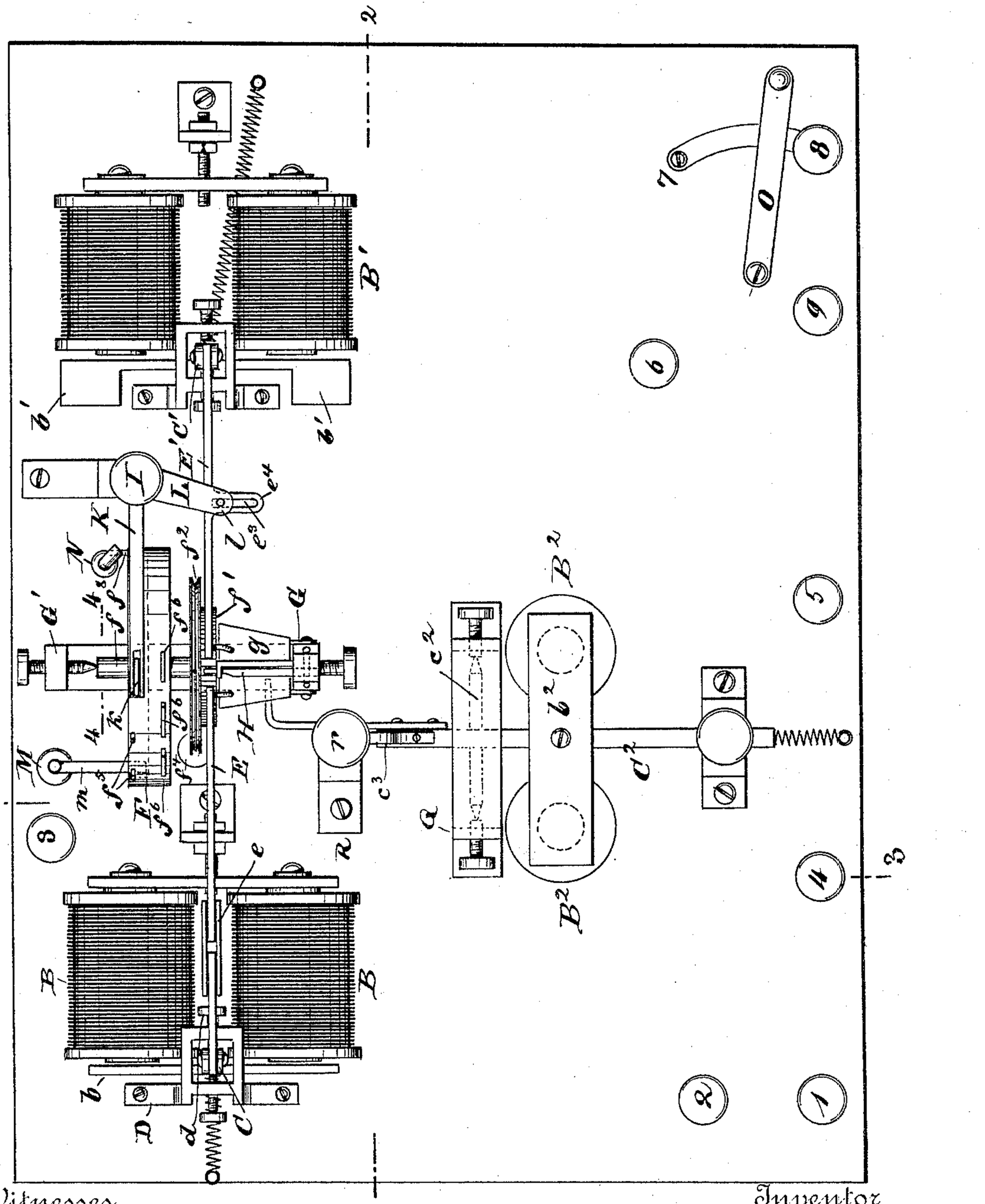
(No Model.) 4 Sheets—Sheet 1.

J. L. CUTLER.

ELECTRICAL COMMUNICATION.

No. 433,619. Patented Aug. 5, 1890.

Fig. 1.



Witnesses
Frank D. Loveland Jr.
James N. Ramsey

Inventor
James L. Cutler
By his Attorneys
Parkinson & Parkinson

(No Model.)

