

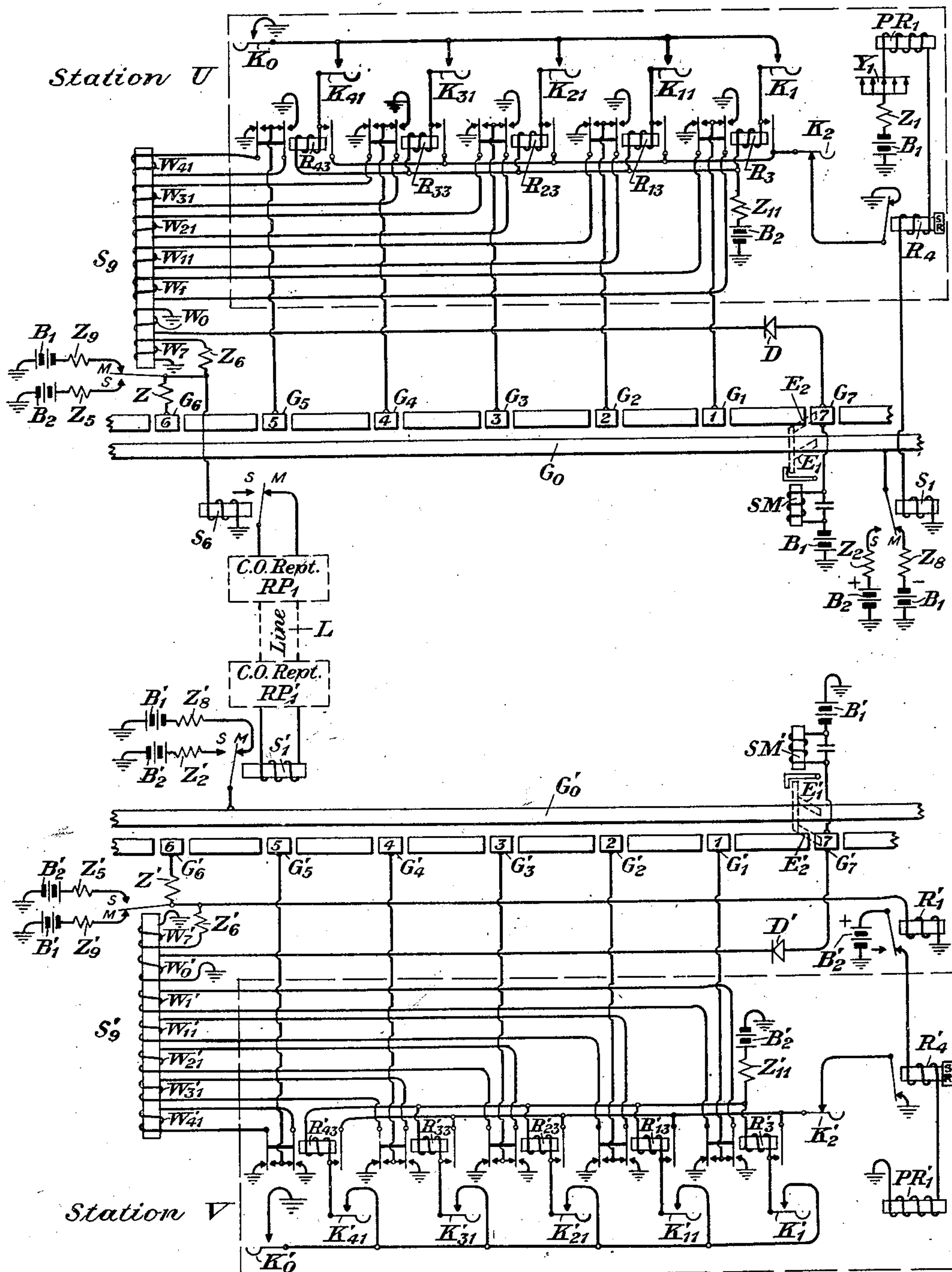
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M. L. GREENE

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TELETYPEWRITER SECRECY SYSTEM

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INVENTOR
M. L. Greene
BY *Jefferson Echolich*
ATTORNEY

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TELETYPEWRITER SECRECY SYSTEM

Monte Lee Greene, St. Louis, Mo., assignor to
American Telephone and Telegraph Company,
a corporation of New York

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This invention relates to secrecy systems. More particularly this invention relates to telegraph and teletypewriter systems which are arranged for the secret transmission of signals.

