

THE VALTELLINA RAILWAY—THE FIRST STANDARD THREE-PHASE ROAD.

Readers of the SCIENTIFIC AMERICAN are more or less familiar with the electric railway built by Ganz & Co., of Budapest, along the shores of Lake Como. The road was opened for regular traffic on September 4 last, since which time it has been running faultlessly.

The Valtellina line is 66 miles long, and of standard gage. It runs along Lake Como and the River Adda, with three branches extending from Lecco to Colico, from Colico to Chiavenna, and from Colico to Sondrio.

The central power station is situated at Morbagnò, the water power of the River Adda being utilized to drive the turbines. The effective head of the turbines is 30 meters (98.4 feet). There have been installed three turbine dynamos, each with a capacity of 2,000 horse power at 150 revolutions per minute. The three-phase alternating-current generators coupled directly with the turbines generate current at a tension of 20,000 volts at the terminals. This high-tension current is led to the primary conductors of the line through a switchboard, and is transformed into three-phase alternating current at 3,000 volts by means of step-down transformers situated along the line. This stepped-down current is led to the contact wires, and thence directly to the motors of the vehicle. The primary conductors are extended along the line on the same poles which carry the contact wires.

For the line at Lake Como the motor cars are 18.1 meters in the carriage body and 19 meters (62¼ feet) over the buffers. The cars rest on two bogie-trucks, each having a wheel-base of 2½ meters. Without passengers a car weighs 50 tons, including the motors. The wheels are 1.17 meters (3.8 feet) in diameter, while those of the electric freight locomotives supplied to the same line have a diameter of 1.4 meters (4.59 feet). The locomotive motor weighs 3.8 tons; its rotor about 1½ tons. The car-motors with a smaller size wheel weigh 3½ tons approximately. Each series pair of these motors develops a full-load horse power of 150, while the high tension motor itself, when running at full speed with the low tension motor cut out, yields about the same horse power. Thus, 300 horse power are developed in one truck carrying two pairs of motors, or 600 horse power (450 kilowatts) on one train with front and rear driving cars.

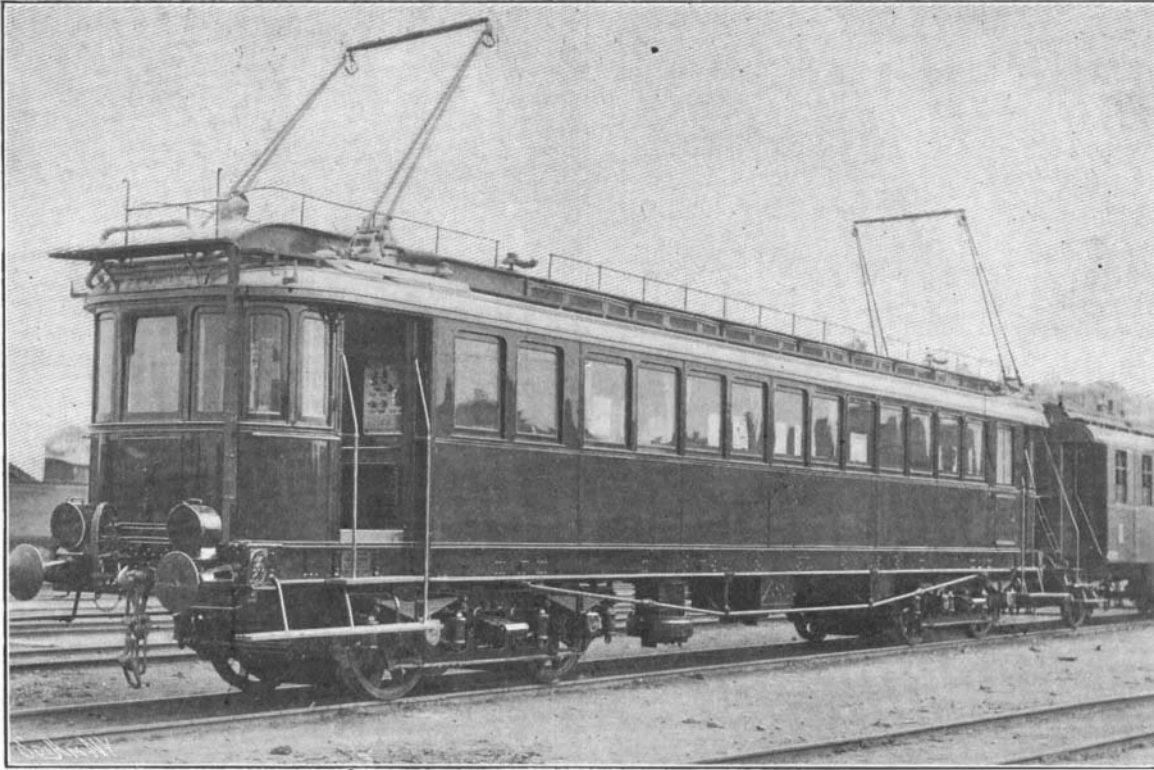
The current generated at the central station has a frequency of 15 per second. When running synchronously the high tension motors make 300 revolutions per minute. In the rotor of the same motor the periodicity currents vary according to the slip. During the start, when the high tension is switched into series connection with the low tension motor, after the speed has risen to "half speed," or 150 revolutions per minute—above which speed the series connection ceases—the periodicity of the currents in the rotor of the high tension and in the stator of the low tension is about 7½ per second. The speed of the locomotive motors is 125 revolutions per minute. The Valtellina locomotive motors are not geared in series; they are all high tension.

