

Colony, including a drawbridge in one block section at Somerset. Protection for trains against an open draw was secured by including the track rails on the drawbridge in the track circuit, so that the withdrawing of the locking bolts and the moving of the rails would break the track circuit and set the signals to danger. Also about the same time the signals were installed in the Tehuantepec tunnel on the Southern Pacific in California. This installation was made by Stephen D. Field of the Electrical Construction & Maintenance Company, San Francisco, with materials and according to instructions furnished by Mr. Robinson. In letters written by Mr. Field, it was stated that this track section was two miles long, extending through the tunnel one mile and for one-half mile at each end, and that the rails in the tunnel "are buried in wet mud and outside no moisture touches them for six months of the year." A cut section with battery and relay was installed at the center of the tunnel.

In 1878, Mr. Robinson organized the Union Electric Signal Company, of which he was the president and owner. He assigned to this company the nine United States patents covering the track circuit, electro-pneumatic signal mechanism, etc. About two years later George Westinghouse and his associates bought a controlling interest in this company, which was reorganized under the name of the Union Switch & Signal Company. With this sale the control of signaling apparatus passed out of the hands of Mr. Robinson and he has since devoted his energies largely to other fields.

During his early years in Boston he was associated very closely with the three men to whom credit has been given at various times and to varying degrees for the invention of the track circuit and other fundamental signaling apparatus—Frank L. Pope, Oscar Gasset and Israel Fisher. The facts apparently establish pretty conclusively the correctness of Mr. Robinson's assertions regarding these three men. He gives Pope credit only for bringing out an open-circuit system, Gasset for his success as a promoter, largely through his relationship with Wendell Phillips and consequent personal standing, and Fisher as an excellent mechanic, who was instrumental in making a large part of the signal apparatus which Robinson installed on New England roads between 1876 and 1878.

Like most inventors of importance, Dr. Robinson has not received, either in money or in renown, the returns which would seem to be commensurate with the importance of his work. His financial return consisted of the sum received for the controlling interest in his Union Electric Signal Company, and while undoubtedly considered large at that time, would seem rather meager as compared with the magnitude of the signal business since that time. In the way of recognition, a number of writers on the early history of signaling have given him full credit for his valuable work. It is only fitting, however, that his standing in this regard be more generally understood and acknowledged before it is too late for him to experience the gratification which this honor should bring.

NEW YORK CENTRAL AND PENNSYLVANIA CHANGE COLORS

The New York Central Lines West commenced on August 8 to change the color signal indications to green for "Proceed" and yellow for "Proceed with Caution." The work was carried out on one division at a time, commencing with the Western division and completing on the branch lines.

A careful check was made on the ground to determine the actual material required, and this, together with a small number of additional switch and marker lamps, was then ordered. Two old baggage cars were fitted up with a work bench and a supply of oil, and in these cars were placed the surplus material, together with the necessary material for changing, enroute, the lenses in the switch lamps. All roundels for signals were sent to the maintainers who, prior to the day of the change, went over all bolts in the semaphore castings, loosening and oiling

them so that they could be removed quickly.

On the day of the change, the two work trains started out, each covering one-half of the division. The men on these trains picked up all the old switch lamps, crossing flagmen's signals and lamps, and flags used by the section men, substituting the new standard colors, while at the same time the maintainers made the changes in the roundels on all automatic and train order signals and also changed out the lamps at the track tanks. Painters also were started out early in the morning to paint the switch targets, slow and release signs, take-siding signals and train order banners in the new colors. On the work train the lenses in the switch lamps that were picked up were removed and the lenses of the new standard color substituted. By handling the lamps in this way only a small quantity of extra lamps with new standard colors were required. On the night of "the day of the change" a round trip was made on the inspection engine to determine that all indications were correctly displayed. The inspectors and maintainers covered the portion of the division assigned to them to make any adjustments necessary. After one division was changed over, the cars and all surplus material were shipped to the next division, where the work was carried on in a similar manner. The changes in yards were handled by motor cars.

In the train marker lamps, in place of the green used heretofore, high transmission yellow lenses were substituted and in all new lamps purchased in addition to the high transmission yellow lenses, there was inserted a spreadlite high transmission red lens. This type of lens produces a beam of light with an extreme spread of 60 ft. at a point 100 ft. from the lamp, equal to an angular measurement of 34 deg. 17 min., whereas the optical lens displaced had a spread of but 13 ft., equal to an angular measurement of but 7 deg. 25 min.

With the high transmission spreadlite lens, the wider spread of the beam is obtained without diminishing the maximum range, due to the fact that theoretically the high transmission color gives an increase in range of about 20 per cent. The spreadlite lens was adopted for marker lamps primarily, to take care of any variation in the application of the lamp brackets on the cars and to permit more wear in the bracket without diminishing the intensity of the red marker indication.

In the semaphore signals, roundels of the arched type were installed, all new ones purchased being in high transmission color. The high transmission green purchased, which now gives the "Proceed" indication, is approximately 50 per cent higher in transmission than the green formerly used, and the high transmission yellow is purposely of somewhat diminished intensity, lying midway between the red and the green.

In yard switch lamps, lunar white and yellow are used, and in main track switch lamps, green and red. Lunar white in the yard switch lamps indicates that the switch is set for the lead. This lens gives a bluish white indication about equal in intensity to that of high transmission green and is very distinctive.

It was observed that with green for "Proceed," it was necessary, particularly on curves, to range the semaphore lamps somewhat differently than when white was used for "Proceed," due, no doubt, to the intensity of the light being diminished. Other than that, no difficulties arose and the entire change was accomplished without any irregularity. The above information was furnished by F. B. Wiegand, signal engineer.

A similar change in color indications will be made on the Pennsylvania system, both east and west of Pittsburgh, as soon as the necessary material can be obtained. This material is now being ordered and a detailed program will be worked out on each division on receipt of the notice fixing the date for the change. The announcement of this change issued by the Pennsylvania states that "the proposed signal system has been tried out on the extreme eastern end of the New York division and has been found to work satisfactorily." The red, yellow and green for the new indications are high transmission glass.