May 31, 1938. H. C. VANTASSEL 2,119,303

REMOTE CONTROL APPARATUS

Original Filed Jan. 31, 1929 2 Sheets-Sheet 1

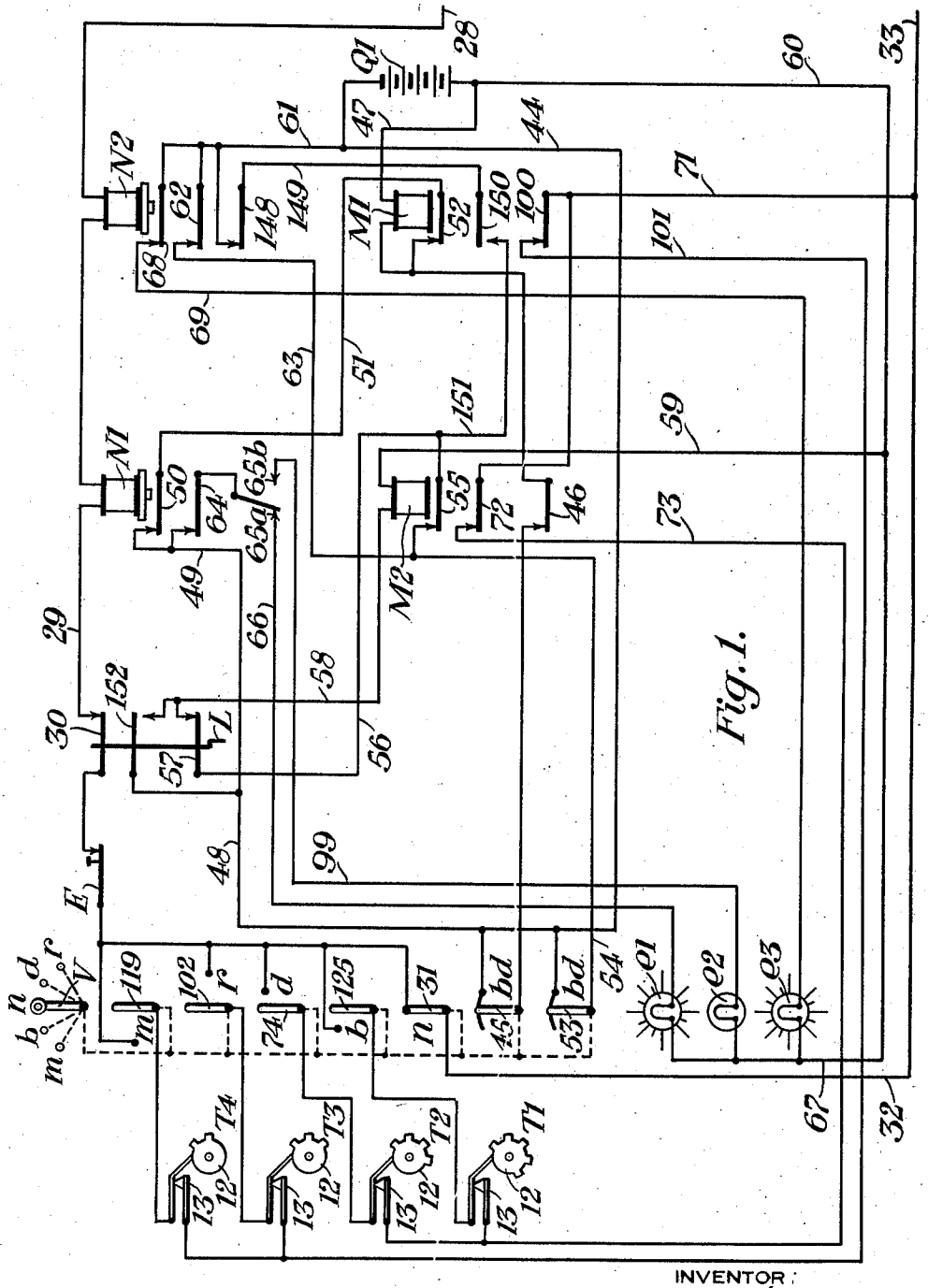


Fig. 1.

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REMOTE CONTROL APPARATUS

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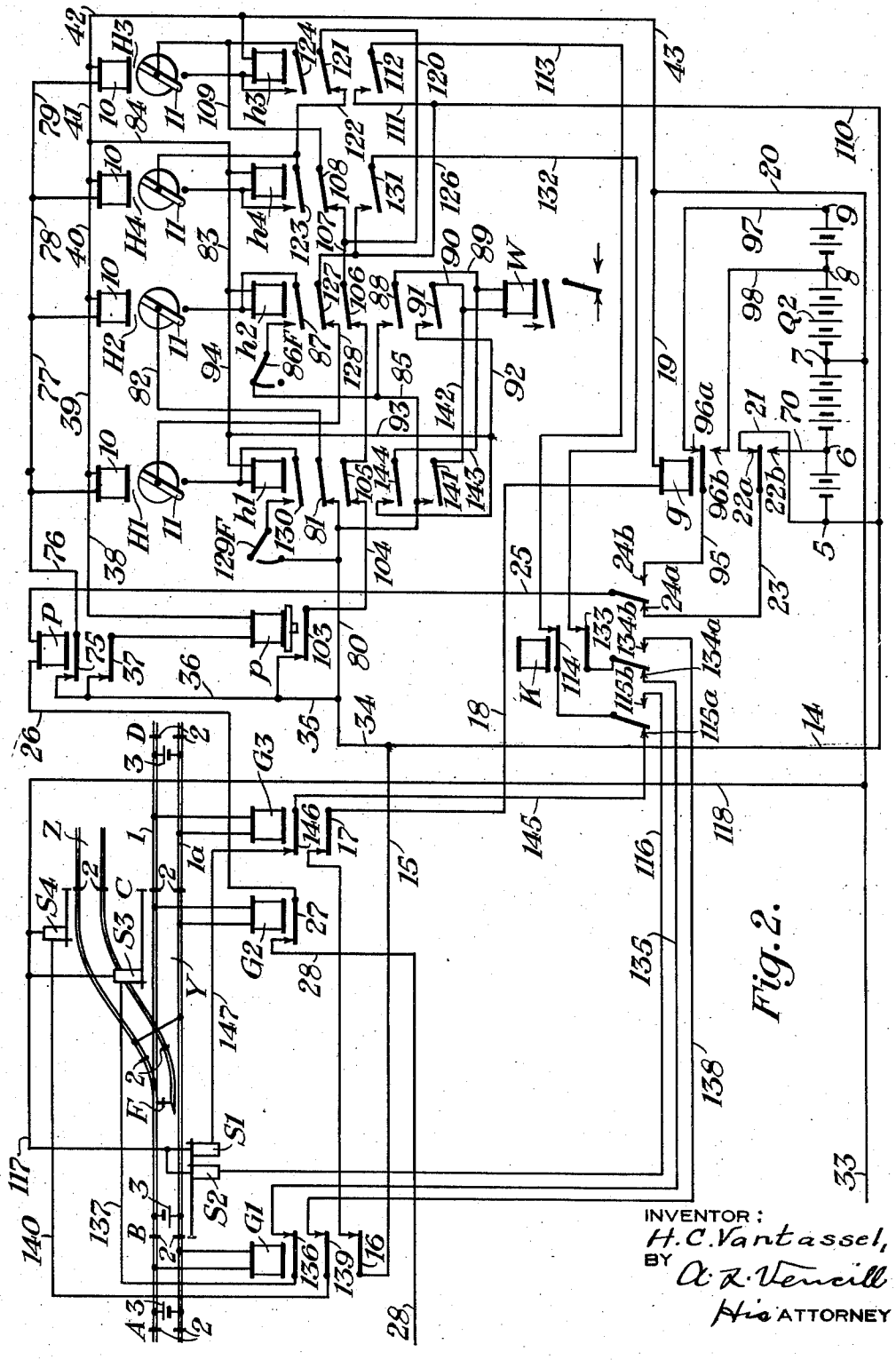


