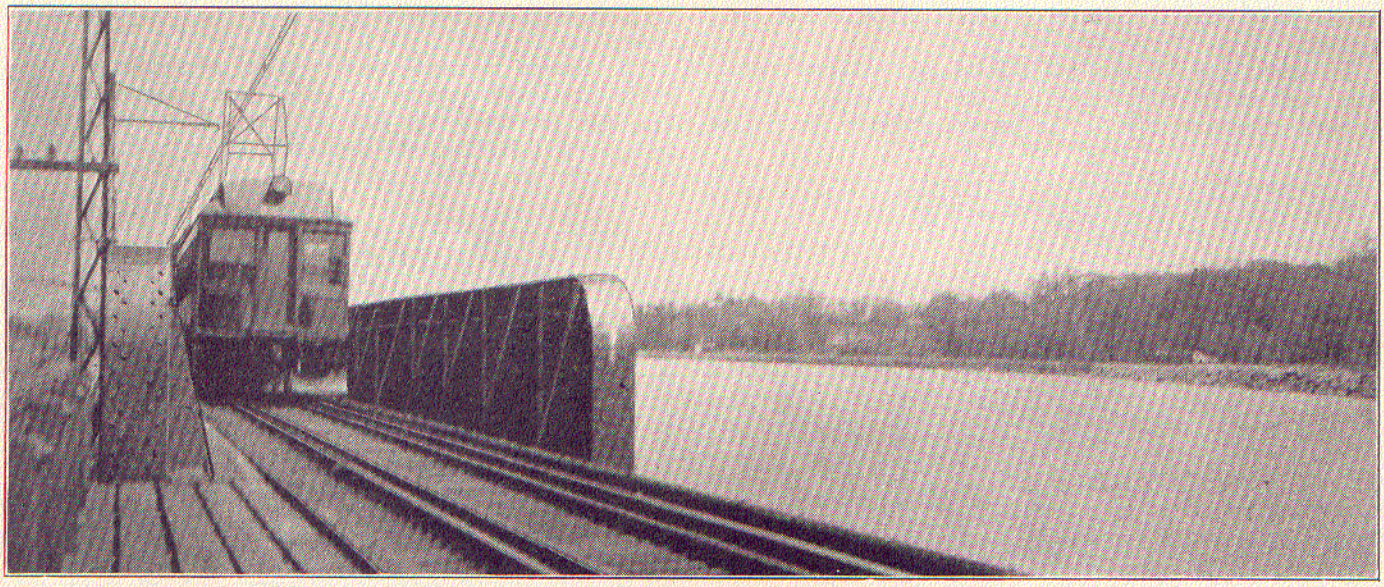

An Erie Train Crossing a Bridge Over the Genesee River Near Rochester, N. Y.

Erie Replaces Steel Contact Wire With Bronze

It Was a Pioneer in Use of 11,000 Volt A. C. Power—Much Valuable Experience Has Been Gained

NEW CONTACT WIRE is being strung on the electrified section of the Erie Railroad which extends from Rochester, N. Y., to Mt. Morris, N. Y., a distance of 34 miles. The new wire will be strung from Rochester to Avon, N. Y., a distance of 19 miles. This division of the Erie was electrified at the same time as the New York, New Haven & Hartford between New York City and New Haven, Conn. Both roads use 11,000-volt alternating current and both roads are in a position to furnish valuable information pertaining to the design and construction of high voltage catenary systems.

Type of Equipment Used

The power distribution system consists essentially of a single catenary supported on wood and on steel poles except in yards where cross catenaries stretched between steel poles are used to support the main catenary (Figs. 1 and 2). The main catenary is made up of three wires or cables, namely, a supporting messenger consisting of a 7/16-in. seven-strand, galvanized Siemens-Martin high-strength steel cable, a 3/0 solid copper auxiliary messenger and a 3/0 solid steel contact wire. The maximum height of the contact wire above the rail is 22 ft. and the minimum is 18 ft.

