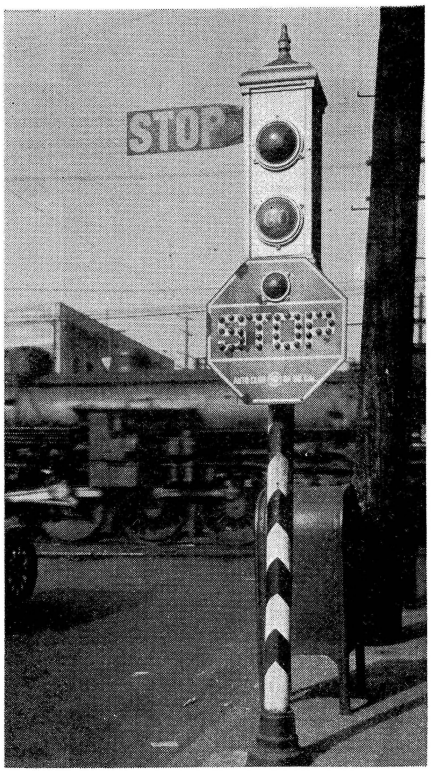
Street Traffic Signals Controlled by Trains



Standard Los Angeles traffic signal at Alameda street

Southern Pacific has successfully co-ordinated automatic timing circuits of city traffic signals with track circuits to provide warning as trains approach

THE SOUTHERN PACIFIC has installed automatic controls at Los Angeles, Cal., for setting street traffic signals in the stop position upon the approach of a train. Within the city the double-track main line of this road occupies the middle of Alameda street for a distance of 3.6 miles. On each side of the tracks Alameda street is paved and handles heavy motor traffic. Several of the principal streets of the district cross Alameda street and the railroad tracks at right angles, and as the motor traffic over these intersections is quite heavy, a standard traffic signal, the same as used at other street intersections in the city, is in service at each corner.

Trains Interrupt Timing Cycle

As it would obviously be unsafe to permit these signals to display the "Go" semaphore and green light while a train is occupying or approaching the crossing, the city, county and railroad authorities have co-operated in setting up a co-ordinated system whereby the timing cycle of the "Stop" and "Go" signals for street traffic is automatically interrupted upon the approach of a train and occupancy of the crossing. The restrictive aspect of these signals is maintained until the crossing is clear, after which the normal timing cycle is resumed.

A-C. Directional Track Circuits

All trains are operated at low speed and no automatic block signaling is in service. For this reason no track circuits were in service prior to the installation of the present layout. Under these circumstances the use of short normally-open track circuits, capable of directional selectivity, was feasible. Of course, the directional feature eliminates the necessity for interlocking relays, the neutral-relay arrangement giving the equivalent operation. These track circuits are located in approaches to the crossing for movement with the current of traffic. Yard engines moving against current of traffic are governed by traffic signals.

A typical directional track circuit is illustrated in the accompanying diagram, which shows the two 11-ft. single-rail sections and the connection to the common rail. The two a-c. galvanometer track relays are energized at the proper time. Relay *A* directly affects the control circuits at the crossing by energizing the feed to a stick relay whenever track section *A* is energized by an eastbound train. It will be noted that this instrument becomes energized only while the *A* section is occupied and *B* section is not occupied. As relay *A* is fed through the back contacts of relay *B*, in a normal eastward movement, the former is energized momentarily through each truck that enters the circuit. Relay *B* immediately interrupts the *A* setup and remains energized so long as either section is occupied. For a westward movement, relay *B* is energized first and remains so to the exclusion of relay *A*.

Considering a normal through train movement, the corresponding *A* relay is momentarily energized by the train approaching the crossing. This energizes a stick-relay circuit which, in turn, interrupts the normal timing cycle of the traffic signals, setting them at "stop" and starts the DT-10 relay. This aspect is maintained until the rear of the train clears a short, normally open, track circuit spanning the street, after which the "stop and go" timing cycle is restored to normal operation.

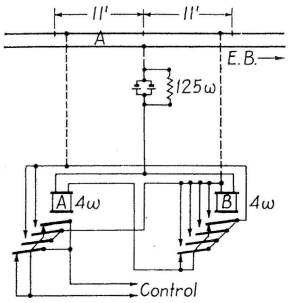
However, if a train should stop before it occupies the crossing, the DT-10 time-element relay set at 50 seconds, functions. After this time interval the signals are automatically restored to normal control, releasing the crossing. When the train resumes its movement, the first wheels entering the A circuit energize the stick-relay circuit and the signals are again set at "stop". Thus, it is impossible for traffic over the crossing to be delayed unreasonably without there being a train actually across the street.

As a train trails off of any approach, the *B* track relays are energized prior to occupancy of the A track sections and this prevents the *A*

track relays from being momentarily energized to set the signals and obstruct traffic.