Fig. 2.

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Patented May 31, 1938

2,119,303

UNITED STATES PATENT OFFICE

2,119,303

REMOTE CONTROL APPARATUS

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Application January 31, 1929, Serial No. 336,440
Renewed August 14, 1931

36 Claims. (Cl. 246—3)

My invention relates to remote control apparatus, and particularly to apparatus for safely controlling traffic governing devices, such as railway switches and signals, from a distant point.

The apparatus of my invention is an improvement upon that disclosed in the co-pending applications of H. A. Wallace, Serial No. 125,659, filed July 29, 1926, for Railway traffic controlling apparatus, and of C. S. Snavely, Serial No. 362,948, filed May 14, 1929, for Remote controlling apparatus.

One feature of my invention is the provision of means for controlling a railway switch and associated signals by currents of various codes supplied through a given pair of conductors, and of means for controlling various indicating devices by non-coded current supplied through the same pair of conductors.

I will describe one form of apparatus embodying my invention, and will then point out the novel features thereof in claims.

The accompanying drawings, Figs. 1 and 2, when placed end to end with Fig. 1 on the left, constitute a diagrammatic view showing one form of apparatus embodying my invention.

Referring to the drawings, the reference character Y designates a stretch of main railway track connected by means of a switch F with a siding Z. Rails 1 and 1a of stretch Y are divided by means of insulated joints 2 into sections A—B, B—C and C—D. Each of these sections is provided with a track circuit which is supplied with current from a battery 3 connected across the rails adjacent one end of the section, and which includes a track relay G1, G2 or G3, respectively, connected across the rails adjacent the opposite end of the section. A relay designated by the reference character *g* is controlled by front contacts of track relays G1 and G3.

Signals designated by the reference characters S1, S2, S3 and S4 and which, as here shown, are of the semaphore type, control the movement of traffic over switch F. Signals S1 and S3 govern the movement of traffic over stretch Y only with switch F in its normal position as shown, and signals S2 and S4 control the movement of traffic over stretch Y to or from siding Z with switch F reversed.

Manual control apparatus comprising four code transmitting keys T1, T2, T3 and T4 and a lever V are arranged in a central location such as a train dispatcher's office. Each of the code keys T comprises a code wheel 12 operating a contact 13 in such manner that when the key is wound and then released, the consequent movement of the code wheel periodically opens and closes the associated contact 13 until the key has unwound. Each of the code keys T, when operated, supplies current having a distinctive control code to the line wires 28 and 33. Code keys of this type being well known in the art, further detailed description of their construction is omitted from this application. The line wires 28 and 33 provide a message circuit extending from the dispatcher's office to the way station at which the track switch F is located. This message circuit has a plurality of branches, and as shown in the drawings, current flowing through the contacts of the code keys T is supplied to the message circuit by a battery Q2 located at the way station adjacent switch F. Each of the code key contacts 13 is closed except while its code wheel 12 is being operated subsequent to the winding operation of the respective code key. Lever V has five positions *m*, *b*, *n*, *d* and *r*, and is provided with seven contacts 119, 102, 74, 125, 31, 45 and 53. Contact 119 is closed while lever V is in its *m* position only, contact 125 is closed while lever V is in its *b* position only, contact 31 is closed while lever V is in its *n* position only, contact 74 is closed while lever V is in its *d* position only, contact 102 is closed while lever V is in its *r* position only, and contacts 45 and 53 are closed while lever V is in its *b* or its *d* position or at any intermediate point.

A relay P, adjacent switch F, is controlled by the current supplied to line wires 28 and 33 by battery Q2, and opens its front contacts every time its circuit is interrupted by any one of the code keys T. It is thus clear that the front contacts of relay P repeat the code furnished by each of the code keys T.

Current of each code thus repeated is supplied to windings 10 of selectors H1, H2, H3 and H4. Each of these selectors is provided with a contact 11 which becomes closed when current of the code to which the selector responds is supplied to its winding 10. When any of the code key wheels 12 comes to rest, contact 11 of the selector H which it controls, will open. Operation of code key T1 causes current to be supplied to relay P of the proper code for causing selector H1 to close its contact 11, and the operation of code keys T2, T3 and T4 similarly causes selectors H2, H3 and H4, respectively, to close their contacts 11.

Each of the selectors H, by means of its contact 11, controls the pick-up circuit for a stick relay designated by the reference character *h* with a distinguishing suffix 1, 2, 3 or 4. Stick circuits for relays *h*1 and *h*2 are controlled by

contacts 129F and 86F respectively, which are so operated by switch F that contact 129F is closed at all times except while switch F is in its normal position, and that contact 86F is closed at all times except while switch F is in its reverse position. Stick circuits for relays *h3* and *h4* include contact 103 of a slow releasing relay *p* which is in turn controlled by relay P. Relay *p*, being of a slow releasing type, does not respond to the opening of the circuit of relay P by code keys T but does respond to a prolonged open state of the circuit of relay P.

