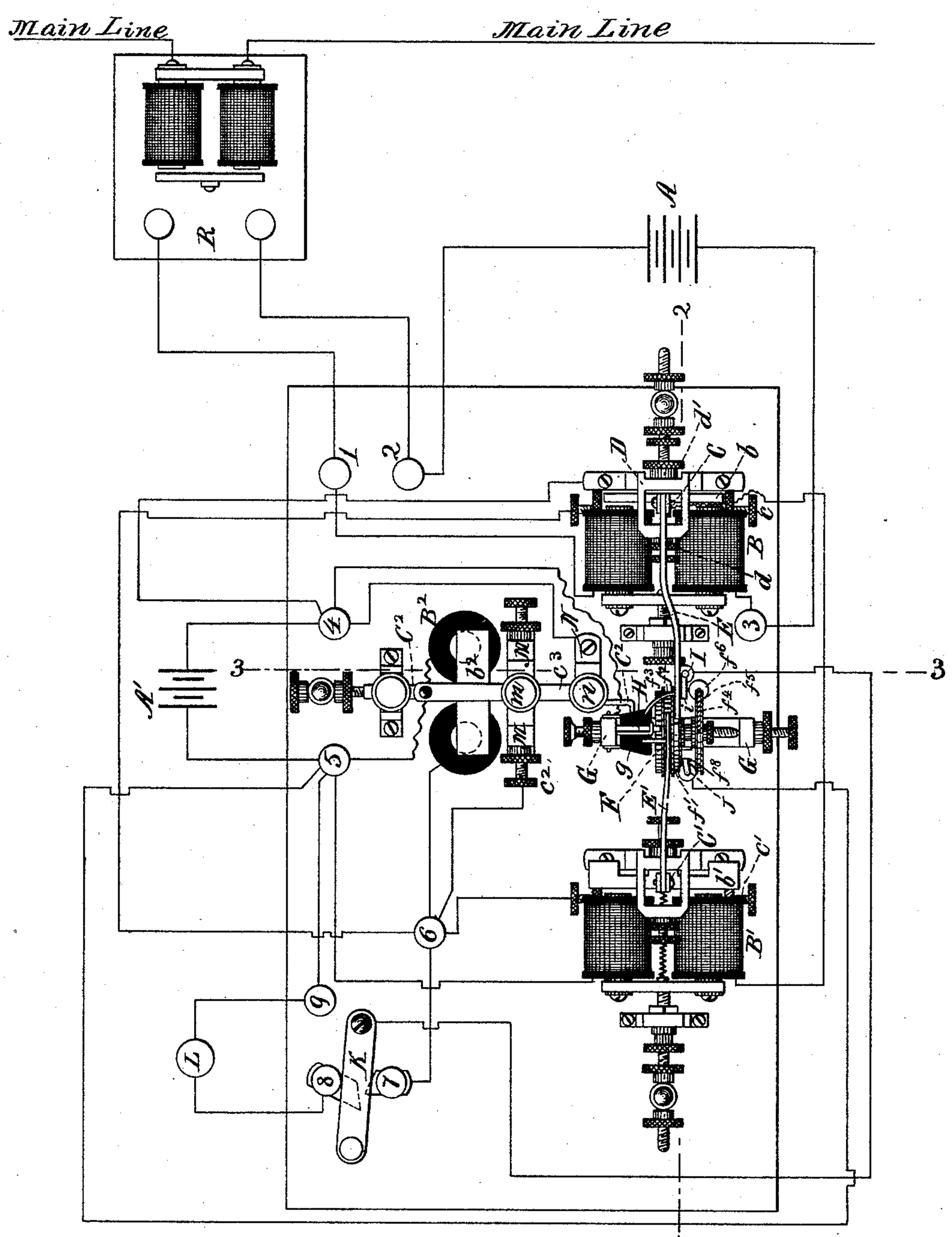
(No Model.) 2 Sheets—Sheet 1.

J. L. CUTLER.

ELECTRICAL COMMUNICATION.

No. 421,371. Patented Feb. 11, 1890.



Witnesses:
W. C. Tirdinston.
Frank O. Loveland

Fig. 1.

Inventor:
James L. Cutler
by Parkinson & Parkinson
his Attorneys.

