

Electro-Mechanical Interlocking at Sunbury, Pa.

A. C. Power Is Used for Electric Functions Except Signal Control Relays and Locks on Machine

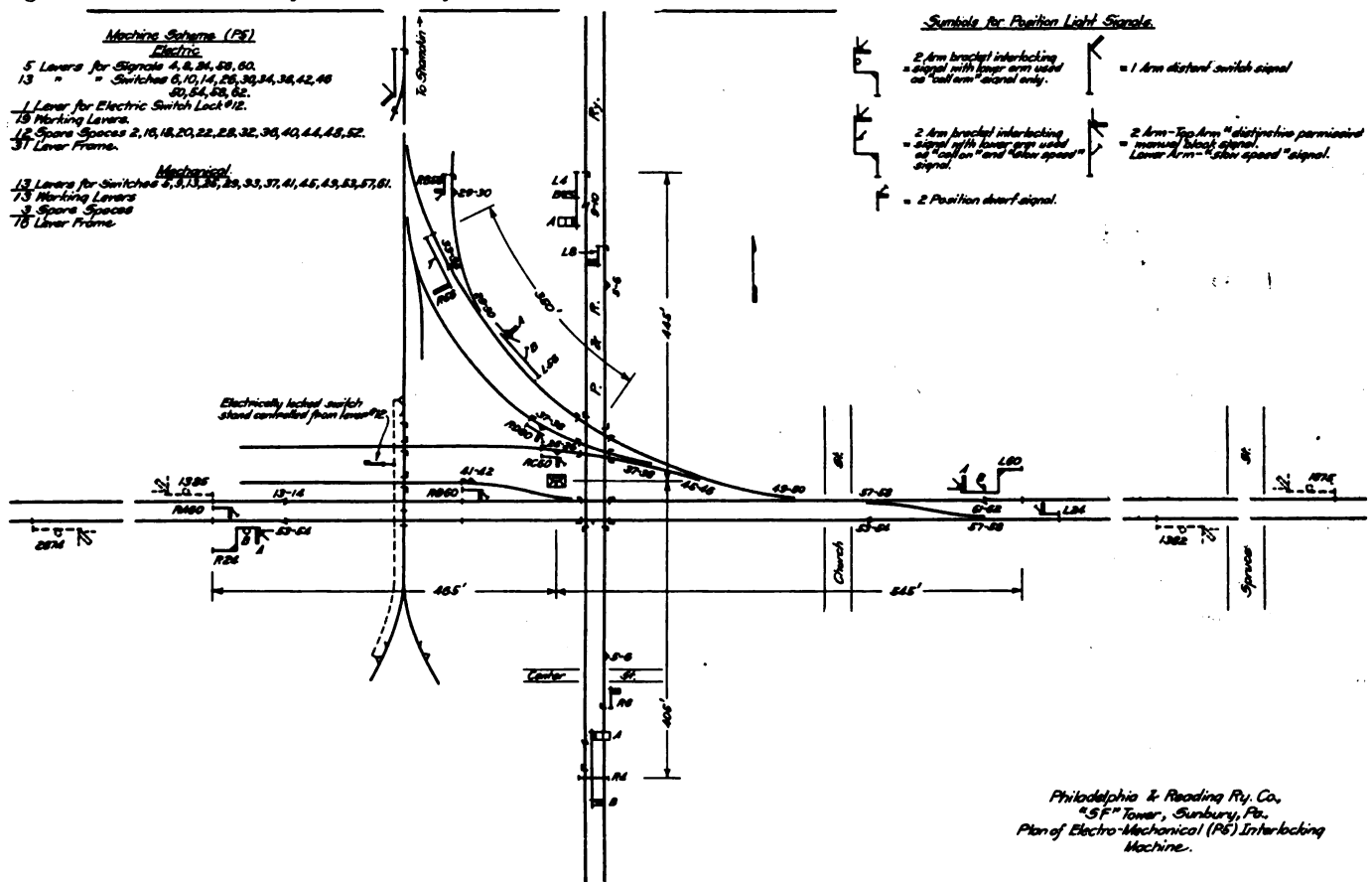
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THE Philadelphia & Reading recently placed an electro-mechanical interlocking in service at Sunbury, Pa., where its line crosses the Sunbury division of the Pennsylvania. The Shamokin branch of the Pennsylvania also crosses the P. & R. tracks and connects with the Sunbury division of the Pennsylvania at this point. All materials were furnished and the installation was made by the Union Switch & Signal Company, Swissvale, Pa.

