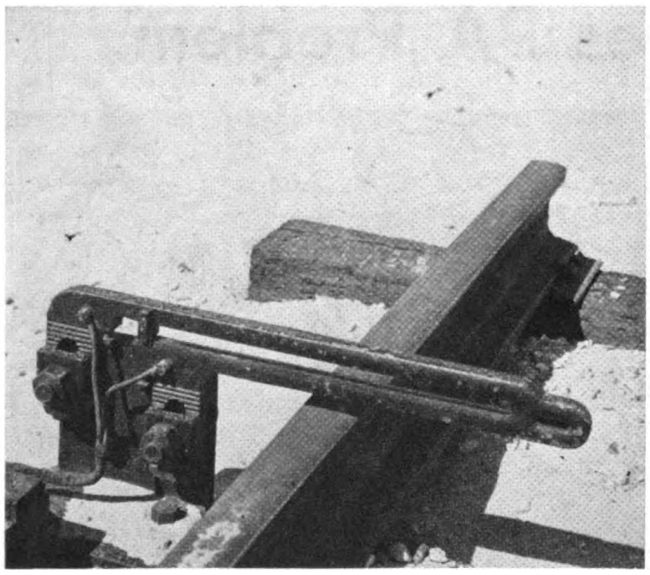
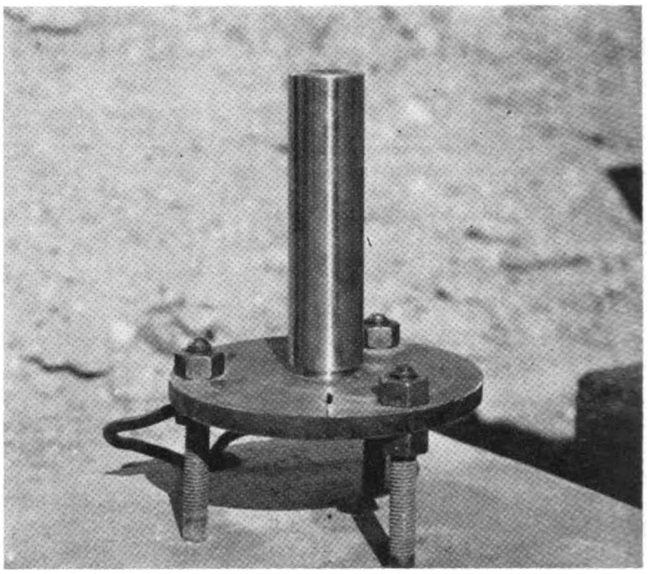


If a car runs away it breaks this cast-iron arm which opens a circuit that holds signals at Stop



Cylinder 1½ in. in diameter, stands on a small plug—when the earth moves, the cylinder falls

CTC on the SP has Special Devices

Unique device detects earthquake tremors and sends warning to dispatcher; equipment detector checks for run-away cars; special lighting protection for arid areas, and highway tracks for maintainers are features of 194 mi. centralized traffic control project on Southern Pacific in California.

THE FIRST HALF of this article, dealing with the layouts of sidings, signal arrangements, and new aspects, was published in the May issue. The remainder of the article, dealing with special equipment and construction practices, is as follows:

Run-Away Protection at Ferrum

At Ferrum the branch line from the iron ore mine is on a descending grade toward the main track connection. As protection to prevent cars on the branch from coasting out on the main, the branch is connected to the main by a crossover, and the branch track extends on past the crossover up a grade as a run-away track. Cast-iron type dragging-equipment detectors are mounted so that the wheels of an approaching car, in normal position on the rails, will break the cast-iron units, and thus control circuits to send an indication to the dispatcher, and also set up electric locking to prevent operation of the cross-over or the clearing of a signal. This detector was furnished by the Western Railroad Supply Co.

The detector track circuit for the branch line end of the crossover extends to the dragging-equipment detector. Part of this track circuit will be used only when a car gets away, therefore the rail is rusty. To improve the shunting, stainless steel beading was welded on the running surface of the rail.