(No Model.) 2 Sheets—Sheet 2.

J. L. CUTLER.

ELECTRICAL COMMUNICATION.

No. 421,371. Patented Feb. 11, 1890.

Fig. 2.

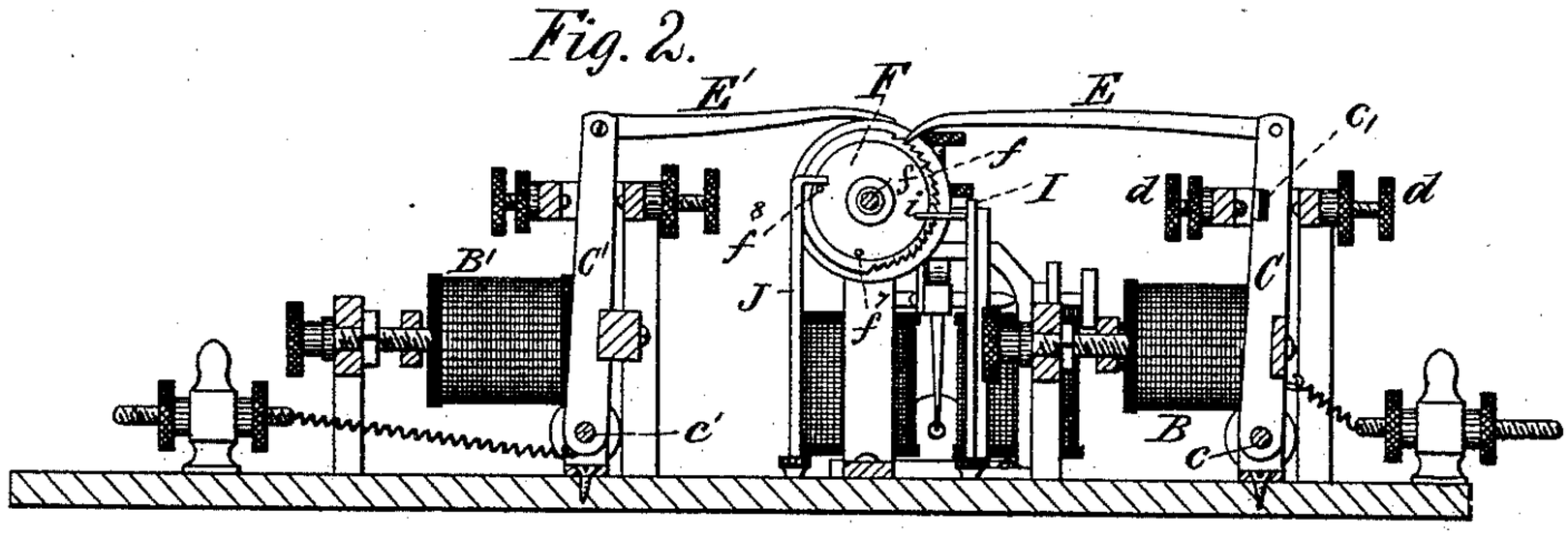


Fig. 3.

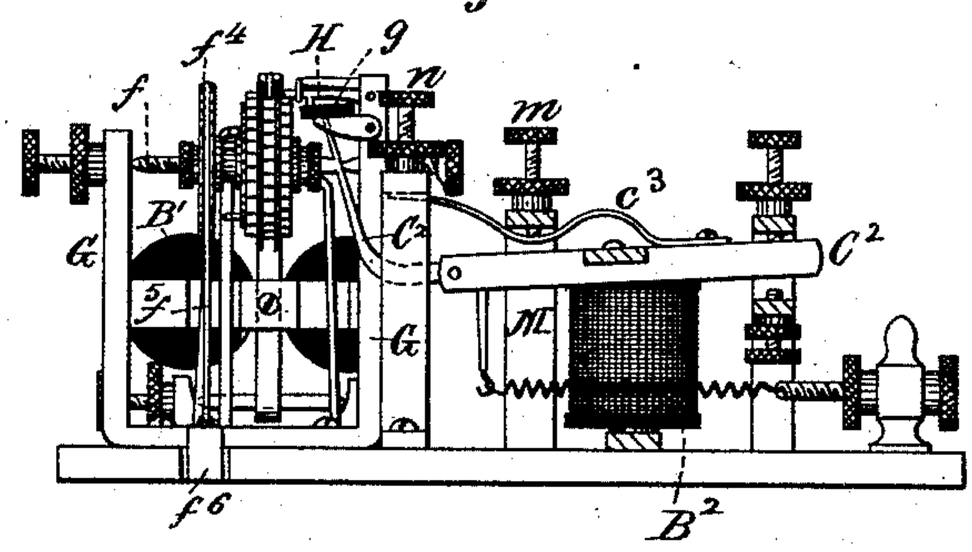


Fig. 4.

