

would at the same time keep down the cost of repairs and not require much empty return mileage to the owner?

The Duty of the Railroads.—The above treatise may suggest to those in everyday touch with these problems some lines of thought for further development, and perhaps bring out better ideas which may differ in substance. Suggestions will be most valuable which are developed in sufficient detail to apply in a practical way to our present codes, and thus put the railroads in the position of having something actually started which will meet the new demands. This development must be the product of railroad experience; and our railroad minds must reveal the most desirable practice rather than wait for Governmental agencies to point out an arbitrary way. It is not a subject to be disposed of in the rush legislation of a closing Congress, or to be determined by law-makers who cannot appreciate or who are in no way familiar with the technicalities of the problem. Expert discussion by our railroad men should precede the enactment of law, rather than remaining dormant to invite the passing of legislation embodying general theories in accordance with popular demand and which may force a further burden upon the railroads. The recent Esch-Pomereene amendment of the act to regulate commerce may yet, as a by-product of the war, prove to be a great hardship, and its enforcement may be unconstitutional in taking cars from one road and turning them over for the use of another, unless a proper system is evolved to compensate the owner equitably for his cars when they are arbitrarily loaned to another.

This general subject should be argued by our railroad men among themselves and through the columns of the railroad journals as a matter of self preservation, so that when the war is over they will not find themselves blindly following the dictates of some left-over war measure, or adapting themselves to the theories of the platitudinarian. No brand new or revolutionary practice will spring up suddenly, unless, perchance, it is forced by governmental agency on account of a lack of preparedness on the part of the railroads themselves in not being ready when the time comes to put into actual practice such principles and methods as will meet the new demands.

A plea is here entered for our railroad managers to begin an active standardization movement, and then with their car service and interchange experts vigorously to continue their study in the development of the broad principles involved, so that they can start right in at the next meetings of the M. C. B. Association and of the American Railway Association to work out a gradual transformation in the details of the present codes for interchange and car service. These codes today embrace the best that our railroad experts have been able to produce. They are the result of years of conscientious study and service, and contain much in detail which must be used as the basis for a code to meet the change which is taking place in the transportation world. Principles can be revised to meet the new demands, but which need not cause the discard of all the working detail which is the resultant of our best experience. Adherence to railroad ownership in our car distribution would save much of our present practice which can be broadly expanded and supplemented so as to meet the most fastidious demands of our new national transportation.

EXEMPTION FOR BRITISH RAILWAY SHOPMEN.—The Railway Executive Committee has informed the British National Union of Railwaymen that the director of recruiting has agreed that, until further notice, skilled men from railway shops, notified to the war-office for release, who are not required for mechanical or craftsmen's work in the army, will be returned to the railway companies, and will not be posted for combatant duties in line regiments.

ELECTRIC SECTION ADDED TO A MECHANICAL INTERLOCKING PLANT

The Delaware, Lackawanna & Western crosses the Pennsylvania at Bailey avenue tower, about three miles east of Buffalo, N. Y. This crossing is spanned by an overhead bridge carrying the main line of the Lehigh Valley and just north of the tower a highway bridge on Bailey avenue crosses over the Pennsylvania tracks. On account of the large amount of interchange freight handled between the Lackawanna and the Pennsylvania at this crossing, it was decided to add a double track wye connection south of the Lackawanna and east of the Pennsylvania tracks. A large part of the freight is hauled by the Pennsylvania over the Lackawanna main tracks from Bailey avenue to East Buffalo, a distance of about 1½ miles. From this point the trains run about 9½ miles over the Black Rock branch of the Lackawanna to a connection with the Grand Trunk. Previous to the installation of this wye, it was necessary for northbound Pennsylvania freights to back into the Lackawanna interchange tracks over a single-track connection. This arrangement not only blocked the crossing, but also congested the traffic on the interchange track.

Before the wye connection was installed, the old mechanical interlocking plant simply protected the grade crossing. This plant was operated by a 40-lever Saxby & Farmer interlocking machine with 18 levers operating signals, 11 levers operating switches, nine levers operating facing point locks, and two spare levers. The signals were of the lower-quadrant mechanical type. The high signals were slotted and pipe-connected, while the dwarf signals were wire-connected.

On account of the size of the new wye connection, it was not advisable to enlarge the old interlocking machine. Nevertheless, from a construction and maintenance viewpoint, it was desirable to utilize as much of the old apparatus as possible. To do this a 40-lever, style S-8, electric section was added to the old 40-lever mechanical machine, 38 of the mechanical and 33 of the electric levers in the new electro-mechanical machine being used for the operation of the 71 switches and signals.

This type of plant, while it is the first one of its kind on the Lackawanna, is giving good service on the Pennsylvania, and is entirely satisfactory for a busy layout. A recent count shows a total of 5,600 lever and 223 train movements per day at this plant. Of the 223 train movements, 43 were passenger and 180 freight.

