bility of line crosses or breaks in the circuit developing combinations that would cause the installation to function improperly. With the two- or three-wire code type, due to the few line wires necessary, the possibility of such combinations is limited to the actual local wiring at each location.

I have also found that the failures in the code type are very few and far between. In fact the longest installation on this road has functioned for three years without any appreciable failure of the code apparatus itself. In fact, the few failures that have occurred have been track-circuit and signal-mechanism failures. This installation has gone at times as long as eight months without a failure of any kind. The installation is more than 24 miles long and is maintained by two maintainers, each of whom has some additional territory to look after. They work on an eight-hour-day basis.

In comparing the three types of installations, I do not wish it to be understood that the code type is freer from failures and interference than either of the other types, as the failures on the full-wire control scheme, or the modification thereof, have been few and far between, but I do feel the possibility of failures on the latter occur slightly oftener than on the strictly code type.

Distance an Important Factor

By D. W. Dower

Assistant Signal Engineer, Southern Pacific, San Francisco, Cal.

The decision as to the type of control to be used is determined by the distance from the operated functions to the point of control, and if the units to be operated are a considerable distance from the control point, then, as a matter of economy, the C.T.C. coded type of control is used. If the control point, which may be an existing telegraph office, is near the functions, then the scheme of wiring is generally of the direct-wire type.

False Change of Lineup

"In designing the circuits for an automatic interlocking plant at a grade crossing, what is the best way to prevent the possibility of the lineup being transferred from a train on one road to a train on the other road, by reason of a momentary failure of one of the crossing track circuits?"

Automatic Time Release

By Louis R. Zehnder

Signal Engineer, Louisville Frog, Switch & Signal Company, Louisville, Ky.

Perhaps the best way to prevent the possibility of the lineup being transferred from a train on one road to a train on the other road, by reason of a momentary failure of one of the approach track circuits, is to use automatic time releases in the control system of the automatic interlocking.

The circuits may be arranged so that the first train approaching the plant will hold its lineup for a predetermined time (based on the length of the approach section and the train speed) after another train on the crossing line has entered its approach section, or an approach track section on the crossing line has failed, due to power interruption, or other cause.

When automatic time releases are used, the control system may be designed so that, if the approach sections on both railroads are occupied indefinitely, or the approach track sections on both railroads fail, the lineup will be transferred automatically from one railroad to the other at predetermined time intervals until one train moves off the approach section, when the plant will be lined up for the second train.

If the second train remains on the approach section for an indefinite length of time, the signal governing its movement will go to the Stop position after a predetermined time interval, and will remain so until a second time interval has elapsed, when it will again clear.

Stick Approach Locking

By Roy E. Testerman

Chief Draftsman, St. Louis-San Francisco, Springfield, Mo.

Our solution of this problem has been to provide "stick approach locking." We accomplish this, without the use of additional relays, by making the normal repeater relay for each home signal stick around a contact in the approach track repeater relay. This stick relay drops when the home signal clears and will not pick up again until the train has cleared the approach track section.

An objectionable feature of this circuit, which may be caused by the fleeting of trains through the plant, has not caused serious inconvenience in our case, because traffic is not usually handled in this manner through our automatic interlocking plants.

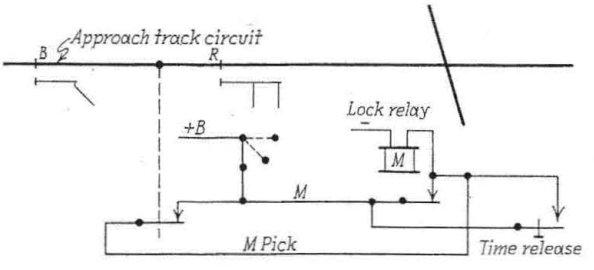
Approach Locking

By C. B. Cargile

Signal and Electrical Inspector, Florida East Coast, St. Augustine, Fla.

As approach locking has been found necessary for manually controlled interlocking to keep operators from shifting conflicting routes in the face of approaching trains, so automatic interlocking plants, not equipped with approach locking, are no safer than a manual plant in charge of a nervous operator with the approach locking cut out. Interruptions in the plant circuits can result from causes too numerous to mention, such as loose connections, broken bond wires, or a track gang working in the plant limits.

When a train has received a clear signal for a route through the plant, and whether that signal remains clear or not, it should not be possible to clear a signal on any conflicting route until the first train has been disposed of, or until a time release has been operated at the crossing in the prescribed manner.



Approach locking circuit for each home signal of an automatic interlocking at a grade crossing

The approach lock circuit shown in the illustration is simple and effective. If it is desired to extend the approach control past the distant signal, operated to three positions, the lock wire is taken back to it, and broken in its third or green position, and in that case the *M PICK* circuit would cut through the approach control relay rather than through the single approach track relay as shown.

When a train enters the approach circuit and receives a clear signal for the route, the *M* relay opens and cannot automatically pick again as long as the approach circuit is occupied, regardless of whether the signal remains clear or is put to Stop by some cause, accidental or otherwise, because the approach relay must be picked up to close the *M PICK* circuit and pick up the *M* relay. All route circuits conflicting with the route governed by this signal are cut through its *M* or lock relay picked up so that no conflicting route or signal can be cleared while its approach is occupied, or until the manual time release has been operated for the purpose of transferring routes.