The track layout, showing the location of the tower, the arrangement of the leadout and the numbering of the switches and signals, is shown in Fig. 1. This interlocking is located in the city of Sunbury. Because of the

3,300-volt main transformer which is adjacent to the tower connects to a Crouse-Hinds slate panel board mounted in this company's type A. K. cabinet, which is located on the wall in the first story of the tower. All main circuits supplying a.c. energy to the interlocking are distributed from the main busses on this panel. Alternating current is used for the position light signals and semaphore lamps of the type T-2 motor-operated signals and also for relay locals, lever indicator lights, track circuits and tower lighting. The only direct current apparatus involved is the signal control relays and electric locks on the machine and one electric switch lock to which further reference is made in this article. One



Layout for Sunbury, Pa., Electro-Mechanical Interlocking, Showing Machine Scheme and Position Light Signal Symbols

buildings and streets in the vicinity of the plant, the available space for the tower, the main runs of trunking and the pipe lines was limited.

The Power Supply

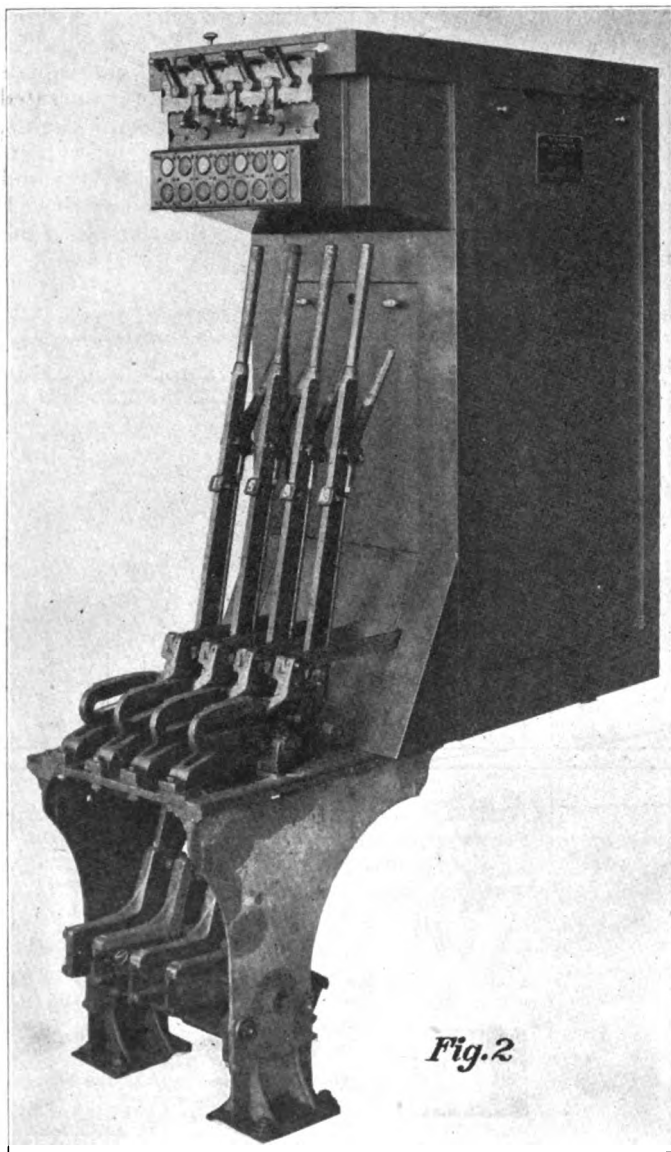
A two-story tower of fireproof construction with structural steel supports for the machine was provided in place by the railroad company. The batteries and relays are located in the first story of the tower. Practically all of the energy required for the operation of the plant is alternating current, which is secured from a 3,300-volt, single phase, 60-cycle underground transmission line serving the automatic signals on the Pennsylvania through this territory. The 110-volt secondaries of a

set of 16 cells of soda battery supplies all the d.c. energy required.

The Interlocking Machine

The interlocking machine is type P-5, manufactured by the Union Switch & Signal Company. It was desired to mechanically operate the switches and at the same time obtain the advantages of power-operated signals, electric switch indication and electric detector locking in lieu of detector bars. The machine chosen adapts itself to the requirements, and a section of it is illustrated in Figs. 2 and 3. The former shows the four mechanical levers and the seven electric levers, with the steel case in place. The latter is the same machine with

the steel case removed to expose the locking, the indication magnets and also to better illustrate the scheme of locking between the mechanical and electric levers. It will be noted that this machine consists of a set of mechanical levers supported in a frame which is in accordance with the design of the standard Saxby & Farmer type of machine, and that the supports and locking bed which are ordinarily furnished with this type of machine are omitted and that a support for the electric levers is mounted in place of the usual mechanical locking bed. The part of the machine involving the electric levers is identical in all general principles of design to the power interlocking machine known as the model 14 type man-



Machine With Cover in Place

ufactured by the Union Switch & Signal Company, also used in its type F electric or electric-pneumatic interlocking.

