RECALL CONTROL MEANS
Our invention relates to remote control systems for the control from a central office of selected devices located at remote stations, and for also indicating at the office the condition of such devices and of other devices located at the stations. More particularly, our invention relates to centralized traffic control systems for railroads in which traffic governing devices are distributed along a stretch of track are controlled from time to time by means of impulse codes transmitted over a line circuit and in which the same line circuit is used at other times to indicate the positions of the traffic governing devices and to indicate the presence and movement of trains through the stretch.

Our invention is an improvement upon that disclosed in Letters Patent of the United States No. 2,398,812, granted March 19, 1946, to George W. Baughman, for Remote control systems.

In systems of this character it is the practice to provide coding units at the office and at the several stations which are arranged to deliver code to the line circuit connecting the office and the field station. It is also the practice to employ composite codes in which the code elements are arranged in two groups, those of the first group being arranged in a distinctive pattern to provide a code call identifying the selected location, and those of the second group providing means for controlling a plurality of devices in the same code. More particularly, in each control code transmitted from the office, the first group of elements operates a selector relay at the selected station, while a selector relay at the office operated at the same time places the coding unit under the control of a group of levers contained in an individual panel for that station which govern the character of the second group of elements in the code to control a group of traffic governing devices at the selected station.

In an indication code the selector relay by which the office coding unit is associated with the control panel for the transmitting station is operated by the first group of elements to render the second group of elements of the code effective to control a plurality of indication lamps mounted on the panel to indicate the condition of each of a plurality of movable devices at that station.

Such indication codes are initiated automatically in response to a change in condition of any one of the movable devices. For example, the system may be arranged to initiate a code in response to the release of a track relay by a train passing the station, or as a result of a change in the position of a track switch, or in the condition of the signals which govern traffic movements over the switch due to the reception of a control code from the office.

It is sometimes desirable to verify the condition of the station devices without changing their condition, particularly after the system has been idle for a while.

In the system shown in the above-identified patent to George W. Baughman, there is shown an improved arrangement by which the operator may effect the initiation of indication codes by the coding units at one or more selected stations without transmitting control elements of the second group. In the system of the patent to George W. Baughman a special recall button is provided, which, if operated along with the individual starting button by means of which the code call is selected and the code initiated, causes the transmission of a special recall code containing only the first group of elements constituting the station code call, while the station apparatus is correspondingly modified so that an indication code will be initiated in response to the operation of the station selector relay provided the code is terminated on the step following the group constituting the station code call.

The system shown in the patent to George W. Baughman is adapted for use with a code communication system of the type shown in Letters Patent of the United States No. 2,220,246, granted January 21, 1941, to Lloyd V. Lewis. The system of the patent to Lloyd V. Lewis is arranged so transmission of a control code to a field station is initiated by energization of a starting relay at the office for the panel associated with the station to which the code is to be sent. Each starting relay, when energized, remains energized until the corresponding station is selected, as evidenced by energization of the associated selector relay. In this way control codes may be stored for transmission to any number of stations.

As explained in detail in the patent to Lloyd V. Lewis, when a plurality of starting relays are picked up, each starting relay will cause the transmission of a control code to the corresponding station, and these codes will be transmitted in sequence in a predetermined order governed by the elements of the first group of elements of the control code. The operation of the system of the Lewis patent is such that the various stations are arranged in a predetermined order of preference insofar as transmission of control...
codes is concerned. Each starting relay when energized will cause transmission of a control code to the associated station unless control codes are sent to stations inferior to it in the order of preference even though the starting relays for the inferior stations were energized first. Similarly, a starting relay when energized will not cause a control code to be transmitted to the associated field station until all of the starting relays for superior stations are released even though the starting relays for some of the superior stations are not energized until after the starting relay for the station under consideration was energized. The operation of the system of the patent to Lloyd V. Lewis is such, therefore, that when a starting button is pressed to energize the starting relay for a panel to cause a control code to be sent to the corresponding station, the control code may not be sent until after control codes are sent to one or more other stations.

The recall relay RCR provided by the patent to George W. Baughman governs the operation of the office coding unit in such manner that when the relay is picked up the first eight or station selection steps of a control code are transmitted in the normal manner and operate the field station units to select the desired station. When relay RCR is picked up, the ninth step of the control code is made abnormally long with the result that the relay RCR is released and the office coding unit is restored to normal. The extra long ninth step in the control code will not operate the function control relays at the selected station but will operate the starting relay at that field station to cause an indication code to be transmitted to the office.

An object of this invention is to provide improved means for controlling the recall control relay RCR of the patent to George W. Baughman so as to insure that when the operator attempts to send a recall code to a selected station, the recall code will be sent to the designated station.

A further object of the invention is to provide improved means of the type described which is arranged so that attempted transmission of a recall code to a selected station will not interfere with the transmission of control codes which are being transmitted to other stations.

Another object of the invention is to provide improved means of the type described which is arranged so that transmission of a recall code to a selected station will not result in undesired transmission of control codes to other stations.

A further object of the invention is to provide improved means of the type described which is arranged so that when the operator attempts to send a recall code to a selected station, the code subsequently transmitted to this station is certain to be a recall code and will not be a normal control code.

Another object of the invention is to provide improved means of the type described which is arranged so that when the operator actuates the starting push buttons to send a recall code to one station and to send control codes to other stations, the equipment is certain to be conditioned to transmit a recall code to the designated station regardless of the condition of the office coding unit at the time that these push buttons are actuated.

A further object of the invention is to provide improved means of the type described which is arranged so that a recall code will be transmitted promptly and so that the indication code in response to this recall code will be transmitted with a minimum of delay.

Another object of the invention is to provide improved means of the type described which causes a recall code to take precedence over all other control codes regardless of the relative superiority of the stations to which the recall and control codes are to be transmitted.

A further object of the invention is to provide improved means of the type described which operates so that after a recall code is initiated all control codes are deferred until the indication is received in response to the recall code to thereby reduce the delay in the recall indication code for the time which would be required to transmit the stored control codes and by the time required to transmit indications from at least some of the stations for which these stored control codes are intended.

Another object of the invention is to provide improved means of the type described which will not operate to send a recall code if, at the time a starting button is actuated to initiate the recall code, an indication code is being received from the station to which the recall code is to be sent.

A further object of the invention is to provide improved means of the type described which operates in such manner that if any code is initiated as a result of an attempt to send a recall code it will be a recall code and will not be a control code.

Another object of the invention is to provide improved means of the type described which is arranged so that the recall control means may be applied to all stations or only to selected stations as desired.