A polarized relay W is controlled in its normal direction by front contacts of relay *h1*, and in its reverse direction by front contacts of relay *h2*. Switch F may be operated by any suitable means, such for example as an electric motor which can be controlled in a usual and well known manner by relay W. Such control circuits, forming no part of my present invention, are omitted from the drawings.

A polarized relay K is so controlled by a pole-changer operated by switch F as to be energized in its normal direction when switch F is in its normal position, and in the reverse direction when switch F is in its reverse position. Circuits for such control, being well known and forming no part of my invention, are omitted from the drawings.

Signals S1 and S2 governing in the eastbound direction which is toward the right, as shown in Fig. 2, are controlled by relay *h3*, and westbound signals S3 and S4 governing toward the left, as shown in Fig. 2, are controlled by relay *h4*. Since the stick circuits for relays *h3* and *h4* are controlled through a contact of relay *p*, it is clear that a prolonged open state of the circuit for relay P by some means such as contact 30 of a time element contacting device L or a manually operable push button E, or by the operation of lever V to some point other than positions *m*, *b*, *n*, *d* or *r*, causes relay *h3* or *h4* to become de-energized, thereby in turn causing the arm of any signal, which may at the time be indicating "proceed", to be operated to its "stop" position.

A switch and track circuit indication relay N1, and an approach indication relay N2 are included in series in the circuit of relay P. These relays are of the slow releasing type, and hence do not respond to the opening of the circuit by code keys T. Relay N1 is responsive to the polarity of the current flowing through its winding as controlled by switch indication relay K. Relay N2 is responsive only to current of greater magnitude than is required for the operation of relay N1, the supply of current of the one or the other magnitude to the circuit being controlled by back or front contacts, respectively, of relay *g*.

A stick relay M1 provides stick control for signals S, relay M1 having a pick-up circuit controlled by lever V and a stick circuit controlled by indication relay N1. A stick relay M2 provides approach locking for switch F, relay M2 having stick circuits controlled by approach indication relay N2 and lever V respectively, and pick-up circuits controlled by a back contact of relay M1 and by a reverse contact of the time element contacting device L respectively. Time element device L as here shown is a clockwork release, and is provided with contacts 30 and 57 which are normally closed and with a contact 152 which becomes closed only upon the lapse of a measured interval of time after the opening of contacts 30 and 57 by the operation of release L. Indicating devices, here shown as electric lamps *e1*, *e2*, and *e3*, are controlled by relays N1 and N2. Lamp *e1* when lighted indicates that switch F is in its normal position, lamp *e2* when lighted indicates that switch F is reversed, and lamp *e3* when lighted indicates that approach track sections A—B and C—D are unoccupied. The track occupancy of section B—C is indicated to the dispatcher by the extinguishing of both lamps *e1* and *e2*. A battery Q1 supplies current for operating relays M1 and M2, and for lighting lamps *e1*, *e2* and *e3*.

Having thus described, in general, the arrangement and location of the various parts comprising my invention, I will now explain the operation of the apparatus.

As shown in the drawings, all parts are in their normal condition, that is, code keys T are at rest, lever V is in its *n* position, switch F is in its normal position, signals S1, S2, S3 and S4 are indicating "stop", and track sections A—B, B—C and C—D are unoccupied and hence relays G1, G2 and G3 are energized. With relays G1 and G3 energized, relay *g* is energized by its circuit passing from terminal 5 of battery Q2, through wires 14 and 15, contact 16 of relay G1, contact 17 of relay G3, wire 18, winding of relay *g*, and wires 19 and 20 to terminal 7 of battery Q2. With switch F in its normal position, relay K is energized in its normal direction and hence its neutral contacts are closed and its polar contacts are closed to the left as shown in Fig. 2.

With lever V in its *n* position, the windings of relays P, N1, and N2 are supplied with current by a circuit passing from terminal 5 of battery Q2, through wire 21, contact 22*a* of relay *g*, wire 23, contact 24*a* of relay K, wire 25, winding of relay P, wire 26, contact 27 of relay G2, wire 28, windings of relays N2 and N1, wire 29, contact 30 of release L, the contact of push button E, contact 31 of lever V, and wires 32 and 33 to terminal 7 of battery Q2. The current flowing in this circuit is of sufficient magnitude to operate relay N2 as well as relays N1 and P. With relay P energized, relay *p* is also energized by its circuit passing from terminal 5 of battery Q2, through wires 14, 34, 35 and 36, contact 37 of relay P, winding of relay *p*, and wires 38, 39, 40, 41, 42, 43 and 20 to terminal 7 of battery Q2. With lever V in its *n* position, the pick-up circuit for relay M1 is closed, passing from battery Q1, through wire 44, contact 45 of lever V, contact 46 of relay M2, winding of relay M1, and wire 47 back to battery Q1. A stick circuit for relay M1 is also closed, passing from battery Q1, through wires 44, 48 and 49, contact 50 of relay N1, wire 51, contact 52 of relay M1, winding of relay M1, and wire 47 back to battery Q1. As shown in Fig. 1, relay M2 is energized by its stick circuit passing from battery Q1, through wire 44, contact 53 of lever V, wire 54, contact 55 of relay M2, wire 56, contact 57 of release L, wire 58, winding of relay M2, and wires 59 and 60 back to battery Q1. A second stick circuit for relay M2 is also closed, passing from battery Q1, through wire 61, contact 62 of relay N2, wire 63, contact 55 of relay M2, wire 56, contact 57 of release L, wire 58, winding of relay M2, and wires 59 and 60 back to battery Q1.

The current now flowing in the circuit traced through the winding of relay N1 is in such direction that the polar contacts of relay N1 are closed to the left, and hence lamp *e1* is lighted by its circuit passing from battery Q1, through wires 44, 48 and 49, contacts 64 and 65*a* of relay N1, wire 66, lamp *e1*, and wires 67 and 60 back to

battery Q1. With relay N2 energized, lamp *e3* is also lighted by its circuit passing from battery Q1, through wire 61, contact 68 of relay N2, wire 69, lamp *e3*, and wires 67 and 60 back to battery Q1.

I will now assume that an approaching train enters either approach section A—B or C—D, causing relay G1 or G3 and, in turn, relay *g* to become de-energized. Current of a lower magnitude will now be supplied to the windings of relays N1, N2 and P, such current of lower magnitude flowing from terminal 6 of battery Q2, through wire 70, contact 22*b* of relay *g*, and thence by the circuit previously traced to terminal 7 of battery Q2. The current now flowing, although of sufficient magnitude to cause relays N1 and P to retain their contacts in the closed position, is of insufficient magnitude to cause relay N2 to retain its contacts in the closed position. Contact 68 of relay N2 therefore opens, extinguishing lamp *e3* and thus indicating to the dispatcher that a train is on one of the approach sections A—B or C—D.

