H. G. WEBSTER.

SIGNALING SYSTEM.

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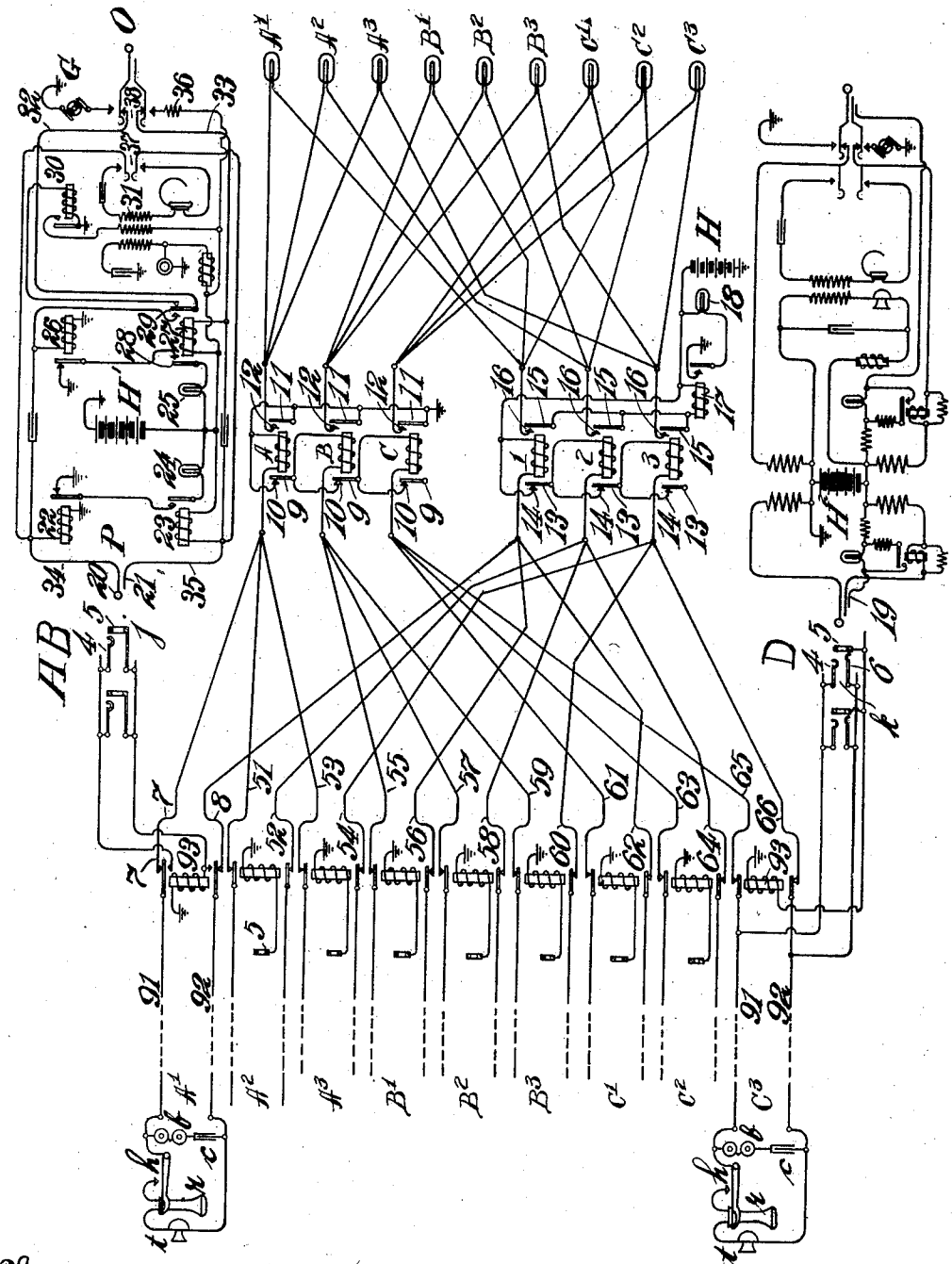

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SIGNALING SYSTEM.

1,078,229. Specification of Letters Patent. Patented Nov. 11, 1913.