A further object of the invention is to provide improved recall code control means which is arranged so that when a starting button is operated to initiate a recall code to the corresponding station, the starting button is ineffective to control the circuits which it governs for actuating the starting relays for other stations to thereby prevent unintended transmission of control codes to such other stations.

Other objects of the invention and features of novelty will be apparent from the following description taken in connection with the accompanying drawings.

We shall describe two forms of remote control systems embodying our invention and shall then point out the novel features thereof in claims.

In practicing our invention we provide for each station an auxiliary relay which is energized or actuated along with the associated starting relay when the operator wishes to transmit a recall code to the corresponding station. When an auxiliary relay is actuated or energized and the office code transmitter transmits a code including the station selection steps designating the station with which the auxiliary relay is associated, a circuit is established to pick up the recall control relay to thereby cause the ninth step of the code to be abnormally long, after which operation of the code transmitter is discontinued and the code which is transmitted is that of the recall code. When the recall control relay is picked up only when a code is transmitted to the station to which the operator intended the recall code to be transmitted, initiation of a recall code to one station will not cause control codes intended for other stations described as recall codes.

In the modification shown in Fig. 1 each auxiliary relay is released immediately after the
recall code is transmitted to the associated station, while in the modification shown in Fig. 2, each auxiliary relay is maintained energized until an indication code is received from the corresponding station.

The modification shown in Fig. 2 is also arranged so that each auxiliary relay when picked up conditions the office code transmitted to transmit a code to the corresponding station, and also renders the office incapable of transmitting codes to other stations. This insures prompt transmission of recall codes and prompt receipt of indication codes from the recalled stations.

The modifications shown in both Figs. 1 and 2 are arranged so that the starting buttons are operated in one manner to initiate a control code, and in a different manner to initiate a recall code. The starting buttons are also arranged so that when a button is operated in the manner to initiate a recall code it will not establish circuits governed thereby for starting the control relays for stations other than that with which the starting button is associated.

In the drawings, Fig. 1 shows a portion of a suitable machine located at a control office and including control panels for three field stations located at the ends of passing sidings, as indicated by the miniature track diagram at the top of the view, and Fig. 2 is a diagram of a modified arrangement which we may employ.

Similar reference characters refer to similar elements in each of the two views.

Referring to Fig. 1 of the drawings there is shown in the upper portion of this figure a diagram of a stretch of railway including a passing siding together with a single track stretch connecting this passing siding with another passing siding, while the lower portion of this figure shows a portion of the circuits within the control machine and incorporating this invention.

Consideration of the detailed mode of operation of the code communication system or of the construction of the wayside signaling system is not needed for an understanding of our invention and it is deemed sufficient to point out that a field station is provided at each end of each passing siding and that coding units are provided at the office and at each field station and are connected by a pair of line wires, not shown, over which control codes are transmitted at times from the office to a selected field station, while at other times indication codes are transmitted over the same line wires from the different field stations to the office without interference, and that the transmission of each code includes the temporary establishment of a plurality of communication channels, as for example, seven, between the office and station to position a group of relays.

Each code includes a distinctive code call by means of which a selector relay 1-2S, 2-4S or 8-8S at the office, and a similar relay, not shown, at one station only is energized to effect temporary establishment of seven communication channels between the office and the station. The different stations have different code calls, consequently, the selector relays for different stations or panels are not energized at the same time, and the same channels provide communication at different times with all of the stations.

The signal levers 2SIG, 4SIG and 6SIG on the panel of the control machine are the usual three-position levers for the control of the signal control relays at the field stations. Similarly, the switch levers SW, SW and WSW are the usual three-position levers for the control of the switch control relays at the corresponding field stations. The means by which the switch and signal levers control the switches and signals is not essential for an understanding of this invention and has been omitted in order to simplify this disclosure.

Each panel is provided with a starting button STB for operating the usual code starting relay ST by means of which control codes are initiated and the corresponding stations selected. Each starting relay, when energized, initiates a control code as described in Lewis Patent No. 2,229,240 including a code call for energizing a selector relay 9 for the same panel. Each selector relay when energized releases the associated starting relay and connects terminal B of a local source of energy to selected ones of the control channels in accordance with the positions of the switch and signal levers, and at the selected station relays are operated in accordance with the condition of energization of each of the control channels.

As shown in the drawings the starting buttons ST are of the push-pull type and each has movable contacts which are displaced to an intermediate position. When the starting button is pressed the movable contacts in one set of circuits are closed, and when the starting button is pulled the movable contacts in a different set of circuits are closed.

In addition to the usual starting relay ST, each panel is provided with an auxiliary starting relay RCST which is energized or actuated when the operator initiates transmission of a recall code to the station governed through the panel with which the auxiliary relay is associated. The relays RCST operate as hereinbefore explained to govern the recall control relay RCR, while the relay RCR, when energized, operates as explained in the above-identified patent to George W. Baughman to cause the code transmitted by the office coding unit to be a recall code instead of a normal control code.

The operation of the office coding unit in transmitting a code is governed by the counting relays of—08, while a back contact of the relay RCR is included in the circuit of these counting relays.

As explained in detail in the patent to George W. Baughman, when relay RCR is picked up the counting relays operate to cause the office coding unit to transmit the first eight or station selection steps of a code in the normal manner, but the ninth step in the code is made unusually long, after which the relay RCR releases and the office coding unit is restored to normal.

A detailed description of the manner in which the relay RCR effects this control of the office coding unit, and the effect of the recall code on the field station units is not necessary for an understanding of this invention and is fully explained in the patent to George W. Baughman. In order to simplify this disclosure and to restrict it to the structure provided by this invention, the construction of the office and field station coding units, except for the counting relays of the office coding unit, has not been shown, and it is to be understood that substantially the same in construction and operation as the corresponding units of the patent to George W. Baughman.

As shown in the drawings each starting button STB, when depressed, establishes a circuit for supplying energy to the associated starting relay,
while contacts of the starting button in additional circuits over which energy may be supplied to the starting relays for one or both of the adjoining panels are closed. These additional circuits are governed by relays BKSR so that they may be established only when a relay BKSR is picked up. The details of the control of the relays BKSR is not a part of this invention and are being omitted in order to simplify this disclosure. These relays may be controlled in the same manner as the corresponding relay of application Serial No. 567,185 filed by us on December 8, 1944, now Patent No. 3,107,367, issued November 19, 1961, and it is sufficient to state that a relay BKSR is picked up when the office equipment is operated to cause wayside apparatus for the track stretch between two field stations to change the direction of traffic in that stretch, while the relay BKSR releases when indications are received from the field stations that the wayside apparatus has established the new direction of traffic.