Clearview type arresters furnished by the Railroad Accessories Corporation are used on the code line and on the signal line circuits, one set of these arresters being located in the instrument housing and another set in a box on the pole under the crossarm. The special purpose of the arresters on the pole is to drain off static and provide protection, to the drop cables, from lightning surges.

Ground connection for the arresters in the instrument houses is obtained by connecting to one of the track leads. Normally there are four-track leads entering the instrument house; three of these leads are also connected to Thyrite lightning arresters, and the fourth lead is connected to the ground post of all lightning arresters, including the three for track leads.

By providing lightning arresters at all track cuts and always using the track lead that connects to a certain rail and extending in the same direction, the rail actually becomes a condenser of large capacity, since a charge will continue to dissipate through several track circuits by discharging through a lightning arrester at each consecutive track cut. With this arrangement, lightning coming in on the rails from either direction is influenced to pass through the location and be dissipated on the rail beyond, rather than affecting the track relays. Experience on the Southern Pacific has proved that this arrangement is effective. General Electric Company pellet-type arresters are used on the 220-volt and 4800-volt a.c. power distribution circuit.

Two Copperweld ground rods, ⅝-in. by 8 ft., are driven at the line pole and one such rod is driven at some of the instrument housing at CTC code locations. A 9/32-in. hole is drilled through the rod, 1 in. from the top, the ground wire being connected to the rod by driving a channel pin in this hole, on the existing installation, but Copperweld ground rod clamps were used on the new work.

As part of this project, flashing-light signals with short-arm gates

Unique Device Detects Earthquakes

Niland is located in an area where earthquake tremors have been noted from time to time during years past. Although no damage has been done to railroad tracks or structures, a means of knowing the intensity of future tremors in this area is desirable. Accordingly, the signal department designed unique equipment to detect and indicate earthquake tremors. This apparatus was installed at Niland, and connected with the CTC system. A picture shows one of the 12 units in normal position with the cylindrical steel weight standing on end. The 12 cylinders are all the same diameter, 1½ in., being turned from discarded line shafting. The cylinders range in length from 4½ in. to 6 1/16 in. The bottom of each cylinder is turned to form an extending plug at the center ¼ in. long. The diameters of these plugs range from 1⅜ in. for the shortest cylinder to 13/16 in. for the longest cylinder. When in operating position, each cylinder stands vertical on its plug, therefore the diameter of the plug, as well as the length of the cylinder are factors in determining how much movement of the earth is required to topple over any one cylinder. The weight of the cylinder on the plug end causes a contact in an electrical circuit to remain closed normally. The 12 instruments are used experimentally to determine a definite point of reference which may be used in ultimately developing a single instrument which will indicate only such earth shocks as would be expected to cause damage to track and structures.

The base plate is on three ½-in. anchor bolts on which the nuts can be turned to make the base plate level. These anchor bolts extend down into a precast concrete foundation 14 in. square and 30 in. deep.

The foundations, with anchor bolts and base plates, move with the earth tremors. Within the range of the 12 detectors, a mild tremor would topple over the tallest detector. A somewhat stronger tremor would topple over the tallest and the next tallest detectors, etc. When any detector operates, an indication is transmitted over the CTC line system to the dispatcher at Beaumont, and he calls the maintainer to go to inspect detectors, and if necessary track forces are called to patrol track and make necessary inspection to determine that the track and structures are safe.

were installed at Thermal. This project, which utilizes Griswold gates, includes special speed selection controls and automatic cutouts.

Fast Construction

The 122-mile CTC project from Indio to Yuma was authorized on August 8, 1955. Work started September 1, and the first 50 miles from Thermal to and including Niland was placed in service April 25, 1956, with the entire project completed June 29, 1956. The number of construction men varied, depending on materials available, ranging from 60 to 120 men. The pole line gang went through as a separate operation. For the remainder of the work, each crew had a given section ranging from 10 to 15 miles.