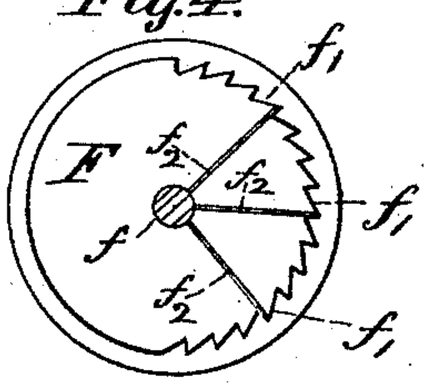
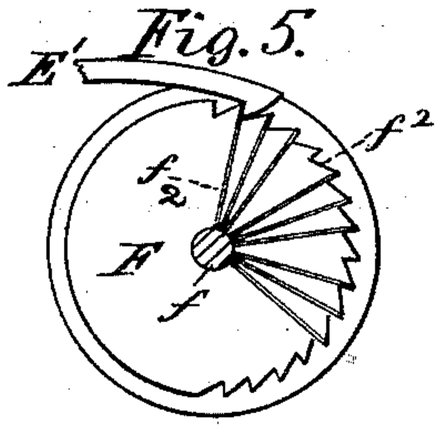


Fig. 5.



Witnesses:
W. C. Tirdinston.
Frank O. Loveland

Inventor:
James L. Cutler
By Pardee and Pardee
his Attorneys.

UNITED STATES PATENT OFFICE.

JAMES L. CUTLER, OF PIKETON, ASSIGNOR TO JOSEPH A. SULLIVAN, FRANK O. LOVELAND, AND GUY MALLON, ALL OF CINCINNATI, OHIO.

ELECTRICAL COMMUNICATION.

SPECIFICATION forming part of Letters Patent No. 421,371, dated February 11, 1890.

Application filed August 9, 1889. Serial No. 320,209. (No model.)

To all whom it may concern:

Be it known that I, JAMES L. CUTLER, a citizen of the United States, residing at Piketon, in the county of Pike, State of Ohio, have invented a new and useful Improvement in Electrical Communication, of which the following is a specification.

My invention relates to the art of electrical communication by means of a series of signals or other devices connected with and operated from a central station; and its object is to provide mechanism whereby each of a series of visual, palpable, or audible signals at various points on a main circuit may be operated or called into action or other work performed from a central station without operating or calling into action the signals or performing the work at other points or stations on the same circuit. This I accomplish by means of a regulating-instrument at the local or relay station, which may be actuated from a central station by making and breaking the main circuit, so constructed, arranged, and operated that the signal or machine to be operated at that station will respond to or be actuated by the "call" for that station and will not respond to or be operated by other calls.

Referring to the drawings, Figure 1 is a top view of one of my improved regulating-instruments. Fig. 2 is a section on line 2 2 of Fig. 1. Fig. 3 is a section on line 3 3 of Fig. 1. Figs. 4 and 5 are detailed views of the permutation-wheel.

I introduce into a main circuit at the various stations where a signal is desired one of my regulating-instruments, relays, and local batteries of the usual construction. The main line is connected at each local station with a relay R and the relay with posts 1 and 2.

A and A′ are local batteries.

