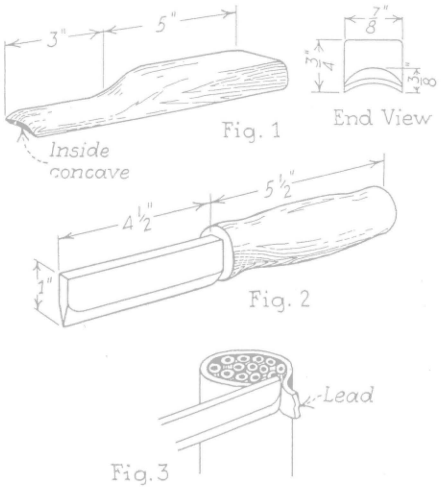
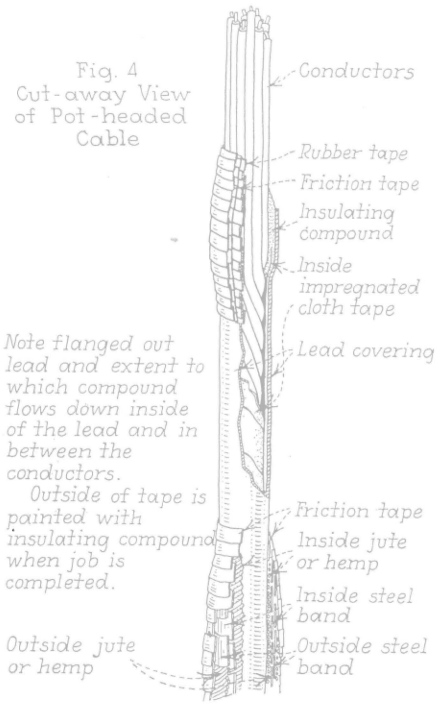
the outside coverings are to end. With a knife sever the strands of the outside jute squarely around the cable at the top edge of the tape. The tape prevents the strands from unraveling back down the cable. Apply a few more turns of tape above and next to the last applied tape. Then with a hacksaw sever the outside steel band. Remove this and apply tape as before. With a hack saw, sever the inside or second steel band. Care must be exercised that the saw does not cut through and check the lead. It is only necessary to nick the steel band all the way across, as it will break off easily enough. Then apply another turn of tape as before over the inside jute protective covering. Cut this jute away with the knife square with the top edge of the tape, working the cutting edge of the knife away from the lead. Then apply three or four layers of friction tape from one inch up on the lead to about two inches down on the original outside protective covering.

The following procedure for the remainder of the work may be applied to either parkway or ordinary lead cable: With a cable knife, as in Fig. 2, cut the lead, starting from the cable end down to the point where it is desired to end the lead covering. A cable knife should be kept reasonably sharp, yet not a razor edge; more of



Details of construction of special tool and knife, and sketch showing method of cutting lead sheath

a wedge shape, looking endwise. An ordinary claw hammer or small ball-pein hammer may be used on the back of the knife. Hold the knife in position so that all the cutting is done within about one-half inch of the end of the knife and so that the cutting edge lays somewhat parallel with the inside circumference of the lead. At the same time hold the lengthwise line of the knife at about a 45-deg. angle with respect to the cable. In this way by a slight turning of the knife, the cut may be guided inward or outward as desired. After sufficient length of the lead is split, mark the lead squarely all the way around at the



Cut-away view of pot-headed cable showing methods of protecting ends of the outer protection

point where the lead is to end. Then with the hammer pound the split open and, beginning at the end, pull the conductors in the complete group out of the split and the lead will break off at the point marked. If this procedure is followed with care and the hammer not used too heavily, an ordinary mechanic can remove the lead without marking the inside protective covering around conductors. A good cable knife can be made from a one-inch flat file. A little of the temper should be taken out so that the file will not break from the hammer blows.

After the lead is removed, with the special tool shown in Fig. 1, flange out the end of the lead to a depth of 1½ to 2 in. The lead can be stretched by repeatedly driving the flanging tool down between it and the conductors, proceeding around and around the cable so that it will have at least ⅜ in. larger inside diameter than originally, without injury or splitting. Care must be exercised when driving the tool in order that its point does not dig in toward the conductors. This is taken care of by holding the tool properly, by the shape of its point, and by not trying to drive it too deeply the first few times around the cable.

Next, unpeal the impregnated tape covering over the conductors and cut it off about ½ in. down inside of the lead. Untwist the conductors and fan them out loosely. Remove the hemp fillers, cutting them off inside the lead. While the conductors are still fanned out and with the lead end standing vertical, pour in some hot insulating compound, moving each conductor around slightly to be sure the compound runs down beside the conductors into the lead. Before the compound cools, pull the conductors up into a straight lay out of the lead, and wind a few turns of tape around them.

Keep the compound level above the top of the lead all the way around and while still warm—not hot—and with the conductors held up straight, start winding, not too tightly, with four layers of rubber tape from about 2 in. down on the lead to 2 or 3 in. above the lead. Over this apply about two or three layers of friction tape. Then paint all of the tape with an insulating compound that will not solidify to the cracking point.

The idea of removing the hemp fillers is that if left in they would eventually act as a wick and convey moisture down inside of the lead. By following the foregoing procedure, an inexpensive yet well-sealed cable end will result.

Other answers to this question were published on page 382 of the July issue.