As previously stated, the starting buttons are of the push-pull type. Each of these buttons, when pressed, establishes a pick-up circuit for an associated auxiliary relay RCS, as well as the associated starting relay ST, while each auxiliary relay RCS, when energized or actuated, operates as hereinafter explained to cause the code transmitted to the associated field station to be a recall code instead of a control code.

It is to be understood that the contacts governed by pressing a starting button are not closed when the button is pulled, and that the contact governed by pulling the button is not closed when the button is pressed.

The equipment shown in Fig. 1 of the drawings includes relays OM and OLBP which are a part of the office coding unit. As explained in the above-identified patents to Lloyd V. Lewis and George W. Baughman, the relay OM is governed so that it is energized when and only when the office coding unit is transmitting a code, while the relay OLBP is governed so as to be picked up as long as the office line relay is operated by coded energy. The office relay is operated by coded energy during transmission of a code by the office unit and also during receipt of an indication code by this unit.

The pick-up and stick circuits of all of the starting relays ST and all of the auxiliary relays RCS, are governed by the cancelling button CB so that all of these relays may be released by pressing the button CB.

The equipment is shown in the condition which it assumes when the starting relays ST and the auxiliary relays RCS are released, showing that there are no codes stored for transmission by the office coding unit. In addition, as shown, the relays OM and OLBP are released showing that the office coding unit is neither transmitting nor receiving a code. Also, as shown, the relays 3-4BKSR and 4-5BKSR are released, indicating that the wayside apparatus prepares the main track portion between signals 2R and 4L, and between signals 4R and 6L for traffic in the direction designated by the office equipment.

If with the equipment in the condition shown the operator wishes to transmit a control code to station 3-4 for any purpose, such as to operate switch 3W, he may initiate this code by pressing the starting button 3-4STB. When the button 3-4STB is pressed, its contact 10 establishes a pick-up circuit for the starting relay 3-4ST and its contacts pick up with the result that contact

11 establishes the relay stick circuit which is governed by contact 12 of selector relay 3-4S.

In addition, when starting button 3-4STB is pressed, its contact 14 is closed and energy will be supplied to starting relay 1-2ST if contact 18 of relay 2-4BKSR is closed. Similarly, when starting button 3-4STB is pressed, its contact 15 is closed and energy will be supplied to starting relay 5-6ST if contact 17 of relay 4-5BKSR is closed. As shown in the drawings, the relays 2-4BKSR and 4-5BKSR are both released so that when starting button 3-4STB is pressed energy is not supplied to the relay 1-2ST. However, if conditions are such that pressing of starting button 3-4STB causes energy to be supplied to relay 1-2ST or 5-6ST, its contacts will pick up and establish a stick circuit for the relay, while the relay will cause a control code to be transmitted to the associated station as explained below in connection with relay 3-4ST.

When relay 3-4ST is actuated, that is, picks up, its contact 20 establishes a circuit including back contact 21 of selector relay 3-4S for supplying energy to the office coding unit to initiate transmission of a code to station 3-4, as explained in detail in the above-identified patents to Lloyd V. Lewis and George W. Baughman. During operation of the office coding unit to transmit this control code, the relay OM is picked up, while, when the office coding unit transmits the station selection steps which identify station 3-4, the selector relay 3-4S picks up. When relay 3-4S picks up, its contact 12 transfers the stick circuit for relay 3-4ST from the direct connection with terminal B of the battery to the connection governed by back contact 20 of relay OM, but as relay OM is picked up during transmission of control codes the relay 3-4ST releases and interrupts its stick circuit. The relay 3-4S is picked up during receipt of an indication code from station 3-4, and the circuit provided by back contact 23 of relay OM prevents release of relay 3-4ST at such times. When relay 3-4ST is restored to normal, that is, releases, its contact 20 in the circuit leading to the office coding unit is open so that energy is not supplied to the circuit on release of relay 3-4S which occurs at the end of the control code transmitted to station 3-4.

The code transmitted to station 3-4 at this time is a normal control code having a full complement of sixteen steps, and the function of the code will position relays at the remote station in accordance with the position of the switch and signal levers or other control means associated with this panel of the C. T. C. machine.

If relay 1-2ST or 5-6ST is picked up, it is unaffected by transmission of the control code to station 3-4, while each of these relays causes a control code to be transmitted to the associated station, and has is released when the associated selector relay 1-2S or 5-6S picks up during the transmission of this control code.

If the operator wishes to transmit a recall code to station 3-4, he may do so by pulling the starting button 3-4STB instead of pushing it. When this button is pulled, contact 25 of the button is closed so that energy is supplied to the upper winding of the auxiliary relay 3-4RCS, and its contacts pick up so that energy is supplied to push button contact 25 and front contact 26 of relay 3-4RCS to the winding of relay 3-4ST. Accordingly, the contacts of relay 3-4ST pick up and contact 11 establishes the relay stick circuit, while energy from this circuit is supplied over front contact 25 of relay 3-4RCS to the upper
winding of relay 3-4RCST and keeps the contacts of this relay picked up after the starting button is released and contact 25 opens.

When the starting button 3-4STB is pulled, the contacts 16 and 18 remain open so that energy will not be supplied to relay 1-2ST or 5-6ST regardless of the state of relays 2-4STB and 4-6STB. Accordingly, there is no possibility that transmission of a recall code to station 3-4 will result in undesired transmission of control codes to stations 1-2 and 5-6. If energy should be supplied to relay 1-2ST or 5-6ST when the recall code for station 3-4 is initiated, normal control codes would be sent to these stations and would position the control relays in accordance with the switch and signal levers on the corresponding panels. This might result in unintended clearing of a signal at one of these stations if the signal control lever on the corresponding panel is in its signal-clearing position or in the unintended putting of a signal to stop if the signal lever is in its signal stop position.

The signal at one of these stations will not clear unless the conditions are met such as a route in the opposite direction. The signal, if cleared, may be manually put to stop at once, but the associated lock relay may not be reenergized for a substantial time interval, such as six minutes, and the establishment of traffic in the desired direction will be delayed for this period of time.

If a signal is unintentionally put to stop, it may greatly delay traffic in the stretch.

Since these circuits are arranged so that operation of the starting buttons to transmit a recall code to one station cannot cause unintended transmission of control codes to adjoining stations, it eliminates the delays which might result from these unintended control codes.

As previously explained, when the starting button 3-4STB is pulled, the relays 3-4STB and 3-4RCST are energized. When the contacts of relay 3-4STB pick up, its contact 26 in the circuit leading to the office coding unit is closed so that this unit operates in the customary manner to initiate transmission of a code to field station 3-4. This, and as a result of this operation of the office coding unit the relays OLB and OM are picked up.