A power-operated ditching machine was used to dig trenches for the buried cable. One cable of six No. 6 wires and another of ten No. 14 wires extends from the instrument house to each power switch. A 12-conductor cable of eight No. 14 and four No. 8 extends to each near signal, and one 19-conductor cable of No. 14 and 4 No. 8 extends to the far signal. Single-conductor No. 10 is used for connections from the house to bootlegs for track circuit connections. All this buried cable, made by General Electric Company, has Flamenol insulation with an overlay of bronze tape and 4/64 in. to 7/64 in. Flamenol jacket overall, depending on outside diameter of the cable.

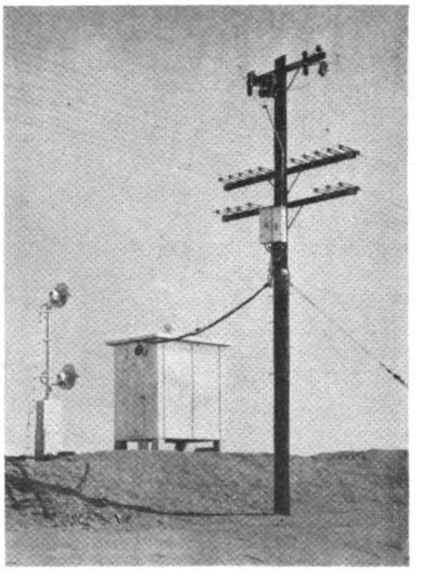
Pole Line Construction

As part of this project, the previous signal pole line was thoroughly rebuilt, using about 75 percent new poles with new crossarms.

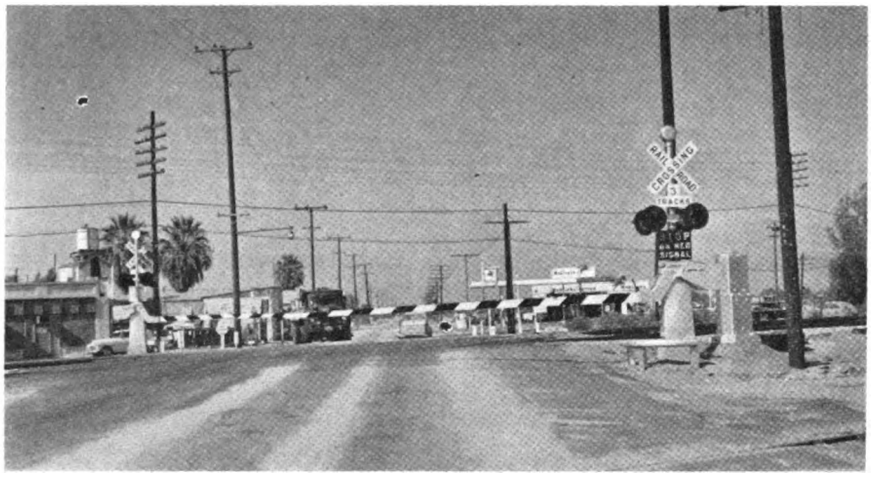
The new poles are Douglas Fir, Penta treated full length. Poles are 25 ft. where there is one arm, or 30 ft. for two arms. Poles are set 35 to the mile. A machine mounted on a crawler-type track, and including a hole digger and a winch with cable over a 16 ft. pipe boom, was used to dig the holes and set the poles. One man operated the tractor, one man the digger, and one man handled the winch line, and assisted in setting pole in hole. Arms, pins, and insulators were applied before setting the poles. Holes were dug and poles set, at an average of 1 mile, 35 poles, daily.

The CTC code line circuit is on two No. 8 Copperweld line wires. The local line controls are on No. 10 Copperweld. These wires were covered with PVC type insulation.