B, B′, and B² are electro-magnets. The armature *b* of magnet B is attached to a lever C, mounted upon a spindle *c* and carrying a conducting-surface *c′* insulated therefrom. This conducting-surface is adapted to engage with a set-screw *d* on a standard D, which is also provided with a non-conducting set-screw *d′*. To the free end of this lever is pivotally attached a pawl E, adapted to actuate a permutation-wheel F. I have illustrated the permutation-wheel as a ratchet-wheel fixed upon a spindle *f* and having three parallel rows of teeth f' f^2 f^3 on its periphery. Every fourth tooth *f* in row f' is electrically connected with the spindle, the remaining teeth in the row being insulated therefrom. Each insulated tooth in the row f' has a conducting-tooth opposite it in row f^2, and vice versa. The arrangement of these teeth may be varied indefinitely. Pawls E and E′ engage the teeth on rows f' and f^2, respectively. The conducting-teeth are electrically connected with the spindle *f* by a piece of conducting material f^2, countersunk in the bearing-face of the teeth, leaving the points of the teeth insulated. The teeth in row f^3 are insulated from the spindle and are engaged by pawl H to prevent the permutation-wheel from turning backward. The spindle *f* is supported in suitable bearings G G and carries a grooved pulley f^4, over which takes a cord f^5, carrying a weight f^6. A spring may be used in place of the weighted pulley, if desired. The armature b' of magnet B′ is attached to a lever C′, mounted upon a spindle e' and pivotally attached at its free end to a pawl E′, adapted to engage with and actuate the permutation-wheel in the same direction in which it is actuated by the pawl E. The magnet B′ is preferably of higher resistance than magnet B². The armature b' is preferably heavier than armature *b*. The magnet B′ is so provided with adjusting devices that its armature will only respond to a firm dash. The permutation-wheel is provided with pins or lugs f^7 and f^8, the former adapted to engage an arm *i*, preferably a spring-arm, upon a standard I, and the latter adapted to engage with a standard J.

K is a switch-key adapted to engage with posts 7 and 8, and L is the signal or mechanism to be operated, (shown as a bell.)

The armature b^2 of magnet B² is attached to a bent lever C², having its fulcrum upon a spindle c^2, carried by a standard M. One end of lever C² is adapted to engage a non-conducting arm *g*, pivoted to standard G, and taking under the pawls E, E′, and H for the purpose of lifting them out of engagement

with the permutation-wheel. This lever also carries a spring-arm c^3, adapted to engage a set-screw n in a standard N when the armature b^2 is attracted by the magnet B^2. Spring-arm c^3 is adjusted by means of a set-screw m in standard M.

1, 2, 3, 4, 5, 6, 7, 8, and 9 are binding-posts. The instrument is provided with the ordinary springs, adjusting devices, &c. The coils of magnets B and B′ are preferably horizontal and those of magnet B^2 vertical.

Magnet B is connected with posts 1 and 3, post 3 with post 2, standard D with post 4, magnet B′ with bearing-surface c' and post 5, post 5 with post 4, magnet B^2, standard J, and post 9, standard 1 with switch-key K, post 6 with magnet B^2, standard M, lever C, and post 7, post 8 with post 9, and post 4 with standards N and G. Local battery A is on the line 2 3, battery A′ on the line 4 5, and the signal or machine to be operated on the line 8 9. When the sending-instrument at the central station is operated by depressing the key, the relay will respond and a circuit I is formed through post 2, battery A, post 3, magnet B, and post 1, and the armature b will be attracted by the magnet B, carrying with it the lever C. The pawl E will move with the lever C, and, being in engagement with a tooth on the periphery of the permutation-wheel, will move it one space. Circuit I will be formed and operate magnet B and its armature and lever either by a dot or a dash. Circuit II will be also formed either by a dot or a dash, as conducting-surface c on lever C must necessarily come in contact with set-screw d, thus completing (whenever circuit I is closed) circuit II through set-screw d, conducting-surface c', magnet B′, post 5, battery A′, post 4, and standard D; but, owing to the momentary contact with set-screw d and conducting-surface c', the heavy armature b', lever C′ of magnet B′, with its adjustment, will not respond except when a firm dash is made. When circuit II is formed by a dash, the movement of the armature b' draws with it lever C′ and pawl E′, thereby moving the permutation-wheel one space in the same direction in which it has been pushed by the pawl C.

Each signal or machine is designed to respond to a series of pulsations, which may differ from that responded to by each or any of the other signals or machines on the line, the particular series to which each signal or machine responds being determined by the arrangement of the conducting and non-conducting teeth on the permutation-wheel, which arrangement can be varied to a practically unlimited extent. The conducting and non-conducting teeth are so arranged that one of the pawls will engage a conducting-tooth if a wrong pulsation is made, but will pass the conducting-tooth and engage only with the non-conducting teeth when it is properly moved to call the signal or machine into operation. The call for the instrument illustrated is dot, dot, dash, dot, dot, dash, dot, dot, dash. The conducting-teeth are arranged so that they may be passed by both pawls when the proper pulsations are made.