The tower is of two-story frame construction, steam heated, and equipped with electric lights. In addition to housing the interlocking apparatus, the tower is used as a block station by the Pennsylvania for protecting traffic beyond the interlocking limits.

The electro-mechanical machine is located on the second floor of the tower. The electric levers of the S-8 machine are fastened in an iron frame above the mechanical locking bed. Each of the electric levers is connected to the locking bed by vertical iron rods, which actuate the mechanical locking. An indication lock is provided, preventing a signal being cleared under improper conditions. An electric lever locks each mechanical lever operating a switch or derail. Where a crossover requires two mechanical levers, on account of the distance from the tower, one electric lever locks both. The locking of levers 035L and 036L is so arranged that lever 036L must be operated in advance of 035L. This is done so that it will not be necessary to stop Lackawanna trains on the railroad or trolley crossing and to assist the trains over the grades on either side of the tower. Slow-speed signal 040L is given a separate number in order to permit switching movements to be made when Pennsylvania trains are on the crossing.

Above the machine, and supported from the ceiling by

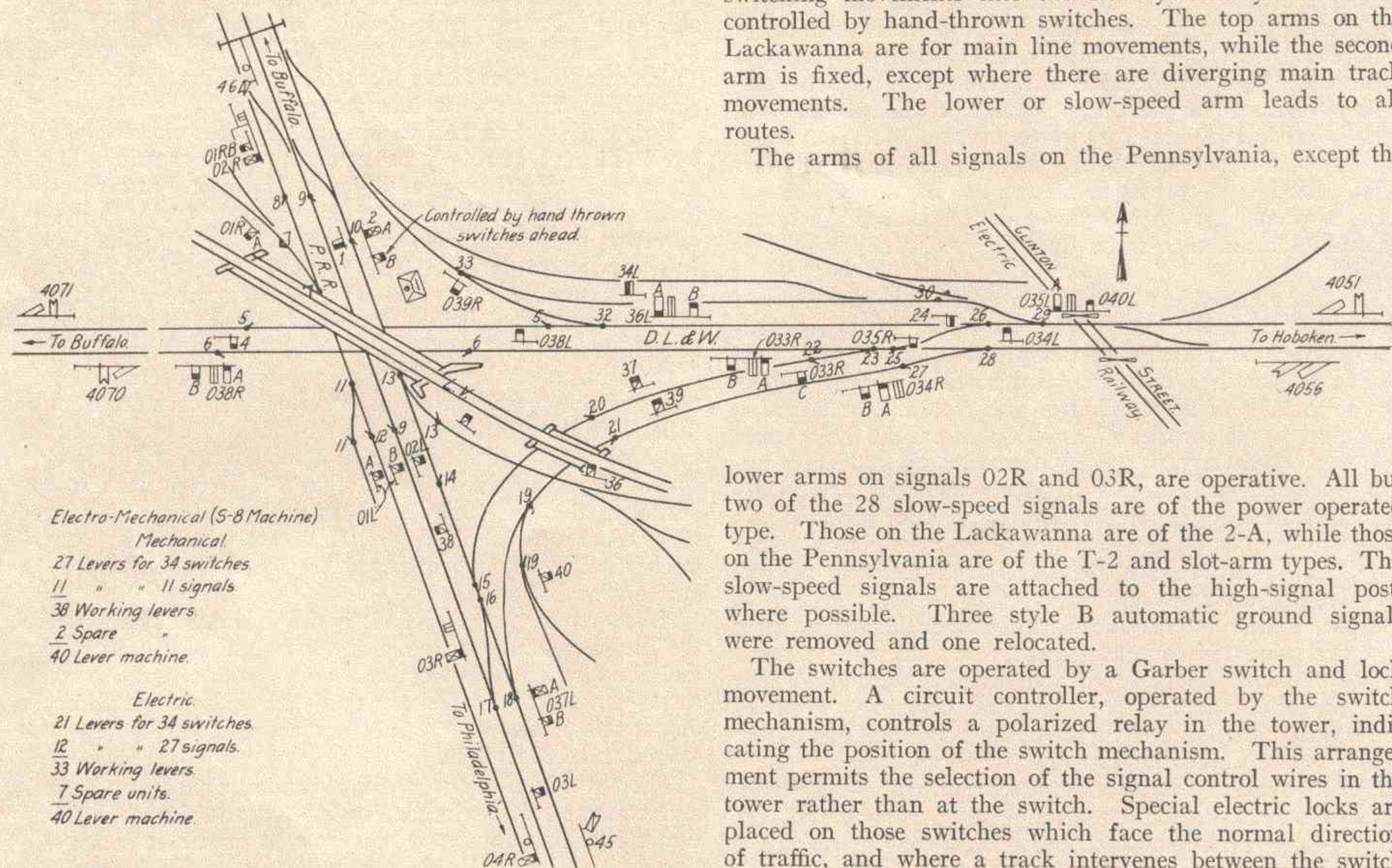
angle irons, is the illuminated track model. The model board, made in the signal repair shop at Hoboken, is of 1/2-in. ebony asbestos board, and shows the various tracks, track circuits and signals. The clear position of each signal and the condition of each track circuit is repeated on the model board by a 1 1/4-watt, 12-volt, candelabrum type electric lamp that is operated on a 6-volt circuit. About 80 lights repeat the various signal and track indications. Two manipulation charts, mounted on the side of the model board, assist the towerman in picking out the proper levers for the indicated movements.