It has heretofore been the practice in teletypewriter systems, for example, to obtain some degree of secrecy by specially arranging the sending contacts and the receiving code bars of the teletypewriter machines. In such prior secrecy systems each teletypewriter signal or character—which usually includes five marking or spacing pulses in the ordinary Baudot code system—undergoes a change in one of its five pulses as, for example, the second pulse, the second pulse being reversed from its normal code at the transmitter from marking to spacing or vice versa. The system is so arranged that a corresponding reversal in the changed pulse, for example, the second pulse, is caused to take place at the code bars in the receiving machine so as to reproduce the original signal or character.

This prior secrecy arrangement has the disadvantage, however, that the "scrambling" is uniform and consistent in that it always takes place in the same pulse—for example, the second pulse—of every teletypewriter signal or character. Due to the uniformity of the "scrambling" process, the messages may be decoded readily by unauthorized parties. Moreover, considerable time and expense is required to rearrange the sending contacts and the receiving code bars of this coding system so as to bring about a reversal of one of the other of the five pulses of the signals or characters. Therefore frequent changes in the "scrambling" practice are impractical.

Accordingly it is one of the objects of this invention to provide a secrecy system for teletypewriter signaling circuits in which the operator may promptly change any desired one of the five pulses merely by closing a contact. In reversing a desired pulse of the transmitter the circuit arrangement to achieve this object will also be set up to simultaneously reverse the same pulse at the receiver so that the signals will be rendered intelligible to authorized parties at the receiver.

It is another object of this invention to permit the operator to change more than one of the various pulses of the teletypewriter signals whenever desired. This will entail a corresponding reversal of the same pulses in the same order at the receiver to reproduce the original signals.

Another object of this invention is to enable an operator to provide secrecy in a teletypewriter signaling system by arranging the circuit so that the changed pulse or pulses may be promptly varied from time to time under control of the operator at the transmitter.

Still another object of this invention is to provide a secrecy system for teletypewriter circuits in which the secrecy introduced by changing the

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pulses as above referred to may be quickly eliminated by sending, for example, a signal such as the character designated "Blank" from the transmitter. Thus by operating the "Blank" key all of the signals or characters will become unreversed or "unscrambled" and therefore rendered intelligible at both the transmitter and receiver.

These and other objects of this invention will be better understood from the detailed description hereinafter following when read in connection with the accompanying drawing which shows one embodiment of the invention merely for the purpose of illustration.

In the drawing there are shown two stations—a transmitting station U and a receiving station V—at each of which there is teletypewriter keyboard apparatus of well-known type (not shown) and regenerative repeater equipment. Only portions of the repeater equipment are shown along with additional equipment to be described all of which comprises this invention. The apparatus at the two stations is the same in many respects, the reference characters at one of the stations being primed to designate like apparatus.