The auxiliary messenger is supported from the main or supporting messenger by space bars placed 10 ft. apart and the contact wire is supported from the auxiliary messenger by clips also placed 10 ft. apart and located half-way between the space bars.

The poles are placed 120 ft. apart and fitted with brackets as shown in Fig. 1. A pin type insulator on the end of the bracket supports the messenger and a second pin type insulator, top mounted, holds a steady brace (Figs. 1 and 3) which keeps the contact wire from swinging. The return current is carried through the running rails.

There is one sub-station on the line located at Avon, N. Y., about half-way between the terminals at Rochester and Mt. Morris. Power is purchased from the Niagara, Lockport & Ontario Power Company and is converted in the sub station from 60,000 volts to 11,000 volts for use on the trolley.

The frequency is 25 cycles. The three main power transformers in the sub-stations have a rating of 750 kilovolt-amperes each and are oil-insulated and water-cooled.

There are eight motor cars and eleven trailers which, like the motor cars, are equipped with electric heaters. The motor cars weigh 98,000 lb. and are equipped with 4 Westinghouse type 132-A railway motors.

Traffic

The train schedule includes 12 regular electric trains a day in each direction between Rochester and Mt. Morris. These trains vary from one consisting of a single motor car to one made up of two motor cars and eight trailers. The maximum current required at starting is 70 amperes per car or 140 amperes for a train including two motor cars. The normal running load is about 16 amperes per motor car. All of the freight traffic is handled with steam locomotives. One of the motor cars is shown in Fig 4.

Both freight and passenger service are heavier between Rochester and Avon than between Avon and Mt. Morris. For this reason it is not yet necessary that the contact wire between Avon and Mt. Morris be renewed.

Experience in Catenary Design

As installed originally the catenary consisted of a 3/0 solid copper contact wire with a grooved cross-section supported by space bars (as shown in Fig. 5) from a 7-strand galvanized steel messenger. This catenary was installed in 1906 and retained in service until 1913. A change was then made because of a fundamental weakness of the original design. It was found that the contact wire would move or creep longitudinally with relation to the messenger. This caused the space bars to assume a slightly inclined position with a consequent kink in the contact wire. As a result the

contact wire broke frequently at points where it had been kinked.

To correct this difficulty a 3/0 solid, grooved steel contact wire was strung, supported from the old contact wire by clamp as shown in Fig. 6. As stated previously the clamps are placed midway between space bars and are spaced 10 ft. apart.

The clamps are made of two pieces of galvanized malleable iron held together by two ½-in. galvanized bolts. The bolts are fitted with lock washers. The clamps are so designed that they grip the steel contact wire tightly, but will slide on the old contact wire which is now really an auxiliary

