stalled at the beginning and ends of each installation, these signs being in accordance with the plan.

Gate Arm Stripes

Do you use reflectorized striping on crossing gate arms? What are the advantages and/or disadvantages of this practice? Please explain.

Standard Striping Effective

By G. K. Thomas

Signal Engineer, System
Atchison, Topeka & Santa Fe
Topeka, Kan.

The standard black and white striping of automatic crossing gate arms is very effective both by day and by night. The three red lights on the arm assist in making it especially visible at night, and it hardly seems necessary to also use reflectorized striping on the arm.

We have experimented at a few locations with the addition of reflective material over the white surfaces of the arms, and they do, of course, add to the brilliance at night. However, there has been some peeling of the strips, and in view of the frequent breakage of these arms by highway traffic, the use of reflective strips would add to maintenance expense and would result in additional delay getting the gate back in service each time it is broken. All things considered, it does not appear to be necessary or worthwhile to add reflectorized striping on these gate arms.

Switch Machines for CTC

In centralized traffic control territory, do you use dual-control switch machines? Please explain why, or why not.

Standardize on Dual-Control

By R. E. Testerman

Assistant Superintendent
Communications & Signals
St. Louis-San Francisco
Springfield, Mo.

The crank-type power switch machine was used in our first CTC installations primarily on account of the cost. We have since standardized on the dual-control machines for the following reasons:

(1) During construction the dual-control machine can be installed to replace the old switch stand and operated as a hand-operated switch. This greatly reduces the work necessary on the day CTC is placed in service.

(2) In event of emergency or when "track and time" limits are granted for switching, train movements are expedited. This is especially true at crossover or other locations where more than one power switch movement is used. In such layouts considerable time is saved by not having to return the crank to the central telephone booth.

(3) In event of complete failure of CTC system the dual-control movements, when placed in hand operating position, provide safety equal to that of a standard switch stand. Where the crank-type movements are used, there is always the possibility that the crank may not be turned far enough to lock the switch. To protect this feature we require that such switches be spiked.

(4) Considerable time is saved in making regular inspections and tests by signal and track forces.

Use Dual and Non-Dual Control

By H. L. Moseley

General Signal Inspector
Delaware & Hudson
Albany, N. Y.

The Delaware & Hudson uses both dual and non-dual control for its power switch layouts in traffic

control territory. Dual-control switch machines are used at locations such as at end of double track and end of so-called passing sidings where long train delays would be possible due to failure of switch machines to operate. At these locations a member of the train crew is permitted to operate switch by hand after receiving permission from traffic control operator in charge of territory involved.

At locations where there are alternate routes that may be taken or locations near maintainers' headquarters, non-dual control switch machines are used which result in a saving in original cost and lower maintenance charges.

Telephone Repeater

What type or types of telephone repeaters do you use on your road? Will you please explain with diagrams if desirable, what procedures you use to balance these repeaters.

Use WE Types

By J. A. PARKINSON

General Superintendent
of Communications
Atchison, Topeka & Santa Fe
Chicago, Ill.

The majority of telephone repeaters used on our railroad are of the Western Electric types. Balance is obtained in the following manner:

(1) In the office, making the network equipment the electrical equivalent of the line equipment.

(2) Using hybrid coil, beat frequency oscillator and DB meter, determine the best balance obtainable over the voice range using the line balancing network furnished as part of the repeater.

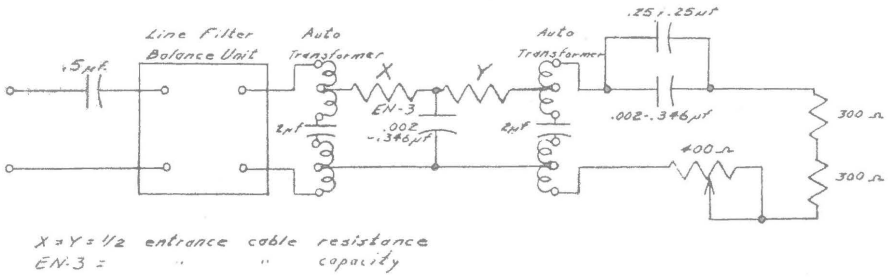
(3) If sufficient balance for desired repeater gain cannot be obtained in steps 1 and 2, we have built up special line matching networks to obtain the needed degree of balance.

22-A Repeater

By L. J. RITTER

Electronics Engineer
New York Central
New York, N. Y.

In situations involving the balance of a 22-A telephone repeater, where there is connected to the line side of the repeater a carrier filter, matching transformers, entrance cable and open wire line, we use a network as shown in the drawing. The components shown are required for the following purpose:



(1) The .5MF condenser balances the ET and ER one microfarad condensers located on the line side of the hybrid.

(2) The line filter balancing unit balances the carrier line filter.

(3) The first auto transformer and mid-point condenser balances the auto transformer and mid-point condenser located between the line filter and the entrance cable.

(4) The resistors X and Y and condenser EN-3 balance the entrance cable.

(5) The second auto transformer and the mid-point condenser balance the auto transformer and mid-point condenser located at the entrance cable-open wire junction.

(6) The remaining portion of the network is required to balance the open wire line.

Resistance Box

By N. L. ALTLAND

Assistant Chief Engineer
Communications
Atlantic Coast Line
Savannah, Ga.

The simplest and most practical way we have found to perform this work is to use a resistance box with terminals connected to a fixed 600 ohm resistance and terminals connected to a continuously variable 0 to 600 ohm resistance and a switch that will reverse these terminals connected in one case to the fixed resistance and then to the variable resistance (for positive and negative poling).

By means of cords, the terminals on the resistance box are connected to repeater line and repeater net jacks of the hybrid coil on the opposite end of the repeater from the network and line that is to be balanced.

With a telephone connected to the monitor jacks to detect singing, the theory of this arrangement becomes obvious.

The greater the unbalance between the fixed and variable resistances becomes at one end of the repeater, the better the balance between the line and its adjustable network becomes at the opposite end.

By alternately adjusting the compromise network to reduce singing, reducing the balance between the fixed and variable resistance and operating the poling switch, the best possible balance (return loss) is obtained.

Trunk-line and Message

By W. CHUNN

Assistant Superintendent
Communications
Missouri Pacific
St. Louis, Mo.

All our repeaters are Western Electric. We have in service approximately the following number and types, which are a.c. operated:

15 22A-1 dispatching type (now obsolete)
2 22A-1 trunk line type (now obsolete)
5 V-1 dispatching type (present standard)
1 V-1 trunk line type (present standard)

The trunk-line type are ordered with precision networks corresponding to the type of open-wire facilities they are to be used on, and the only balancing required is adjusting the building-out condensers for the amount of entrance cable present. This is done by making singing point measurements, in each direction, per manufacturers instructions and setting these B.O. condensers so as to obtain the highest singing points This building-out condenser capacity is approximately the capacity of the entrance cable in each respective direction. The repeater then should be operated at a gain not greater than, that the sum of the gains, in the two directions, is 10 db less than the sum of the singing points, in the two directions.

For repeaters on dispatching and message circuits, we have found it impracticable to make singing point measurements. Just make the network, for a 22A-1 dispatching type, 630 ohms plus .442 MF. (Based on 114-mil copper wire, 12-in. spacing). If the entrance cable, each direction, is less than about 500 ft., use no building-out condenser capacity; if greater than 500 ft., use building-out capacity approximately equal to