These reduction-gear sets, including the motors, are manufactured by Roth Brothers & Company, Adams & Loomis Streets, Chicago, Ill. Six of these machines with alternating-current motors have been furnished to the Panama Canal Commission for use along the Panama Canal.

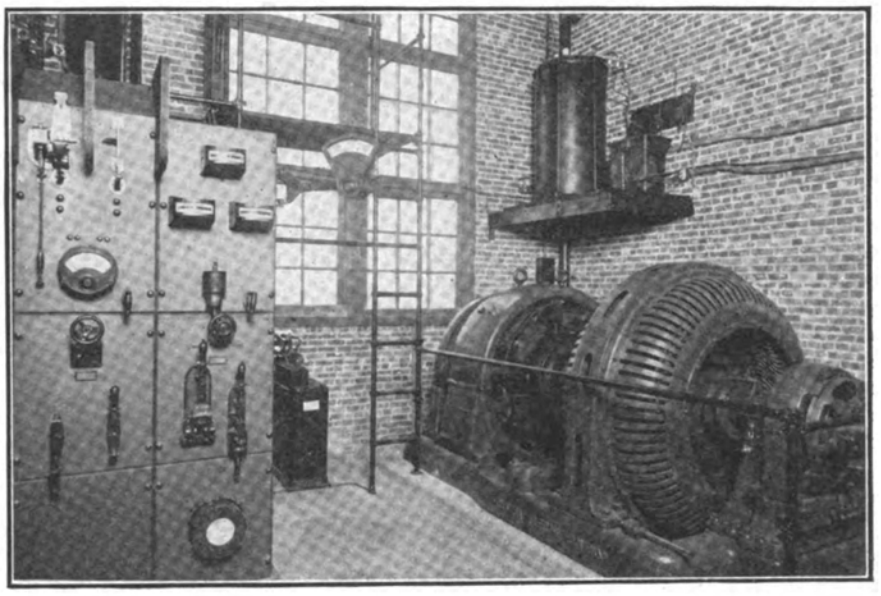
Electrification of Great Falls Terminal.

As a forerunner of the 3,000-volt, main-line electrification of the Chicago, Milwaukee & St. Paul Railway, which was described in our issue of December 26, 1914, the railway company has recently begun electrical operation of the terminal line in the city of Great Falls, Mont. That city is at present the terminal of the new 138-mile feeder line from Lewistown, Mont., connecting with the main-line transcontinental division at Harlowton, the eastern terminus of the 3,000-volt electrification now under construction. The Great Falls terminal yards are located in the center of the city and are connected by a crosstown line, about four miles in length, known as the Valeria Way Line. There are about three miles of additional electrified trackage, making a total of seven miles. The terminal buildings include a large freight house, roundhouse, power plant and passenger station.

The tracks connecting the Falls yards and the terminal yard pass through the business part of the city, and it is expected that considerable benefit will be derived from the elimination of steam-locomotive smoke from the center of the city, as well as a reduction in the cost of train haulage. The traffic includes the transfer of both freight and passenger trains from the Falls yards to the terminal station, as well as switching service in the terminals.

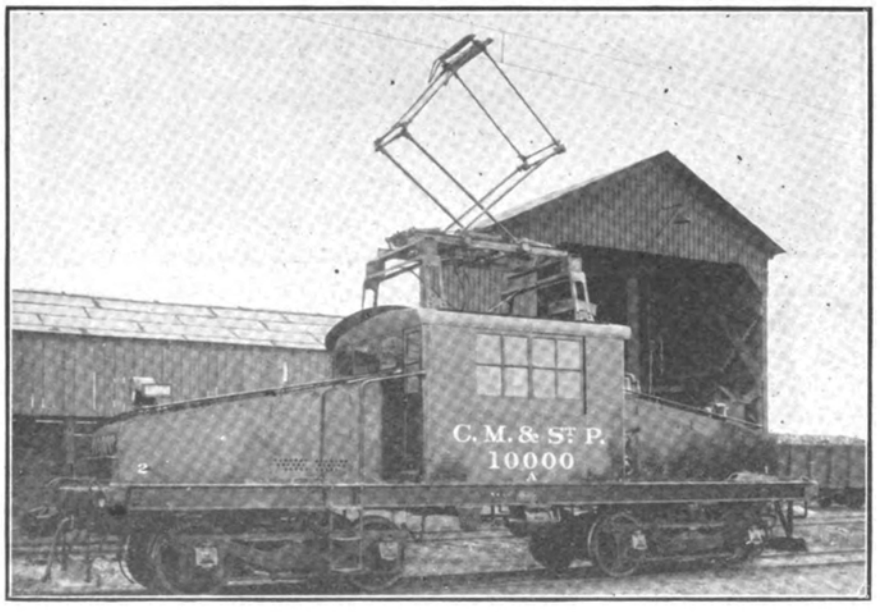
The electrical equipment is of sufficient capacity to take care of 580-ton freight trains operating at about 9.5 miles per hour on the maximum grades of 0.65 per cent. Electric power is supplied by the Great Falls Power Company from the hydroelectric plant at Rainbow Falls, about six miles from the substation. Energy is transmitted at 6,600 volts, three phase, 60 cycles as generated.