The sending station includes, among other things, sending apparatus designated Y_1 and a receiving magnet designated PR_1 . The receiving magnet PR_1 controls selecting mechanism of well-known type (not shown), together with a plurality of contacts designated K_0 , K_1 , K_{11} , K_{21} , K_{31} and K_{41} , and another contact designated K_2 . These contacts may be part of or incorporated in the teletypewriter equipment. The contacts K_0 , K_1 , K_{11} , K_{21} , K_{31} and K_{41} are employed to control the pulse-changing equipment so as to change any one or more of the five pulses characteristic of each teletypewriter signal or character from marking to spacing, or vice versa. The contact K_2 will be employed to return the pulse-sending equipment to its normal or "unscrambled" condition. The contacts K_1 , K_{11} , K_{21} , K_{31} and K_{41} control relays R_3 , R_{12} , R_{23} , R_{33} and R_{43} , respectively, which in turn control the direction of current flow through the windings W_1 , W_{11} , W_{21} , W_{31} and W_{41} , respectively of a relay S_9 . At the same time that any of the contacts K_1 , K_{11} , K_{21} , K_{31} and K_{41} are operated, the magnet PR_1' at the receiving station will be energized to operate the corresponding contacts K_1' , K_{11}' , K_{21}' , K_{31}' and K_{41}' . The latter contacts will control the direction of current flow through windings W_1' , W_{11}' , W_{21}' , W_{31}' and W_{41}' , respectively. The operation of one of the contacts, such as K_1 at the transmitting station, will in turn bring about the operation of the contact K_1' at the receiving station so as to re-invert at the receiving station the pulse controlled by contact K_1 into its normal or "unscrambled" position.

In the idle condition of the apparatus contacts K_0 , K_1 , K_{11} , K_{21} , K_{31} and K_{41} at the transmitter

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are open and contact K_2 is closed. Current flows from battery B_1 through resistor Z_1 and the sending equipment Y_1 , the receiving magnet PR_1 , the winding of relay R_4 and the winding of relay S_1 . The armature of relay S_1 is then positioned against its marking contact M . The armature of relay S_9 is also held against its marking contact M , current flowing over a circuit which includes battery B_1 , resistor Z_9 , the armature and marking contact M of relay S_9 , resistor Z_6 , the winding W_7 of relay S_9 and ground. The winding of relay S_6 is in parallel with resistor Z_6 and winding W_7 , and hence the armature of relay S_6 will be held against its contact M . Relay S_1' at the receiver will then also be energized by current transmitted through repeaters RP_1 and RP_1' . Also, relay S_9' will be held operated by the flow of current through its winding W_7' over a circuit including battery B_1' , resistor Z_9' , the armature and contact M of relay S_9' , resistor Z_6' , winding W_7' of relay S_9' and ground. Current will also flow from battery B_1' through resistor Z_9' and the armature and contact M of relay S_9' , over a circuit including the windings of relay R_1' , relay R_4' and the receiving magnet PR_1' .

When one of the keys of the keyboard (not shown) corresponding, for example, to the letter "A," is operated, the starting pulse—which is a spacing pulse—will open the circuit of the transmitting equipment Y_1 to release relay S_1 , the armature of which will then close its spacing contact S . This will also release the receiving magnet PR_1 . Upon the closure of contact S of relay S_1 , current will then flow from battery B_2 through resistor Z_2 and the armature of relay S_1 , over the common segment G_0 of the distributor apparatus, then over brushes E_1 and E_2 , the segment G_7 , rectifier D , the winding W_0 of relay S_9 and ground. Relay S_9 will therefore close its contact S . Current will also flow from battery B_2 through the winding of the starting magnet SM to battery B_1 . This will operate the starting magnet SM , and therefore release the brushes E_1 and E_2 so that they may sweep across the commutating segments G_7 , G_1 , G_2 , G_3 , G_4 , G_5 and G_6 . Upon the closure of contact S of relay S_9 , a weak holding current will then flow from battery B_2 , through resistor Z_5 over the armature and contact S of relay S_9 , through resistor Z_6 and the winding W_7 of relay S_9 to ground, the latter winding being energized for the purpose of holding the relay S_9 against its contact S . With the closure of contact S of relay S_9 current will reverse through the winding of relay S_6 , current flowing over a circuit which includes battery B_2 , resistor Z_5 , the armature and contact S of relay S_9 , and the winding of relay S_6 to ground. The armature of relay S_6 will then move its spacing contact S , and a space impulse will, therefore, be transmitted through repeater RP_1 over line L , then through repeater RP_1' , and through the winding of relay S_1' at the receiving station V . The relay S_1' will then move its armature to its spacing contact S .

