Illuminating Engineering Society.

THE attention which signal officials have recently been giving to the use of light signals has made the work of the Illuminating Engineering Society of considerable interest to them. The convention of this association will be held at Cleveland, Ohio, September 21-24, 1914. A large number of papers have been prepared for presentation. Among them the following are of especial interest to railway employees: "Color of Illuminants," by L. A. Jones; "Development of Daylight Signals," by E. J. Brady; "The Locomotive Headlight," by J. L. Minnick, and "Some Tests of Possible Reflecting-Power Standards," by P. G. Nutting, L. A. Jones and F. A. Elliott. In the May issue of *The Signal Engineer* we abstracted several papers which were presented before the Chicago section of this society, at a joint meeting with signal men. Abstracts of some of the papers mentioned herein will appear in a later issue.

EFFECT OF THE DEVELOPMENT IN TRACK AND SWITCHES ON SIGNAL DESIGNS.

WHEN the old stub switch was in general use there was comparatively little signaling work. Therefore few problems of signaling or interlocking were encountered in connection with this design. Insulation would have been simple, but good bonding, on account of the lateral movement of the rails, would probably have been difficult.

Signaling and interlocking came into general use only after split switches had become common on the older railways. It is in connection with the development of this type of switch that signaling problems have been met. There has been considerable development in the design of the point, especially in increasing the length and thereby decreasing the angle of departure; and also in using a harder material in its manufacture. This increased length of switchpoint and the gradual decrease in the angle of turnout frogs have made it necessary to materially change the design of the operating apparatus and have increased the possible speed over turnouts and thereby required frequent changes in the methods of signaling.

The invention of the spring-rail frog greatly increased the life of frogs of sharp angle, and made even sharper angles practicable. They also decreased the shock or jar to equipment passing over them. The adaptation of manganese steel for frogs marked still another advance in the tendency toward longer turnouts. Spring rails cannot be adapted to very sharp angles, but manganese steel frogs may be made in practically any angle. It is usually in interlocked territory that the use of such expensive frogs is advisable or economical. In some cases even these sharp-angle frogs are located so that each lead is curved, thereby reducing the radius of curvature to one-half what it would be if it were all in one lead, and such layouts are now operated, and must be signaled, as high-speed tracks.

Manganese has been gradually adapted to the use of crossing frogs, and here again, on account of its cost, it is most economical in territory which has heavy traffic, requiring interlocking for high speeds. Many attempts have been made to develop a practical continuous crossing, and these efforts seem to have developed at least one such design. A continuous crossing requires an operating lever or levers, and also locking levers if in interlocked territory. Manganese or hard metal rails are being gradually adopted for locations where rail wear is very severe. It was early found necessary to provide for bond wires in manganese track designs, as it is practically impossible to drill this metal with the ordinary bonding drill.

Turnouts of greater length tended to cause longer designs for interlocking plants, and this called for a change in the transmission of power to the different units. The first transmission, as in other fields, was entirely mechanical. Later there was developed the electro-pneumatic plant using electricity for control and air-pressure for operation. Following this, the all-electric plant was brought out, in which both control and operation are by electricity. Electric transmission, on account of the time required for the motors to operate, necessitated the use of shorter control track sections, which release the levers one by one, as a train passes over a route, so that the signalman can line up a second route gradually behind the first train. The last two types of plant, the electro-pneumatic and the all-electric, give a high degree of flexibility in operation. Of course, the great increase in the size of interlocking plants and the increased number of units operated were also influential in the development of the new types of transmission. It would be almost impossible to operate many modern plants entirely by mechanical power. The mechanical plant is still, however, the most economical for small layouts such as simple railway crossings, with or without one or several turnouts.

The scarcity of timber has gradually forced railroads to use treated ties. Some of the materials used as preservatives do not decrease the resistance between the rails to any appreciable extent; but it has been found that zinc chloride does decrease the resistance of the ties, especially in a wet climate. The solution of this signal problem has attracted considerable attention.

Ballast has gradually been improved. Originally, tracks were ballasted with dirt, which retains water and is likely to cause short circuits. Cinders, gravel, burnt clay, broken stone, etc., have gradually come into use. Cinders and gravel absorb water quite readily and thus are likely to cause short circuits. In spite of the improvement in ballast, most railways have found it necessary to adopt a standard ballast section wherein the ballast is required to be from one to three inches below the base of rail to prevent contact between it and the rail. These developments have greatly reduced track-circuit trouble.

The improvement of track designs and conditions, it is seen, has greatly increased speed, vitally effecting the necessity for signaling lines of heavy traffic. However, much is yet to be done in improving track, and signal men should carefully follow those developments which affect the design of signal and interlocking systems.

ORGANIZED CO-OPERATION.

THE Pennsylvania Railroad recently replaced a signal tower in 23 days, including the renewal of all interlocking apparatus within the tower. Much of this apparatus was ordered and made by the signal company and other manufacturers of special apparatus within this time, shipped to the tower and erected by the railway company's forces. An illustration of the way the work was handled is the fact that the requisition for new material for the entire new tower was ready four hours after the old tower was burned. There was complete co-operation by the different departments, and it was only through this co-operation, made possible by excellent organization, that the structure was completed in so short a time. The way emergencies like this are handled throws much light on whether a railway has a good or a poor organization. In ordinary times, when all moves follow a certain routine, there is not such great need for capable individuals or for the effective co-ordination of the different kinds of special work. It is the strong organization which rises to the occasion and proves equal to any extra tax that is put upon its resources.

Attention is also called to the fact that a good deal of the work of preparing the coach for use as a telegraph and block station was done en route to the job. Many times considerable work in preparing apparatus and tools can be done by a gang of men when going to an emergency job, so that the installation can be made in the quickest time. For example, nuts can be loosened from bolts and threads oiled, and other parts of apparatus can be loosened and worked into such condition that they can be most quickly applied. It is also advisable entirely to organize the gang, assigning each man to his work. This results is saving a very considerable amount of the time which would otherwise be consumed after arriving where the labor is to be done.