I will assume that, with all parts of the apparatus again in their normal condition as previously described, the dispatcher desires to clear signal S1 for a train to move over stretch Y with switch F normal. He therefore operates lever V to its *r* position. The slow releasing feature of relay N1 is such that relay N1 does not open its front contacts during this operation of lever V from its *n* to its *r* position. The circuit previously traced through the windings of relays N1, N2 and P is now closed through a branch path around contact 31 of lever V, this branch path passing from the contact of push button E, through contact 102 of lever V, contact 13 of code key T3, wire 101, contact 100 of relay M1, and wire 71 to wire 33. Relays N1, N2 and P are hence energized as before. The dispatcher next winds and then releases code key T3, which, by its contact 13, then interrupts the current flowing through the windings of relays N1, N2 and P according to a code to which relay P responds and opens its contacts 37 and 75 each time contact 13 of key T3 opens. Relays N1 and N2, being of a slow releasing type, meanwhile retain their contacts in the closed position. Relay P, by means of its contact 75, now causes current of the same code as the current flowing in the circuit of relays N1, N2 and P to be supplied to selectors H, only selector H3 responding to current of the code of key T3. This circuit completed by contact 75 for selector H3 passes from terminal 5 of battery Q2, through wires 14, 34, 35 and 36, contact 75 of relay P, wires 76, 77, 78 and 79, winding 10 of relay H3, and wires 42, 43, and 20 to terminal 7 of battery Q2.

Selector H3, upon responding to the coded current supplied through contact 75 of relay P, closes its contact 11 thus completing the pick-up circuit for relay *h3*, passing from terminal 5 of battery Q2, through wires 14, 34 and 35, contact 103 of relay *p*, wire 104, contacts 105 and 106 of relays *h1* and *h2* respectively, wire 107, contact 108 of relay *h4*, wire 109, contact 11 of selector H3, winding of relay *h3*, and wires 43 and 20 to terminal 7 of battery Q2. Relay *h3*, by closing its contact 124, completes its stick circuit which includes its pick-up circuit, just traced, as far as wire 109, and thence through contact 124 to the winding of relay *h3*. With relay *h3* energized, operating current is supplied to the mechanism of signal S1 by a circuit passing from terminal 5 of battery Q2, through wires 110 and 111, contact 112 of relay *h3*, wire 113, contacts 114 and 115*a* of relay K, wire 145, contact 146 of relay G3, wire 147, operating mechanism of signal S1, and wires 117 and 118 to terminal 7 of battery Q2. The arm of signal S1 is then operated to its "proceed" position.

When an approaching train de-energizes relay G1, the approach indication will be given to the dispatcher by lamp *e3* as previously described. Upon the de-energization of relay N2, the stick circuit for relay M2 passing through contact 62 of relay N2 is opened, and the stick circuit for relay M2 passing through contact 53 of lever V having been previously opened due to lever V being operated to its *r* position, relay M2 is de-energized.

If now the dispatcher finds it necessary to hold the approaching train at signal S1, he will either open the circuit by means of push button E or by moving lever V to some position other than positions *m*, *b*, *n*, *d* and *r* and retaining it there for a sufficient period to cause relay *p* to become de-energized by relay P, relay *p* in turn de-energizing relay *h3* and so causing the arm of signal S1 to be returned to its "stop" position. If he later desires to reverse switch F, he will move lever V to its *d* position. Contact 31 of lever V continues open in the circuit through the windings of relays N1, N2 and P and the branch path previously traced around contact 31 is now open at contact 102 of lever V. Contact 74 of lever V is closed in a second branch path around contact 31, but, on account of relay M2 being de-energized, this second branch path is open at contact 72 of relay M2. In order to energize relay M2, the dispatcher now operates clockwork release L causing contacts 30 and 57 of release L to be at once opened and contact 152 of release L to be closed upon the lapse of a measured interval of time. If, when relay M2 has been de-energized by an approaching train, the dispatcher finds it necessary to send the train over switch F reversed to siding Z instead of to simply hold the train at signal S1, he will at once start the operation of release L, thereby opening contact 30 and causing signal S1 to indicate "stop". He will not operate push button E nor lever V as previously described for causing signal S1 to indicate "stop" when he does not wish to reverse switch F but desires to simply hold the train at switch F. He will, however, move lever V to its *d* position as before. In either instance, when contact 152 of release L becomes closed, relay M2 becomes energized by its pick-up circuit passing from battery Q1, through wires 44 and 48, contact 152, wire 58, winding of relay M2, and wires 59 and 60 back to battery Q1.

Current is then supplied to the circuit for the windings of relays N1, N2 and P through the second branch path around contact 31 of lever V, this branch path passing from push button E, through contact 74 of lever V, contact 13 of key T2, wire 73, and contact 72 of relay M2 to wire 71. Relays N1 and P now close their front contacts. The dispatcher winds key T2 causing current to be supplied to relay P of a code to which selector H2 will respond, similar coded current passing through the circuit previously traced for selector H3 as far as wire 77, thence through winding 10 of selector H2, and wires 40 and 41 to wire 42.

Selector H2, upon responding to such coded current controlled by key T2, closes its contact 11, thus completing the pick-up circuit for relay *h2* passing from terminal 5 of battery Q2, through wires 14, 34 and 80, contact 81 of relay

h1, wire 82, contact 11 of selector H2, winding of relay *h2*, and wires 83, 84, 41, 42, 43 and 20 to terminal 7 of battery Q2. Relay *h2*, by closing its contact 87, completes its stick circuit passing from terminal 5 of battery Q2, through wires 14, 34, 80 and 85, contact 86F which is operated by switch F, contact 87 of relay *h2*, winding of relay *h2*, and wires 83, 84, 41, 42, 43 and 20 to terminal 7 of battery Q2. With relay *h2* energized, relay W is energized in its reverse direction by current flowing from terminal 5 of battery Q2, through wires 14, 34, 80 and 85, contact 88 of relay *h2*, wire 89, winding of relay W, wire 90, contact 91 of relay *h2*, and wires 92, 93, 94, 83, 84, 41, 42, 43 and 20 to terminal 7 of battery Q2. With the polar contacts of relay W closed in their reverse position, switch F becomes operated to its reverse position causing relay K to be energized in its reverse direction.