Recurring now to the action of the permutation-wheel when driven by the pawls C and C′, it will be seen that the permutation-wheel is moved one space by the depression of the key for the first dot, and by a similar depression it will be moved a second space by pawl E for the second dot. Upon the next depression of key for the dash the permutation-wheel will be moved one space in the same direction by pawl E and another space by pawl E′, and the pawl E is carried over the first of the conducting-teeth, with which it would engage if a dot had been made and pawl E forced forward by magnet B. In this manner, when the proper call is made, the pawls are automatically kept from contact with the conducting-teeth and the wheel rotated until the call is complete, when the lug f^7 engages with arm i on standard I, when a circuit III is formed through arm i, switch-key K, (which is set in contact with post 8,) post 8, the bell L, posts 9 and 5, battery A′, post 4, standard G, spindle f, and the permutation-wheel, thereby ringing the bell or operating the signal or machine. This circuit may be broken at the local station by turning the switch-key. If the switch-key be brought into engagement with post 7, another circuit IV will be made through posts 7 and 6, magnet B^2, post 5, battery A′, post 4, standard G, spindle f, the permutation-wheel, arm i, standard I, and the switch-key.

The movement of the armature b^2 toward its magnet will actuate the lever C^2, thereby raising the arm g and lifting the pawls E, E′, and H out of engagement with the teeth of the permutation-wheel, and the permutation-wheel will be moved by means of the weighted cord f^5, thus moving the lug f^7 out of engagement with the arm i. As this circuit is broken as soon as the permutation-wheel moves, other means are required to complete the work of this circuit and hold the pawls out of engagement long enough to allow the regulator-wheel to return to its normal position. When the lever C^2 engages with the arm g, the spring-arm c^3 engages with the set-screw n in standard N and a circuit V is formed through standard N, post 4, battery A′, post 5, magnet B^2, post 6, standard M, spindle c^2, lever C^2, arm c^3, and set-screw n. This holds the armature on its magnet, thereby holding the pawls out of engagement with the teeth on the permutation-wheel until the permutation-wheel has returned to its first position, when a new circuit is formed to break the one just described. When the permutation-wheel reaches its first position, the lug f^8 engages the standard J, and a circuit VI is formed through standard J, post 5, battery A′, post 4, standard G, spindle f, the permutation-wheel, and lug f^8. As this circuit passes through no coil or other medium of

high resistance and circuit V passes through a coil of the electro-magnet, the current will pass through circuit VI, and the armature b^2 will be released, breaking circuit V and permitting the pawls to again engage with the permutation-wheel.

If a dot or dash be made out of its proper place in the call, as in making the call for some other station, or an error of the operator be made, a conducting-tooth on the permutation-wheel will engage one of the pawls E or E′. If the contact be made with pawl E, a circuit VII will be formed through pawl E and lever C, spindle *c*, post 6, magnet B^2, post 5, battery A′, post 4, standard G, spindle *f*, the permutation-wheel, and a conducting-tooth. If the contact be made with pawl E′, a circuit VIII will be formed through pawl E′, lever C′, spindle *c*′, post 6, magnet B^2, post 5, battery A′, post 4, standard G, spindle *f*, the permutation-wheel, and a conducting-tooth. The movement of the armature b^2 and lever C^2 in either case lifts the pawls E, E′, and H out of engagement with the permutation-wheel, which will be rotated by the action of the weighted cord f^5, breaking the circuit, when circuits V and VI are again made and the instrument is reset by their action, as before described.

Any instrument may at any time be reset for its call by the operator at the central station making one more dash in succession than there is in any sequence in the call for the instrument desired to be reset. I prefer to so arrange each instrument that its signal will begin with a dot or series of dots, and the instrument will be reset by the circuits and in the manner hereinbefore described.