When the armature of relay S_1' reaches its spacing contact S , the starting magnet SM will be energized, the energizing circuit for the starting magnet SM' including battery B_2' , resistor Z_2' , the common segment G_0' , brushes E_1' , and E_2' , the winding of the starting magnet SM , battery B_1 which is connected to the starting magnet and ground. The starting magnet SM' will then release the brushes E_1' and E_2' so that they may sweep across the various segments of the regenerative repeating equipment at the receiving station V . With the brush E_2' in contact with seg-

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ment G_7' current will also flow from battery B_2' and resistor Z_2' through a parallel circuit which includes rectifier D' and the winding W_0' of relay S_9' to ground. This will actuate relay S_9' so as to move its armature to its spacing contact S . Current will then flow from battery B_2' through resistor Z_5' and over the armature and spacing contact S of relay S_9' , then through the winding of relay R_1' . The armature of relay R_1' will then close its back contact, whereupon the relay R_4' and the receiving magnet PR_1' will be deenergized, the magnet PR_1' being released. The relay R_4' is of the slow-release type, however, and therefore does not follow teletypewriter impulses.

It has thus been shown that the starting or spacing impulse of any teletypewriter character, such as the letter "A," actuates the starting magnets SM and SM' of the two stations and at the same time moves the armatures of relays S_9 and S_9' to their spacing contacts. The first subsequent pulse for the letter "A" being marking will cause the circuit including the transmitting equipment Y_1 , receiving magnet PR_1 and relay S_1 to be energized so that the relay S_1 will move its armature to its marking contact M . As the brush E_2 then contacts segment G_1 , current will flow from battery B_1 , through resistor Z_8 , over the armature and marking contact M of relay S_1 , the common segment G_0 , brushes E_1 and E_2 , segment G_1 , the left inner armature and back contact of relay R_3 , the winding W_1 of relay S_9 , the outer left armature and back contact of relay R_3 and ground. The flow of current from battery B_1 through the winding W_1 of relay S_9 will be so poled as to cause the armature of that relay to close its marking contact M . The armature will be held against this contact by a holding circuit which includes battery B_1 , resistor Z_9 , marking contact M and the armature of relay S_9 , resistor Z_6 , the winding W_7 of relay S_9 and ground. At the same time current will reverse through the winding of relay S_6 to move its armature to its contact M , the interconnecting circuit including marking battery B_1 , resistor Z_9 , the armature and contact M of relay S_9 , the winding of relay S_6 and ground. This marking condition will be transmitted through the repeater RP_1 over line L , then through repeater RP_1' to energize the relay S_1' . The armature of the latter relay will then close its marking contact M .

At the receiving station V as the armature of relay S_1' closes its marking contact M , the winding W_1' of relay S_9' will then be energized over a circuit which includes battery B_1' , resistor Z_8' , the armature and contact M of relay S_1' , the common segment G_0' of the receiving distributor equipment, brushes E_1' and E_2' , segment G_1' , the inner left armature and back contact of relay R_3' , the winding W_1' of relay S_9' , the outer left armature and back contact of relay R_3' and ground. The armature of relay S_9' will then close its marking contact M . The armature of relay S_9' will be held against its marking contact M by a locking circuit which includes battery B_1' , resistor Z_9' , the armature and contact M of relay S_9' , resistor Z_6' and the winding W_7' of relay S_9' . The relay R_1' will then be energized over a circuit which includes battery B_1' , resistor Z_9' , the armature and contact M of relay S_9' and the winding of relay R_1' and ground. The closure of the forward contact of relay R_1' will then energize the windings of relay R_4' and the receiving magnet PR_1' . Thus it will be observed that the first marking pulse will move the armatures of relays S_9 and S_9' at the two stations to their

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marking contacts M and at the same time record the marking pulse at the receiving magnet PR₁'.