Relay K, upon becoming energized in its reverse direction, causes current of reverse polarity to be supplied to the circuit through the windings of relays N1, N2 and P, passing from terminal 7 of battery Q2 in the reverse direction through this circuit as far as wire 25, thence through contact 24*b* of relay K, wire 95, contact 96*b* of relay *g*, and wire 98 to terminal 8 of battery Q2. The current flowing in the reverse direction through this circuit causes relay N1 to close its polar contacts in the reverse direction thus opening the circuit for lamp *e1* and completing the circuit for lamp *e2* passing from battery Q1, through wires 44, 48, and 49, contacts 64 and 65*b* of relay N1, wire 99, lamp *e2*, and wires 67 and 60 back to battery Q1. Lamp *e2* is thus lighted, indicating to the dispatcher that switch F is in its reverse position.

In order to clear signal S2 for the train to proceed over switch F to siding Z, the dispatcher will now return lever V to its *r* position. When lever V is returned to its *r* position, contact 53 of lever V is opened in one of the stick circuits for relay M2, causing relay M2 to be deenergized since contact 62 of relay N2 in the other stick circuit for relay M2 is already open on account of the presence of a train in section A—B. The dispatcher will then again wind key T3 causing selector H3 to again close the pick-up circuit for relay *h3*. The arm of signal S2 will now be operated to its "proceed" position by its circuit passing from terminal 5 of battery Q2, through wires 110 and 111, contact 112 of relay *h3*, wire 113, contacts 114 and 115*b* of relay K, wire 116, operating mechanism of signal S2, and wires 117 and 118 to terminal 7 of battery Q2.

As the train enters the switch section B—C, relay G2 becomes de-energized, opening its contact 27 and thus causing relays N1 and P to become de-energized. With relay N1 de-energized, the circuit for lamp *e2* as well as that for lamp *e1* is open and both lamps are extinguished, thus indicating to the dispatcher the presence of the train in section B—C. With lever V in its *r* position, the pick-up circuit for relay M1 is open at contact 45 of lever V, and with relay N1 de-energized the stick circuit for relay M1 is open at contact 50 and hence relay M1 is de-energized. Relay *p* is de-energized due to the opening of contact 37 of relay P, and hence relay *h3* is de-energized by contact 103 of relay *p*, causing the arm of signal S2 to return to its "stop" position.

When the train moves out of section B—C, relays N1, N2 and P will not become energized until the dispatcher returns lever V from its *r* to its *n* position. This is because the first branch path around contact 31 of lever V passes through contact 100 of relay M1. When the dispatcher has returned lever V to its *n* position and when all of the track sections A—B, B—C and C—D are unoccupied, relays N1 and N2 will close their front contacts. Relay M2 then becomes energized by a pick-up circuit which passes from battery Q1, through wire 61, contact 148 of relay N2, wire 149, contact 150 of relay M1, wires 151 and 56, contact 57 of release L, wire 58, winding of relay M2, and wires 59 and 60 back to battery Q1. Relay M2, upon becoming energized, completes at its contact 46 the pick-up circuit previously traced for relay M1, causing relay M1 to become energized.

If, while switch F is reversed, an approaching train, by entering sections A—B or C—D deenergizes relay *g*, contact 96*a* of relay *g* will open and contact 96*b* will close, thus reducing the current supplied by battery Q2 through the windings of relays N1, N2 and P, and thereby causing relay N2 to open its front contacts. Relay N2, by opening its contact 68, extinguishes lamp *e3* thus indicating to the dispatcher that a train is approaching.

When the dispatcher desires to return switch F from its reverse to its normal position, he will operate lever V to its *b* position. He will then wind key T1 which controls current of a code to which selector H1 will respond. Selector H1, by closing its contact 11, completes a pick-up circuit for relay *h1* passing from terminal 5 of battery Q2, through wires 110 and 126, contact 127 of relay *h2*, wire 128, contact 11 of selector H1, winding of relay *h1*, and wires 94, 83, 84, 41, 42, 43 and 20 to terminal 7 of battery Q2. Relay *h1*, upon closing its contact 130, completes its stick circuit passing from terminal 5 of battery Q2, through wires 14, 34 and 80, contact 129F which is operated by switch F, contact 130 of relay *h1*, winding of relay *h1*, and wires 94, 83, 84, 41, 42, 43 and 20 to terminal 7 of battery Q2. With relay *h1* energized, relay W becomes energized in its normal direction by its circuit passing from terminal 5 of battery Q2, through wires 14, 34 and 80, contact 141 of relay *h1*, wire 142, winding of relay W, wire 143, contact 144 of relay *h1*, and wires 93, 94, 83, 84, 41, 42, 43 and 20 to terminal 7 of battery Q2. With the polar contacts of relay W closed in their normal position, switch F will be returned to its normal position causing relay K to become energized in its normal direction.

In order to clear signals S3 or S4 for a westbound move with switch F normal or reversed, respectively, the dispatcher will operate lever V to its *m* position. He will then wind key T4 which controls current of a code to which selector H4 will respond. Selector H4, by closing its contact 11, completes a pick-up circuit for relay *h4* passing from terminal 5 of battery Q2, through wires 14, 34 and 35, contact 103 of relay *p*, wire 104, contact 105 of relay *h1*, contact 106 of relay *h2*, wires 107 and 120, contact 121 of relay *h3*, wire 122, contact 11 of selector H4, winding of relay *h4*, and wires 84, 41, 42, 43 and 20 to terminal 7 of battery Q2. Relay *h4*, upon becoming energized, completes its stick circuit which includes its contact 123 in multiple with contact 11 of selector H4 in the pick-up circuit just traced. When relay *h4* is energized while switch F is in its normal position, signal S3 will be supplied with operating current by a circuit passing from terminal 5 of battery Q2, through wires 110 and 126, contact 131 of relay *h4*, wire 132, contacts

133 and 134a of relay K, wire 135, contact 136 of relay G1, wire 137, operating mechanism of signal S3, and wire 118 to terminal 7 of battery Q2. With this circuit closed, the arm of signal S3 is operated to its "proceed" position. If relay *h4* is energized while switch F is in its reverse position, an operating circuit is closed for signal S4 including the operating circuit just traced for signal S3 except passing from contact 133 of relay K, through contact 134b of relay K, wire 138, contact 139 of relay G1, wire 140, and the operating mechanism of signal S4 to wire 118.

