172, 69th Congress, 2d Sess., 1926, pp. 39.

Telling the world. Baltimore, 1933. The Williams and Wilkins Co. in cooperation with The Century of Progress Exposition, 1933. A Century of Progress Series, pp. 156-162, portrait.