The line will be used for the transportation of both passengers and freight. Passengers are carried by the cars at a speed of 60 kilometers (37½ miles) per hour. The electric locomotives are used for hauling freight trains. Each train has a net weight of 250 to 300 tons. The speed attained is about 30 kilometers (18½ miles) per hour.

The commercial merits of the system are many. The initial outlay was not inordinate. The cost of maintenance is said to be comparatively small. For

railways of considerable length and heavy traffic, less maximum power is required in the central station with the Ganz high tension distribution than with the necessarily low tension of continuous current distribution, the ratio of maximum to average load at the central station being less.

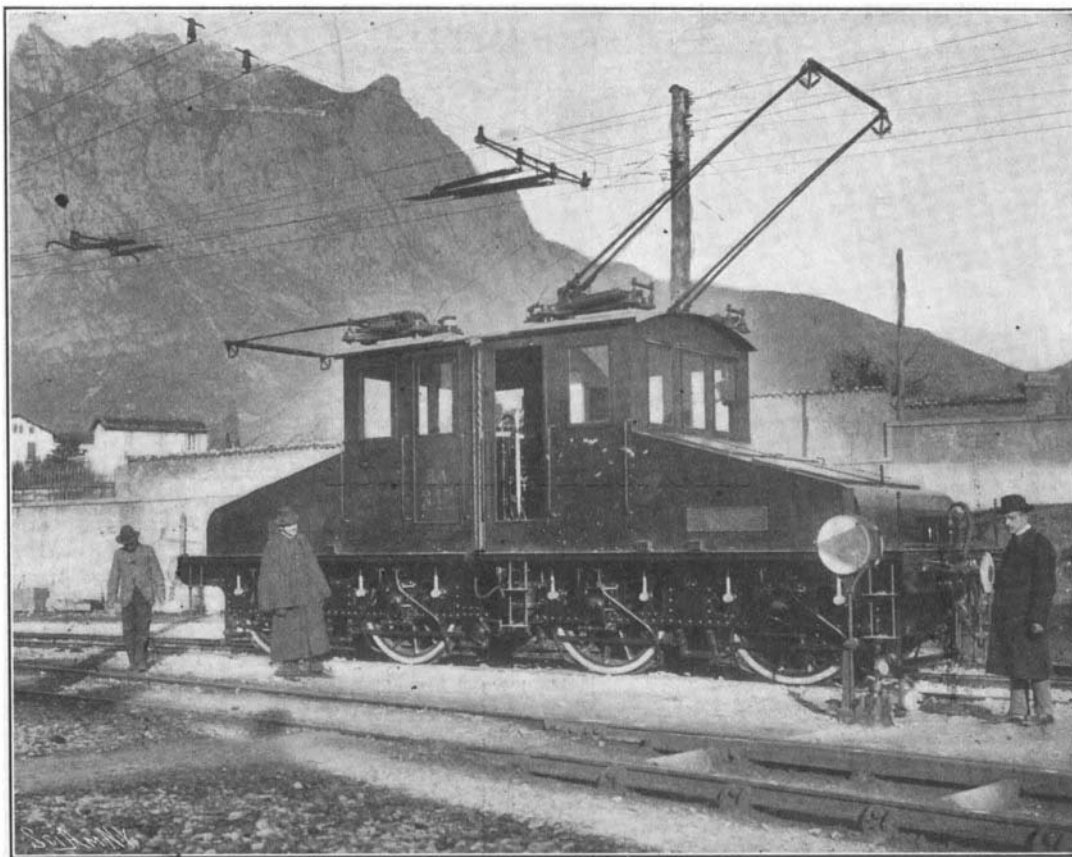
The electrical merits of the system are no less noteworthy, especially when the length of transmission from one central station is considered. By reason of



