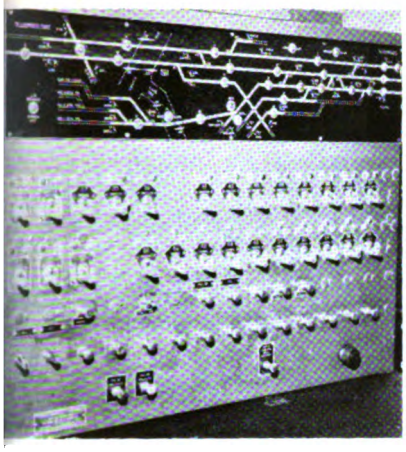
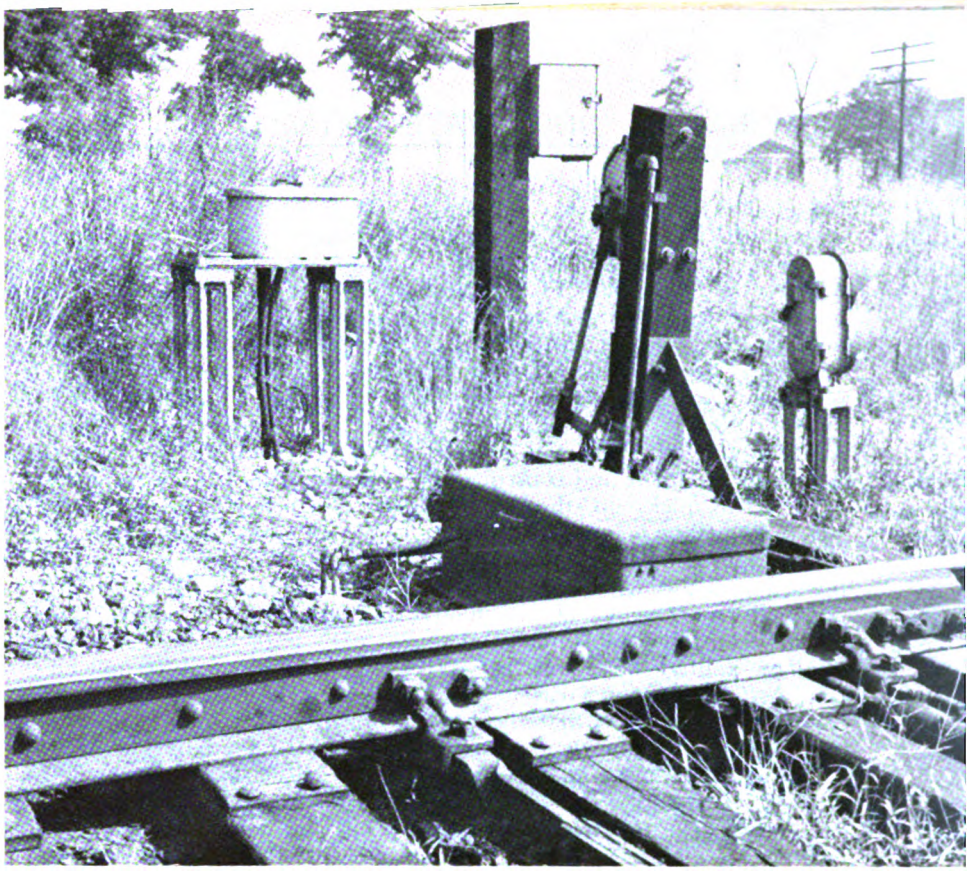


ove: The two lower left pushbuttons are
: emergency release affecting the portion
the interlocking which becomes inun-
ted.

ght: Pneumatic switch machine is not
iously affected by water, but valves are
sed above high water. Note switch cir-
it controller on post. Emergency release
shbuttons are in phone box at right.



N&W Has an "Underwater Interlocking"

Tidal waters sometimes inundate track circuits at the Norfolk & Western's passenger station interlocking at Norfolk, Va. To expedite train movements during these times, special circuitry and equipment mounting have been devised.

Certain wind and tide conditions casionally cause salt water to rise ound the rails at Union Station, rfolk. This water doesn't come up the top of rail, but does cause the ck circuits to drop out. To keep pas-ger trains, and switching move-nts attendent thereto moving, emer-ncy push-buttons have been installed allow the NA-15 electro-pneumatic itch machines to be operated with track circuit shunted by salt water. ie switch circuit controller and elec-pneumatic valves are mounted ove high water. The track circuits dc with 4-ohm relays, but without ndby battery.

gh Water Shunts Track Circuit

When water shunts the track circuit, tower operator and a trainman in field must simultaneously push but-ns in order to operate a switch ma-ine. The signal for movement into station, which has call-on signal ntrol, may be cleared to Restricting. ie signal for movement out of the ation has no call-on control and nnot be cleared. Hand signals are ed in this instance.