The substation equipment is located in the power station operated by the railway company for heating the terminal buildings, and includes a two-unit, synchronous motor-generator set with a two-panel switchboard for controlling the alternating and direct-current units. The motor is rated 435 kilovolt-amperes (0.8 power-factor), 6,600 volts, and operates at 900 revolutions per minute. Provision is made for starting as an induction motor through a compensator, which is operated from the alternating-current panel. The generator is of the commutating-pole type, rated at 300 kilowatts at 1,500 volts. The set is capable of carrying 200 per cent overload momentarily. Excitation for the motor fields and for the shunt fields of the direct-current generator is furnished by a 10-kilowatt, 125-volt, direct-connected exciter.



Substation Equipment for Great Falls Terminal.

The switchboard consists of two natural-black slate panels, one controlling the synchronous motor and the other the direct-current generator and feeder. The direct-current panel is a standard 1,500-volt type, carrying a remote-control, hand-operated switch and circuit-breaker mounted between slate barriers at the top of the panel. The motor panel contains the usual instruments and starting and operating switches for controlling the motor. An aluminum-cell lightning arrester is also installed in the station as a protection against electrical storms.



1,500-Volt Direct-Current Switching and Freight Locomotive, Great Falls Terminal.

All trains are handled by a standard, 50-ton electric locomotive of the steeple-cab type, designed for slow-speed freight and switching service. The running gear consists of two swivel equalized trucks, carried on semi-elliptic equalizer springs. The driving wheels are of solid rolled steel, 36 inches in diameter.

The motor equipment includes four type GE-207, 750-volt, box-frame, commutating-pole motors insulated for 1,500 volts. Each motor has a normal one-hour rating of 79 horsepower at 750 volts, and two motors are connected permanently in series. All motors are ventilated by a blower direct-connected to the dynamotor in the cab of the locomotive. The gear reduction is 64 to 17.

The control equipment is Sprague-General Electric type M, arranged for operation from either end of the cab. There are ten steps with the motors in series

and seven steps in series-parallel. Control current for operating the contactors, lighting and other auxiliary circuits is furnished by a 1,500-600-volt dynamotor. A multivane fan carried on an extension of the shaft furnishes air for ventilating the motors.

The current collector is a sliding pantograph, similar to that being installed on the main-line 3,000-volt locomotives. The slider is lifted into position by air pressure and is held against the wire by steel coil springs. Provision is made for operating at trolley heights varying from 17 to 25.5 feet above the top of the rail.

Compressed air for operating the air brakes, whistles and sanders is supplied by two 1,500-volt, motor-driven air compressors. Each of these units has a displacement of 27 cubic feet of air per minute at 90 pounds pressure. The compressors are located in the cab of the locomotive convenient for inspection.

A headlight, provided with a concentrated-filament type Mazda lamp of about 100 candlepower, is mounted on each end of the locomotive.

As a safety precaution, no trolley wire is installed inside of the roundhouse. A connection is made in the cab of the locomotive for applying power to the locomotive through a length of special flexible cable insulated for 2,400 volts. A double-throw switch in the locomotive cab allows connection to be made either to the trolley or cable circuit.

The overhead line construction is of the catenary type, similar in a general way to that installed on the Butte, Anaconda & Pacific 2,400-volt railroad. Both span and bracket construction are used, depending on local conditions. Poles are spaced approximately 150 feet apart on tangent track, supporting a 4/0 grooved trolley from a three-point suspension. There is no feeder copper installed.

The work was done by the electrification department of the Chicago, Milwaukee & St. Paul Railroad, R. Beeuwkes, engineer-in-charge, under the direction of C. A. Goodnow, assistant to the president. All of the electrical apparatus, including locomotive, substation equipment and line material, was furnished by the General Electric Company.

Sprague Electric Club Organized.

A large and representative gathering of the members of the commercial and manufacturing departments of the Sprague Electric Works of General Electric Company recently met at the Hotel Marlborough, New York City, for dinner and organized the "Sprague Electric Club." It will be the purpose of the club to bring the salesmen, engineers, factory heads and other employees into closer personal contact and co-operation.