The second, third, fourth and fifth pulses will likewise cause the relays S₁ and S₆ to move their armatures between their two contacts M and S in accordance with the polarity of these pulses in a manner which requires no further explanation. As the brush E₂ subsequently sweeps across the segments G₂, G₃, G₄ and G₅, the windings W₁₁, W₂₁, W₃₁ and W₄₁ of relay S₉ will in turn be energized with suitably poled current to cause the armature of relay S₉ to follow the armature of relay S₁. As relay S₆ moves its armature between its M and S contacts, it will correspondingly actuate relay S₁' at the receiving station V and thereby send corresponding pulses over the circuits, as already described, to energize the windings W₁₁', W₂₁', W₃₁' and W₄₁' of relay S₉'. This will cause the armature of relay S₉' to follow these same pulses. As relay S₉' follows these pulses, relay R₁' and magnet PR₁'—which are controlled by the armature of relay S₉'—will likewise follow these pulses in the manner already described. The character "A," or any other character, will therefore be transmitted to and reproduced at the receiving station.

In order to employ the secrecy feature of this invention, it is necessary to transmit a special character such as "Figs." for example, followed later by another character as, for example, "F." The transmission of the code corresponding to the character "Figs." will shift the teletypewriters at both stations in a well-known manner to their upper case positions, thereby closing the contact K₀ at station U and contact K₀' at station V. The subsequent transmission of the code corresponding to the letter "F" will operate the receiving magnet PR₁' in such a way that the pull bar of the character F (not shown) will operate or close contact K₁', for example. It will be understood that contact K₁ at station U was operated simultaneously, as previously described. The closure of contacts K₀ and K₀' will condition a circuit from ground to K₁ and K₁', respectively to operate relays R₃ and R₃'. Thus a system may be arranged so that upon the transmission of two such teletypewriter characters a contact such as K₁ may be momentarily closed at the transmitter U to change or invert the first pulse of each signal or character. This is accomplished by reversing the direction of current flow through the corresponding winding W₁ of relay S₉ so that a marking pulse will close contact S of relay S₉ and a spacing pulse will close contact M of relay S₉. At the receiving station V the corresponding contact K₁' will be momentarily closed and likewise reverse the current flow through winding W₁' of relay S₉'. The reversal of current in winding W₁' is employed to reinvert the first pulse of each signal or character to its normal position so that the signal or character may be rendered intelligible at the receiving station V.

Assume now that contact K₁ has been operated for the purpose of "scrambling" the teletypewriter signals transmitted electrically over the line L between the two stations. Relay R₃ will then operate over a circuit which includes battery B₂, resistor Z₁₁, the winding of relay R₃, contacts K₁ and K₀ and ground. Immediately after relay R₃ operates it will be locked in its operated position, the locking circuit including battery B₂, resistor Z₁₁, the winding of relay R₃, the right armature and make contact of relay R₃, contact K₂ (which is normally closed), the armature and make contact of relay R₄ and

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ground. The closure of the make contacts of relay R₃ will then cause such current as will flow through segment G₁ to traverse the winding W₁ of relay S₉ in a direction opposite to that which it followed heretofore.

At the receiving station V the contact K₁' will also be momentarily closed, as already explained. Relay R₃' will then be operated by the flow of current from battery B₂', through resistor Z₁₁', the winding of relay R₃', contacts K₁' and K₀' and ground. Relay R₃' will then be locked in its operated position, the locking circuit being provided by contact K₂', the armature of relay R₄' and ground. As relay R₃' closes its make contacts, current then reaching segment G₁' will flow through the winding W₁' of relay S₉' in a direction opposite to that which it followed heretofore.

Assume now that relays R₃ and R₃' are operated and that a marking pulse has actuated relay S₁ at the time when the brush E₂ contacts segment G₁. Current will then flow from battery B₁, through resistor Z₈, the armature and marking contact M of relay S₁, the common segment G₀, brushes E₁ and E₂, segment G₁, the outer left armature and make contact of relay R₃, the winding of relay W₁, the inner left armature and make contact of relay R₃ and ground. Current will then flow through the winding W₁ of relay S₉ in response to a marking pulse in a direction opposite to that which was previously traced. The armature of relay S₉ will, therefore, close its spacing contact S instead of its marking contact M. Hence the armature of relay S₆—which is controlled by the armature of relay S₉—will close its spacing contact S instead of its marking contact M.