No provision is made to display a ll-on indication on the R38 signals cause trailing point moves can be made through the NA-15 direct acting switches used for this installation. Facing point moves require a check and indication.

The circuits were designed and installed under the jurisdiction of J. G. Karlet, Superintendent Signals and Communications.

The field pushbutton is located in a telephone box adjacent to each switch. After contacting the towerman by telephone to arrange the desired movement, the trainman and the towerman both depress simultaneously an emergency pushbutton. The towerman, in addition to this button, must first line the switch lever then also depress his operating pushbutton (analagous to a code start button) and hold it depressed along with the emergency pushbutton. All of these pushbuttons must be held depressed until the switch machine completes its movement. The use of these emergency pushbuttons expedites switching during this high water period. The circuits involved are shown and described in detail.

When the track circuit D1T is inundated and the track relay will not pick up, the operation of the circuits is as follows:

To reverse switch 35, for example, lever 35 is lined reverse, and the starting pushbutton 35PB is pushed. This picks up relay 35PBPR, a slow release pushbutton repeater relay (**a**). The rectifier across the coil helps to slow down the release of this relay. The "NV" indicates that it is a Non Vital telephone type relay.

A circuit (**b**) will be completed through a front contact of 35PBPR, through lever 35 reversed, through 35LR up, to the reverse switch stick relay, 35RWSR. This relay will then stick up through its own front contact in series with a back contact on the normal switch stick relay, 35NWSR. However, since track relay D1TR is down due to the salt water, its re-

peater D1TPAR is down and consequently the lock relay 35LR is down. In order to pick up 35LR so that we may establish a circuit to 35RWSR, it is necessary that a man in the field push his emergency pushbutton 35EPB (**c**) while the towerman simultaneously pushes his emergency pushbutton, 35EPB and the operating pushbutton 35PB. This will complete the circuit to 35LR and consequently, when 35LR picks up, the circuit to 35RWSR will be completed. All three of these pushbuttons must remain depressed until the switch machine completes its movement. The switch is actually controlled by contacts on the retained neutral polar relay, 35WR (**d**). As a contact of 35LR is also in this circuit, it insures that the pushbuttons must remain depressed until the switch machine completes its movement.

A similar operation would take place in order to operate switch 39. In this case, the field emergency pushbutton 39EPB, the office emergency pushbutton 39EPB and the office operating pushbutton 39PB would have to be depressed, after lever 39 was lined.

In the signal circuits, note that in the HR circuit, that with the track circuit repeater D1TPR down (**e**) that neither RA38HR, RB38HR, nor RC38HR can be energized. However, by operating the call-on toggle switch, a circuit to L38HR can be completed, and hence a restricted indication may be given to signal 38L.

This circuit may be established as follows: Switch levers 35 and 39 are positioned as desired. Then signal lever 38 is positioned to the left and the call-on toggle switch is operated to the ON position. Then, if it is necessary to operate both switch machines, either two men would be required in the field to hold the corresponding emergency release pushbuttons, which are located near their respective switch machines, or first one switch and then the other switch would be positioned and the dwarf signal 38L cleared to yellow (Restricting).

Pushing the operating pushbutton, 39PB, causes relay 39PBPR to pick up (**f**). A circuit is then completed through contacts of lever 38 left to L38HSR. When the pushbutton is released, a stick circuit is established through the back contact of 39PBR through D1TPPR, a back contact of R38HSR to L38HSR. The arc on the end of the 39PBPR transfer contact indicates that it is a make-before-break contact, thus making the back contact before breaking the front contact. This keeps L38HSR from dropping out during the time 39PBPR is transferring its contact. In this case, it has been assumed that D1T was down due to water, therefore the slow release repeater D1TPPR would have had time to drop out and complete its back contact. The relay 2POSR is a repeater of the power off stick relay. This contact in the HSR circuit allows the call-on signal to be given when the track circuits are down due to a power failure. The N&W does not use standby battery on its track circuits, because in this area it has found the commercial power reliable.