Although I have herein shown and described only one form of remote control apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination, a selector responsive to current of a given code, means for supplying said coded current to said selector, a pair of conductors, a circuit including said conductors for controlling said means, a device controlled by said selector, an auxiliary control means having a first and a second position for controlling said device, a relay, a second relay responsive only to current of greater magnitude than is required for the operation of said first relay, means including said conductors and controlled by said device for supplying said first and second relays with current of sufficient magnitude to operate said first relay but not said second relay when said auxiliary control means is in its first position, and means including said conductors and controlled by said device for supplying said first and second relays with current of sufficient magnitude to operate said second relay as well as said first relay when said auxiliary control means is in its second position.

2. In combination, a selector responsive to current of a given code, a relay, a pair of conductors, a circuit including said relay and said conductors as well as a source of current, a code key, means controlled by said code key for interrupting said circuit according to said given code, said relay opening its contacts each time said circuit is interrupted by said means, a second relay responsive to non-coded current, means including said conductors and controlled by said selector for supplying said second relay with non-coded current, and a second circuit including the winding of said selector and a source of current as well as a contact of said first relay.

3. In combination, two selectors one of which is responsive to current of a given code and the second of which is responsive to current of a given different code, a relay which opens and closes its contacts in response to current of said first or second code according as current of said first or of said second code is supplied to the winding of said relay, a pair of conductors, a circuit including said conductors and the winding of said relay, a code key, means controlled by said code key for supplying said circuit with current of said first code, a second code key, means controlled by said second code key for supplying said circuit with current of said second code, means controlled by said relay for supplying said selectors with current of said first or second codes, an electrical device capable of being put into either a first or a second condition, means for putting said electrical device into said first condition when said first selector is operated, means for putting said electrical device into said second condition when said second selector is operated, an indication relay responsive to the polarity of the current supplied to its winding, means including said conductors for supplying said indication relay with current of normal or reverse polarity according as said electrical device is in its said first or its said second condition, and indication means controlled by said indication relay.

4. In combination, two selectors one of which is responsive to current of a given code and the second of which is responsive to current of a given different code, a relay which opens and closes its contacts in conformity with said first or second code when current of said first or second code respectively is supplied to the winding of said relay, a pair of conductors, a circuit including said conductors and the winding of said relay, a code key, means controlled by said code key for supplying said circuit with current of said first code, a second code key, means controlled by said second code key for supplying said circuit with current of said second code, means controlled by said relay for supplying said selectors with current of said first or second codes, an electrical device capable of being put into either a first or a second condition, means for putting said electrical device into said first condition when said first selector is operated, means for putting said electrical device into said second condition when said second selector is operated, a second relay responsive to the polarity of the current supplied to its winding, means including said conductors for supplying said second relay with current of normal or reverse polarity according as said electrical device is in its said first or its said second condition, a third relay responsive only to current of greater magnitude than is required for the operation of said first and second relays, a second electrical device separately controlled to a first and a second condition, means including said conductors and controlled by said first electrical device for supplying said third relay with current of sufficient magnitude to operate said third relay when said second electrical device is in its said first condition, and means including said conductors and controlled by said first electrical device for supplying said third relay with current of sufficient magnitude to operate said first and second relays but not said third relay when said second electrical device is in its said second condition.

5. In combination, two selectors one of which is responsive to current of a given code and the second of which is responsive to current of a given different code, a circuit for controlling the supplying of said coded currents to said selectors, an electrical device capable of being put into either a first or a second condition, means for putting said electrical device into said first or said second condition according as said first or said second selector is operated, indication control means included in said control circuit and responsive to the polarity of current flowing in said control circuit, means for supplying said control circuit with current of one polarity or the other according as said electrical device is in its said first or its said second condition, and indication means controlled by said indication control means.

6. In combination, two selectors one of which is responsive to current of a given code and the second of which is responsive to current of a

given different code, a circuit for controlling the supplying of said coded currents to said selectors, an electrical device capable of being put into either a first or a second condition, means for putting said electrical device into said first or said second condition according as said first or said second selector is operated, indication control means included in said control circuit and responsive to the polarity of current flowing in said control circuit, means for supplying said control circuit with current of one polarity or the other according as said electrical device is in its said first or its said second condition, indication means controlled by said indication control means, a second device separately controlled to a first and a second condition, a second indication control means included in said control circuit and responsive only to current of greater magnitude than is required for the operation of said first indication control means, means controlled by said first device for supplying said control circuit with current of sufficient magnitude to operate both said first and second indication control means when said second device is in its said first condition, means controlled by said first device for supplying said control circuit with current of sufficient magnitude to operate said first but not said second indication control means when said second device is in its said second condition, and indication means controlled by said second indication control means.

7. In combination, a railway traffic governing device capable of being put into either a first or a second condition, two selectors one of which is responsive to current of a given code and the second of which is responsive to current of a given different code, a circuit for controlling the supplying of said coded currents to said selectors, means for putting said governing device into its said first or its said second condition according as said first or said second selector is operated, an indication relay the winding of which is included in said control circuit and which is responsive to the polarity of current flowing through its winding, means for supplying said control circuit with current of one polarity or the other according as said governing device is in its said first or its said second condition, and indication means controlled by said indication relay.

8. In combination, a railway traffic governing device capable of being put into either a first or a second condition, two selectors one of which is responsive to current of a given code and the second of which is responsive to current of a given different code, a circuit for controlling the supplying of said coded currents to said selectors, means for putting said governing device into its said first or its said second condition according as said first or said second selector is operated, an indication relay the winding of which is included in said control circuit and which is responsive to the polarity of current flowing through its winding, means for supplying said control circuit with current of one polarity or the other according as said governing device is in its said first or its said second condition, indication means controlled by said indication relay, a track section, a track circuit for said section including a track relay, a second indication relay the winding of which is included in said control circuit and which is responsive only to current of greater magnitude than is required for the operation of said first indication relay, means controlled by said governing device for supplying said control circuit with current of sufficient magnitude to operate both said first and second indication relays when said track relay is energized, means controlled by said governing device for supplying said control circuit with current of sufficient magnitude to operate said first but not said second indication relay when said track relay is de-energized, and indication means controlled by said second indication relay.

9. In combination, a railway switch, a signal for governing the movement of traffic over said switch, a first selector responsive to current of a given code only, a second selector responsive to current of a second given code only, a third selector responsive to current of a third given code only, a first and a second stick relay, a pick-up circuit for said first stick relay controlled by said first selector, a stick circuit for said first stick relay controlled by a contact operated by said switch, a pick-up circuit for said second stick relay controlled by said second selector, a stick circuit for said second stick relay controlled by a contact operated by said switch, means for controlling the operation of said switch to its normal and reverse positions by said first and second stick relays respectively, means for controlling said signal by said third selector, a manually operable lever having a first and a second and a third position, a circuit for controlling the supplying of said coded currents to said selectors according to the coded current supplied to said circuit, and means for supplying said circuit with current of said first or second or third codes when said lever is in said first or second or third positions respectively.