D-C. Directional Circuits

At Florence avenue the controls are somewhat similar to those used at other intersections, however, in this vicinity several turnouts and a crossover between the main lines are used for switching movements and freedom from foreign current permits the use of d-c. circuits. Of course, the street traffic can not reasonably be obstructed by the signals during such operations within the control limits. Therefore, as soon as the initial track section is occupied, a stick relay is energized and a time-element relay



Typical d-c. normally-open circuit illustrating A and B relay set-up

is immediately set in operation. The stick relay remains energized until the time relay completes its cycle of 50 seconds, when the stick relay is automatically released and the traffic signals resume normal operation. Auxiliary directional circuits located on turnouts and on crossovers insure that no switching movements are made over the intersection without setting the traffic signals properly.

Certain of the crossings over Alameda street also include street-car tracks. In such cases the street-railway traffic observe the same signals used by motorists.

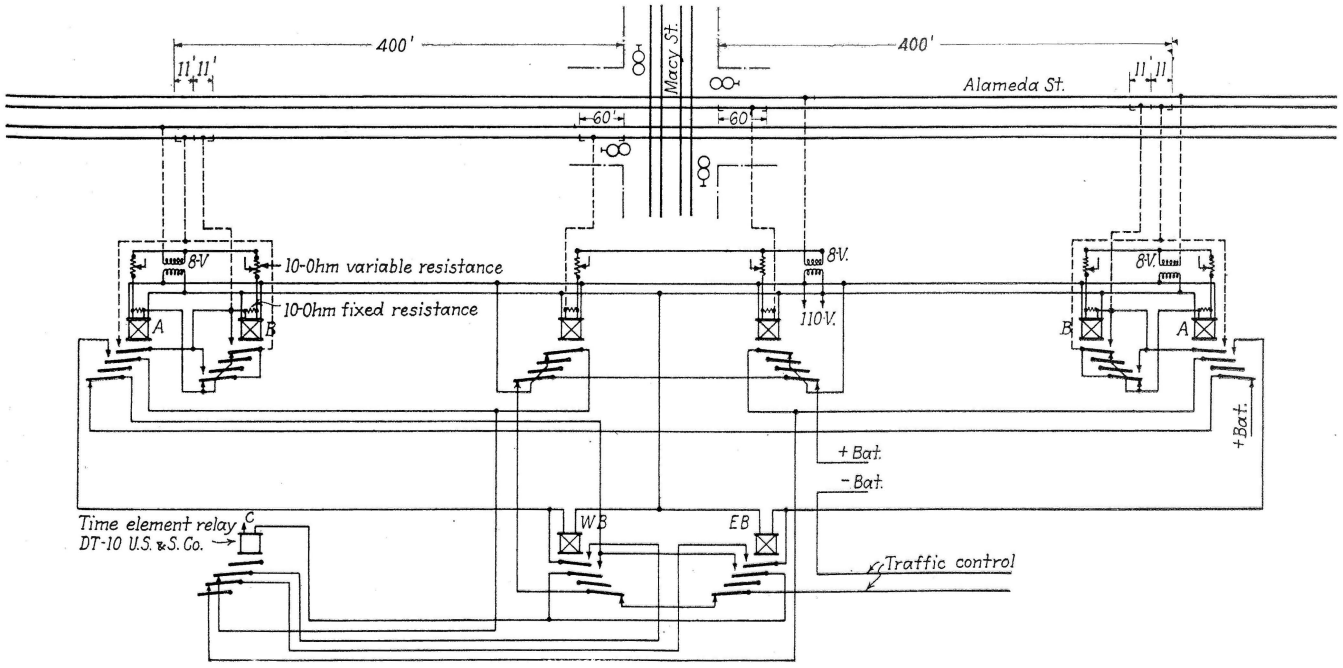
The circuit illustrated below typifies the a-c. track- and control-circuit scheme employed at several other crossings. As the Macy street layout does not include crossovers and turnouts for industrial connections, no provision has been made for auxiliary track-circuit controls. The short track sections immediately adjacent to the crossing, however, provide proper protection in the event a train less than 400 ft. in length stops within the dead space between the first 22-ft. control circuit and the crossing. If such a train occupies this section of track longer than the 50-second period measured by the time-element relay it will, of course, lose its priority until it restarts and enters the short crossing section at low speed.

The a-c. track relays at Macy street are of the two-element type for which a common 110-volt circuit has been run to all of the housings. This circuit also supplies energy to the 8-volt controlling elements through suitable limiting resistors and the local transformers. A local battery, however, has been provided to energize the traffic signal controls as these are uniformly designed for direct current.

The net effect of the signal facilities is to give not only greater protection to motor traffic but to provide flexibiliy of control without sacrifice of safety in order to expedite both rail and highway traffic. By minimizing unnecessary signal restrictions, consistent with safety, the special controls accomplish the desired effect. These signals have been in satisfactory service for several years.

Relays used in this installation were furnished by the Union Switch & Signal Company. Except the straight alternating-current circuits, the controls are fed by lead storage batteries on floating charge. The d-c. directional track circuits are operated by primary battery.

Traffic signal indications are enforced by city authorities



Complete control-circuit scheme at Macy street involving a-c. relays