When relay OM picks up, its contact 23 establishes the circuit including front contact 22 of relay 3-4RCST for supplying energy to the lower winding of relay 3-4RCST so that the relay contacts remain picked up after release of relay 3-4STB.

The steps in the code which identify field station 3-4 for which the code is intended will be transmitted during the first eight code steps, the location of the station identifying elements within the first eight steps being dependent on the code call of the station. When the last one of the station identifying code elements is transmitted, the selector relay 3-4S is picked up. The operation of the office coding unit is such that selector relay S may be picked up as soon as the fourth step in a code or as late as the eighth step in this code, but in any event the selector relay S will be picked up before the ninth step in the code in reached.

When relay 3-4S picks up, its contact 12 transfers the stick circuit for relay 3-4STB to the circuit governed by back contact 23 of relay OM, and as relay OM is picked up the supply of energy to relay 3-4STB is cut off and the relay contacts release. When the supply of energy to the stick circuit for relay 3-4STB is cut off, the supply of energy to the upper winding of relay 3-4RCST is also cut off, but the contact 31 of relay 3-4RCST are maintained picked up by energy supplied to the lower winding of the relay through the circuit established by its own front contact 23 and front contact 23 of relay OM. As the contacts of relay 3-4RCST remain picked up after relay 3-4S picks up, relay 3-4RCST in the circuit of relay RCR is closed and relay RCR is certain to be picked up.

The two windings of relay 3-4RCST are independent and the energy supplied to the lower winding cannot reach the starting relay 3-4STB. If energy supplied to relay 3-4RCST over front contact 23 of relay OM should reach relay 3-4STB, it would prevent release of this relay and the continued energization of the relay would cause the office coding unit to repeat the code to station 3-4 indefinitely. The circuit arrangement shown in the drawings eliminates this possibility and insures that relay 3-4STB will release at the proper time.

When relay 3-4S picks up and relay 3-4RCST is picked up, energy is supplied over front contact 21 of relay 3-4S, front contact 30 of relay 3-4RCST, and front contact 31 of relay OM to relay RCR and its contacts pick up with the result that contact 33 of relay RCR establishes the circuit including front contact 34 of relay OLB for supplying energy to the recall control relay RCR. In addition, as explained in the above-identified patent to George W. Baughman, when relay RCR picks up, one of the relay contacts interrupts the pick-up circuit for relay OLB of the office coding unit with the result that the ninth step of the code is made exceptionally long. During this long ninth step in the code the office line relay OM, not shown, remains released and the relays OM and OLB become released with the result that contact 31 of relay RCST, relays 3-4STB and 3-4RCST pick up, the pick-up circuit for relay RCR and contact 34 of relay OLB interrupts the stick circuit for relay RCR. Accordingly, the contacts of relay RCR release and the contact of this relay in the circuit of relay OLB of the coding unit is closed, but before this occurs the office coding unit will be restored to normal and will not continue with the transmission of the code to station 3-4 after release of relay RCR.

In addition, on release of relay OM its contact 23 interrupts the circuit for supplying energy to the lower winding of relay 3-4RCST and its contacts release with the result that the relay thereafter remains released until picked up by operation of starting button 3-4STB.

At field station 3-4, as explained in the patent to George W. Baughman, the equipment responds in the normal manner to the first eight steps of the code, while the unusually long ninth step in the recall code will not operate any of the function control relays, but will cause the starting relay for the station 3-4STB to operate so that this station will transmit an indication code to the office as soon as the line becomes free. This indication code, when received at the office, will inform the operator of traffic conditions at the station.

The equipment operates in a similar manner when it is desired to transmit a recall code to one of the other stations, and a detailed descrip-
tion of the operation of the equipment at such times is not necessary. This apparatus is arranged so that if at the time the operator decides to send a recall code to station 3—4 a control code is awaiting transmission to another station, the recall code for station 3—4 will not interfere with this stored control code, nor will the stored control code interfere with the recall code for station 3—4.

For purposes of illustration it will be assumed that the operator has pressed a starting button to engage the starting relay for one of the other stations, such as station 5—6, and that this control code has not been transmitted at the time the operator decides to send a recall code to station 3—4. Under these conditions, relay 5—6ST is picked up at the time the starting button 3—4ST is pushed to pick up relays 3—4ST and 3—4RCST.

When relays 3—4ST and 5—6ST are both picked up, each establishes a circuit over which energy may be supplied to the office coding unit to cause this unit to transmit a code. At such times, the office coding unit operates as explained in the above-identified patent to Lloyd V. Lewis to transmit a code first to one station and then to the other station, the order of transmission of the codes to the two stations being determined by the relative superiority of the code calls assigned to the two stations.

As explained above, when the code is transmitted to stations 3—4, the relay 3—4ST picks up to release the starting relay 3—4ST and to pick up the relay RCR so that the code sent to station 3—4 is a recall code. This method of operation takes place regardless of whether the code sent to station 3—4 is transmitted before or after the code is sent to station 5—6. This is true because the operation of the equipment for the panel governing station 3—4 is in no way affected by the position of the contacts of relay 5—6ST or the operation of the office coding unit in transmitting a code to station 5—6.

Similarly, relay 5—6ST remains picked up until a code is transmitted to the associated station, whereupon it releases. During transmission of the code to station 5—6 the contact 32 of relay 5—6ST and front contact 31 of relay OM are closed, but energy is not supplied to relay RCR since contact 38 of relay 5—4RCST is open.

Accordingly, relay RCR remains released and the code sent to station 5—6 will not be a recall code, but will be a normal control code and will position the function control relays at that station in accordance with the position of the levers on the panel in the office. This is proper since the code sent to station 5—6 was intended to be a control code and not a recall code. Since the code sent to station 5—6 is certain to be a normal control code the functions which the operator intended to have performed when he initiated the transmission of the control code to this station are certain to be carried out.

If the control code stored for transmission to station 5—6 should be converted to a recall code, the starting relay 5—6ST would be released as a result of transmission of the recall code and the control code intended for this station would not be transmitted, while the functions intended to be performed by the control code would not be carried out. Although the failure of these functions to be carried out cannot create a hazardous condition, and the operator can readily correct the situation by pressing the starting button 5—6ST to pick up the relay 5—6ST and thereby cause a control code to be transmitted, considerable time might elapse before the operator becomes aware of the fact that the control code intended for station 5—6 has been cancelled and as a result there might be considerable delay in the control of traffic in the stretch. This recall control system eliminates this potential source of delay by insuring that if a recall code to one station does not interfere with the transmission of a control code stored for transmission to another station.

