Developments in Signaling*

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My pleasant task is to discuss present and future signaling for modern railroads, and to explain the need for coordination between departments, and the beneficial results from research and technical advancements. World War II was responsible for intensive development of navigational aids and safety devices for air transport, largely at government expense. On the other hand, the railroads forged ahead with little outside assistance. In carrying out heavy programs of new construction to increase the safety and efficiency of train operation, many new construction methods and improvements in signal systems were devised. The signal supply industry rendered invaluable assistance in designing new equipment, simplifying control schemes, and adapting systems to the operating requirements. For their development efforts, consistent optimism, faith and vision, they are deserving of full recognition and our highest appreciation. The government did not do the job, private industry did.

The use of radio for transmitting centralized traffic control codes was recently demonstrated. From the initial tests, it appears to have great future possibilities from both signaling and communication viewpoints. Another new device is a mechanical time lock for hand-operated switches which will enforce the "wait" period, now generally required by rule, before switches may be thrown.

By Signal Indication

While safety was undoubtedly the main purpose for which signals were originally installed, more and more emphasis is being placed on the facilitation of train movements and the economics of operation. Modern railway signaling offers many systems each specifically designed to meet some particular operating requirement and at the same time, provide maximum safety. It is highly essential to obtain the fullest possible utilization of diesel locomotives, and modern signaling is an important factor in this as well as in increasing the safety of operation. The trend is strongly towards centralized traffic control, where the traffic justifies it. During 1946 a total of 1,143 miles of track was equipped with this system as compared with 1,734 miles in 1945 and 1,326 miles in 1944. The C.T.C. installations continue to increase in size, and there has been an increasing tendency to locate the control machines at division headquarters.

Improvements have recently been worked into the automatic block system whereby the dispatcher is furnished visual information on the movement of trains and the control of certain signals is placed in his hands. Thus train meets can be set up signal indications and by providing for hand, power, spring, or different combinations thereof, for the operation of siding switches, depending on the grade, direction of traffic to be favored and other conditions, additional flexibility, and facility in handling train movements can be secured. It should be borne in mind, however, that it only takes a few stops or unnecessary delays per day to a diesel-operated train to pay for power operation of sidings. The modified automatic block system as described is adapted to lines having fairly light but important traffic.

Coded track circuits continue to be used almost exclusively on new work particularly in centralized traffic control installations. One of the important features of the coded track circuit is that it permits the handling of the signal system either with no line wires or with a reduction in the number of wires required. Another important feature is that the track circuits of greater length may be operated safely with the code than with the previous conventional form of steady energy circuit, which reduces the number of cut sections, insulated joints and track wiring.

The I.C.C. Order

The conference and hearing held by the Interstate Commerce Commission last year would indicate that the roads may be required, under the Signal Inspection Act, to provide additional signaling and safety devices on their lines where trains are operated at speeds of 50 or more miles per hour. There would be some 28,600 mi. of unsignaled track involved, and approximately 101,500 mi. of track, presently signaled, on which additional safeguards might be required. Pending legislation would give the I.C.C. jurisdiction over train communication systems as well as signaling.

No one system of signaling which can be installed as a cureall. Hence, it is pertinent to good engineering that studies be made which will consider collectively all contributing factors; density of train movement, nature of the traffic, maximum and minimum speeds of operation, and physical characteristics of the line, before a decision can be reached as to the manner of operation and the specific signal system best suited to a particular territory. Too, insofar as is possible and practical, consideration must be given to the probable future demands upon the line being studied as this has a direct bearing on the long term economic return which can be rightfully expected. Such studies require the co-operation of the operating, engineering, motive power, traffic and executive departments.

More Crossing Protection

During the past year there has been renewed activity in the installation of protection at highway-railroad grade

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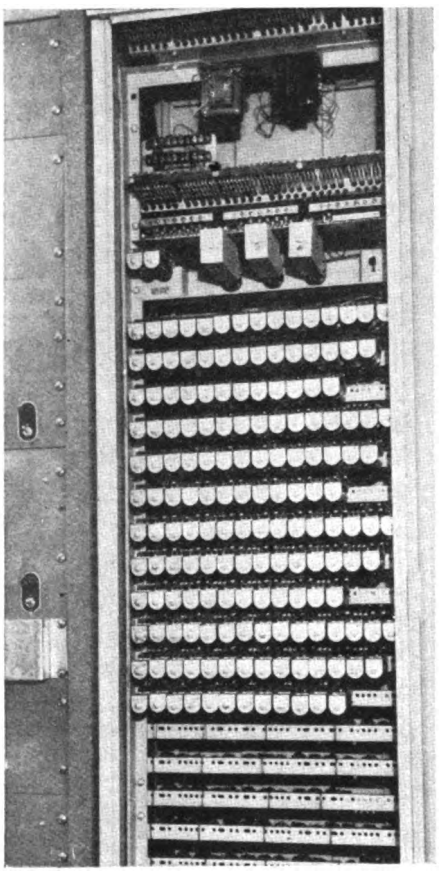
when broadcasting an emergency call. These lines are matched so that each paging speaker gets about 14 watts. The incoming circuit from a yard talk-back to the tower is fed into a 2.5-watt amplifier by action of the relay control, as previously explained. On the output side of this amplifier is the small 5-watt speaker in the center panel on the yardmaster's desk. The amplifier sets are in duplicate, one being held in standby. If the set in service fails, the standby set can



Telephone-type relays in cabinet

be cut in service by the yardmaster throwing a special toggle switch on his panel.