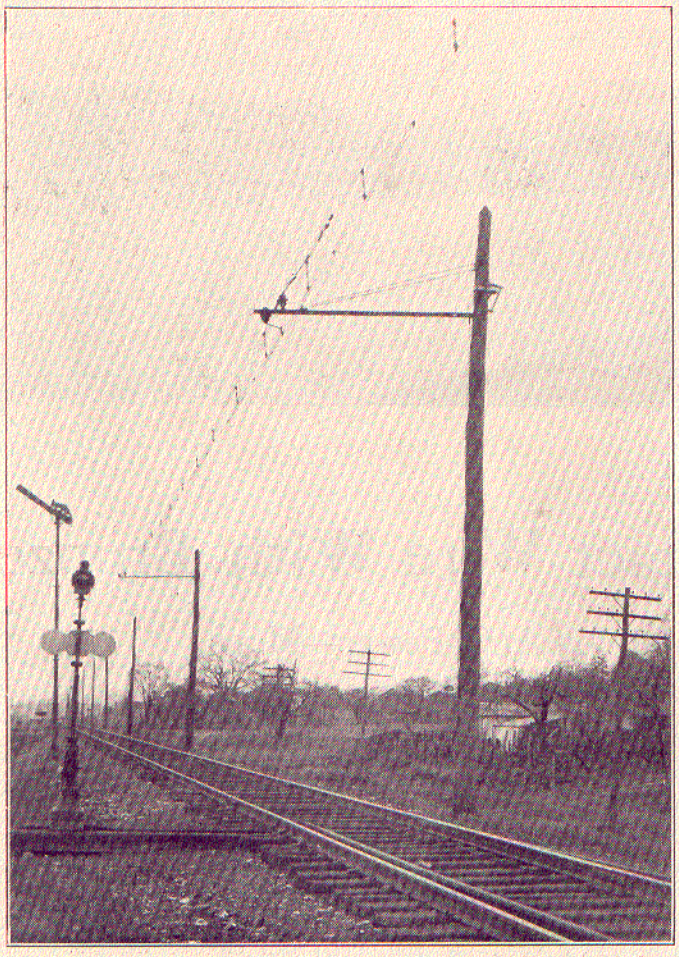

Fig. 1—Typical Wood Pole Catenary Construction for Tangent Track

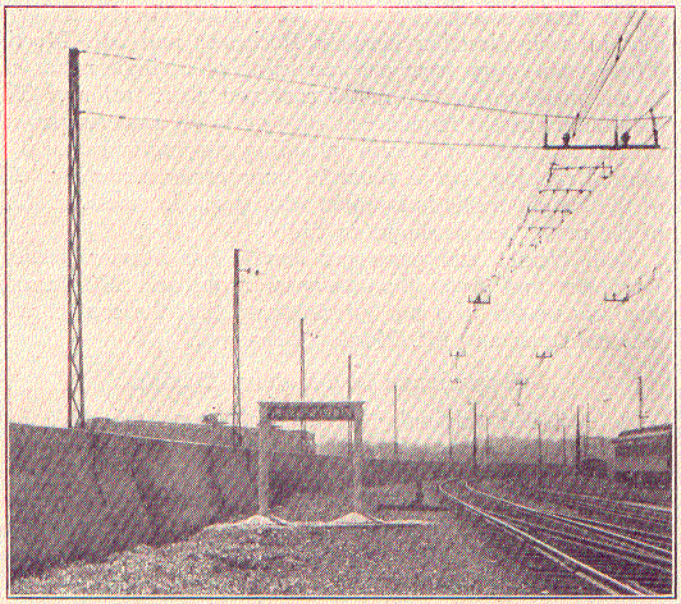

Fig. 2—Cross Catenaries Are Used Where There Are a Number of Tracks

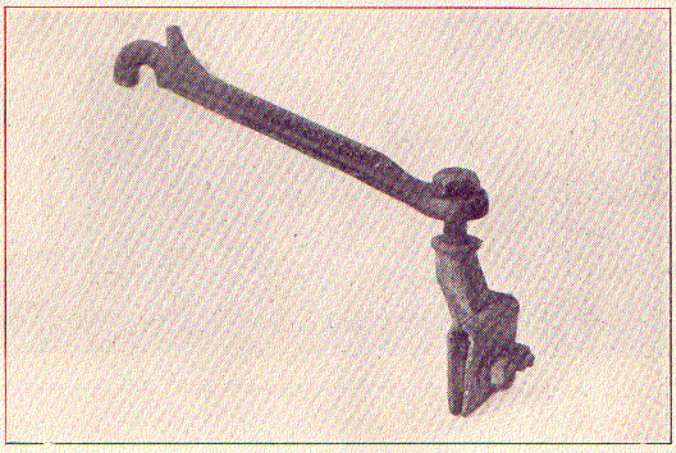

Fig. 3—Steady Brace and Clamp

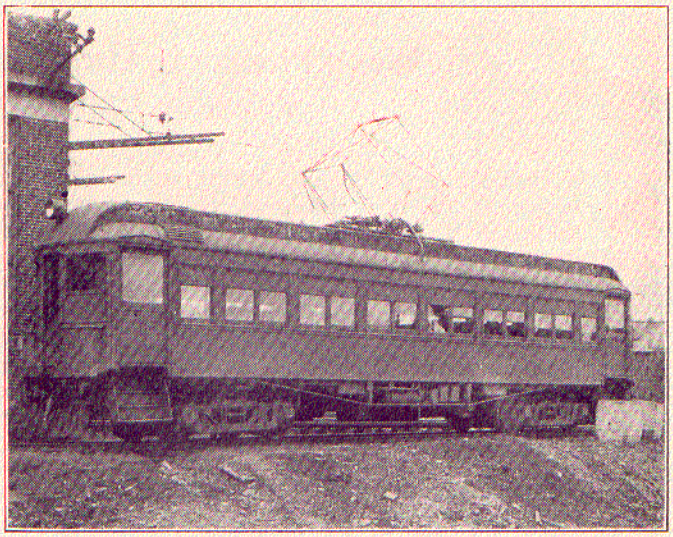

Fig. 4—One of the Motor Cars

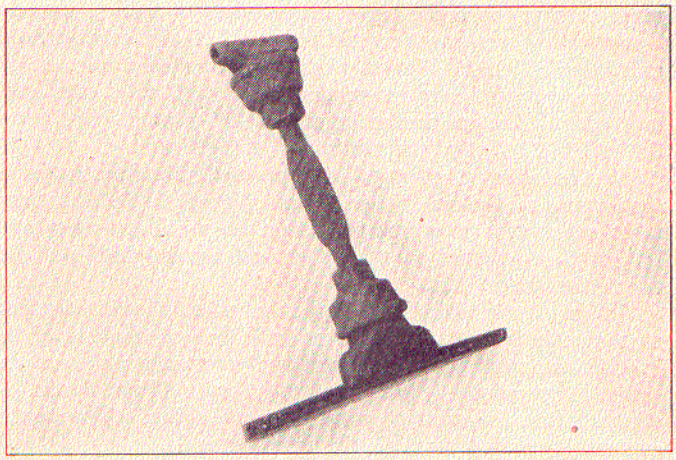

Fig. 5—The Original Catenary Consisted of a Contact Wire Supported by Space Bars From a Single Messenger

messenger. A clear conception of the design of the clamps may be had by looking at the end view of the steady clamp, Fig. 3.

With regard to service and dependability the three-wire catenary has been highly satisfactory. The steel wire was strung in 1913 and during its 10 years in