The club adopted a constitution and by-laws and elected a board of governors and officers, and plans were tentatively formulated for a series of meetings and events which are destined to stimulate the interest of the members in the new association.

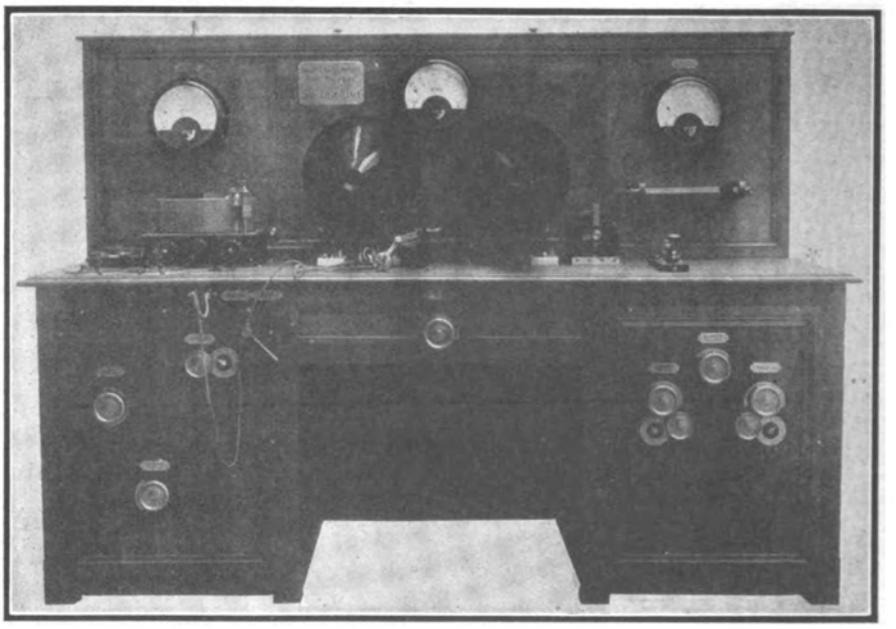
Colin-Jeance Wireless Telephone Apparatus.

It is claimed that wireless telephony enters upon a new epoch with the French apparatus which is the invention of Officers Colin and Jeance. Long-distance messages can now be sent over 300 miles distance, and this not only with a few words or phrases, but with long conversations or reading of text which is heard with surprising clearness. The recent tests made between Paris and Noves were the subject of long articles in the French daily press commenting upon the great practical value of the system.

Waves are produced as before in continuous manner by three arcs in series, using a negative electrode formed of a thin carbon pencil of 1.5 millimeters diameter working with a copper disk as the anode. This disk, which can easily be replaced, forms the bottom of a cylinder filled with oil and cooled by water circulation. Arcs burn in an atmosphere of hydrocarbon gas, such as a mixture of acetylene and hydrogen, the former produced by carbide and the latter by hydride of calcium. Such gases are produced in suitable generators having a continual movement. This mixture of gases is such that the carbons do not wear out, but on the contrary have their length somewhat increased. The arcs are operated by a regulator, which keeps them a constant distance apart, but it has been found that, owing to the composition of the gas, the distance variation is very small, even without the regulator and the latter can be replaced by hand regulation.

Voltage at the terminals of the dynamo can vary according to the amount of regulation, from 500 to 750 volts. Current passes two protecting choke coils and an electric resistance acting as a steadier. The tension at the ends of the arcs varies from 250 to 350 volts. In parallel to the arcs is mounted the main oscillating circuit having a self-induction coil and a variable condenser. An intermediate oscillating circuit having similar makeup serves to couple this circuit to that of the antenna and acts to sift out the waves, for among the numerous waves set up in the main circuit, only one and this quite pure, is sent out by the antenna This latter contains the secondary of the resonator, a variable condenser and a self-induction coil.

The microphone circuit has 19 usual carbon microphones mounted in series and acted on by a common speaking funnel. Such circuit is mounted in shunt between the resonator and ground, which avoids the crackling noise which always occurs when the microphone is placed in the antenna. A station comprises two microphone apparatus with two funnels and a switch for throwing from one to the other. When one of the microphone sets commences to heat up, current is switched over to the second so as to allow the first set to cool off. This allows of using the telephone indefinitely without injuring the microphones. In the Colin-Jeance system the current in the microphones is 0.5 ampere and the wave-length is 985 meters. This information respecting the system has been obtained from the constructors of the apparatus, the Compagnie Générale de Radiotelegraphie, 63 Boulevard Haussmann, Paris, France.



Main Transmitting and Receiving Control Station, Colin-Jeance Wireless Telephone System.