Each home signal in the plant is equipped with an approach lock circuit and relay identical with the unit shown.

Parkway Bootlegs at Rail Connections

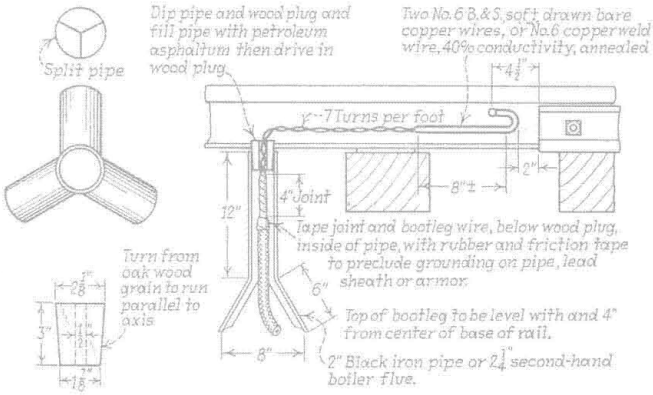
"Where parkway cable is used for rail connections, what is the best method of terminating the parkway and making the connection to the rail? What size conductor is used in the cable, and is it solid or flexible?"

Bootleg Costs Less Than 75 Cents Per Track Connection

By Leroy Wyant
Signal Engineer, Chicago, Rock Island & Pacific, Chicago, Ill.

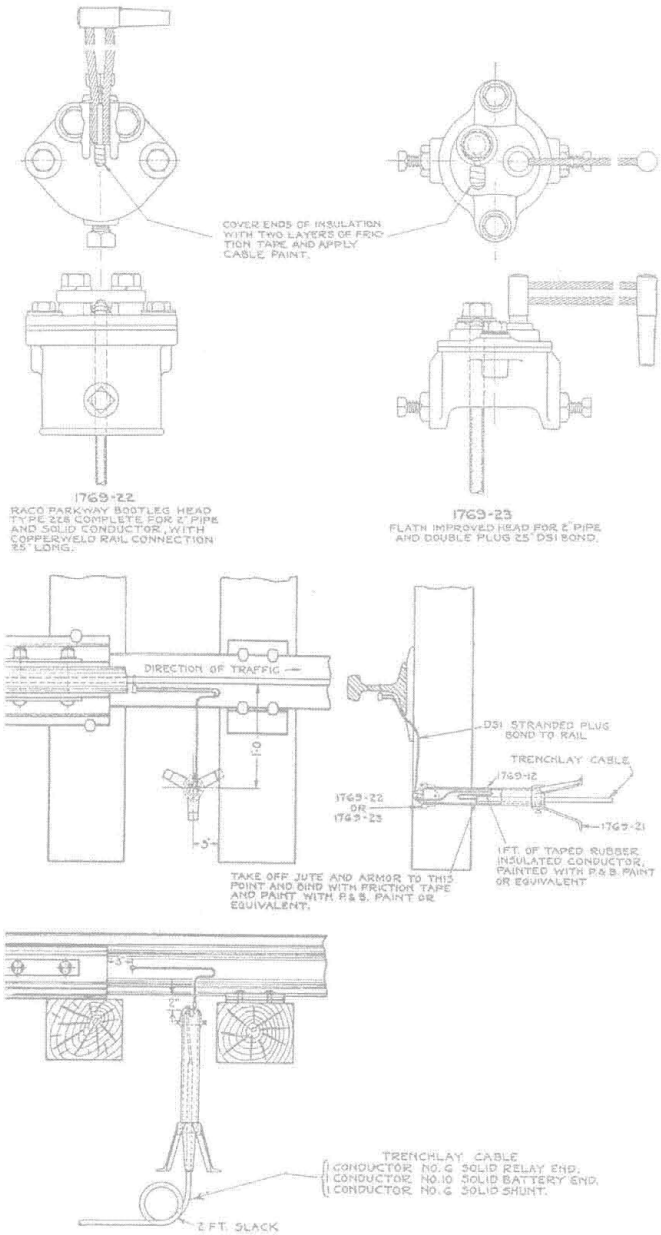
We use single-conductor solid wire with rubber insulation, without braid. The outside covering consists of steel tape and jute. We have made tests with stranded wire but did not obtain as good results as with solid wire.

The sketch shows in detail how this bootleg is made and applied. We have used this design for approximately 10 years, and, all things considered, we find it better than any of the other various devices which we have tested. It is very inexpensive, costing less than 75 cents per track connection completely installed.



An inexpensive standard bootleg for steel armored cable

F. B. Wiegand, signal engineer, New York Central, submitted the accompanying sketch as a description of the practice on the New York Central. The drawing shows clearly the design and application of this bootleg.



Parkway bootleg outlet as used on N. Y. C.

Highway-Crossing Signals

"Should highway-crossing color-light signals be screened carefully to prevent them from being visible to the engineman of the train causing their operation? Is it desirable, where possible, to control the wayside signals through the highway-crossing-signal control relay in such a way that the former can indicate Proceed only when the crossing signals are displaying their Stop indication?"

Complicated Circuits Are Not Desirable

By A. H. Rudd
Chief Signal Engineer, Pennsylvania, Philadelphia, Pa.

There is no necessity for screening crossing signals to prevent them from being visible to the engineman