service it has broken only three times. The original wire was .438 in. in diameter and a typical sample of the wire measured recently had a diameter of .331 in. Samples of the contact wires are

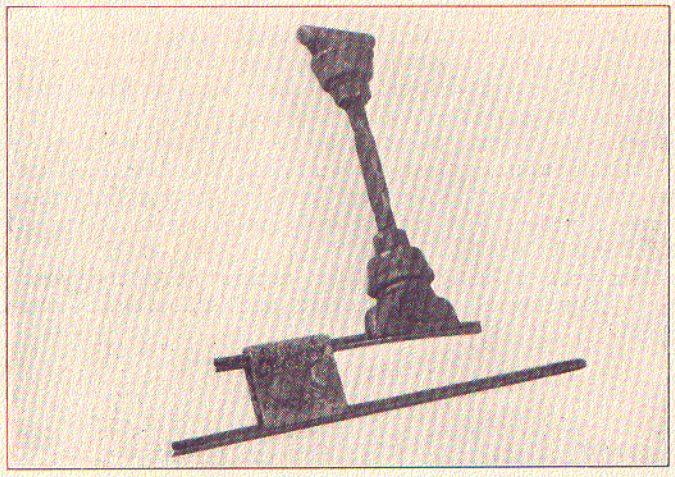

Fig. 6—The Addition of a New Contact Wire Greatly Improved the Catenary

shown in Fig. 7. The sample at the left showing a section is a piece of the steel wire while the one at the right is a piece of the original copper contact wire. The amount of wear on the steel wire may be seen to be large while that of the copper is comparatively small. The two samples below are steel and show the rusted condition of the wire. The supporting messenger will be serviceable for a number of years and there is practically no depreciation of the copper auxiliary messenger.