Likewise at the receiving station V relay S₁' will also close its spacing contact S at the receipt of the first pulse of each character or signal. The relay R₃' at the receiving station being also operated and locked in the operated position, current will now flow through the winding of relay W₁' of relay S₉' in a direction so as to move the armature of relay S₉' to its marking contact M and not to its spacing contact S. The circuit which now supplies current to relay W₁' includes battery B₂', resistor Z₂', the armature and contact S of relay S₁', segment G₀', brushes E₁' and E₂', segment G₁', the outer left armature and make contact of relay R₃', the winding W₁' of relay S₉', the inner left armature and make contact of relay R₃' and ground. Thus the first or spacing pulse which was transmitted over line L and received as a spacing pulse by relay S₁' will so operate relay S₉' as to have its armature close its marking contact M and not its spacing contact S, thereby causing the receiving magnet PR₁' to be operated to register the pulse as originally transmitted from station U. Therefore all of the signals or characters registered by magnet PR₁' will be rendered intelligible.

It will be observed that for each teletypewriter character transmitted between the two stations after contacts K₁ and K₁' have been operated, the first pulse for every succeeding character will be inverted at the transmitting station to provide secrecy on the line and then reinverted at the receiving station to reproduce the original character without distortion.

The contacts K₁ and K₁' at the two stations will be momentarily operated on either upper or lower case but the closure of these contacts on lower case effects no change in relays R₃ or R₃' because the contacts K₀ and K₀' are open

except in the "Figs." or upper case position. To invert any of the other pulses, such as the second pulse, or the third pulse, the contacts K_{11} or K_{21} at the transmitter U and contacts K_{11}' or K_{21}' at the receiver V may be operated by selecting, for example, the upper case characters "D" or "G," respectively, on the keyboard (not shown). When contacts K_{11} and K_{21} are momentarily operated, relays R_{11} and R_{23} will be operated and locked in their operating positions in the manner already noted to reverse the current thereafter flowing through windings W_{11} and W_{21} of relay S_9 . The same inversion will take place at the receiving station V at relay S_9' in response to the operation of contacts K_{11}' and K_{21}' to re-invert these same pulses so as to reproduce the original pulses. It will be understood that other upper case characters, such as "H" and "J," for example, may be employed to operate contacts K_{31} and K_{41} and the corresponding contacts K_{31}' and K_{41}' at the receiving station to change the fourth or fifth pulses of the teletypewriter characters whenever so desired. In fact, any predetermined characters may be employed according to this invention to actuate any or all of the various contacts K_1 , K_{11} , K_{21} , K_{31} and K_{41} and their corresponding contacts at the receiver, and this selection may be made in any desired order.

After one or more of the pulses have been changed according to the secrecy plan of this invention, the "scrambling" processes may be nullified merely by momentarily opening the contact K_2 at the transmitter U and contact K_2' at the receiver V. This may be accomplished, for example, by transmitting a "Blank" signal by depressing, for example, the "Blank" key of the keyboard. When contacts K_2 and K_2' are opened, the locking circuits for all of the relays R_3 , R_{13} , R_{23} , R_{33} and R_{43} at the transmitter and relays R_3' , R_{13}' , R_{23}' , R_{33}' and R_{43}' at the receiver will also be opened, and all of these relays will be released. This will, therefore, rearrange the circuit so that currents will traverse the corresponding windings of relays S_9 and S_9' in the normal directions to correspond with the original signals. There will then be no further re-inversion of any of the pulses at the transmitting or receiving stations. It will be understood that the secrecy feature may subsequently be invoked again by causing any one of the contacts K_1 , K_{11} , etc. to be reoperated.