4 Sheets—Sheet 2.

J. L. CUTLER.

ELECTRICAL COMMUNICATION.

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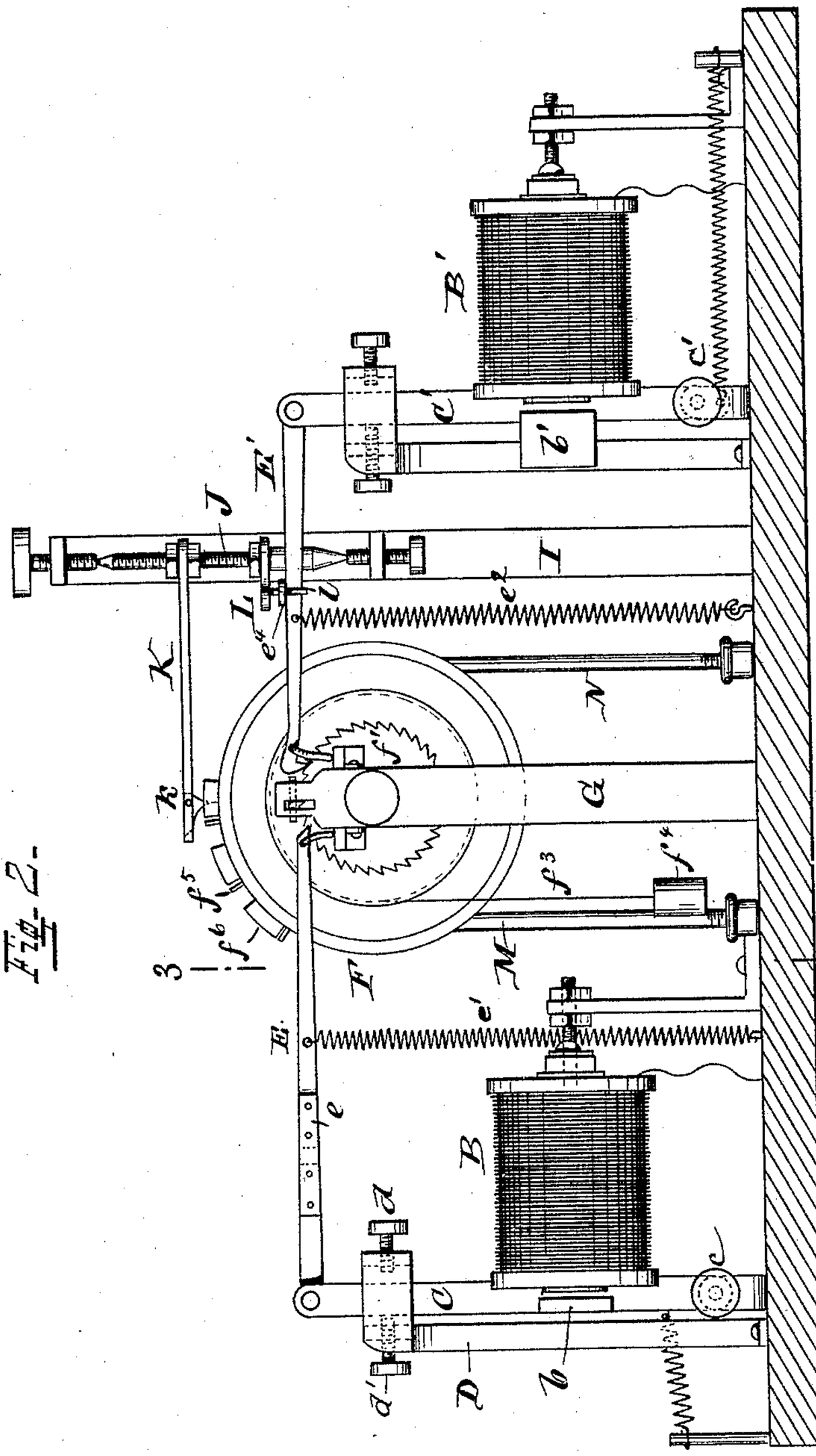

Fig. 2.