The line relays and the signals, in the limits of the interlocking, are operated from a 14-cell, 18-volt, type A-6, 225-a. h. storage battery. Outside the interlocking limits 16 cells of BSCO battery operate the distant signals, while 12 cells operate the line circuits. Three cells of BSCO battery, connected in multiple, operate each of the 40 track circuits. A fixed resistance unit, varying from 0.1 to 0.3 ohms,

Standard approach, detector and route locking circuits are used. Several clockwork time releases are provided in connection with the approach locking circuits on the high signals. A trap circuit is installed on the dead section of track at the Clinton street trolley crossing, just ahead of signal 035 on the Lackawanna. Several telephones, attached to the signal cases and located at convenient points, permit communication with the tower.

The signals on the Lackawanna are of style B, two-position, lower-quadrant type, while those on the Pennsylvania are of the style B and T-2, three-position upper-quadrant types; except that the distant signals are two-position, upper-quadrant, operating from 45 to 90 degrees. The normal position of the distant signals is at 45 degrees. The style B signals on the Pennsylvania are equipped with the proper attachments for giving the necessary upper-quadrant indications. Pennsylvania signals 04R and 2 are used as block signals. The lower arm on signal 2 is used for switching movements into the Pennsylvania yards and is controlled by hand-thrown switches. The top arms on the Lackawanna are for main line movements, while the second arm is fixed, except where there are diverging main track movements. The lower or slow-speed arm leads to all routes.

The arms of all signals on the Pennsylvania, except the



- Electro-Mechanical (S-8 Machine)
- Mechanical.
- 27 Levers for 34 switches
- 11 " " 11 signals
- 38 Working levers.
- 2 Spare "
- 40 Lever machine.
- Electric.
- 21 Levers for 34 switches.
- 12 " " 27 signals.
- 33 Working levers.
- 7 Spare units.
- 40 Lever machine.

Track and Signal Layout of the Delaware, Lackawanna & Western Plant at Bailey Avenue, Buffalo, N. Y.

is connected in series with each track battery. The track batteries are housed in battery chutes, while the sets of signal and line batteries are housed in 20-way wooden battery boxes.

The storage battery is charged by a 1-kw. direct connected, 220-volt, 60-cycle, single-phase motor generator set. A two-panel switchboard controls the charging apparatus and the various lighting circuits. Power is distributed over the plant at 110 volts for supplying the five 75-volt lighting transformers for the operation of the signal lights. Each signal arm is lighted by a 5-watt, 13-volt Mazda lamp operated on a 10-volt circuit.

The pole line circuits outside the interlocking limits required 30 miles of No. 9 double-braid weatherproof iron wire, and 52 miles of insulated wire was used outside and 18,000 ft. inside the tower. No. 8 iron bond wires, with duplex channel pins, were used on rail joints.

lower arms on signals 02R and 03R, are operative. All but two of the 28 slow-speed signals are of the power operated type. Those on the Lackawanna are of the 2-A, while those on the Pennsylvania are of the T-2 and slot-arm types. The slow-speed signals are attached to the high-signal post, where possible. Three style B automatic ground signals were removed and one relocated.

The switches are operated by a Garber switch and lock movement. A circuit controller, operated by the switch mechanism, controls a polarized relay in the tower, indicating the position of the switch mechanism. This arrangement permits the selection of the signal control wires in the tower rather than at the switch. Special electric locks are placed on those switches which face the normal direction of traffic, and where a track intervenes between the switch and the pipe line. This prevents the switch being unlocked by a disarrangement of the pipe line.

The entire work was handled by the Buffalo division construction forces of the Lackawanna, under the direction of and with plans furnished by M. E. Smith, signal engineer. We are indebted to B. T. Anderson, assistant signal engineer, for the above information.

IMPORTANCE OF COAL IN INDIA.—In more than one respect coal is the most important mineral mined in India. According to the Indian and Eastern Engineer, it gives direct employment to about 180,000 persons, its value at the place of consumption in India or the port of export is greater than that of all the other minerals taken together, and nearly the whole quantity is used in industrial processes in the country, exports to places outside India being for the last six years under 5 per cent. Practically every industry in India is dependent upon coal for the production of power.