10. In combination with a railway switch, a signal for governing the movement of traffic over said switch, a first selector responsive to current of a given code only, a second selector responsive to current of a second given code only, a third selector responsive to current of a third given code only, means for controlling the operation of said switch to its normal and reverse positions by said first and second selectors respectively, a manually operable lever having a first and a second and a third position, a circuit for controlling the supplying of said coded currents to said selectors according to the coded current supplied to said circuit, means for at times supplying said circuit with current of said first or second or third codes when said lever is in said first or second or third positions respectively, means for at other times supplying said circuit with non-coded current when said lever is in said first or second or third positions, a stick relay, a pick-up circuit for said stick relay controlled by said third selector, a stick circuit for said stick relay controlled by said non-coded current in said circuit, and means for controlling said signal by said stick relay.

11. In combination, a railway switch, a signal for governing the movement of traffic over said switch, a manually operable lever having a first and a second and a third position, a control circuit, means for supplying said control circuit with current of a first or a second or a third code according as said lever is in its said first or second or third positions respectively, means for controlling the operation of said switch to its normal or its reverse position according as current of said first or of said second code is supplied to said control circuit, means for controlling the operation of said signal by current of said third code supplied to said control circuit, an approach track section for said switch, a detector track sec-

tion for said switch, a track circuit for each of said sections each including a track relay, an indication relay responsive to the polarity of current flowing through its winding which is included in said control circuit, means for supplying said control circuit with current of one polarity or the other according as said switch is in its normal or its reverse position, a second indication relay the winding of which is also included in said control circuit and which is responsive only to current of greater magnitude than is required for the operation of said first indication relay, means for supplying said control circuit with current of sufficient magnitude to operate both said first and second indication relays when said approach section relay is energized, means for supplying said control circuit with current of sufficient magnitude to operate said first but not said second indication relay when said approach section relay is de-energized, a front contact of said detector section relay included in said control circuit, a locking relay, a second locking relay, a pick-up circuit for said first locking relay controlled by a front contact of said second locking relay and by a contact which is closed while said lever is in its said first or second positions or at any intermediate point, a stick circuit for said first locking relay controlled by said first indication relay, a time element contacting device, a pick-up circuit for said second locking relay controlled by a front contact of said second indication relay and by a back contact of said first locking relay as well as by a normally closed contact of said time element device in series, a second pick-up circuit for said second locking relay controlled by a contact of said time element device which becomes closed only upon the lapse of a measured interval of time after said normally closed contact is opened by said time element device, a stick circuit for said second locking relay controlled by a normally closed contact of said time element device and by a contact which is closed only while said lever is in its said first or second positions or at any intermediate point, a second stick circuit for said second locking relay controlled by said second indication relay and by a normally closed contact of said time element device, a contact of said first locking relay included in said control circuit when said lever is in its said third position, and a contact of said second locking relay included in said control circuit when said lever is in its said first or second positions.

12. In combination, a railway traffic governing device, means adjacent said device and controlled by said device for supplying electric currents of different characteristics, means controlled by said currents for indicating at a remote point the condition of said device, means at said remote point for interrupting said currents according to a given code, and means responsive to said coded currents for controlling said traffic governing device.

13. In combination, a section of railway track including a switch, a line circuit extending from a remote control point to a point adjacent said switch, means at said remote point for interrupting said line circuit according to a given code, means responsive to said coded circuit for controlling said switch, and means adjacent said switch for opening said line circuit to prevent operation of said switch while said track section is occupied.

14. In combination, a railway track switch, a line circuit extending from a remote control point to a point adjacent said switch, means at said remote point for interrupting said line circuit according to a given code, means responsive to said coded circuit for controlling said switch, means responsive to the position of said switch for controlling the polarity of current in said line circuit, and switch indicating means at said remote point responsive to the polarity of current in said line circuit.

15. In combination, a switch section and an approach section of railway track, a track switch in said switch section, a signal governing traffic approaching said switch through said approach section and controlled from a remote point, a stick relay having a stick circuit closed when said signal is clear provided said approach section is unoccupied, a control device at the switch for controlling said switch, means controlled from said remote point for at times energizing said control device only when said switch section is unoccupied and said stick relay is energized, a manually operable mechanism, and means responsive to an operation of said mechanism for causing said signal to indicate stop and to pick up said stick relay even though a train occupies said approach section.

16. In combination, a stretch of railway track comprising a switch section and an approach section, a track switch in said switch section, a signal for governing traffic movements from said approach section into said switch section, a lever having a normal and a reverse position and having a contact which is closed when the lever is in its normal position only, means controlled by said lever for causing said signal to indicate "stop" when the lever is in its normal position and for causing said signal to indicate "proceed" when the lever is in its reverse position, an approach locking relay, a pick-up circuit for said relay controlled by traffic conditions in said approach section but not controlled by said lever contact, a stick circuit for said relay including said lever contact, and means including said approach locking relay for controlling said switch.

17. In combination, a stretch of railway track comprising a switch section and an approach section, a track switch in said switch section, a signal for governing traffic movements from said approach section into said switch section, a lever having a normal and a reverse position and having a contact which is closed when the lever is in its normal position only, means controlled by said lever for causing said signal to indicate "stop" when the lever is in its normal position and for causing said signal to indicate "proceed" when the lever is in its reverse position, a signal stick relay, a pick-up and a stick circuit for said relay one of which includes said contact and the other of which is controlled by traffic conditions in said switch section, an approach locking relay, a pick-up and a stick circuit for said approach locking relay one of which is controlled by said signal stick relay and the other of which is controlled by traffic conditions in said approach section, and means including said approach locking relay for controlling said switch.

18. In combination, a stretch of railway track comprising a switch section and an approach section, a track switch in said switch section, a signal for governing traffic movements from said approach section into said switch section, a signal relay and a switch relay controlled selectively from a remote point, means controlled by said signal relay for governing said signal, a locking relay, means controlled by said locking relay for

affecting the control of said switch relay, means for holding said locking relay energized when said signal is clear provided said approach section is unoccupied, a manually operable device, means effective when said device is actuated to pick up said locking relay, and means effective when said device is actuated to prevent control of said switch and signal relays from said remote point until the device is restored to its normal condition.