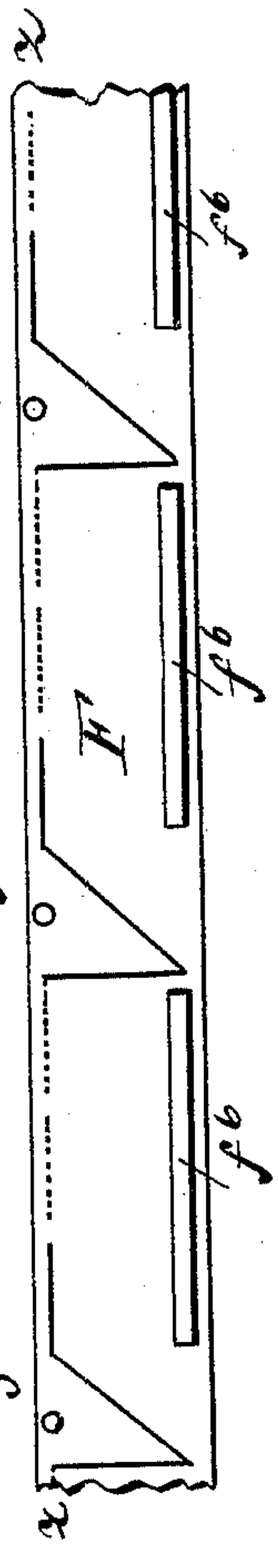

Fig. 6.

Witnesses
Frank D. Loveland
James N. Ramsey

Inventor
James L. Cutler
By his Attorneys
Parkinson & Parkinson

(No Model.)

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J. L. CUTLER.

ELECTRICAL COMMUNICATION.

No. 433,619. Patented Aug. 5, 1890.

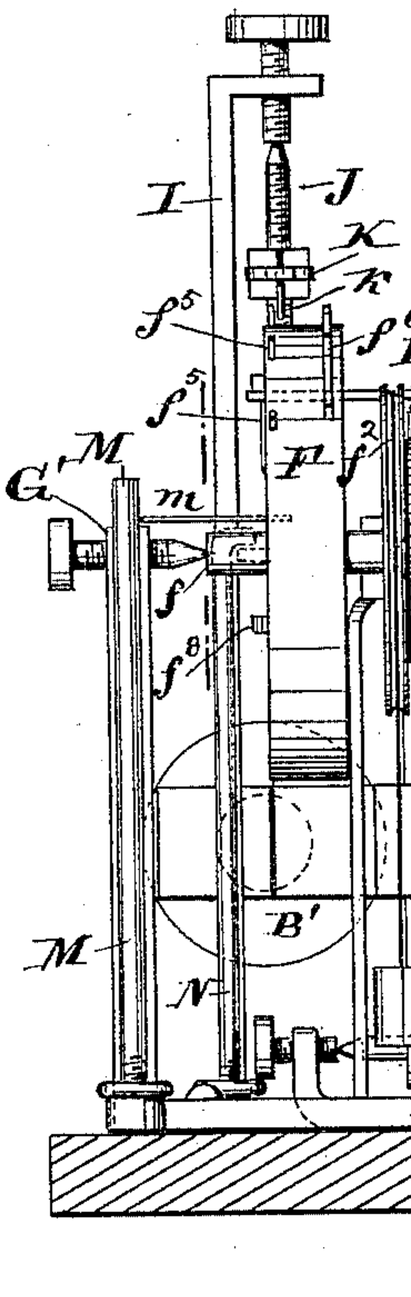

Fig. 3.