This recall control system operates so that if at the time the operator decides to send a recall code to station 3—4 a control code is stored for transmission to that station, the control code will not be sent to that station but will be cancelled in favor of the recall code.

For example, if the operator presses the starting button 3—4ST to send a control code to station 3—4, the relay 3—4ST will be picked up and will remain picked up until the code is transmitted to this station. If, before the code is sent to station 3—4, the operator decides to send a recall code to this station and pulls the starting button 3—4ST, the relay 3—4ST will be picked up and the relay 3—4ST will remain picked up. As explained above, the code sent to station 3—4 after picking up of relay 3—4RCST will be a recall code, and will release relays 3—4ST and 3—4RCST at the office, while this recall code will cause the field station to transmit an indication code to the office. This indication code will show conditions at the field station and from it the operator can determine whether a control code should be sent to the station.

Modification shown in Fig. 2

In Fig. 2 of the drawings there is shown a modified form of recall code control means similar to that shown in Fig. 1 but operating to insure prompt transmission of the recall code and of the indication code from the recalled station.

Except as hereinafter specifically pointed out the modification shown in Fig. 2 is substantially the same in construction and operation as the modification shown in Fig. 1.

The modification shown in Fig. 2 employs the means shown and claimed in application for Letters Patent of the United States Serial No. 708,920, filed by us on November 9, 1946, for Centralized Traffic control systems, for governing the transmission of codes by the office coding unit so that a code may be sent to a station before a code is sent to a superior station, and so that codes stored for transmission will not be transmitted until predetermined conditions are complied with.

In the modification shown in Fig. 2 the transmitting circuits governed by the starting relays for supplying energy to the office coding unit to cause it to transmit a code, such as the circuit including front contact 28 of relay 3—4ST, are governed by contacts of the auxiliary relays RCST so that whenever an auxiliary relay is picked up, energy is supplied between the associated starting relay, while the supply of energy to the transmitting circuits governed by all of the other starting relays is interrupted.

Referring to Fig. 2 of the drawings it will be seen that the control code is transmitted over a circuit including in series with a back contact of each of the auxiliary relays RCST in the office machine. As shown this code transmission control circuit includes back contact 40 of relay 1—RCST, back contact 41 of relay 3—4RCST, and back contact 42 of relay 45—4ST.
5—4RCST, as well as a back contact of corresponding relays (not shown) for other panels in the machine. Accordingly, this circuit is complete when and only when all of the relays RCST are released.

Each auxiliary relay RCST, when released, connects a contact of the associated selector relay S to the code transmission control circuit governed by the back contacts of the relays RCST in series, and when picked up connects the selector relay contact directly to terminal B of the battery. For example, when relay 5—4RCST is released, contact 21 of selector relay 5—4S is connected over back contact 44 of relay 2—4RCST to the circuit governed by back contacts of all of the auxiliary relays, and when relay 3—4RCST is picked up contact 21 of selector relay 3—4S is connected directly to terminal B of the source.

Accordingly, when relay 2—4RCST is released, energy will be supplied to the transmitting circuit governed by contact 21 of selector relay 3—4S only if every other auxiliary relay RCST in the machine is released. On the other hand, when relay 3—4RCST is picked up, energy will be supplied to the transmitting circuit governed by contact 21 of relay 3—4S irrespective of the condition of the other auxiliary relays in the machine.

The modification shown in Fig. 2 further differs from that shown in Fig. 1 in the arrangement of the pick-up and stick circuits for the auxiliary relays. In the modification shown in Fig. 2 these circuits are governed by a back contact of the delivery relay D. Each panel in the machine includes a delivery relay D, which is normally released and is picked up momentarily at the end of an indication code from the associated field station, as explained in detail in the above-identified patent to Lloyd V. Lewis.

The operation of the modification shown in Fig. 2 in transmitting a normal control code to a station is substantially the same as the modification shown in Fig. 1 and a detailed explanation of the operation of the equipment at such times is unnecessary.

If the operator wishes to send a recall code to station 3—4, he may do so by pulling the starting button 3—4STB so that contact 25 establishes the circuit including back contact 45 of relay 3—4D for supplying energy to the upper winding of relay 3—4RCST. If, at the time the starting button 3—4STB is pulled, the relay 3—4D is picked up showing that an indication code is being received from station 3—4, the relay 3—4RCST will remain released and the recall code will not be initiated. This is proper since the indication code which is being received provides the information which the recall code is intended to secure so the recall code is unnecessary.

If, at the time the starting button 3—4STB is pulled, the relay 3—4D is released, energy will be supplied to the upper winding of relay 3—4RCST and its contacts will pick up. When relay 3—4ST picks up, its contact 11 establishes the relay stick circuit over front contact 29 of relay 3—4RCST to the upper winding of the relay to insure that the relay contacts remain picked up as long as relay 3—4ST is picked up. At this time energy is supplied to the lower winding of relay 3—4RCST over the circuit including front contact 29 of relay 3—4RCST and back contact 45 of relay 3—4D.

When relay 3—4RCST picks up, its contact 41 interrupts the code transmission control circuit which includes back contacts of all of the auxiliary relays in series, while contact 44 of relay 3—4RCST disconnects relay 3—4S from this circuit and connects it directly to terminal B so that energy is supplied over back contact 21 of relay 3—4S and front contact 28 of relay 3—4ST to the office coding unit to cause it to send a code to station 3—4.

When relay 3—4RCST picks up and relays 1—2RCST and 5—4RCST are released, contact 41 of relay 3—4RCST interrupts the transmitting circuit governed by back contact 48 of relay 5—6S and front contact 47 of relay 5—6ST for supplying energy to the office coding unit. At this time contact 41 of relay 3—4RCST also interrupts the transmitting circuit governed by back contact 48 of relay 1—2S and front contact 49 of relay 1—2ST for supplying energy to the office coding unit. As a result, after relay 3—4RCST picks up, the relays 1—2ST and 5—6ST are ineffective to control the office coding unit to cause codes to be transmitted to these stations.

Accordingly, if the operator had caused relay 1—2ST or 5—6ST to be energized so as to cause a control code to be sent to either or both of these stations, but these codes had not been transmitted before the operator decided to send the recall code to station 3—4, so that relays 1—2ST and 5—6ST are picked up at the time relay 3—4RCST becomes picked up, the office coding unit will not operate to send codes to stations 1—2 and 5—6 as long as relay 3—4RCST is picked up. The transmission of the recall code to station 3—4, therefore, is not delayed by transmission of stored control codes to superior stations. As hereinafter explained, after transmission of the recall code to station 3—4, the relay 3—4RCST remains picked up until an indication code is received from that station. As a result, after transmission of the recall code to station 3—4, the code line will not be occupied by transmission of stored control codes to inferior stations.