19. In combination, a stretch of railway track comprising a switch section and an approach section, a track switch in said switch section, a signal for governing traffic movements from said approach section into said switch section, a signal relay and a switch relay controlled selectively from a remote point, means controlled by said signal relay for governing said signal, a locking relay, means controlled by said locking relay for affecting the control of said switch relay, means for holding said locking relay energized when said signal is clear provided said approach section is unoccupied, a manually operable device comprising a normally open contact and a normally closed contact, means controlled by said normally open contact for energizing said locking relay, and means controlled by said normally closed contact for governing said signal.

20. In combination, a stretch of railway track comprising a switch section and an approach section, a railway track switch in said switch section, a plurality of signals for governing train movements over said switch, a pair of relays at said switch for controlling said switch, manually operable control means at a remote point for transmitting coded current to selectively operate one or the other of said relays to control said switch, means controlled by a train in said approach section for preventing operation of either of said control relays while one of said signals is controlled to occupy the clear position, and means controlled by a train in said switch section for preventing operation of either of said control relays.

21. In combination, a movable lever, a railway switch, a switch control relay for moving said switch to one position, a second switch control relay for moving said switch to a second position, means for delivering one code when said lever is in one position and another code when said lever is in a different position, means responsive to said first code for energizing said first relay, means responsive to said second code for energizing said second relay, and means responsive to restrictive traffic conditions adjacent said device for preventing the operation of either of said relays while said restrictive traffic conditions exist.

22. In combination, a railway traffic governing device, a circuit extending from a remote point to a point adjacent said device for controlling said device, means for at times delivering one code to said circuit for imposing one condition upon said device and for at other times delivering another code to said circuit for imposing a different condition upon said device, and means responsive to restrictive traffic conditions adjacent said device for opening said circuit to prevent the delivery of codes while said restrictive traffic conditions exist.

23. In combination, a line circuit, a movable lever, a code transmitter, a selector controlled by a code delivered by said line circuit, a relay responsive to conditions adjacent said selector, means controlled by said lever and by said relay for completing said line circuit through said transmitter, a device controlled by said selector, an indicator adjacent said lever, and means controlled by said relay and including said line circuit for operating said indicator.

24. In a train dispatching system of the selector type, the combination with a single line circuit extending along the railway track and connecting a way station and a dispatcher's office, code responsive means at said way station for rendering available a particular message circuit branch upon the reception of a particular code, and means controlled over such message circuit for again making such branch unavailable.

25. In a train dispatching system of the selector type, the combination with a single line circuit extending along the railway track and connecting a way station and a dispatcher's office, means responsive to a plurality of distinctive impulses transmitted in a distinctive order which when it responds makes available for use a particular message circuit branch, and a relay controlled over such message circuit branch for again making said branch unavailable for use.

26. In a train dispatching system of the selector type, the combination with a single line circuit extending along the railway track and connecting a way station and a dispatcher's office, means responsive to a plurality of distinctive impulses transmitted in a distinctive order which when it responds makes available for use a particular message circuit branch, said message branch forming part of a message circuit including said single line circuit, control means and controllable means included in said message circuit, and other means for discontinuing said message circuit available for use and rendering said line circuit available for transmitting another code.

27. In a train dispatching system of the selector type, the combination with a single line circuit extending along the railway track and connecting a way station and a dispatcher's office, means responsive to a plurality of distinctive impulses transmitted in distinctive order which when it responds makes available for use a particular message circuit branch, said message branch forming part of a message circuit including said single line circuit, means controlled over said message circuit to inform the engineer of an approaching train how he is to move his train, and other means for discontinuing said message circuit for use and rendering said line circuit available for transmitting another code.

28. In a train dispatching system of the selector type, the combination with a single line circuit extending along the railway track and connecting a way station and a dispatcher's office, code responsive means at said way station for rendering available a particular message circuit branch upon the reception of a particular code, a railway signal controlled over said message circuit, and means controlled over such message circuit for again making such branch unavailable.

29. In a train dispatching system of the selector type, the combination with a single line circuit extending along the railway track and connecting a way station and a dispatcher's office, code responsive means at said way station for rendering available for use a particular message circuit branch upon the reception of a particular code, and a relay controlled over such message circuit branch for again making said branch available for use.

30. In a train dispatching system of the selec-

tor type, the combination with a single line circuit extending along the railway track and connecting a way station and a dispatcher's office, code responsive means at said way station for rendering available for use a particular message circuit branch upon the reception of a particular code, said message branch forming part of a message circuit including said single line circuit, control means and controllable means included in said message circuit, and other means for discontinuing said message circuit available for use and rendering said line circuit available for transmitting another code.

31. In a train dispatching system of the selector type, the combination with a single line circuit extending along the railway track and connecting a way station and a dispatcher's office, code responsive means at said way station for rendering available for use a particular message circuit branch upon the reception of a particular code, said message branch forming part of a message circuit including said single line circuit, means controlled over said message circuit to inform the engineer of an approaching train how he is to move his train, and other means for discontinuing said message circuit for use and rendering said line circuit available for transmitting another code.

32. In a remote control system, two stations connected by a single line circuit, a source of current for said line circuit at one station, means at the other station for repeatedly interrupting the line circuit to form a code, means at said one station for reversing the polarity of said source, code responsive means at said one station controlled by code interruptions in said line circuit, and means at the other station selectively responsive to the polarity of the current in the line circuit.

33. In a system for the duplex transmission of signals over a line circuit between two stations, a source of current for said line circuit, transmitting means at one station for controlling the polarity of the current in said line circuit, transmitting means at the other station for repeatedly interrupting the current in the line circuit to form a code, and signal receiving means at each station responsive to the transmitting means at the other station.

34. In a centralized traffic controlling system for railroads, a control office, a field station, and means for simultaneously transmitting controls and indications between said control office and said field station over a single line circuit, said means including means at said control office for impressing a series of distinctive impulses on the single line circuit, and means at said field station for modifying said series of impulses.

35. In combination, a railway signal, a line circuit, means for at times supplying coded current impulses to said line circuit, means for at other times supplying non-coded current to said line circuit, a selector controlled by current in said line circuit and responsive only to a particular code, a stick relay, a pick-up circuit for said stick relay controlled by said selector, a stick circuit for said stick relay controlled by said non-coded current, and means controlled by said stick relay for controlling said signal.

36. In combination, an office and a station, a plurality of railway traffic governing devices including a railway signal at said station, a normally energized line circuit extending from the office to the station, means at said office for transmitting different codes over said line circuit to control said devices and to clear said signal, and means non-responsive to said codes but dependent only upon the energized condition of said line circuit for maintaining said signal at clear.

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