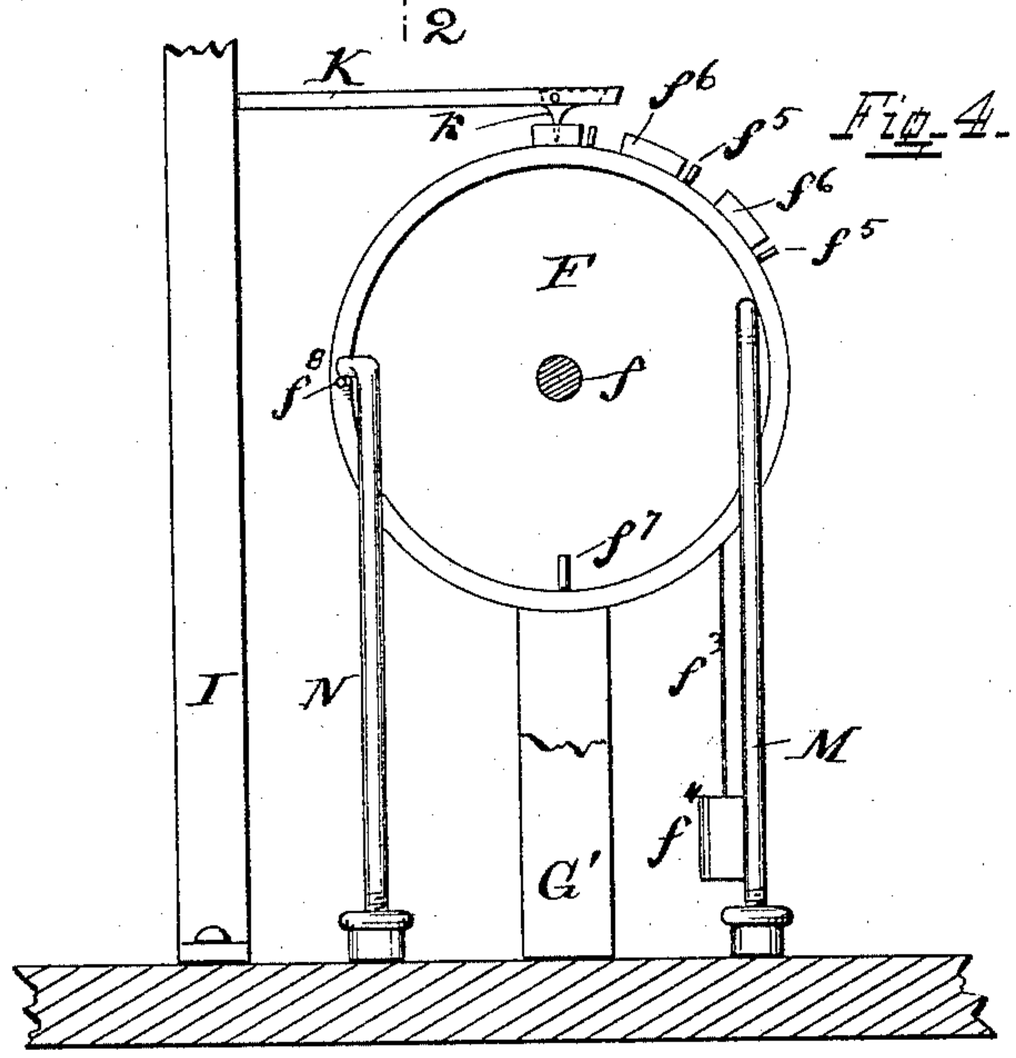

Fig. 4.

Witnesses
Frank O. Loveland
James N. Ramsey

Inventor
James L. Cutler
By his Attorneys
Parkinson & Parkinson

(No Model.) 4 Sheets—Sheet 4.

J. L. CUTLER.

ELECTRICAL COMMUNICATION.

