

prevent moisture from entering the end of the cable. If the insulation between the conductor and the lead sheath absorbs moisture, there may be a tendency for the insulation to break down, particularly so if any inductive discharges either from lightning or other causes are carried by the cable.

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Various Circuits for Directional Control of Single Track Signals

"How are single track signals controlled so as to discriminate between opposing and following trains? (\$5 will be paid for the most simple explanation of methods to provide directional control of single track signals.)"

Stick Relays Employed in Union Switch & Signal Directional Control Scheme—Slow Acting Home Relay Repeaters Used in Stick Circuits for Intermediate Signals

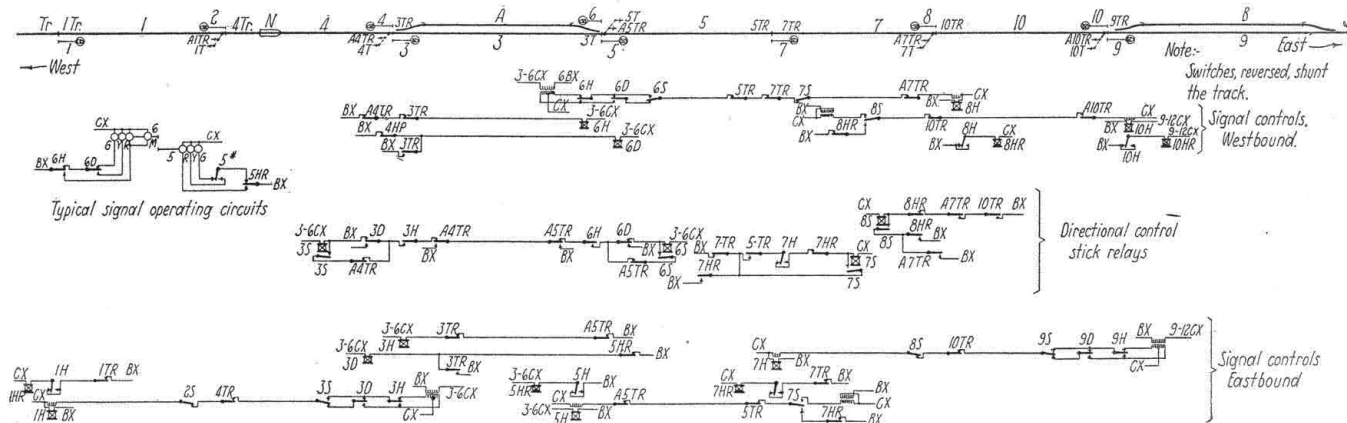
IN the accompanying drawing, an arrangement of circuits is shown for a typical layout of the well known system of A. P. B. single track automatic signaling. Incorporated in this design are directional control stick relays 3S, 6S, 7S and 8S which serve to

causing signal 1 to go to "caution." Signals 2 and 4 will go to "proceed" if the track is clear west of train N.

Upon starting into section 5, train N will shunt track relays A5TR and 5TR thereby opening the circuit of 5H and putting signal 5 to "stop." At the same time, relay 5TR will open control 8H thereby putting signal 8 to "stop." Relay 5S being down, control 10H will also be opened at front contact 8HR and signal 10 will go to "stop." With the front end of the train in section 5 and the rear end in section 3, we now have signals 3, 5, 6, 8 and 10 at "stop," signal 1 at "caution" and signals 7 and 9 at "proceed."

Meantime, when relay A5TR "drops" it closes the circuit of 3S through A4TR front contact, 3H back contact and 3D front contact, thus causing 3S to "pick up." As the train leaves section 3, relay 3D will "drop" when 3TR "picks up" and 3S will then "stick up" through back contact 3D in series with front contact A4TR. Immediately after the train leaves section 3, signal 6 will go to "proceed" but signal 3 will remain at "stop" until the train has advanced far enough to permit relay A5TR to "pick up." Floating relay A5TR provides overlap for signal 6 as previously described.

When relay A5TR "picks up" it closes the control of 3H thereby causing signal 3 to go to "caution." At the same time, relay 3H by picking up, reverses the polarity of control IH because relay 3S is energized. Signal 1



Single track, directional signal control scheme for color-light signals—Floating track relays control overlaps for

differentiate the signal controls in respect to the direction of train movement and hence also as between following or opposing trains.

An understanding of the construction and functioning of the circuits may most readily be obtained by following the operation as a train proceeds over the stretch of track shown. For this purpose assume that an eastbound train N has entered section 4. Opposing signal 4 will indicate "stop" and signals 6 and 8 will indicate "caution." If the track is clear ahead of train N all other signals shown to the right of section 4 will indicate "proceed."

When the train arrives at a point a certain distance from signal 3, let us assume for example, 1,000 ft., floating track relay A4TR will become shunted and will therefore open the circuit of relay 6H putting signal 6 to "stop." All other signals will continue to display the same indications as before. As train N starts into section 3, signal 3 will go to "stop" but none of the other signals will change. When the train clears section 4, relay 4TR will "pick up" thus closing the circuit of relay IH with its polarity reversed through back contact 3S, front contact 3D and back contact 3H, thereby

will now indicate "proceed" whereas if train N were at its present location but traveling in the opposite direction, relay 3S would be "down" and signal 1 would indicate "caution" instead of "proceed." In this way, relay 3S selects between the "caution" and "proceed" indications of signal 1 according to the direction of train movement.

As train N starts past signal 7, relay 7TR becomes shunted and hence closes the pick-up circuit of relay 7S which will "pick up" before contact 7H opens and will then "stick up" through back contact 7TR and afterward through back contact of slow-acting relay 7HR. When relay 7HR "drops" signal 7 will indicate "stop."

Relay 7S will continue energized as long as relay 7HR remains "down." With relay 7S energized, relay 5H will "pick up" in its reverse direction as soon as the train clears section 5, thus causing signal 5 to indicate "caution." In this way, relay 7S selects between the "stop" and "caution" indications of signal 5 according to the direction of train movement, permitting signal 5 to indicate "caution" while the corresponding signal 10 at the other end of the block for governing in the