Application filed September 4, 1906. Serial No. 333,148.

To all whom it may concern:

Be it known that I, HARRY G. WEBSTER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Signaling Systems, of which the following is a specification.

My invention relates to signaling systems in which a plurality of primary circuits, each provided with a transmitting device, terminate at a central point and are there provided with signal-receiving devices and signal indicators.

It relates particularly to that class of systems in which the receiving devices are less in number than the circuits and, when operated, will control indicating devices adapted to indicate the circuit from which a signal is sent.

The object of my invention is to provide improved means in such a system for preventing false signal indications when signals are transmitted over separate circuits simultaneously.

A further object of my invention is to provide means whereby signals originating on separate circuits simultaneously will be indicated successively at the central point, and whereby signals transmitted on separate circuits simultaneously shall not cause the simultaneous operation of separate indicating devices at the central point.

In accordance with the preferred form of my invention, I include in each primary circuit a circuit-changing device and so connect the circuits to a central source of current that the operation of the circuit-changing device of any circuit causes the operation of a relay associated with each limb of the circuit. The lines are arranged in interrelated groups, the relay of one line limb being also connected to corresponding limbs of other circuits; and the relay associated with the other line limb being connected with corresponding line limbs of still different circuits. The remaining line limb of one of the first-mentioned other circuits is connected to a third relay, and the remaining line limb of one of the last-mentioned other circuits is connected to a fourth relay, each of the last two mentioned relays being likewise connected to other line limbs. The relays are arranged in two groups of equal number, those in one group being connected to the active terminal of the battery, and those in the other group being connected to the ordinarily grounded terminal of the battery. When, therefore, the circuit-changer of any primary circuit is operated, one relay in each group will respond as a pair, and the simultaneous operation of any pair of relays causes the operation of a signal indicator responsive only to the operation of that pair. By this arrangement, it is possible to make a given number of relays answer for a number of lines equal to the second power of the number of relays in a group; but in order to prevent interference, should a number of circuits be transmitting signals at the same time, I have found it desirable to establish a serial relation between the relays in each group, as well as a group relation. The relays of each group are therefore serially arranged so that each relay in the series has its winding connected to battery through contacts of all relays preceding it in the series, and any relay when operated will interrupt the battery connection of the windings of those relays subsequent to it in the series. It therefore follows that that line, which operates the first relay in each group, takes precedence over, or is in preceding relation to, all other lines; and that all other lines are in subsequent relation to that line.

My invention will be more fully understood from the accompanying drawing, illustrating its application to two well-known telephone exchange systems.

Referring to the drawing, the primary circuits are indicated at the left as lines extending to various subscribers' stations. The receiving devices are the relays A, B, C in one group, and 1, 2, 3 in another group; and the signal lamps, indicated at the right of the drawing, are the indicating devices of the invention.

At AB, I have indicated the line and cord-circuit arrangement of a well-known telephone exchange system, in which the springjacks or connection terminals have but two contact-pieces. The central battery H is directly connected to relay 1, is connected to relay 2 through contacts 13—14 of relay