It will be seen that the operation of the office equipment is such that when a recall code is initiated it prevents transmission of codes to any station except the recalled station. As a result, the recall code is transmitted promptly and the code line is then made available for the indication code from the recalled station.

As previously explained, when relays 3—4RCST and 3—4ST are picked up, energy is supplied over front contact 44 of relay 3—4RCST, back contact 21 of relay 3—4S, and front contact 29 of relay 3—4ST to the office coding unit and causes it to transmit a code to station 3—4, while the relays OM and OILB are picked up. When the station selection steps of the code are transmitted, the relay 3—4S picks up and its contact 12 transfers the stick circuit for relay 3—4ST to the circuit governed by contact 23 of relay OM which is open at this time. Accordingly, relay 3—4ST delivers while the supply of energy to the upper winding of relay 3—4RCST is cut off, but the contacts of relay 3—4RCST are maintained picked up by energy supplied to the lower winding of the relay over the circuit governed by back contact 48 of relay 3—4D. As relay
3—4RCST remains picked up after relay 3—4S picks up, energy is supplied over front contact 44 of relay 3—4RCST, front contact 21 of relay 3—4S, front contact 30 of relay 3—4RCST, and front contact 31 of relay OM to relay RCR and its contacts pick up to establish the relay stick circuit, and to alter the operation of the office coding unit so that the code sent to station 3—4 is a recall code with the abnormally long ninth step.

As explained in connection with Fig. 1, the transmission of the recall code results in release of relays 3—4S, OLSP, RCR, and OM, but in this modification the relay 3—4RCST is maintained picked up by energy supplied over back contact 46 of relay 3—4D. As relay 3—4RCST remains picked up its contact 41 continues to interrupt the transmitting circuits governed by the selector and starting relays of the other panels for supplying energy to the office coding unit to cause codes to be transmitted to the field stations controlled through these panels. Accordingly, after the recall code to station 3—4 has been transmitted, the office coding machine ceases to transmit and is prepared to receive indication codes. When relay 3—4RCST is energized the starting relay at this station and thereby causes an indication code to be sent from this station to the office.

Prior to the transmission of the recall code to station 3—4 the starting relay at one or more source stations may be energized as a result of train movement or of control codes received from the office. If there are indication codes stored at stations superior to station 3—4 these indication codes will be transmitted prior to the indication code from station 3—4. Since this recall control means operates to prevent transmission of control codes as soon as a recall code is initiated, the number of stations having indication codes stored for transmission is held to the minimum so there is a minimum of delay in the transmission of the indication code from station 3—4 to the office.

When the indication code from station 3—4 is received at the office the relay 3—4D picks up momentarily to cause indication relays, not shown, to be positioned in accordance with conditions at the field station, while contact 44 of relay 3—4D interrupts the supply of energy to the lower winding of relay 3—4RCST and its contacts release so that contact 26 is open and prevents supply of energy to the relay winding on release of relay 3—4D.

When relay 3—4RCST releases its contact 41 in the circuit governed by back contacts of all of the relays RCST is closed and, if the starting relay for any panel is picked up, energy will be supplied to the office coding unit to cause a control code to be transmitted to the corresponding station.

The equipment operates in a similar manner during transmission of a recall code to one of the other stations, as for example, station 5—6. When a recall code is to be sent to this station the starting button 5—6STB is pulled to pick up relays 5—6RCST and 5—6ST. When relay 5—6RCST picks up, its contact 42 interrupts the circuit governed by back contacts of all the relays RCST so that control codes will not be transmitted to other stations until the indication code is received at the station. On receipt of the indication code from station 3—4, relay 5—6RCST is picked up, its contact 36 connects contact 35 of relay 5—6S to terminal B of the source so that a code will be sent to station 5—6 and so that this code will be a recall code. When an indication is received from the recalled station the relay 5—6D picks up momentarily and releases the relay 5—6RCST and on closing of its contact 42 energy may be supplied to the other panels to cause a control code to be sent if the starting relay for a panel is picked up. This control code may be arranged so that the operator may initiate recall codes to more than one station if he desires to do so. For example, the operator may wish to obtain indications from station 3—4 and station 5—6 and in order to do so he pulls the starting buttons 3—4ST and 5—6STB, thereby picking up relays 3—4RCST and 3—4ST and also picking up relays 5—6RCST and 5—6ST. When relay 3—4RCST picks up, its contact 44 establishes the transmitting circuit governed by relays 3—4S and 3—4ST for causing the office coding unit to initiate a code. Accordingly, when relay 3—6RCST is picked up, its contact 50 establishes the transmitting circuit governed by relays 5—6S and 5—6ST for causing the office coding unit to initiate a code. Accordingly, a code will be sent to station 3—4 even though contact 43 of relay 5—6RCST is open, and the code will be sent to station 5—6 even though contact 41 of relay 3—4RCST is open. As relays 3—4RCST and 5—6RCST are picked up, control codes will not be sent to other stations until indication codes are received from both of the recalled stations. For example, if relay 1—2ST is picked up showing that a control code is to be sent to station 1—2, this code will not be sent as long as either relay 3—4RCST or relay 5—6RCST is picked up.

When recall codes are initiated to stations 3—4 and 5—6, the codes to these stations will be transmitted one at a time, the order of transmission of the codes to the two stations being determined by the code calls assigned to these stations. The relay RCR picks up during the code transmitted to each of these stations so that the codes originate at the corresponding stations. As stated above, as long as either of the relays RCST is picked up the office is prevented from transmitting control codes so indication codes from the recalled stations will not be delayed by control codes, and the stored control codes will be transmitted only after recall codes are received from all of the stations which have been recalled.

The modification shown in Fig. 2 is similar to that shown in Fig. 1 in that a recall code intended for a station is certain to be sent to that station and not to another station, while transmission of a recall code from station 3—4 to station 5—6 is so arranged that cancelation of control codes stored for transmission to other stations. In the modification shown in Fig. 2, after a recall code is initiated, transmission
of control codes to other stations is deferred until the indication is received from the recalled station, at which time the control codes are automatically transmitted and carry out the functions intended until they were initiated.

The modification shown in Fig. 2 is also similar to that shown in Fig. 1 in that if a control code is stored for transmission to a station at the time the operator decides to send a recall code to the station, the control code for that station will be cancelled in favor of the recall code. The indication code received in response to the recall code will inform the operator whether or not a control code should be sent to the station.

Although we have illustrated and described two forms of recall control means embodying our invention, it is to be understood that numerous changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of our invention.