On the 29 miles between Indio and Ferrum there are several sections of 110 volt or 220 volt a.c. power line using No. 8 bare copper wire on same crossarm with code and signal control wires which feed through transformers and rectifiers to charge to storage batteries. At each power switch there is a set of 6 cells of Edison type A4H and 12 cells of type B4H storage battery. Six of these cells feed the signal controls and is a reserve for signal

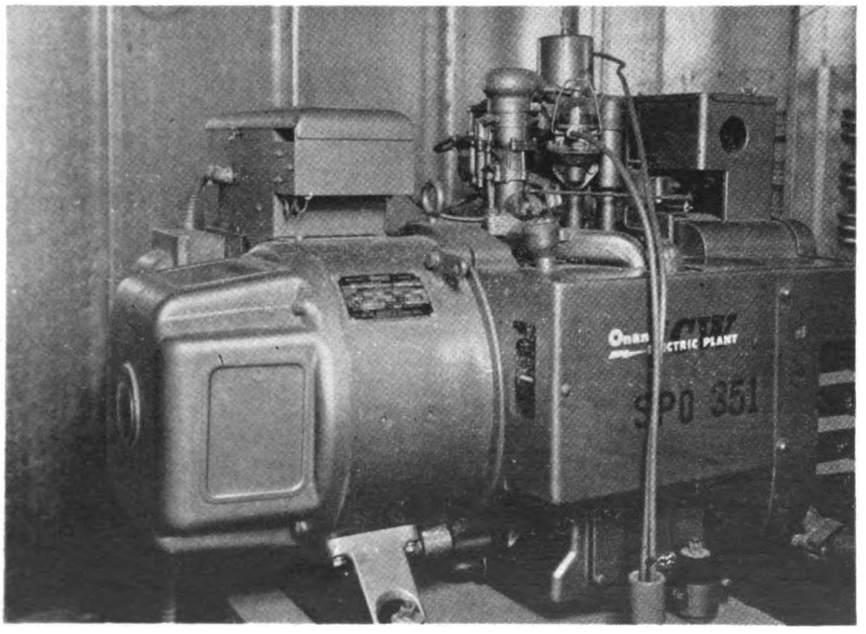


Arresters are in box on pole



The controls for the new highway crossing gates at Niland, include special speed selections and automatic time cutouts

Highway trucks for maintainers cost $30,000 less than installation of motor-car indicators—Territories range from 22 to 28 miles



If the commercial supply of a.c. fails, a gasoline engine driven generator, rated at 25KVA, cuts in automatically

lamps. Other 12 cells feed code equipment. This entire set of 18 cells supply energy to operate the switch machine. At double crossover locations 18 cells type A6H were used. At each intermediate signal, 6 cells of B4H feed signal line controls and are a reserve for signal lamps. In most instances, each track circuit is fed by 2 cells of 500-A.H. Edison primary battery using RTA-104 rectifiers.

No commercial a.c. power was available on the 86 miles between Ferrum and Knob except at Niland and near MP-724, therefore the project included a 4800-volt single-phase, 60-cycle power distribution line circuit on two No. 6 bare copper line wires on the top arm on the signal pole line. If the commercial feed to this line circuit fails at Niland, an Onan gasoline engine-driven generator, rated at 25 KVA, 115 volts, is automatically started, to take over the line load.

A similar 10-KVA, 115-volt gas-engine driven generator is located at MP-724, and at the dispatcher's office at Beaumont.

Highway Trucks for Maintainers

Other CTC installations, made by the Southern Pacific during recent years, have included automatically-controlled indicators which provide information concerning the approach of trains for the benefit of the signal maintainers and other M. of W. employes when operating their motor cars. Based on extensive records and experience, the estimated cost of including this system of motor car indicators in the Indio-Araz Junction section would be about $120,000. An investigation showed that highway motor trucks could be purchased for use of these employees for about $90,000. On most all of this territory the track is not far from an improved highway, therefore the signal and track maintenance can be done effectively by use of these trucks. Accordingly the trucks were purchased for this purpose, and have proved to be satisfactory and economical. Between Indio and Yuma, each maintainer has from 22 to 28 miles of CTC.

This project was planned and constructed by signal forces of the Southern Pacific, under the jurisdiction of H. B. Garrett, signal engineer, the major items of equipment being furnished by Union Switch & Signal, Division of Westinghouse Air Brake Company.