1, and to relay 3 through these contacts and corresponding contacts of relay 2. Relays 1 and 2 are therefore in preceding relation to relay 3, and relays 2 and 3 are in subsequent relation to relay 1. The grounded or return side of the battery is likewise connected to relays A, B and C in a similar manner; A and B are in preceding relation to C; and B and C are in subsequent relation to A. The substation A′ is provided with the usual bell and condenser in permanent bridge of the limbs 91 and 92 of the line; and receiver *r* and transmitter *t* are brought into circuit by the elevation of the switch-hook *h*. The limbs 91 and 92 are connected to the central office through the moving contacts of the cut-off relay 93, normally in engagement with contacts connected by wires 7 and 8 to the windings of relays A and 1 respectively. The normal central office connections of similar lines are in part indicated at A^2 to C^2; the normally closed contact points of the cut-off relays being connected as shown, each pair to a different pair of relays, and each pair consists of one relay in each group. When circuit is closed at the substation of any line, a different pair of relays in energized. If, for instance, circuit be closed at the substation of line B^2, relay B and relay 2 will be energized. The energization of relay 2 removes the battery connection of relay 3 and connects battery to one side of the lamp B^2, as well as to the lamps A^2 and C^2. Relay B, being energized, disconnects the return side of the battery from relay C and connects the return side of the battery to lamps B^1, B^2 and B^3. The circuit for lamp B^2 is thus closed and may be traced from battery H through pilot relay 17, contacts 16—15 of relay 2, lamp B^2 and contacts 12—11 of relay B to the return side of the battery, thus illuminating lamp B^2 to indicate that the subscriber on line B^2 is calling. It will be noted that at this time the circuit of lamp B^1 is open at contact 16 of relay 1, and the circuit of lamp B^3 is open at contact 15 of relay 3. Likewise the circuit of lamp A^2 is closed at relay 2 but open at relay A, and the circuit of lamp C^2 is closed at relay 2 but open at relay C. Therefore, at this time, no lamp but that of line B^2 is illuminated. If, during the time lamp B^2 is displayed, subscriber A^1 should call, his line will be found to be in preceding relation to line B^2. The energization of relay A will therefore interrupt the circuit of relay B at contacts 10—9 of relay A, and the operation of relay 1 will interrupt the circuit of relay 2 at contacts 13—14 of relay 1, thus extinguishing lamp B^2 and illuminating lamp A′. The operator then inserts the answering plug P in the jack *j* and current will flow from the battery H′ through relay 23 of the cord-circuit, strand 35, contact 21 of the plug, contact 5 of the jack *j*, and thence through relay 93 to the return side of the battery, disconnecting limbs 91 and 92 from relays A and 1 and connecting them to contacts 4—5 of the springjack. Circuit is now closed through relay 23, limbs 91 and 92 to the return side of the battery through relay 22, the energization of relay 22 preventing the illumination of lamp 24. The operator answers in the usual manner and tests the contact 5 of a springjack with which she wishes to make connection. If the line be busy, current will flow from such contact, through the tip of the plug O, through strand 32, the normally closed contact of relay 27 and through the test relay 30 to the return side of the battery. The energization of relay 30 includes the test winding of the operator's induction coil 31 in closed circuit with the central battery, thus giving her the customary busy indication. If the line be idle, the calling plug O is inserted, when current will flow from battery H′, through relay 27, strand 33, sleeve contact piece of the plug and thence through the cut-off relay of the desired line, thus cutting off its limbs from the signal receiving relays with which it is associated. The subscriber is called in the usual manner by operating the ringing key 38, during which time the cut-off relay is energized by current through the resistance 36. When the ringing key is restored, again closing circuit through relay 27, the moving contact 28 engages its forward contact, thus completing circuit through the supervisory lamp 25. The moving contact 29 likewise engages its forward contact, thus disconnecting the test relay and completing the circuit of strand 32 to the supervisory relay 26. When the subscriber answers, the consequent energization of relay 26 extinguishes lamp 25 and the connection is in condition for conversation. As each subscriber hangs up his receiver, the deënergization of his relay 22 or 26 illuminates the corresponding lamp; and when both lamps 24 and 25 are illuminated, the operator takes down the connection.

Referring now to the condition of the signal-receiving relays at the time the operator plugs in; circuit has been closed through the substation of line B^2, but has been interrupted at relays A and 1 through their energization over the circuit through line A′. When the answering plug P was inserted, relays A and 1 were thus deënergized and the dropping back of their armatures again completes the circuit for line B^2 through relays B and 2. Lamp B^2 is thus again illuminated and the operator plugs in to the corresponding jack to answer that call. It will likewise be seen that if, prior to the answering of the call from line B^2, the line B^1 had called, relay B would have remained energized, but relay 2 would have