The relays R_4 and R_4' , which are of the slow-release type, have been added to the circuit for "unscrambling" the secrecy system in response to a break signal or line trouble. When a break signal is transmitted, or when line trouble develops, the relays R_4 and R_4' will release and then release any of the relays R_3 , R_{13} , etc., at the transmitting station, and the relays R_3' , R_{13}' , etc., at the receiving station that have previously been operated.

The various characters that have been assigned hereinabove for the operation of any of the various contacts to provide secrecy and to "unscramble" the secrecy feature after it has been invoked, have been given merely for the purpose of illustration. Any other upper or lower case characters may be used for this purpose. Moreover, although the secrecy system has been described in relation to a teletypewriter system using signals of the Baudot type, the secrecy system of this invention may be applied to any other teletypewriter system using any other type of signal, and in fact, it may in general be applied to any form of synchronous or start-stop telegraph system. Moreover, while the relay S_9 and

the corresponding relay S_9' have been used at the two respective stations each with a plurality of windings, it will be understood that a plurality of relays may be employed instead thereof, each relay having its individual winding, all of which is within the scope of this invention.

Although the invention has been described as involving a separate predetermined signal or character for operating each of the pulse reversing contacts such as K_1 , K_{11} , etc., it will be clear that a single predetermined signal or character may be employed to operate any two or more of the pulse reversing contacts, within the scope of this invention.

It will be understood that the apparatus of this invention may be employed for signaling to a plurality of distant stations in such a way that signals may be received in un-inverted and intelligible form at certain selected stations and in inverted and unintelligible form at the remaining stations. In such an arrangement the transmitting station may select the station or stations to receive intelligible copy by transmitting a predetermined upper case character. The selected station or stations will of course have their equipment so arranged as to re-invert the pulse or pulses inverted at the transmitter.

Furthermore, although two stations have been shown and described for the one-way secret transmission of signals, the apparatus and circuits may be arranged for two-way operation, as will be understood by those skilled in the art. It will also be understood that the secrecy system of this invention may be applied to an arrangement including three or more stations, within the scope of this invention.

While this invention has been shown and described in certain particular embodiments merely for the purpose of illustration, it will be understood that the general principles of this invention may be applied to other and widely varied organizations without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. Apparatus for providing secrecy in teletypewriter signaling systems transmitting teletypewriter characters between two stations, comprising manually-operated key-controlled means for selecting and reversing the polarity of any desired one of the pulses of each teletypewriter character at one of the stations to the exclusion of all other pulses of each character, reversing the polarity of the same pulse of each subsequent character, and for simultaneously returning each reversed pulse to its normal or unreversed position at the other station.

2. Apparatus for providing secrecy in teletypewriter signaling systems transmitting teletypewriter characters between a plurality of stations, comprising means responsive to a predetermined signal for selecting and reversing the polarity of one of the pulses of each teletypewriter character at one of the stations, and means for simultaneously returning the selected pulse of each character to its normal or unreversed position at the other stations.

3. In a teletypewriter system for secretly transmitting teletypewriter characters between two stations, the combination of means responsive to a predetermined signal for reversing the polarity of any selected one of the pulses of each teletypewriter character at one of the stations, means responsive to a second predetermined signal for reversing another selected one of the pulses of

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each teletypewriter character at said station, and means at the other station for simultaneously returning each reversed pulse to its normal polarity.

4. In a teletypewriter secrecy system, the combination of means responsive to a plurality of predetermined signals corresponding respectively to the several pulses of each teletypewriter character for selecting and reversing the polarity of said pulses for transmission to a distant point, and means for simultaneously returning each reversed pulse to its unreversed position at the distant point.

5. In a teletypewriter system for secretly signaling between first and second stations, the combination of a plurality of windings at the first station, a plurality of similar windings at the second station, said windings at each station corresponding respectively to the various pulses of each teletypewriter character, means for transmitting the pulses of each teletypewriter character through the respective windings at each station, means for reversing the pulses transmitted through any selected one of said windings at the first station to provide secrecy in the transmission to the second station, each reversed marking pulse being transmitted as a spacing pulse and vice versa, and means at the second station for again reversing the pulses in the winding corresponding to the selected winding at the first station for returning the reversed pulses to their normal positions so that the teletypewriter characters will be rendered intelligible.