Phono-Electric wire is now being used to replace the steel wire. It was chosen primarily because of its high strength

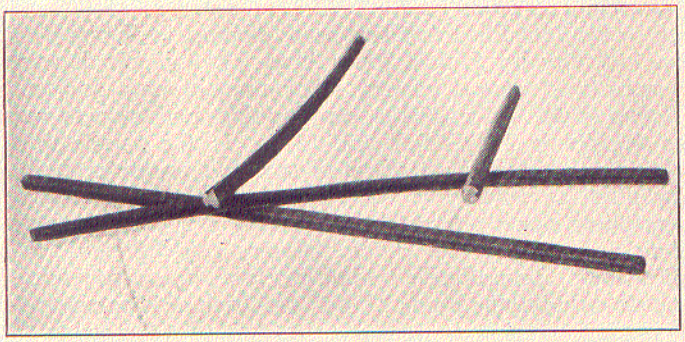

Fig. 7—Sample of the Steel Contact Wire and of the Copper Auxiliary Messenger Previously Used as a Contact Wire

and wearing quality and because it will not rust. Its conductivity at 25 cycles is 60 per cent that of pure copper of equal cross-section. The Phono-Electric is 3/0 wire and has a grooved cross-section.

The principal objection to the steel contact wire is the rust which falls from the wire, making the cars look badly in a relatively short time. It was also found that the steel wire increased the wear of the pantagraph shoes. A shoe that would run 12,000 miles on the copper contact wire ran only 5,000 miles on the steel. This, however, is not a factor of great importance as a pantagraph shoe cost only $2.30. The pantagraphs exert a vertical pressure of 8 lb. against the contact wire.

The work of stringing the wire is done at night between 1:00 A. M. and 6:00 A. M. which is the only time the traffic will permit taking the current off the line.

The construction train consists of an open top car, a box

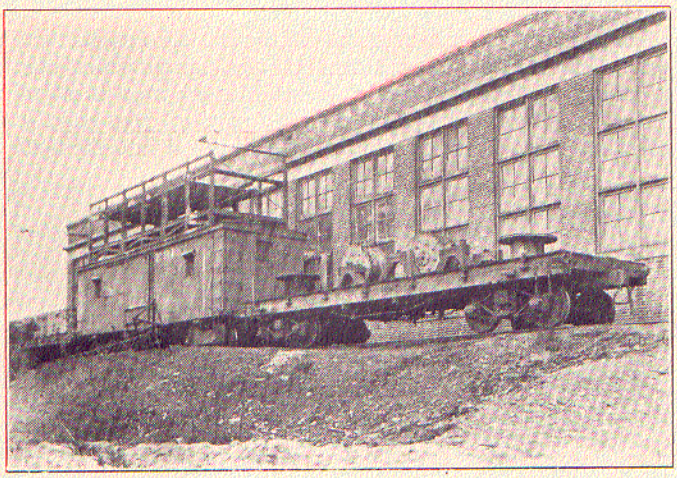

Fig. 8—Construction and Repair Train

car, a flat car and a locomotive. The open top car is used for loading the steel wire that is taken down. There is a working platform mounted on the box car and the car is used to carry tools and a complete supply of space bars, clamps, insulators and other extra parts. The flat car is