The mechanical levers are spaced five-inch centers and are used only for operating the switches and derails. Directly above each mechanical lever is an electric lever and between these two levers there is a mechanical locking device. A better understanding of this feature can be had by referring to Fig. 3. No. 1 is a rectangular bar actuated by a rocker link. The rectangular bar passes through the locking block No. 2 and has two positions, normal and reverse, corresponding to the normal and

reverse positions of the mechanical lever; these are shown in Fig. 3a. The locking block also has normal and reverse positions, corresponding to the normal and reverse positions of the electric levers. It is impossible to complete the stroke of the electric lever to the reverse position until the mechanical lever is in the reverse position. This will be appreciated by referring again to Fig. 3a. With the electric lever in the reverse position the locking block is in its extreme upward position. In this position it engages in the notch on the lower side of the rectangular bar. Likewise an electric lever cannot be placed in its extreme normal position until the mechanical lever is also in its normal position. This results in the locking block being in its extreme downward position and engaging in the notch in the upper side of the rectangular bar. As long as the electric lever is at mid stroke the rectangular bar is free to pass through the hole in the locking block. The locking blocks are mechanically connected to crank arms on the shafts which are rigidly connected to the electric levers. An accurate adjustment of the locking block is obtained by screw adjustment No. 3, which is introduced in the mechanical connections between the locking block and the crank arm on the electric lever.

The mechanical locking is in the electric portion of the machine and is of exactly the same type as used in the power interlocking machines furnished for either type "F" electric or electro-pneumatic interlockings. The electric levers controlling switches are provided with normal and reverse indication magnets and lock segments which are, in turn, controlled by electric circuit controllers on the switches which are actuated by the mechanical levers. The control of the indication magnets is such as to guarantee that the switch and lock movements have not only operated so as to close the points of the switch or derail, but also guarantees that the switch and lock movement has completed its operation and locked the switch or derail before the electric lever can be released from the indicating or mid-stroke position.

Lever-light indicators on the machine are provided to show the condition of each track circuit controlling each switch. A separate row of lever lights is provided to show the condition of the route for signals.

Where the Shamokin division of the Pennsylvania crosses the Sunbury division, the derails on the Shamokin division are operated by a ground lever. An electric lock is attached to this ground lever and controlled from lever No. 12 in the electro-mechanical machine. Lever No. 12 locks all routes conflicting with this crossing and it is necessary to reverse this lever before the electric lock on the ground lever is released.

An indication circuit is provided for lever No. 12 in order to insure that the ground lever has been returned to its normal position and the track circuit on the Shamokin branch is clear.

The mechanical part of the machine has 13 working levers for 20 switches and derails and 3 spare spaces in a 16-lever frame. The electric section has 19 working levers, as follows: 13 for switch indication, 5 for 16 signals, 1 for control of an electric switch lock and 12 spare spaces in a 31-lever frame.

Signals and Switch Movements

The signals on the Reading are top post type T-2 with a.c. motors and are electric lighted. Those on the Pennsylvania are its standard position light signals, high and dwarf types.

The switches and derails on both lines are operated by the Garber type switch and lock movements. The switch movements are equipped with indication boxes to insure that the position of the switch corresponds with

that of its corresponding electric and mechanical lever. Where it was necessary to cross an adjacent track with the pipe line operating a switch or derail, an electric lock was installed on the switch movement. This electric lock, bolt locks the driving bar of the switch movement and prevents the movement from being thrown by dragging equipment from a train on an adjacent track. The control of this lock is so arranged that it will not release the driving bar of the switch and lock movement until the electric lever has been put to the center position.

The main and branch trunking is run on concrete stakes spaced five feet apart. Where a branch leaves the main line, a concrete junction box with an iron cover is provided. All branch wires are terminated on R. S. A. terminals in these junction boxes. Where the main trunking crosses the tracks a vertical terminal box attached to a concrete post is installed on each side of the

approach stick relay is picked up over a back contact on the track relay controlled by the track section just ahead of the home signal, or, if no train is approaching, the stick approach relay can be picked up by operating a clockwork time release. The operation of the time release automatically puts the home signal to danger. The electric switch levers in the route are controlled by the stick approach relay and also by the track circuits in the route governed by the home signal, thereby locking the switches in the route from the time the home signal has been cleared until the train has passed over the last switch in the route.

The above installation was carried out without interrupting the service of the mechanical plant which operated the majority of the switches and signals which were later incorporated in the new layout. All materials were furnished and the installation was made by the Union Switch & Signal Company, Swissvale, Pa.