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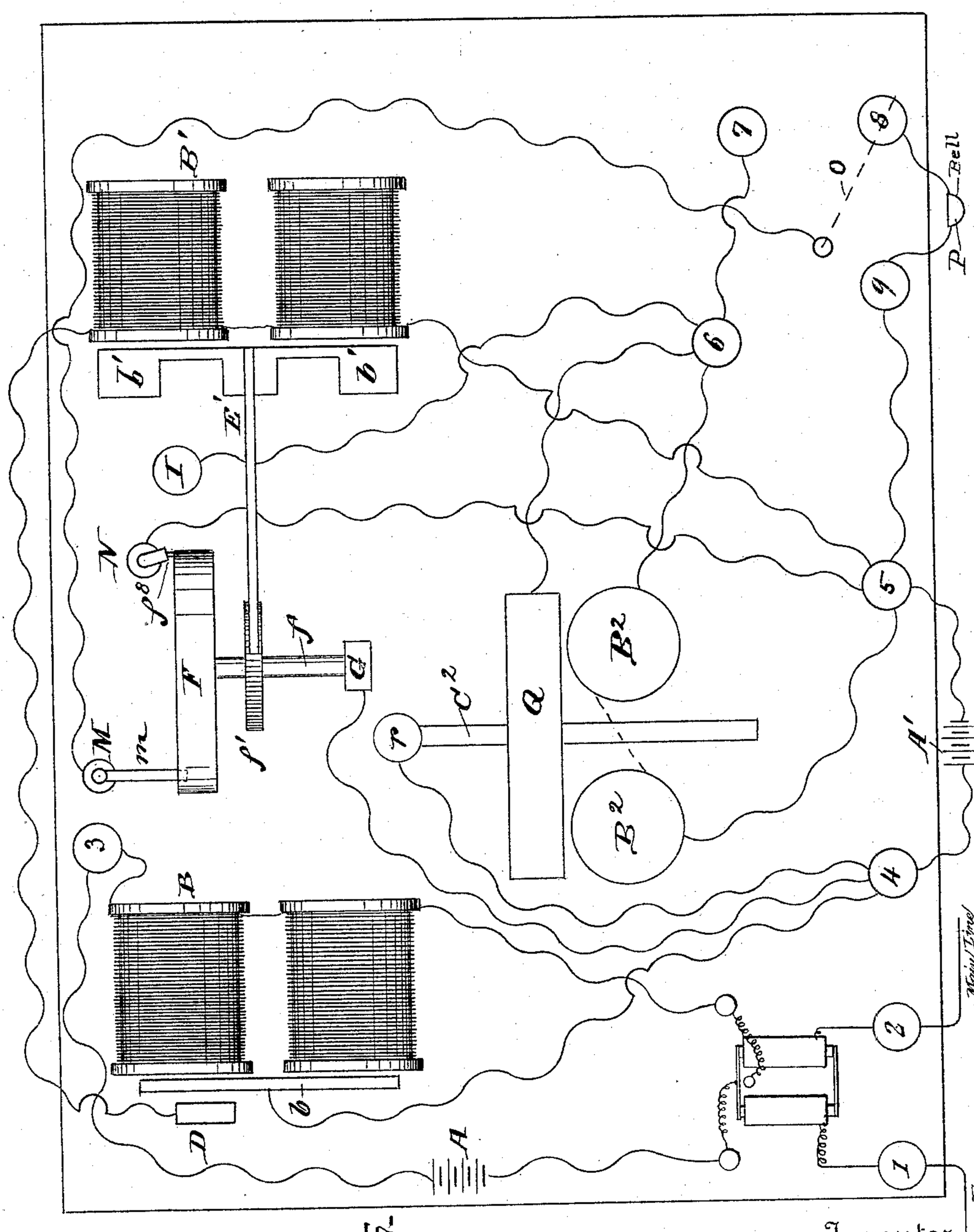

Fig. 5.

Witnesses
Frank O. Loveland.
James N. Ramsey

Inventor
James L. Cutler
By his Attorneys
Parkinson & Parkinson

UNITED STATES PATENT OFFICE.

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

ELECTRICAL COMMUNICATION.

SPECIFICATION forming part of Letters Patent No. 433,619, dated August 5, 1890.

Application filed March 8, 1889. Serial No. 302,521. (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. Fig. 4 is a side elevation of the regulator or permutation wheel. Fig. 5 is a diagram of the circuit-connections. Fig. 6 is a diagram of the path, relative to the periphery of the permutation-wheel, of a movable pin.

I introduce into a main circuit at the various stations where a signal is desired relays, local batteries, and one of my regulating-instruments. The main line is connected at each local station with-a relay 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 adapted to engage with a set-screw *d* in 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 and provided with a non-conducting joint *e*. I have illustrated the permutation-wheel as fixed upon a spindle *f*, which carries a ratchet-wheel *f′*, with which the pawl E directly engages. The spindle *f* is supported in suitable bearings G and G, and also carries a grooved pulley f^2, over which takes a cord f^3, carrying a weight f^4. It is obvious that a spring might be used in place of and as the equivalent of the grooved pulley and weight.

The armature *b′* of magnet B′ is attached to a lever C′, mounted upon a spindle *c′* and pivotally attached at its free end to a hooked pawl E′, adapted to engage with and actuate the ratchet-wheel *f′* in the same direction in which it is actuated by the pawl E. The magnet B′ is preferably of higher resistance than magnet B and the armature *b′* heavier than armature *b*, and the magnet is so provided with adjusting devices that its armature will only respond to a firm dash.