A PASSENGER CAR OF THE VALTELLINA ROAD.

the high voltage no large currents are used. The loss involved in converting to continuous current by rotary converters is eliminated. The use of pure induction motors without commutators, and the coupling of these in series pairs, results in a high motor efficiency.

The French Patent Office has granted a patent for the "penetration" process of glass coloring. Applications for patents have also been made in other countries of Europe, so we are informed. The process is described thus: Silver salt is put on the surface of the glass, which is then heated to 500 deg. or 550 deg. Cent. The excess of salt having been removed, the surface appears yellow, the color penetrating to a depth of 0.17 mm. when the baking has lasted for about five



FREIGHT LOCOMOTIVE OF THE VALTELLINA LINE.

minutes. After an hour, a layer of double that thickness would be colored; after eighteen hours the color would have penetrated through a glass plate 1.6 mm. in thickness. In reflected light this yellow displays a beautiful greenish or bluish fluorescence. Silver and copper give a red. Gold and iron salts have also been used. When the baking is continued for a long period, the coloring matter is renewed from time to time, say every six hours.

THE HON. SALEM H. WALES.

It is with sincere sorrow that we record the death on the 2d instant in this city of our old associate and partner, the Hon. Salem H. Wales.

Mr. Wales was born in Wales, Mass., on October 4, 1825. At the age of twenty-one he came to New York and entered a mercantile house in this city. In December, 1848, he became a member of the firm of Munn & Co., and became associated with Mr. O. D. Munn and Mr. Alfred E. Beach as one of the managing editors of the SCIENTIFIC AMERICAN. He continued to be identified with the publication until 1871, when he retired from business.

In 1855 he was appointed Commissioner to represent New York at the Paris Exposition of that year, and also served on the Executive Committee of the Christian Commission during the civil war. After his retirement from business he became interested in several public institutions and served New York city in a number of positions.

In 1873 he was appointed president of the Board of Park Commissioners, and again in 1880 and 1888 was a member of the same board. In 1874 he received the regular Republican nomination for Mayor of New York. He was not elected, but in the same year he was chosen president of the Board of Commissioners of Docks and in 1895 he

was appointed one of the Commissioners of the new East River Bridge, which position he held for several years.

He was a director in the Hanover Fire Insurance Company, in the National Bank of North America, in the Southampton (L. I.) Bank and the Southampton Water Works. He was a charter member of the Union League Club, organized in 1863, and had always been one of its most prominent and active members. Mr. Wales was also a member of the Century, Press and Church Clubs, the Meadow Club, the Golf Club of Southampton, the New England Society and the Metropolitan Museum of Art, and a member of the Executive Committee of the latter. He was prominent in promoting the success of the New York Homeopathic Medical College, and of the Hahnemann Hospital, and was president of both institutions for a number of years.

Mr. Wales was a man of sterling integrity, possessed a most amiable character, and was widely known and esteemed. His loss will be mourned by a large circle of friends and acquaintances.

He leaves two children, Mrs. Elihu Root, wife of the Secretary of War, and Edward H. Wales. Mr. and Mrs. Wales celebrated the fiftieth anniversary of their marriage on February 12, 1901.

The Scientific American Building Monthly.

There is probably no better illustrated or printed architectural periodical than the SCIENTIFIC AMERICAN BUILDING MONTHLY. In its pages the architect will find photographs and plans of houses, of all styles and costs. To the man who is not an architect, but desires simply to build, it is a treasure-house of suggestions. By glancing through each number he is sure to find a picture of the very house which meets his ideas. A page of bright comment discusses current architectural topics. The "Talks with Architects" are not the least valuable feature of the paper; for often enough the architect interviewed gives information by which even the experienced designer of houses may profit. Each month there appear notes under the captions "The Garden," "The Country House," "The Household," "Legal Decisions" and "New Books," in which new information is presented in an attractive manner. Especial attention is given to formal gardening as an adjunct to the modern mansion.