been deënergized by the interruption of its circuit at contact 13—14 of relay 1. Again, lamp B^2 would have been extinguished and lamp B^1 illuminated. It is thus seen that line B^1 is in preceding relation to line B^2. This explanation will make it evident that any line is in preceding relation to other lines of later letter and number, and in subsequent relation to all lines of earlier letter and number. In the structure of the drawing, it will be observed that should all or any number of the lines in the system have their circuits closed simultaneously, but one lamp will be illuminated—that of line A′—the circuit of relays A and 1 only being at that time closed. When the limbs of this line are disconnected from the receiving relays by the insertion of the answering plug, the armatures of both relays drop back. If, as they drop back, contacts 13—14 of relay 1 engage prior to the engagement of contacts 9—10 of relay A, relays A and 2 will be immediately energized, causing the illumination of lamp A^2. If contacts 9—10 engage before contacts 13—14, relays B and 1 will be immediately energized, causing the illumination of lamp B^1 and leaving relays A and 2 inert. If relays A and 2 are the ones energized after line A^1 has been answered, the plugging in of the operator will deënergize both of the relays and disconnect line A^2 from the groups of relays. As their armatures drop back, if the contacts of relay A close first, relays B and 1 will then be energized, illuminating the corresponding lamp; whereas if the contacts of relay 2 engage first, relays A and 3 will be energized, causing the illumination of lamp A^3, and so on. It is thus seen that where circuit is closed through several lines at short intervals, that lamp will be illuminated which corresponds to the line of preceding relation; and that when circuit then be closed through two or more calling lines simultaneously, through the deënergization of a pair of relays previously energized, there may then be two lines of equal relation. That lamp will then be illuminated corresponding to the one of such lines through which circuit is first closed by the deënergization aforesaid. If subscribers A^2 and B^1 were to call exactly simultaneously, the signal of that line, whose circuit was first interrupted by the operation of the relays, would not be illuminated until after the call of the other line had been answered.

I have indicated at D a line circuit and cord connecting apparatus similar to that illustrated in Patent No. 647,588, issued April 17, 1900. As far as the signal-receiving relays are concerned, the operation of this structure is similar to that of AB, the difference in the line circuit arrangement being that the jack contact 5 is in a wholly local circuit rather than being connected to one of the talking conductors of the line. The operation of the cord connecting apparatus is described in detail in the patent above mentioned and no further description seems necessary here.

While I have illustrated my invention as embodied in a telephone exchange system, it is obvious that it is applicable to other signaling structures and I therefore do not wish to be limited to this particular embodiment.

It will be understood that the several batteries H, H′ and H^2 of the diagram may be one and the same and that the several grounds indicated are the return side of the battery or the office return.

It is also evident that various means, other than lamps in local circuits, may be employed for giving the signal indication, and that many modifications may be made in the invention without departing from its spirit.

What I consider new and novel and desire to secure by Letters Patent of the United States is:—

1. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices each common to a portion only of said circuits, signal indicators controlled by said receiving devices, and means for preventing a false operation of said indicators when any plurality of said transmitting devices are operated at substantially the same time.

2. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices each common to a portion only of said circuits, signal indicators controlled by said receiving devices, and means for preventing a false operation of said indicators when all of said transmitting devices are operated at substantially the same time.

3. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices each common to a portion only of said circuits, signal indicators controlled by said receiving devices, and means whereby any two of said transmitting devices may be operated at substantially the same time without causing the simultaneous operation of any of said indicators.

4. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices each common to a portion only of said circuits, signal indicators controlled by said receiving devices, and means whereby signals may be transmitted from any two of said circuits at substan-

tially the same time without causing the simultaneous operation of a plurality of indicators.

5. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices each common to a portion only of said circuits, signal indicators controlled by said receiving devices, and means whereby signals may be transmitted from any two of said circuits at substantially the same time and the operation of the indicators to be so delayed as to cause them to operate successively.

6. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices each common to a portion only of said circuits, a signal indicator for each circuit controlled by said receiving devices, and means whereby signals may be transmitted from any plurality of said circuits at the same time without causing the operation of indicators associated with idle circuits.

7. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices each common to a portion only of said circuits, signal indicators controlled by said receiving devices, and means whereby the indicating devices may respond at different times when a plurality of transmitting devices are operated at the same time.

8. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices each common to a portion only of said circuits, signal indicators controlled by said receiving devices, and means whereby the indicating devices will respond successively when all of said transmitting devices are operated at the same time.

9. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices less in number than said circuits each common to a portion only of said circuits, a signal indicator for each circuit controlled by said receiving devices, and means for preventing a false operation of said indicators when any plurality of said transmitting devices are operated at substantially the same time.

10. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices less in number than said circuits each common to a portion only of said circuits, a signal indicator for each circuit controlled by said receiving devices, and means for preventng a false operation of said indicators when all of said transmitting devices are operated at substantially the same time.

11. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices less in number than said circuits each common to a portion only of said circuits, a signal indicator for each circuit controlled by said receiving devices, and means whereby any two of said transmitting devices may be operated at substantially the same time without causing the simultaneous operation of any of said indicators.

12. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices less in number than said circuits each common to a portion only of said circuits, a signal indicator for each circuit controlled by said receiving devices, and means whereby signals may be transmitted from a plurality of said circuits at substantially the same time without causing the simultaneous operation of a plurality of indicators.

13. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices less in number than said circuits each common to a portion only of said circuits, a signal indicator for each circuit controlled by said receiving devices, and means whereby signals may be transmitted from a plurality of said circuits at substantially the same time and the operation of the indicators be so delayed as to cause them to operate successively.

14. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices less in number than said circuits each common to a portion only of said circuits, a signal indicator for each circuit controlled by said receiving devices, and means whereby signals may be transmitted from any plurality of said circuits at the same time without causing the operation of indicators associated with idle circuits.

15. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices less in number than said circuits each common to a portion only of said circuits, a signal indicator for each circuit controlled by said receiving devices, and means whereby the indicating devices may respond at different times when a plurality of transmitting devices are operated at the same time.

16. A signaling system comprising a plurality of primary controlling circuits, a signal transmitting device for each circuit, signal receiving devices less in number than

said circuits each common to a portion only of said circuits, a signal indicator for each circuit controlled by said receiving devices, and means whereby the indicating devices will respond successively when all of said transmitting devices are operated at the same time.

17. A signaling system comprising a plurality of transmitting devices arranged in groups, receiving devices common to said transmitting devices, primary controlling circuits connecting the receiving and transmitting devices, signal indicating devices normally controlled over the primary circuits, means for dissociating any of said transmitting devices from the receiving devices, means whereby the operation of a transmitting device in any group will automatically destroy the control of the transmitting devices of subsequently related groups, and means whereby the dissociation of said transmitting device from the receiving devices will restore said control of said other transmitting devices.

18. A plurality of transmitting devices arranged in serially related groups, receiving devices common to said transmitting devices, primary controlling circuits connecting the receiving and transmitting devices, signal indicating devices normally controlled over the primary circuits, means for dissociating any of said transmitting devices from the receiving devices, means whereby the operation of a transmitting device in any group will automatically destroy the control of the transmitting devices of subsequently related groups, and means whereby the dissociation of said transmitting device from the receiving devices will restore said control of said other transmitting devices.

19. A signaling system comprising a plurality of primary controlling circuits arranged in inter-related groups, a transmitting device for each circuit, signal receiving devices less in number than said circuits, signal indicating devices individual to the circuits, controlled by said receiving devices, and means for preventing the simultaneous operation of a plurality of indicating devices.

20. A signaling system comprising a plurality of primary controlling circuits in inter-related groups, a transmitting device for each circuit, signal receiving devices less in number than said circuits, signal indicating devices individual to the circuits, controlled by said receiving devices, and means whereby the transmitting devices of any circuits in separate groups may operate simultaneously without causing the operation of indicating devices of idle circuits.

21. A signaling system comprising a plurality of primary controlling circuits arranged in inter-related groups, a transmitting device for each circuit, signal receiving devices less in number than said circuits, signal indicating devices individual to the circuits, controlled by said receiving devices and means whereby the transmitting devices of any circuits in separate groups and the transmitting devices of any circuits in the same group may be operated simultaneously without operating the indicating devices of idle circuits.

22. A signaling system comprising a plurality of primary controlling circuits arranged in inter-related groups, a transmitting device for each circuit, signal receiving devices less in number than said circuits, signal indicating devices individual to the circuits, controlled by said receiving devices, and means whereby the transmitting devices in any two circuits may be operated simultaneously without causing the operation of indicating devices of idle circuits.