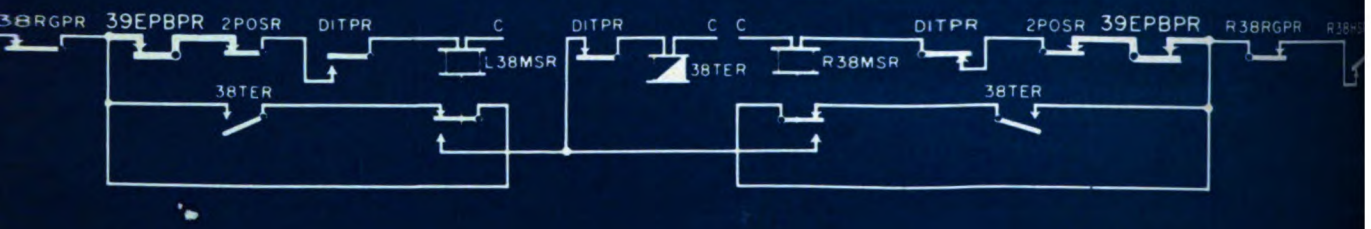
Operating the call-on toggle switch to ON initiates a circuit to L38COSR (**g**). This circuit is completed through a contact of 39PBPR up, L38HSPR down, and L38HSR up. L38HSPR, though essentially a repeater of L38HSR, has a front contact of a repeater of track relay D1TR in its circuit, and hence cannot pick up. Once L38COSR is up, it will remain up as long as lever 38 is in the L position and L38HSR is up, through a stick circuit through its own front contact.

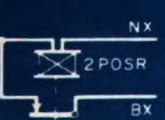
When L38COSR picks up, the circuit (**h**) to the route locking relay L38MSR will be opened and L38MSR will drop, thus establishing the route controlled by signal 38L. The function of a front contact of relay 39EPBPR in this circuit is to check the auxiliary field relay equipment in the normal position before releasing the switch and returning the switch control to the operator.

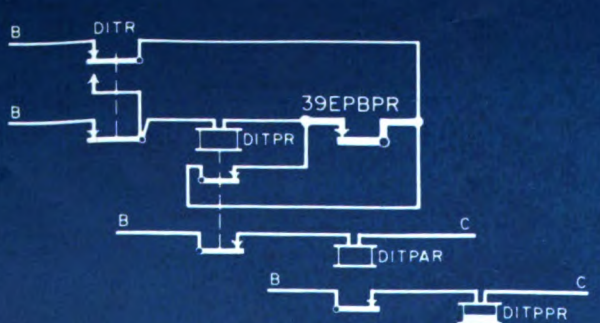
In the signal control circuit (**j**), the circuit to L38HR will be completed from Battery through 39EPBPR up, 35LR and 39LR down, 38TER and its check contact unoperated, L38COSR up, either 39 reverse switch repeater 39RWPR up or both 35 and 39 normal switch repeaters 35NWPR and 39NWPR up, L38MSR down, L38COSR up, through the relay coils and another contact of L38COSR up, plus the other relay contacts shown. While the emergency pushbutton is being held down, 35LR and 39LR will be up and 39EPBPR will be down, but these three relays will reverse their contacts when the pushbutton is released, completing the circuit.

When the relay L38HR picks up, the circuit to the red lamp of signal 38L will be opened and the circuit to the yellow lamp will be completed as in the typical circuit (**k**).

Neither RA38HR, RB38HR, nor RC38HR can be picked up as D1TPR (**e**) is down due to the highwater and L38COSR (**e** and **g**) cannot be picked up with the signal lever lined to the right.