H is a pawl adapted to prevent the ratchet-wheel from turning backward. The pawls E E′ may be forced into engagement with the ratchet-wheel by springs *e′* e^2.

I is a standard carrying in suitable bearings a live spindle J, having mounted thereon an arm K, carrying a hinged tongue *k*, which normally rides in close propinquity to, but not in electric contact with, the permutation-wheel.

L is a non-conducting arm fixed to the spindle J and carrying at or near its free end a pin *l*, adapted to take into a slot e^3 in a plate e^4 upon pawl E′.

The permutation-wheel is provided with a series of lugs or pins or projections f^5, and a series of ledges or projections f^6, extending sufficiently above its periphery to engage with the tongue *k* under conditions which will be more fully explained hereinafter. The permutation-wheel is also provided with pins or lugs f^7 and f^8, the former adapted to engage an arm *m*, preferably a spring-arm, upon a standard M, and the latter adapted to engage with a standard N.

O is a switch-key adapted to engage with posts 7 and 8, and P is the signal or mechan-

ism to be operated. (Shown as a bell.) The armature b^2 of magnet B^2 is attached to a bent lever C^2, having its fulcrum upon a spindle c^2, carried by a standard Q. One end of lever C^2 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 ratchet-wheel. This lever also carries a spring arm c^3, adapted to engage a set-screw r in a standard R, when the armature b^2 is attracted by the magnet B^2. 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, lever C with post 4, magnet B′ with standard D and post 5, post 5 with post 4, magnet B^2, standard N, and post 9, standard M with switch-key O, post 6 with magnet B^2, standards Q and I, and post 7, post 8 with post 9, and post 4 with standards R 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 the ratchet-wheel f' will move it one space, thereby moving the permutation-wheel a corresponding 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 lever C must necessarily come in contact with set-screw d, thus completing (whenever circuit I is closed) circuit II through set-screw d, standard D, magnet B′, post 5, battery A′, post 4, and lever C; but owing to the momentary contact of set-screw d and lever C, the heavy armature B, lever C′ of magnet B^2, 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 ratchet-wheel and permutation-wheel one space in the same direction in which it has been pushed by the pawl C. The same movement of the pawl E′ which actuates the permutation-wheel also draws the arm L, thereby oscillating the spindle J and swinging arm K, carrying the tongue k.

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 pins and ledges on the permutation-wheel, which arrangement can be varied to a practically unlimited extent. The periphery of the permutation-wheel is divided into spaces corresponding with the ratchet-notches. The pins f^5 are placed upon the periphery of the wheel at such intervals as to engage with the tongue k if the regulator-wheel be rotated more than the desired space while the arm K is in its position of rest. The ledges f^6 are placed within the range of movement of the tongue k in such manner that they will engage with it if it be drawn out of its position of rest when such movement is not required for the purpose of calling into operation the signal or machine connected with that instrument, but will not engage with the tongue k when it is properly moved to call the signal or machine into operation. This will be better understood by reference to the diagram shown in Fig. 6 of the drawings. The call for the instrument illustrated is dot, dash, dot, dot, dash, dot, dot, dash. The pins f^5 are placed so that they must be passed by the tongue k when the dashes are made.