23. A signaling system comprising a plurality of primary controlling circuits arranged in inter-related groups, a transmitting device for each circuit, signal receiving devices less in number than said circuits, signal indicating devices individual to the circuits, controlled by said receiving devices, and means whereby the transmitting devices of any plurality of said circuits may be simultaneously operated without operating the indicating devices of idle circuits.

24. A signaling system comprising a plurality of primary controlling circuits arranged in inter-related groups, a transmitting device for each circuit, signal receiving devices less in number than said circuits, signal indicating devices individual to the circuits, controlled by said receiving devices, and means whereby the operation of any plurality of said transmitting devices will cause the operation of only those indicating devices individual to their circuits.

25. A signaling system comprising a plurality of primary controlling circuits arranged in serially inter-related groups, each circuit including a signal transmitting device, receiving mechanisms each common to a portion only of said circuits, a signal indicating device for each controlling circuit operated by said mechanisms, and means whereby the simultaneous operation of the transmitting devices of any two separate circuits will initially operate that indicating device associated with the circuit first in serial relation.

26. A signaling system comprising a plurality of primary controlling circuits arranged in serially inter-related groups, each circuit including a signal transmitting device, receiving mechanisms each common to a portion only of said circuits, a signal indicating device for each controlling circuit operated by said mechanisms, means where-

by the simultaneous operation of the transmitting devices of any two separate circuits will initially operate that indicating device associated with the circuit first in serial relation, and means for rendering any of said indicating devices inert and means, when the transmitting devices of a plurality of circuits are operated at substantially the same time, for causing the operation of the indicating device of any such separate circuit when the operated indicating device of a serially preceding circuit has been rendered inert.

27. A signaling system comprising three or more primary controlling circuits arranged in serially inter-related groups, each circuit including a signal transmitting device, receiving mechanisms each common to a portion only of said circuits, a signal indicating device for each controlling circuit operated by said mechanisms, means for dissociating any circuit from said mechanism, means whereby the operation of the transmitting device of a circuit in any group will cause the operation of its associated indicating device and destroy the control of the indicating devices for circuits in subsequently related groups, and means whereby the dissociation of said circuit from said mechanism will restore said control.

28. A signaling system comprising three or more primary controlling circuits arranged in serially inter-related groups, each circuit including a signal transmitting device, receiving mechanisms each common to a portion only of said circuits, a signal indicating device for each controlling circuit operated by said mechanisms, means for dissociating any circuit from said mechanism, means whereby the operation of the transmitting device of a circuit in any group will cause the operation of its associated indicating device and destroy the control of the indicating devices for circuits in subsequently related groups, means whereby the dissociation of said circuit from said mechanism will restore said control, and means whereby the dissociation of said circuit from said mechanism will cause the operation of the indicating device of a circuit next in serial relation whose transmitting device has been operated.

29. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays are jointly controlled as a pair by a separate primary circuit, signal indicators controlled by the operations of the relays, and means whereby the operation of any relay will prevent the operation of any other relay in subsequent relation thereto.

30. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays are jointly controlled as a pair by a separate primary circuit, a separate signal indicator controlled by each pair of relays, and means whereby the operation of any relay will prevent the operation of any other relay in subsequent relation thereto.

31. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays are jointly controlled as a pair by a separate primary circuit, signal indicators controlled by the operations of the relays, and means whereby the operation of any pair of relays will prevent the operation of any other pair of relays in subsequent relation thereto.

32. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays are jointly controlled as a pair by a separate primary circuit, signal indicators controlled by the operations of the relays, and means whereby the operation of any relay will interrupt the circuit of any other relay in subsequent relation thereto.

33. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays are jointly controlled as a pair by a separate primary circuit, signal indicators controlled by the operations of the relays, and means for preventing the simultaneous operation of two pairs of relays.

34. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays are jointly controlled as a pair by a separate primary circuit, signal indicators controlled by the operations of the relays, and means whereby the operation of any pair of relays will interrupt the circuit of every other pair in subsequent relation thereto.

35. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays in separate groups are jointly controlled as a pair by a separate primary circuit, a separate signal indicator controlled by each pair of relays, and means whereby the operation of any relay will prevent the operation of any other relay in subsequent relation thereto.

36. A signaling system comprising a plurality of primary circuits, a source of cur-

rent supply, a plurality of serially related relays for said circuits, means whereby every two of said relays in separate groups are jointly controlled as a pair by a separate primary circuit, a separate signal indicator controlled by each pair of relays, and means whereby the operation of any relay in a group will prevent the operation of any other relay in subsequent relation thereto in that group.

37. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays in separate groups are jointly controlled as a pair by a separate primary circuit, a separate signal indicator controlled by each pair of relays, and means whereby the operation of any pair of relays will prevent the operation of any other pair of relays in subsequent relation thereto.

38. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays in separate groups are jointly controlled as a pair by a separate primary circuit, a separate signal indicator controlled by each pair of relays, and means for preventing the simultaneous operation of two relays in a group.

39. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays in separate groups are jointly controlled as a pair by a separate primary circuit, a separate signal indicator controlled by each pair of relays, and means for preventing the simultaneous operation of two pairs of relays.

40. A signaling system comprising a plurality of primary circuits, a source of current supply, a plurality of serially related relays for said circuits, means whereby every two of said relays in separate groups are jointly controlled as a pair by a separate primary circuit, a separate signal indicator controlled by each pair of relays, and means whereby the operation of any pair of relays will interrupt the circuit of every other pair in subsequent relation thereto.

41. A telephone exchange system comprising a plurality of calling lines, an operator's position including means for answering said calling lines, signal indicators for the lines, a cut-off relay for each line, means normally controlled by said lines for causing the operation of the indicators, means controlled by one calling line to operate an indicator for that line and to prevent the indicator control of a second calling line, and means controlled by the operator for operating the cut-off relay for said first mentioned line for effacing the control of said first-mentioned line whereby an indicator for said second line is operated.

42. A telephone exchange system comprising a plurality of calling lines, an operator's position including means for answering said calling lines, signal indicators for the lines, a cut-off relay for each line, means normally controlled by said lines for causing the operation of the indicators, means controlled by one calling line to operate an indicator for that line and to prevent the indicator control of a second calling line, and means controlled by the operator for actuating the cut-off relay for the first mentioned line for effacing the control of said first-mentioned line whereby the control of the second line is restored.

43. A telephone exchange system comprising a plurality of simultaneously calling lines, an operator's position including means for answering said calling lines, signal indicators for the lines, an energizing circuit for each indicator, means normally controlled by said lines for closing the circuits of said indicators upon initiation of a call, and means whereby the circuits of said indicators are closed successively.

44. A telephone exchange system comprising a plurality of calling lines, an operator's position including means for answering said calling lines, signal indicators for the lines, an energizing circuit for each indicator, means normally controlled by said lines for closing the circuits of said indicators upon initiation of a call, and means whereby the circuit of an indicator for but one line is closed until after the operator has answered that line.

45. A telephone exchange system comprising a plurality of calling lines, an operator's position including means for answering said calling lines, signal indicators for the lines, an energizing circuit for each indicator, means normally controlled by said lines for closing the circuits of said indicators upon initiation of a call, means at said position for effacing said indicators, and means whereby the closing of the circuit of an indicator for one line is delayed until after the operator has effaced the indicator for another line.

46. A telephone system including telephone lines, substations having receivers and switchhooks for said lines, call signals therefor at the exchange, a circuit for each of said signals, and electromagnetic switching means normally in circuit with said lines and adapted for operation upon the removal of the receivers at said substations whereby simultaneously initiated calls will be successively indicated by said signals.

47. A telephone system including substation telephone lines, receivers and switch-

hooks for said substations, call signals for said lines at the exchange, one only for each line, an energizing circuit for each signal, and means operated upon removal of the receivers at said substations to close the energizing circuit of one of said signals and prevent the closing of the other circuits.

In witness whereof, I hereunto subscribe my name this 30th day of August 1906.

HARRY G. WEBSTER.

Witnesses:
A. H. DYSON,
CAROLYN WEBER.