I claim as my invention—

1. The combination of a transmitting-instrument and a series of signals or machines at relay-stations with permutation-wheels, each permutation-wheel being actuated by two or more local electro-magnets controlled from a central station, and adapted to close, when the proper call is made, the circuit which actuates the signal at its station, substantially as and for the purpose specified.

2. The combination of a transmitting-instrument and a series of signals or machines at relay-stations with permutation-wheels, each permutation-wheel being actuated by two or more local electro-magnets controlled from a central station, and adapted to close, when the proper call is made, the circuit which actuates the signal at its station, and when a differing call is made to close a circuit which resets the permutation-wheel, substantially as and for the purpose specified.

3. The combination of a transmitting-instrument and a series of signals or machines at relay-stations with permutation-wheels, each permutation-wheel being actuated by two or more local electro-magnets controlled from a central station, and adapted to close, when the proper call is made, the circuit which actuates the signal at its station, and to close, when a differing call is made, a circuit which resets the permutation-wheel, and to close when reset a circuit which breaks the resetting-circuit, substantially as and for the purpose specified.

4. The combination, in an electrical instrument in a circuit, of a signal or machine, a permutation-wheel, electro-magnets, and an armature-lever adapted by its movement to and from its magnet to propel the permutation-wheel one space, and also adapted to close a circuit which actuates a second armature-lever, by which the permutation-wheel may be driven another space, substantially as and for the purpose specified.

5. In an electric regulating-instrument, a permutation-wheel having two or more series of teeth so arranged that for each conducting-tooth in a series there will be a non-conducting tooth in another series, substantially as and for the purpose specified.

6. In an electric regulating-instrument, the combination of a propelling magnet or magnets, a pawl or pawls, and a permutation-wheel having two or more series of teeth so arranged that for each conducting-tooth in a series there will be a non-conducting tooth in another series, substantially as and for the purpose described.

7. The combination, in an electric instrument in a circuit, of a signal or machine, a permutation-wheel provided with two or more series of teeth so arranged that for each conducting-tooth in a series there will be a non-conducting tooth in another series, and having thereon a lug adapted, when the proper call for that instrument is made, to close the circuit which actuates the signal or machine, substantially as and for the purpose described.

8. The combination, in an electric instrument in a circuit, of a signal or machine and a permutation-wheel provided with two or more series of teeth so arranged that for each conducting-tooth in a series there will be a non-conducting tooth in another series, and having thereon a lug adapted to close the circuit which breaks a resetting-circuit, substantially as and for the purpose described.

9. The combination, in an electric instrument in a circuit, of a signal or machine and a permutation-wheel provided with two or more series of teeth so arranged that for each conducting-tooth in a series there will be a non-conducting tooth in another series, and having thereon a lug adapted to close the circuit which actuates the signal, and a lug which closes the circuit which resets the instrument, substantially as and for the purpose described.

10. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including the relay and propelling-magnet B, II including a second propelling-magnet B′, and III closed by the proper com-

bination of electric impulses and including the signal mechanism, substantially as and for the purpose described.

11. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including the relay and propelling-magnet B, II including a second propelling-magnet B′, III closed by the proper combination of electric impulses including the signal mechanism, and IV including magnet B^2 and closed by the switch-key, substantially as and for the purpose described.

12. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including the relay and propelling-magnet B, II including a second propelling-magnet B′, III closed by the proper combination of electric impulses and including the signal mechanism, IV including magnet B^2 and closed by the switch-key, and V including magnet B^2 and closed by its armature, substantially as and for the purpose described.

13. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including the relay and propelling-magnet B, II including a second propelling-magnet B′, III closed by the proper combination of electric impulses and including the signal mechanism, IV including magnet B^2 and closed by the switch-key, V including magnet B^2 and closed by its armature, and VI serving to cut magnet B^2 out of circuit V, substantially as and for the purpose specified.

14. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including the relay and propelling-magnet B, II including a second propelling-magnet B′, III closed by the proper combination of electric impulses and including the signal mechanism, IV including magnet B^2 and closed by the switch-key, V including magnet B^2 and closed by its armature, VI serving to cut magnet B^2 out of circuit V, and VII including magnet B^2 and closed by a combination of electric impulses other than the call for its station, substantially as and for the purpose specified.

15. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including the relay and propelling-magnet B, II including a second propelling-magnet B′, III closed by the proper combination of electric impulses and including the signal mechanism, IV including magnet B^2 and closed by the switch-key, V including magnet B^2 and closed by its armature, VI serving to cut magnet B^2 out of circuit V, and VIII including magnet B^2 and closed by a combination of electric impulses other than the call for the station, substantially as and for the purpose specified.

16. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including the relay and propelling-magnet B, VII including magnet B^2 and closed by a combination of electric impulses other than the call for its station, V including magnet B^2 and closed by its armature, and VI serving to cut magnet B^2 out of circuit V, substantially as and for the purpose described.

17. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including the relay and propelling-magnet B, II including a second propelling-magnet B′, VII including magnet B^2 and closed by a combination of electric impulses other than the call for its station, V including magnet B^2 and closed by its armature, and VI serving to cut out magnet B^2 from circuit V, substantially as and for the purpose described.

18. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including the relay and propelling-magnet B, and VII including magnet B^2 and closed by a combination of electric impulses other than the call for its station, substantially as and for the purpose specified.

19. The combination of a main electric current, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including the relay and propelling-magnet B, and VIII including magnet B^2 and closed by a combination of electric impulses other than the call for its station, substantially as and for the purpose specified.

20. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including propelling-magnet B, II including a second propelling-magnet B′, VII including magnet B^2 and closed by a combination of electric impulses other than the call for its station, substantially as and for the purpose specified.

21. The combination of a main electric circuit, a permutation-wheel, a signal or machine, one or more batteries, and the electric circuits, I including propelling-magnet B, II including a second propelling-magnet B′, VIII including magnet B^2 and closed by a combination of electric impulses other than the call for its station, substantially as and for the purpose specified.

22. The combination, in an electrical instrument, of the electro-magnets B B′, levers C C′, pawls E E′, permutation-wheel F, and signal P, substantially as and for the purpose specified.

23. The combination, in an electric instrument, of batteries A A′, electro-magnets B B′, levers C C′, pawls E E′, permutation-wheel F, and the series of teeth f' f^2, substantially as and for the purpose described.

24. The combination, in an electrical instru-

ment, of batteries A A′, electro-magnets B B′ B^2, levers C C′ C^2, pawls E, E′, and H, permutation-wheel F, and the series of teeth f', f^2, and f^3, substantially as and for the purpose described.

25. The combination, in an electrical instrument, of batteries A A′, electro-magnets B B′ B^2, levers C C′ C^2, spring-arm c^3, pawls E, E′, and H, and permutation-wheel F, substantially as and for the purpose described.

26. The combination, in an electrical instrument, of batteries A A′, electro-magnets B B′ B^2, levers C C′ C^2, spring-arm c^3, pawls E, E′, and H, the permutation-wheel F, and means for automatically returning the permutation-wheel to its set position, substantially as and for the purpose described.

27. The combination, in an electrical instrument, of batteries A A′, electro-magnets B B′, levers C C′, pawls E E′, permutation-wheel F, provided with a lug f^7, arm i, and signal L, substantially as described.

28. The combination, in an electrical instrument, of batteries A A′, electro-magnets B B′ B^2, levers C, C′, and C^2, pawls E, E′, and H, permutation-wheel F, provided with a lug f^8, arm J, and signal L, connected and arranged substantially as and for the purpose specified.

29. The combination, in an electrical instrument, of batteries A A′, electro-magnets B B′, levers C C′, pawls E E′, permutation-wheel F, provided with lugs f^7 f^8, and a signal L, connected and arranged substantially as and for the purpose specified.

30. The combination, in an electrical instrument, of batteries A A′, magnets B B′ B^2, spring-arm c^3, pawls E, E′, and H, permutation-wheel F, provided with lugs f^7 and f^8, and a signal, connected and arranged substantially as and for the purpose specified.

31. The combination, in an electrical instrument, of batteries A A′, electro-magnets B B′ B^2, lever C, carrying a pawl E, lever C′, carrying a pawl E′, and permutation-wheel F, provided with lugs f^7 and f^8, lever C^2, carrying a spring-arm c^3, pawl H, non-conducting arm g, weighted pulley f^4, and signal L, connected and arranged substantially as and for the purpose described.

J. L. CUTLER.

Witnesses:
FRANK O. LOVELAND,
AUGUST F. HERBSLEB.