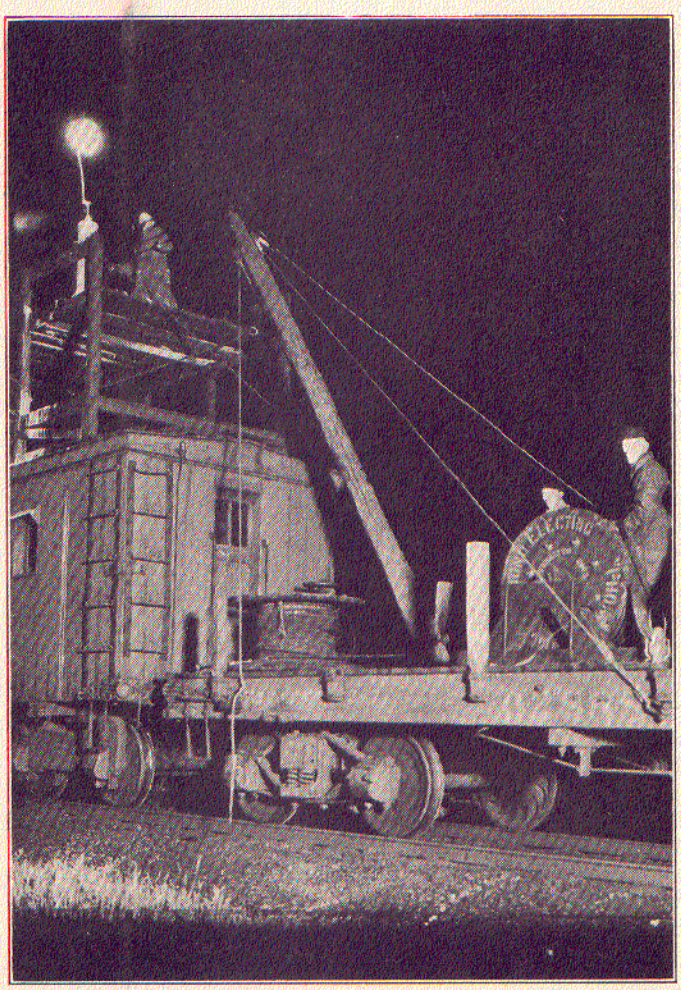

Fig. 9—Stringing the New Phono-Electric Contact Wire

used to carry the reels of Phono-Electric wire and the mountings for the reels. The locomotive is coupled to the flat car and when the work is in progress, the locomotive is used to pull rather than push the train. The front end of the locomotive is coupled to the flat car and light for the work is supplied by three acetylene flood lights and the locomotive headlight. There are seven men to do the work besides the train crew.

The first operation consists of taking the old contact wire down. The men on the platform take the clamps which hold the contact wire off with socket wrenches as the train is moved along. It is then cut up into lengths varying from eight to twelve feet with large bolt cutters and dropped into the open

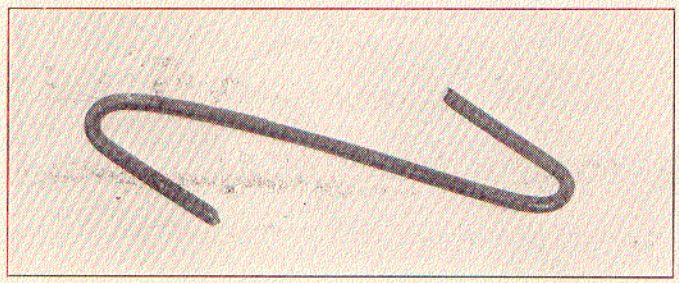

Fig. 10—A Sister Hook Made From Old Steel Contact Wire

top car. About a mile of the wire is taken down at one time and the remaining contact wire is kept from running slack by clamping the end to the supporting catenary.

The second operation consists of stringing new contact wire. This work is shown in progress in Fig. 9. A jin pole with a pully sheave at the top is erected and held with guys as shown. The new wire from the reel is run up over the sheave and is connected to such wire as has been strung previously with a Cleveland connector. The train then moves ahead steadily at a speed of from one to two miles an hour. Two men with a heavy plank, brake the reel so that the wire