Power for the communication equipment is supplied for incoming a.c. circuits feeding through transformers and rectifiers to give the different voltages as well as a.c. or d.c. as required. The main rectifier, which operates on 110 volts a.c., has a rated output of 4 amp. at 48 volts.

The yardmaster's desk, complete with console cabinet including the keys, indication lamps, panels and wiring, as well as the cabinets of telephone type relays and the rectifier on the floor below, were all furnished by the North Electric Company, Galion, Ohio. The talk-back speakers in the yard are the midget marine type rated at 10 watts and were furnished by the Racon Elec. Mfg. Co., New York. The small speakers in the yard offices are the type P5X furnished by the Jensen Mfg. Co., Chicago, and the large paging speakers rated at 14 watts are the Hypex type furnished by Jensen. The amplifier equipment and the Teletalk monitor sets were furnished by the Webster Electric Company, Racine, Wis. The equipment for the pneumatic tube system was furnished by the Grover Company, Detroit, Mich.

This yard communication system was installed by forces of the Kentucky & Indiana Terminal, under the supervision of H. L. Kincaid, electrical engineer, and under the general direction of C. F. Burrell, chief engineer. From an operating standpoint, the system was planned with the co-operation of C. W. Ashby, president and general manager, and R. G. Claiborne, superintendent.

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crossings which was held at almost a standstill during the war years. Governmental agencies are now programming work of this nature in preference to some of the largest highway projects previously considered. The Public Roads Administration favors the use of short-arm gates, combined with the standard A.A.R. flashing-light signals, and instructions were sent out to that effect to State Representatives some time ago. The reduction in accidents and the lifting of speed restrictions by municipalities, where this type of protection has been provided, would seem to justify the additional expense. It is, of course, particularly effective in multiple-track territory but there are arguments in its favor at single-track crossings as well. Adequate protection may in some cases mean the postponement of grade separation.

Other Matters of Importance

This opportunity to talk shop, and to go over our signal problems with you is welcomed, as it may help to clear some of the issues. Time will permit of only brief mention of some of the matters on which closer coordination and co-operation would be advantageous: C.T.C. installations usually involve considerable track work such as the elimination, relocation, or extension of sidings; refitting of switches; drainage; grading; banking; placing of insulation and other details. It is also desirable to schedule new signal construction with track programs of rail renewal, reballasting, rail-end treatment, moving of switches, rearrangement of yards and like work, in order to avoid duplication of effort and later changes.

Emphasis is placed on the need for study and assistance in determining the siding requirements, and giving the operating officers convincing proof that fewer sidings are needed with C.T.C. than under the old system, and that their elimination means substantial savings in track and signal maintenance and that the retirements will help to pay for the new installation. Opportunities for effecting greater economies are presented through the use of C.T.C., and conversion of double to single track, with sidings properly located. The experience of a number of roads that are successfully handling heavy volumes of traffic on single track, affords proof that there are sections of second track that could be retired without serious loss of operating efficiency. Projects of this kind result in substantial economies, and, when properly timed, may avoid heavy expenditures for track renewals. The Signal Section has prepared considerable data on the subject which is now available. Peace-time competition, mounting costs and decreasing business may result in more consideration being given in the future to the possibilities along this line.

Obstruction Tests

Considerable difficulty is experienced in maintaining interlocked switches in proper adjustment to meet the obstruction tests prescribed by the I.C.C. In order to accomplish this, heavier fittings, additional bracing and improved type rods are called for in many instances. Collaboration in the design of the end rails and locking features of drawbridges, and the application of insulated joints in crossovers and on crossing frogs is desirable in meeting I.C.C. requirements. Co-operation in planning electric and gas heater installations for snow melting is desirable. Under new agreements being entered into between the railroads and Western Union, the railroads are taking over the maintenance of pole lines. This means additional responsibilities calling for larger organizations and new equipment.

In closing, I would like to say that, because of the accomplishments which have been mentioned and the utilization of the techniques that are being developed, I feel sure you will join me in acclaiming for railway signaling a bright future. The aim of the Signal Section, A.A.R., is to co-operate to the fullest extent in maintaining safe, dependable and economical rail transportation. We feel that modern signaling provides an efficient means to that end.