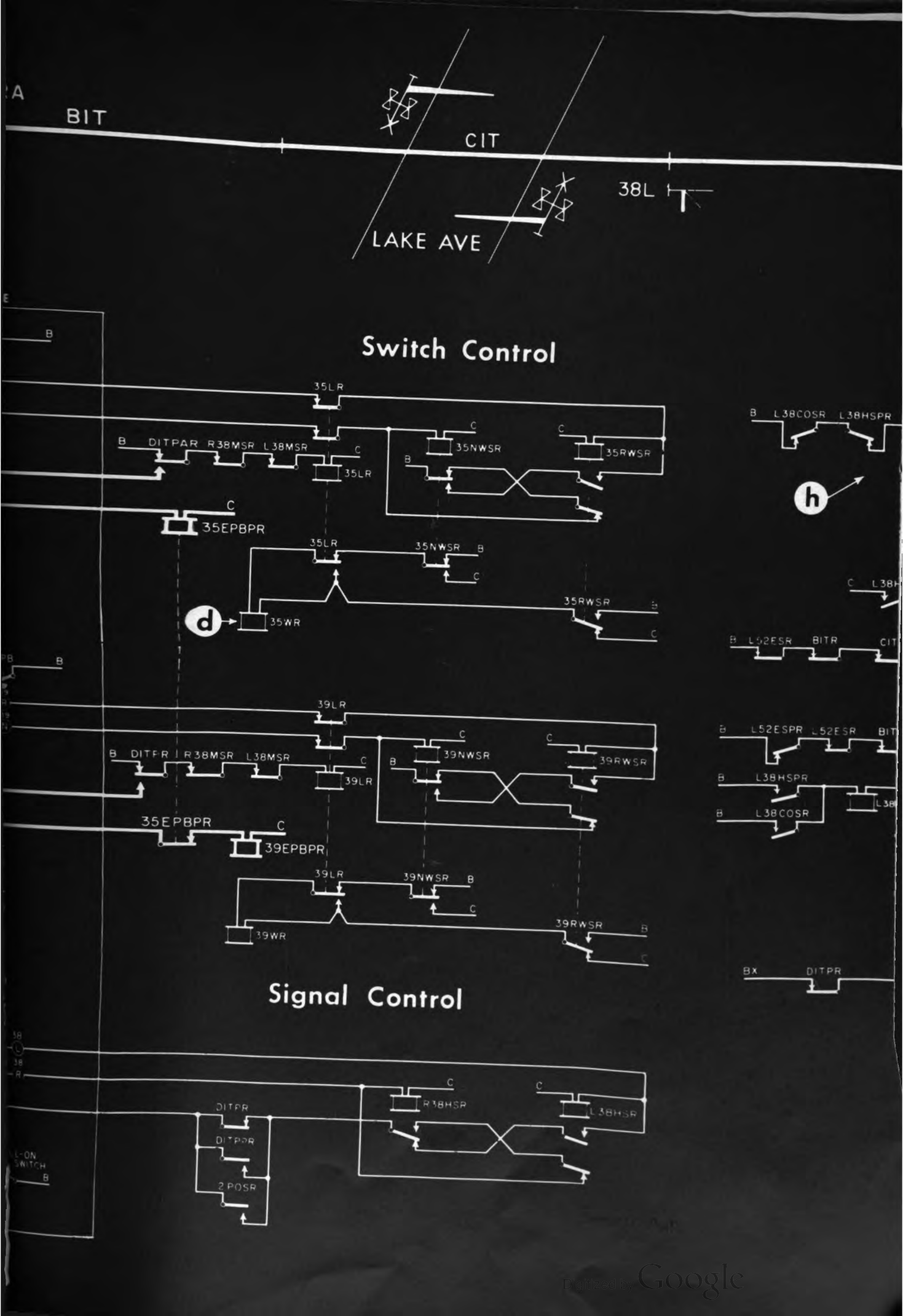






NORFOLK & WESTERN RAILWAY
INTERLOCKING CIRCUITS
NORFOLK, VIRGINIA

DRAWN FOR R.S.&C.



WHAT'S THE ANSWER?

(*Continued from page 31*)

able to give a "high green" or clear signal and maintain operation at maximum authorized speed permitted for the territory, with no restriction placed on account of the No. 24 equilateral turnout.

Safety and comfort limit the speed with which a passenger train may negotiate a turnout and any speed that gives comfortable riding is well within the limits of safety. We find that at maximum authorized speed riding conditions are comfortable with the No. 24 equilateral.

Studies have proved that unnecessary stops and slow-downs cost money, and with the No. 24 equilateral turnout we have eliminated the slow-down which would otherwise be required to negotiate a lateral No. 24 or sharper lateral turnout. And with high speed freights, savings can be evaluated in running time, brake shoe wear, fuel consumption and market arrival time.

We know of no outstanding disadvantages chargeable to the equilateral turnout, except perhaps the higher initial installation cost, which we consider is amply offset by the economies derived from the higher speed operation and the elimination of slow-downs.

Considering turnouts to sidings. Level lateral turnouts No. 15-16-18 and 20 with 30-ft straight points are good for 36 mph; this can be increased if made equilateral and curved points installed at increased installation cost. However, with maximum authorized speed of say 75 mph, the turnout not being good for 75 mph, would therefore require to be signaled for medium speed (half maximum authorized speed), which would eliminate any advantage to be gained outside of riding comfort. Therefore the Erie does not install equilateral turnouts at sidings.

Power Line Carrier

Have you tried making use of the signal power line for transmitting carrier type signals, such as the type used in hotbox detection? What precautionary steps must be taken to insure success? What is the distance that the carrier signal is being transmitted? Who supplied the coupling devices, etc.?