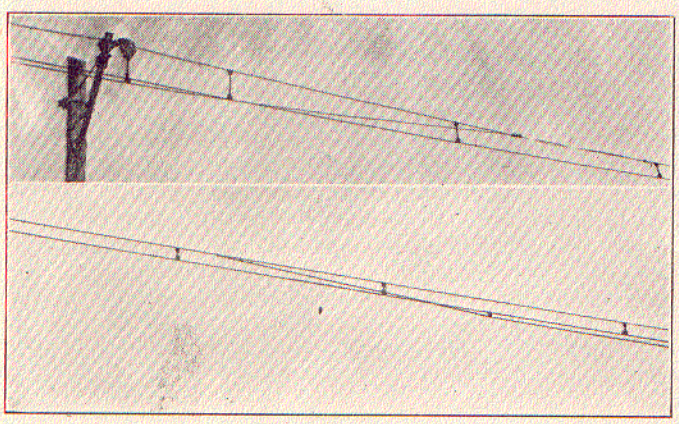

Fig. 11—Sections of the Overhead Showing How the Contact Wires are Secured Temporarily to the Messenger So That the Trains Can Be Operated from the Auxiliary Messenger Without Interruption

is taut as it is payed out. As the train moves along the men on the platform suspend the new wire from the supporting messenger with sister hooks (Fig. 10) made from short pieces of the old contact wire. These hooks are made up previously in varying lengths and are short enough so that as the new wire is payed out it hangs in a position above the auxiliary messenger or old contact wire.

There is about a mile of wire on each reel and after it is all payed out the end of the new wire is clamped to the supporting messenger. The wire is then pulled to the proper tension, first with block and tackle and finally with a turnbuckle. About half a mile of wire is pulled at a time and after the second pull the end of the new contact wire is again clamped to the supporting messenger.

The Final Step

The next and final step consists of removing the sister hooks and putting on the clamps which support the contact wire from the auxiliary messenger.

The fact that the auxiliary messenger was a contact wire before it was a messenger has proved an advantage in replacing the contact wire. After a length of the old wire has been taken down it often happens that there is not time enough left to replace it before the early morning trains must start. A section of the auxiliary messenger is then used temporarily as a contact wire and no special expedients need be resorted to, to maintain regular service. The beginning and the end of a one-mile section in which the auxiliary messenger functions as a contact wire are shown in the upper and lower halves of Fig. 11.

The work is being carried on under the supervision of R. C. Thurston, electrical engineer, and is now nearly completed.

Union Pacific Holds Safety Rally at Green River, Wyo.

A Green River day celebration was held at Green River, Wyo., on June 18 under the auspices of the Western Division Safety Committee of the Union Pacific and the Citizens' Committee of Green River. This celebration was patterned after that held at North Platte, Neb., on May 31. Special trains brought citizens and employees from Evanston, Rawlins and Superior, Wyo., each accompanied by a Union Pacific shop band. Delegations from other points arrived on regular trains and in automobiles.

The Safety Committee convened in a session open to the public at 8 a. m. After the completion of the regular order of business, addresses were made by a number of officers and employees of the road. At 11 a. m. a parade was formed led by the 76th Field Artillery band, escorted by Troop G of the 13th Cavalry, United States Army. In this parade were a number of general officers, safety committeemen and employees of the Union Pacific, carrying flags and banners won as trophies in 1920, 1921 and 1922. In the parade were also a number of illustrations of safe and unsafe methods, including an automobile truck carrying a full size electric semaphore signal alternately at the stop and cautious positions and carrying the words "Observe crossing signal indications." Immediately behind this truck was a new automobile carrying the words "I did" and back of it an automobile truck carrying a wrecked automobile with the words "I didn't."

A feature of the parade was an exhibit of several stages of transportation, including in turn a trapper, a prospector, a pony express rider, a stage coach with armed guard and a replica of the modern steam locomotive. Another feature of the day's program which attracted much interest was a demonstration by the First Aid life saving crew from the Union Pacific mines showing the manner of rescue and resuscitation of miners. Other features included a chicken hunt, a wolf hunt and a bear hunt. The day was concluded with a barbecue of 5,000 lb. of beef. In the evening Edson Rich, assistant general solicitor of the Union Pacific, and Charles J. Lane addressed the employees, farmers and business men on the railroad problem.