Motor Car Indicators

"What special line control arrangement, utilizing existing signaling line wires, can be used to control train indicators to inform men operating motor cars of the approach of trains?"

Location Important

C. Precious
Signal Helper, Canadian Pacific, Tichborne, Ont.

On all bad curves and rock cuts, it is a relatively simple matter to install a train indicator for the protection of employees operating motor cars. The existing line control wires can be used as a means for supplying the necessary control energy to hold the indicators to the clear position. However, the placing of such indicators merits considerable thought, as to the most suitable and likely place.

(Continued on page 544)

These should be located far enough from curves to allow a good view of the track, in order that cars can be removed with safety. It is not necessary at all curves to install cable posts to mount the indicators, as existing track-cut and signal cases may be utilized.

Where the signal case is used, the energy required can be taken directly from the local supply. The wiring of the indicators is a simple matter. The energy for the westward indicator is tapped from the eastward signal control wires and the eastward indicator from the westward control wires. All indicators should be wired with proper resistance and lightning protection.

Utilizes Polarized Circuit

J. C. Law
Chief Draftsman, Eastern Lines, A.T. & S.F., Topeka, Kan.

Where single track is signaled by the overlap system and the signals are controlled over polarized line circuits, an arrangement of control of a train indicator can be easily devised. For example, an indicator controlled through polarized relays bridged across the signal line control circuits will indicate the presence of a train within the caution control limit of the first signal in each direction from the location of the train indicator, as shown in the accompanying sketch.

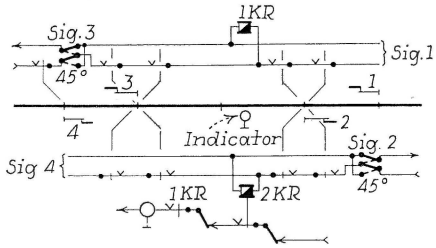


Diagram of circuit for train indicator utilizing polarized relay scheme

If it is desired to shorten the control in either direction, a neutral series relay may be substituted for the polarized relay and connected in series in the line circuit.

Indicators on Signal Circuits

D. W. Dower
Assistant Signal Engineer, Southern Pacific, San Francisco, Cal.

Practically all of the controls of our motor car indicators utilize in some manner the signal mechanism or the control circuits of the automatic block signals. Where possible, the indicator is tapped directly to the signal control wire, but where the location of the indicator prevents this being done, some additional line wire is required. The accompanying diagram shows a few typical installations, utilizing automatic signal mechanisms, control wires and relays for both semaphore and light type signals on the Southern Pacific.

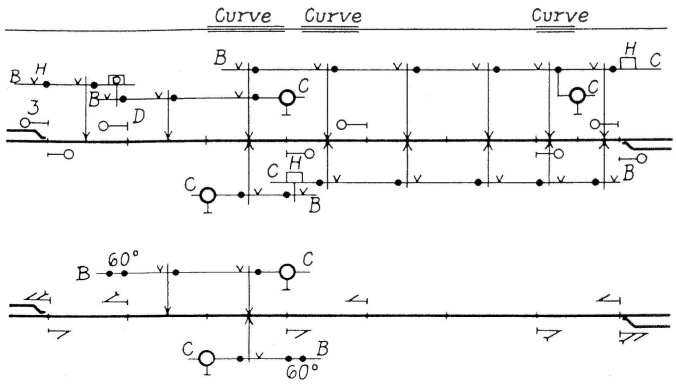


Diagram of control circuits for indicators as used in automatic territory on the Southern Pacific

Inspection of Arresters

"What routine do you recommend for the inspection of low-voltage lightning arresters?

Grounding Is Important

W. H. Dutton
Signal Inspector, Missouri-Kansas-Texas, Denison, Tex.

A good low-resistance ground must be provided if full protection is to be expected from any type of lightning arrester and it is important that all ground connections be maintained in good condition. A complete check-up should be made periodically, and any damaged or defective parts should be replaced. All parts of the arrester should be clean and properly adjusted. A follow-up inspection during the lightning season is necessary to insure protection at all times.

Circuits Tested for Grounds

A. G. Nutting
Supervisor of Signals, Northern Pacific, St. Paul, Minn.

On the Northern Pacific we always stress the importance of the condition of grounds for lightning arresters. Tests are made at frequent intervals to determine the resistances of these grounds and the continuity of ground connections.

After each electrical storm all track circuits in the storm area are shorted out and the operation of the signals is observed. If a storm occurs during daylight, this same test is made, and further inspection is made of all arresters of the spark-gap type. Defective arresters are removed or the damaged parts are exchanged for good ones or are re-adjusted. Arresters of the visible neon gas type are tested with the aid of a motor-car spark coil, and other types of arresters are tested in accordance with their design to determine their condition for conducting an electrical discharge to the ground.

During the spring season all circuits are tested for grounds and any grounded arresters either removed or parts replaced. Arresters of the spark-gap type are kept in a specified adjustment by the use of gages, and any burned points on the metal parts of spark gaps are either turned to a new position or replaced.

No Special Inspection Required

W. A. Hoffman
Superintendent, Telegraph & Signals, Florida East Coast, St. Augustine, Fla.

The low-voltage lightning arresters used on the Florida East Coast are of the carbon to metal air-gap type with built-in choke coils. Aside from cleaning and adjusting the air gaps, and checking the ground connections to insure low ground resistance, we make no special routine inspection during the spring season.