Trainphone Carrier on Power Line

F. L. CHATTEN, System Engineer-Communications and Signals, Pennsylvania, Philadelphia, Pa.

We have not attempted to use signal power lines for transmitting carrier signals in hotbox detector service. We do use a signal power line for transmitting trainphone carrier signals, the power line serving as an antenna for inductive train communication. For train communication the signal covers a distance of about 68 miles. This is not a maximum distance obtainable, but is the distance over which the system is used.

Carrier signals on open wire must be coordinated with other neighboring carrier systems by negotiations, since the use of carrier frequencies is practically unregulated.

The coupling device is a capacitor designed for this particular application by the manufacturer of the trainphone equipment.

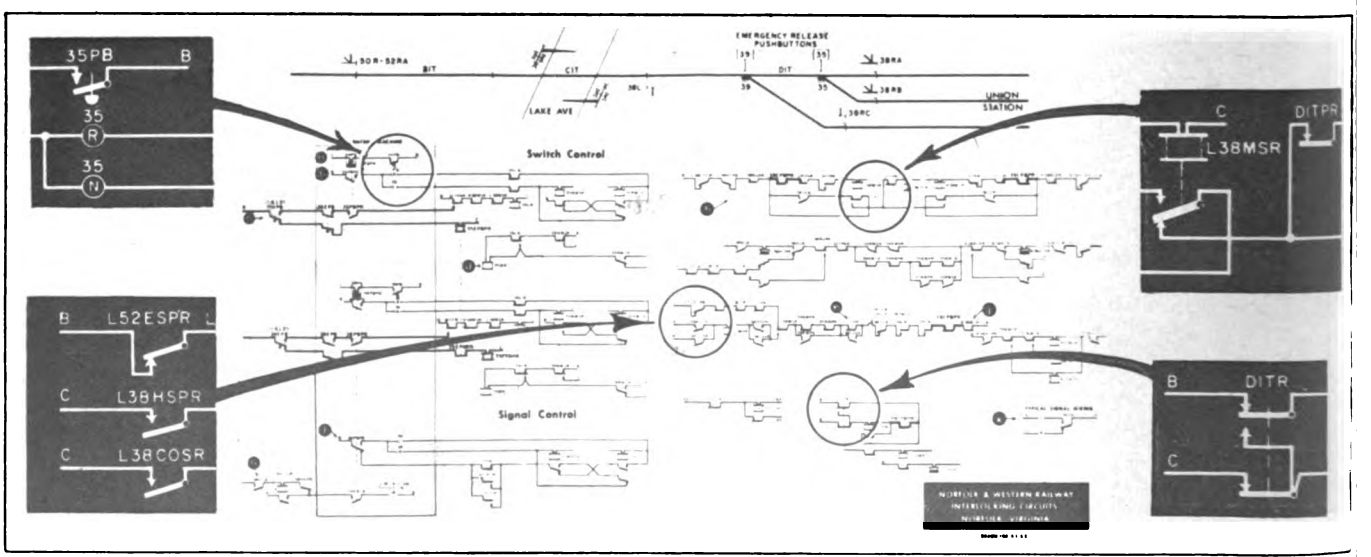
Communication Lines Available

P. V. MATHER, Assistant Engineer—Signals, Chicago, Milwaukee, St. Paul & Pacific, Chicago, Ill.

We have not as yet made use of the signal power line for transmitting carrier type signals, either for hotbox detection or for other purposes. One reason is that in non-electrified territory we obtain commercial power locally, the maximum length of power line being about 10 miles. Another reason is that a communication or CTC code line has been available and more readily adaptable for carrier transmission over the distances so far required. The remaining sections of transmission lines for AC signaling in non-electrified territory are being abandoned as signaling is converted to DC operation with battery standby. In electrified territory carrier circuits for the remote control of substations are handled on communication lines.

Until such time as greater distances between field and read-out require transmission by carrier, it is our plan to utilize communication and CTC code lines for hotbox detector information.

CORRECTIONS for "Underwater Interlocking" Circuits



The fold-out circuit plan in the January issue, page 22, regrettably contained four errors. These errors were spotted by observant readers who called them to our attention. They are: (upper left) lower lever contact should be **35N**, not 35L; (lower left) left side connections to relay L38HR should lead to common, **"C"**, not to "B"; (upper right) stick contact on relay L38MSR should be making its **back** contact, not its front contact; and (lower right) left side connection to relay D1TPR should lead to **"C"**, not to "B". These corrections have been made the same size and color as the original circuit plan, and the squares may be cut out and pasted on top of that plan to provide a corrected plan of N&W interlocking circuits.