SECTIONAL COMMITTEE ACTIVITIES

THE St. Paul Sectional Committee, Signal division, American Railroad Association, will hold a meeting in room 1110, Railroad building, Fifth and Jackson streets, St. Paul, Minn., on Saturday, September 18, at 9:00 a. m. An excellent program is to be presented and it is expected that papers on: "The Track Circuit" will be given by A. R. Fugina, signal engineer, Louisville & Nashville; "Use and Abuse of Drills and Reamers," with moving pictures, by Cleveland Twist Drill Company; "Manufacture, Use and Abuse of Dry Cells," with motion pictures, by J. M. Spangler of the National Carbon Company, and a paper on "Maintenance," by T. C. Hanson, signal supervisor, Northern Pacific.

At this meeting a neat device for use in making calculations pertaining to Ohm's law will be distributed by the National Carbon Company. Those in a position to attend this meeting should bear in mind the date and come prepared to discuss the various papers presented on the basis of their own experience. E. J. Relph, mechanical engineer of signals, Northern Pacific, is chairman of the committee, and an invitation is extended to all those interested in these subjects, whether signal department employees, to be present and take an active part.

The Texas Sectional Committee

The Texas Sectional Committee held a meeting at Hotel Galvez, Galveston, Tex., on September 4. At this meeting the Central Electric Company showed by means of motion pictures the process of manufacturing rubber-covered insulated wire, following which a paper on "The Electric Lighting of Signals" was presented by B. F. Hines of Thomas A. Edison Company.

The Kansas City Sectional Committee

The Kansas City Sectional Committee will hold a meeting in the Union station, Kansas City, on September 15. A. H. Rudd, chief signal engineer, Pennsylvania System, will present a paper on "Position Light Signals," and J. M. Spangler, manager of the railroad sales department of the National Carbon Company, will present a paper on "The Use and Abuse of Dry Cells."

Chicago Sectional Committee

The Chicago Sectional Committee and the railroad section of the Western Society of Engineers will hold a joint evening meeting on Thursday, October 21, in the rooms of the Western Society of Engineers, Monadnock block, Dearborn and Van Buren streets, Chicago. At this meeting the problem of automatic train control will be considered. W. B. Murray, chief engineer, Miller Train Control Corporation, will present a paper on some of the

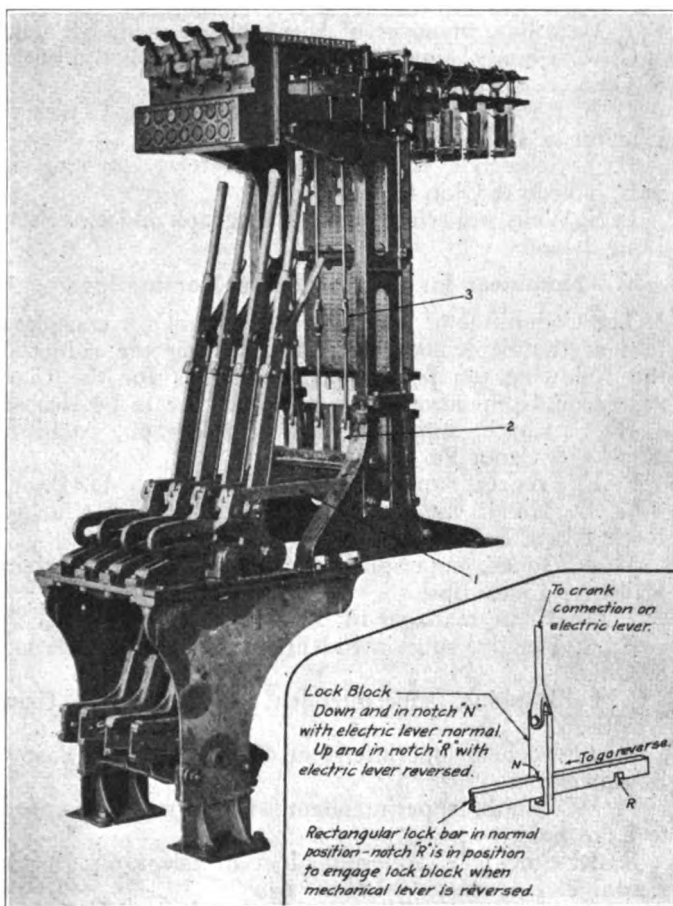


Fig. 3 Machine With Case Removed Fig. 3a

tracks. All wires running across the tracks terminate in these boxes. One of these vertical terminal boxes is also installed 10 ft. from each side of the tower. The trunking between these two boxes each side of the tower and in the tower is made of asbestos board. All track relays and electric locks are a.c. with Union Switch & Signal Company's S. L. V.-13 type relays located in the tower except the one-track circuit for the Shamokin distant signal, which has a model 15 two-position relay located at the signal.

Electric Route Locking

Approach stick locking is provided for all home high signals. This locking is so arranged that whenever one of the high home signals is cleared, an approach stick relay is dropped. This relay remains open until the approaching train has passed the home signal, when the ap-