Having thus described our invention, what we claim is:

1. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different control codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at each station including an auxiliary relay having contacts which normally occupy a first position, manually controlled circuit means for said recall means, said control means comprising for each station an auxiliary relay having contacts which normally occupy a first position, manually controlled circuit means effective when the operator actuates control devices to transmit a recall code to a selected station for moving the contacts of the auxiliary relay for that station to their second position, means for actuating said recall means when the office code transmitter transmits a code including the selecting elements designating a station and the contacts of the auxiliary relay for that station are in their second position, and means for each auxiliary relay effective subsequent to the indication of the selecting elements of a code designating the corresponding station for causing the relay contacts to move from their second to their first position.

2. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different control codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at each station including an auxiliary relay having contacts which normally occupy a first position, manually controlled circuit means for said recall means, said control means comprising for each station an auxiliary relay having contacts which normally occupy a first position, manually controlled circuit means effective when the operator actuates control devices to transmit a recall code to a selected station for moving the contacts of the auxiliary relay for that station to their second position, means for actuating said recall means when the office code transmitter transmits a code including the selecting elements designating a station and the contacts of the auxiliary relay for that station are in their second position, and means for each auxiliary relay effective subsequent to the indication of a code designating the corresponding station for causing the relay contacts to move from their second to their first position.
of transmission of a code to the corresponding station, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay having contacts which normally occupy a first position, a starting button at the office for each station, each starting button being selectively operative so that at times it will cause the associated starting relay to be actuated and at other times will cause the associated auxiliary relay to be actuated and will also govern the associated auxiliary relay to move its contacts to their second position, means for actuating said recall means when the office code transmitter transmits a code including the selecting elements designating a station and the contacts of the auxiliary relay for that station are in their second position, and means for each auxiliary relay effective subsequent to actuation of the recall means over the circuit governed by said auxiliary relay for causing the relay contacts to move to their first position.

5. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being effective when actuated to render effective a circuit governing the code transmitter to cause a code to be sent to the corresponding station and being restored to normal in consequence of transmission of a code to the corresponding station, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and a starting button, each starting button controlling circuits for actuating the associated starting and auxiliary relays and also controlling a supplemental starting circuit which at times may actuate the starting relay for a station other than that with which the button is associated, said circuits being arranged so that the starting button when operated in one manner causes the associated starting relay to be actuated and also governs said supplemental starting circuit so that the starting relay governed thereby may be actuated, said circuits also being arranged so that the starting button when operated in a different manner causes the associated starting and auxiliary relays to be actuated but does not govern said supplemental starting circuit to actuate the starting relay governed thereby, means for actuating said recall means when the office code transmitter transmits a code including the selecting elements designating a station and the auxiliary relay for that station is actuated, and means for each auxiliary relay effective subsequent to actuation of the recall means over the circuit governed by said auxiliary relay for causing the auxiliary relay to be restored to normal.

6. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being effective when actuated to render effective a circuit governing the code transmitter to cause a code to be sent to the corresponding station and being restored to normal in consequence of transmission of a code to the corresponding station, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and a starting button, each starting button controlling circuits for actuating the associated starting and auxiliary relays and also controlling a supplemental starting circuit which at times may actuate the starting relay for a station other than that with which the button is associated, the circuits controlled by each starting button being arranged so that the starting button when operated in one manner causes the associated starting relay to be actuated and also governs said supplemental starting circuit so that the starting relay governed thereby may be actuated, said starting button being ineffective when operated in said one manner to actuate the associated auxiliary relay, said circuits also being arranged so that the starting button when operated in a different man-
her causes the associated auxiliary relay to be actuated, and to thereafter cause the associated starting relay to be actuated, said starting button being ineffective when operated in said different manner to govern said supplemental starting circuit to actuate the starting relay-governed thereby, means for actuating said recall means when the office code transmitter transmits a code including the selecting elements designating a station and the auxiliary relay for that station is actuated and the code transmitter to relay for causing the relay to be restored to normal provided the associated starting relay has been restored to normal, the restoring means for each auxiliary relay being automatically rendered effective subsequent to actuation of the recall means over the circuit governed by the auxiliary relay.

8. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being effective when actuated to render effective a circuit governing the code transmitter to cause a code to be sent to the corresponding station and being restored to normal in consequence of transmission of a code to the corresponding station, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and manually controlled circuit means, each such circuit means being selectively operative to at times actuate the associated starting relay without actuating the associated auxiliary relay and to at other times actuate the associated auxiliary relay and to thereafter actuate the associated starting relay, means for actuating said recall means when the office code transmitter transmits a code including the selecting elements designating a station and the auxiliary relay for that station is actuated, and means for each auxiliary relay for causing the relay to be restored to normal provided the associated starting relay has been restored to normal, the restoring means for each auxiliary relay being automatically rendered effective subsequent to actuation of the recall means over the circuit governed by the auxiliary relay.

9. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being effective when actuated to render effective a circuit governing the code transmitter to cause a code to be sent to the corresponding station and being restored to normal in consequence of transmission of a code to the corresponding station, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and manually controlled circuit means, each such circuit means being selectively operative to at times actuate the associated starting relay without actuating the associated auxiliary relay and to at other times actuate the associated starting relay and to also actuate the associated auxiliary relay, means for each auxiliary relay for automatically causing the relay to be restored to normal subsequent to transmission of a code to the associated station, and means operative when and only when said code transmitter transmits a code designating a station and the auxiliary relay associated with that station is actuated for actuating said recall means.

10. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being effective when actuated to render effective a circuit governing the code transmitter to cause a code to be sent to the corresponding station and being restored to normal in consequence of transmission of a code to the corresponding station, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and manually controlled circuit means, each such circuit means being selectively operative to at times actuate the associated starting relay without actuating the associated auxiliary relay and to at other times actuate the associated starting relay and to also actuate the associated auxiliary relay, means for each auxiliary relay for automatically causing the relay to be restored to normal subsequent to transmission of a code to the associated station, and means operative when and only when said code transmitter transmits a code designating a station and the auxiliary relay associated with that station is actuated for actuating said recall means.
the equipment at the office including a starting relay for each station, each starting relay being effective when actuated to render effective a circuit governing the code transmitter to cause a code to be sent to the corresponding station and being restored to normal in consequence of transmission of a code to the corresponding station, the equipment at the office also including means for receiving indication codes from the different field stations, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and manually controlled circuit means, each such circuit means being selectively operative to at times actuate the associated starting relay without actuating the associated auxiliary relay and at other times actuate the associated starting and auxiliary relays, means for actuating said recall means when the office code transmitter transmits a code including the selecting elements designating a station and the auxiliary relay for that station is actuated, and means for each auxiliary relay responsive to receipt of an indication code from the associated station for causing the auxiliary relay to be restored to normal.

12. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being effective when actuated to render effective a circuit governing the code transmitter to cause a code to be sent to the corresponding station and being restored to normal in consequence of transmission of a code to the corresponding station, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and manually controlled circuit means, each such circuit means being selectively operative to at times actuate the associated starting relay without actuating the associated auxiliary relay and at other times actuate the associated starting and auxiliary relays, means for actuating said recall means when the office code transmitter transmits a code including the selecting elements designating a station and the auxiliary relay for that station is actuated, and means for each auxiliary relay for causing the relay to be restored to normal provided the associated starting relay has been restored to normal.

13. In a remote control system of the type having an office and a plurality of stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being effective when actuated to render effective a circuit governing the code transmitter to cause a code to be sent to the corresponding station and being restored to normal in consequence of transmission of a code to the corresponding station, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and manually controlled circuit means, each such circuit means being selectively operative to at times actuate the associated starting relay without actuating the associated auxiliary relay and at other times actuate the associated starting and auxiliary relays, means for actuating said recall means when the office code transmitter transmits a code including the selecting elements designating a station and the auxiliary relay for that station is actuated, and means for each auxiliary relay for causing the relay to be restored to normal provided the associated starting relay has been restored to normal.

14. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being effective when actuated to render effective a circuit governing the code transmitter to cause a code to be sent to the corresponding station and being restored to normal in consequence of transmission of a code to the corresponding station, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and manually controlled circuit means, each such circuit means being selectively operative to at times actuate the associated starting relay without actuating the associated auxiliary relay and at other times actuate the associated starting and auxiliary relays, means for actuating said recall means when the office code transmitter transmits a code including the selecting elements designating a station and the auxiliary relay for that station is actuated, and means for each auxiliary relay for causing the relay to be restored to normal provided the associated starting relay has been restored to normal.
cept of an indication code from the associated station for causing the auxiliary relay to be re-
stored to normal.
15. In a remote control system of the type hav-
ing an office and a plurality of stations, the equip-
ment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being adapted when actuated to render effective a control circuit for causing said code transmitter to transmit a code to the corresponding station, the equipment at the office including means for receiving indication codes from the different field stations, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and manually controlled circuit means for said auxiliary relay when actuated conditioning the associated starting relay and to at other times actuate the associated starting and auxiliary relays, each auxiliary relay when actuated rendering effective a circuit operative to actuate said recall means when said code transmitter transmits a code designating the station with which said auxiliary relay is associated, and means for each auxiliary relay for causing the relay to be restored to normal upon actuation of the associated relay provided the associated starting relay has been restored to normal.
16. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being adapted when actuated to render effective a control circuit for causing said code transmitter to transmit a code to the corresponding station, the equipment at the office including means for receiving indication codes from the different field stations, the combination with the foregoing apparatus of control means for said recall means, said control means comprising for each station an auxiliary relay and manually controlled circuit means for said auxiliary relay when actuated conditioning the associated starting relay and to at other times actuate the associated starting and auxiliary relays, each auxiliary relay when actuated rendering effective a circuit operative to actuate said recall means when said code transmitter transmits a code designating the station with which said auxiliary relay is associated, and means for each auxiliary relay for causing the relay to be restored to normal upon actuation of the associated relay provided the associated starting relay has been restored to normal.
17. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including a starting relay for each station, each starting relay being adapted when actuated to render effective a circuit operative to actuate said recall means when said code transmitter transmits a code designating the station with which said auxiliary relay is associated, and means for each auxiliary relay for causing the relay to be restored to normal upon actuation of the associated relay provided the associated starting relay has been restored to normal.
transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at each station including a code transmitter for transmitting indication codes to the office for indicating the condition of said movable devices and also including starting means for initiating the operation of the associated transmitter in response to a change in the condition of any of the movable devices at such station and also in response to said interrupted code provided the interrupted code includes the selecting elements to which such station is selectively responsive, the equipment at the office including means for receiving indication codes from the different field stations, the equipment at the office also including for each station a transmitting circuit operative when rendered effective to cause the office code transmitter to transmit a code to the corresponding station, the equipment at the office including in addition a starting relay for each station effective when actuated to render effective the associated transmitting circuit, each starting relay being restored to normal in consequence of transmission of a code to the corresponding station, the combination with the foregoing means of control means comprising for each station an auxiliary relay and a circuit means controllable by the operator in one manner to actuate the auxiliary relay and circuit means without actuating the associated auxiliary relay and controllable in a different manner to actuate the associated auxiliary relay, means for each station including the auxiliary relay for that station and effective only when said auxiliary relay is actuated for rendering the associated transmitting circuit effective and to also render effective a circuit for actuating said recall means when said office code transmitter transmits a code including the selecting elements designating the station with which said auxiliary relay is associated, and means for each auxiliary relay responsive to receipt at the office of an indication code from the corresponding station for causing the relay to be restored to normal.

19. In a remote control system of the type having an office and a plurality of field stations, the equipment at the office including a code transmitter for transmitting different codes to said stations each comprising a first group of elements adapted to select a station and a second group of elements for operating movable devices at the selected station and also including recall means effective when actuated to cause the first group of elements of a code transmitted by said code transmitter to be followed by a single delivery element in place of said second group of elements, the equipment at the office including for each station a transmitting circuit operative when rendered effective to cause the code transmitter to transmit a code to the office, the equipment at the office also including for each station a starting relay effective when actuated to render effective the associated transmitting circuit, each starting relay being restored to normal in consequence of transmission of a code to the corresponding station, the combination with the foregoing means of control means comprising for each station an auxiliary relay and a starting button, each starting button being manually controllable in a first or a second manner, each starting button being operative when controlled in the first manner to actuate the associated starting relay and also controlling a circuit for actuating the starting relay for a station other than that with which the starting button is associated, each starting button when controlled in said first manner being incapable of actuating the associated auxiliary relay, each starting button being operative when controlled in said second manner to actuate the associated auxiliary relay and being incapable of actuating the starting relay for a station other than that with which the starting button is associated, means for each station including the auxiliary relay for that station and effective only when said auxiliary relay is actuated for rendering the associated transmitting circuit effective and also to render effective a circuit for actuating said recall means when said office code transmitter transmits a code including the selecting elements designating the station with which said auxiliary relay is associated, and means for each auxiliary relay responsive to subsequent to actuation of said recall means over the circuit governed by said auxiliary relay for restoring the relay to normal.

FRANK T. PASCOE, ARTHUR L. JEROME.

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