6. In a teletypewriter system for the secret transmission of signals between first and second stations, the combination of two relays one at each of said stations, each relay including a plurality of windings each carrying a separate one of the pulses of a teletypewriter character, a source of current at each station for separately energizing the various windings of the relay thereat in accordance with the various pulses, means for reversing the pulses transmitted through any one of said windings at the first station so that each reversed marking pulse will be transmitted as a spacing pulse and vice versa, and means at the second station for similarly returning each reversed pulse to its normal position in the corresponding winding so that the signals at the second station may be rendered intelligible.

7. In a teletypewriter system for secretly transmitting teletypewriter characters between first and second stations, the combination of a plurality of windings at the first station each of which will carry one of the pulses of a teletypewriter character, a source of current for sequentially energizing the various windings at said first station in accordance with the pulses to be transmitted, a plurality of windings at the second station each of which corresponds to one of the windings at the first station, a source of current for sequentially energizing said windings at said second station, means for reversing certain selected pulses of each teletypewriter character at the first station so that each reversed marking pulse will be transmitted as a spacing impulse and vice versa, said reversing means including means for reversing the flow of current through the windings corresponding to the pulses to be reversed, and means for simultaneously reversing the current through the corresponding windings at the second station so as to return all of the pulses to their normal conditions, whereby the

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teletypewriter characters will be rendered intelligible at said second station.

8. Apparatus for providing secrecy in teletypewriter systems transmitting teletypewriter characters between two stations, each character including a plurality of pulses, comprising means responsive to a plurality of predetermined signals for reversing the polarity of certain selected ones of said pulses of each teletypewriter character at one of said stations in a predetermined order, and means for simultaneously returning said pulses to their normal positions in the same order at the other station.

9. In a teletypewriter transmitting system, the combination of manually operated key-controlled means for selecting and reversing the polarity of any desired one of the pulses of each teletypewriter character for providing secrecy in the transmission of the teletypewriter characters, and key-controlled means for thereafter returning all of the previously reversed pulses to their unreversed positions.

10. In teletypewriter apparatus, the combination of a plurality of contact devices each of which corresponds to one of the pulses of a teletypewriter character, a source of current, a plurality of windings each controlled by one of said contact devices, means whereby said source of current will energize said windings in a predetermined order in accordance with said pulses, and means for operating any desired one of said contact devices so as to reverse the current traversing the corresponding winding, whereby each marking pulse will be transmitted as a spacing pulse and vice versa.

11. In a teletypewriter transmitting apparatus, the combination of a plurality of contact devices, a plurality of windings, one of said contact devices and one of said windings corresponding to each of the pulses of a teletypewriter character, a source of current for energizing all of said windings sequentially in accordance with said pulses, means whereby the direction of the flow of current through each winding may be controlled by its associated contact device, and means for operating certain of said contact devices so as to reverse the currents through the associated windings, whereby each marking pulse transmitted through a winding in which the current has been reversed will be transmitted as a spacing pulse and vice versa.

12. In a teletypewriter secrecy system, the combination of means for producing a plurality of marking or spacing pulses corresponding to each teletypewriter character, means responsive to a predetermined character for reversing the polarity of any selected one of said pulses so that each selected pulse will be converted from a marking pulse into a spacing pulse and vice versa, and means responsive to the same predetermined character for returning each selected pulse to its unreversed polarity, whereby the teletypewriter characters may be rendered intelligible.

13. Apparatus for providing secrecy in telegraph signaling systems in which each signal is transmitted between a plurality of stations as a multi-pulse character comprising means responsive to a predetermined signal for reversing the polarity of selected pulses of each character so as to render each character unintelligible, and means for reversing said selected pulses so as to render each character intelligible.

MONTE L. GREENE.