Recurring now to the action of the permutation-wheel when driven by the pawls E and E′, it will be seen that the wheel is moved one space by the depression of the key for the dot. Upon the next depression of the key for the dash the wheel will be moved one space in the same direction by the pawl E and another space by the pawl E′, and the first of the series of pins f^5 would engage with the tongue k if the pin remained in its position of rest; but when the dash is made the tongue k is drawn out of line with the pins f^5 by the action of the arm L. The ledges f^6 are so arranged that the tongue k will swing into a space between two of the series when the dash is made at its proper place in the call for the signal or machine connected with the instrument. In this manner when the proper call is made the tongue k is automatically kept from contact with the pins and ledges, as indicated by the line $z z$ in Fig. 6, on which the dotted portion indicates the position of the tongue k relatively to the periphery of the wheel during the travel of the wheel caused by the dots and the unbroken portion its position during the travel caused by the dashes, and the wheel continues to rotate without engaging with tongue k until the call is complete, when the lug f^7 engages with arm m on standard M and a circuit III is formed through arm m, standard M, switch-key O, (which is set in contact with post 8,) post 8, the bell P, posts 9 and 5, battery A′, post 4, standard G, spindle f, and the regulator-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 m, standard M, 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 ratchet-wheel f', and the permutation-wheel will be moved by means of the weighted cord f^8, thus moving the lug f^7 out of engagement with the arm m. As this circuit is broken as soon as the regulator-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 permutation-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 r in standard R, and a circuit V is formed through standard R, post 4, battery A′, post 5, magnet B^2, post 6, standard Q, spindle c^2, lever C^2, arm c^3, and set-screw r. This holds the armature on its magnet, thereby holding the pawls out of engagement with the ratchet-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^7 engages the standard N, and a circuit VI is formed through standard N, post 5, battery A′, standard G, spindle f, the permutation-wheel, and lug f^7. 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 ratchet-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 be an error of the operator, a pin or ledge on the permutation-wheel will engage with the tongue k, and a circuit VII will be made through tongue k, arm K, spindle J, standard I, post 6, magnet B^2, post 5, battery A′, post 4, standard G, spindle f, and the permutation-wheel. The movement of the armature b^2 and lever C^2 lifts the pawls E, E′, and H out of engagement with the ratchet-wheel, and the permutation-wheel will be rotated by the action of the weighted cord f^9, 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.

A portion of the subject-matter herein set forth is described and claimed in another application filed August 9, 1889, Serial No. 320,209.

I claim as my invention—

1. The combination, in an electric circuit, of electro-magnet B, lever C, pawl E, permutation-wheel F, having projections f^5 and f^6, and signal P, substantially as and for the purpose specified.

2. The combination, in an electric circuit, of the electro-magnet B, lever C, pawl E, permutation-wheel F, having projections f^5 and f^6, signal P, electro-magnet B′, lever C′, and pawl E′, substantially as and for the purpose specified.

3. The combination, in an electric circuit, of electro-magnet B, lever C, pawl E, permutation-wheel F, signal P, electro-magnet B′, lever C′, pawl E′, and arms L and K, substantially as and for the purpose specified.

4. The combination, in an electrical instrument, of batteries A A′, electro-magnets B, B′, and B^2, levers C, C′, and C^2, pawls E, E′, and H, arms L and K, permutation-wheel F, and signal P, connected and arranged substantially as and for the purpose specified.

5. The combination, in an electrical instrument, of batteries A and A′, electro-magnets B, B′, and B^2, lever C, carrying non-conducting pawl E, lever C′, carrying pawl E′, provided with slotted plate e^4, arm K, permutation-wheel F, lever C, pawl H, and signal P, connected and arranged substantially as and for the purpose specified.

6. The combination, in an electrical instrument, of batteries A A′, electro-magnets B B′, levers C C′, pawls E, E′, and H, permutation-wheel F, having projections f^5 and f^6, and signal P, connected and arranged substantially as and for the purpose specified.

7. The combination, in an electrical instrument, of batteries A A′, electro-magnets B B′, levers C C′, pawls E, E′, and H, arms L and K, permutation-wheel F, and signal P, connected and arranged substantially as and for the purpose specified.

8. The combination, in an electrical instrument, of batteries A A′, electro-magnets B, B′, and B^2, levers C, C′, and C^2, pawls E, E′, and H, arms L and K, permutation-wheel F, and weighted pulley f^2, connected and arranged substantially as and for the purpose specified.

9. The combination, in an electrical instrument, of batteries A A′, electro-magnets B, B′, and B^2, levers C, C′, and C^2, spring-arm c^3, contact I, pawls E, E′, and H, arms L and K, permutation-wheel F, and weighted pulley f^2, connected and arranged substantially as and for the purpose specified.

10. The combination, in an electrical instrument, of batteries A A′, electro-magnets B, B′, and B^2, levers C, C′, and C^2, spring-arm c^3, non-conducting arm g, pawls E, E′, and H, arms L and K, permutation-wheel F, and weighted pulley f^2, connected and arranged substantially as and for the purpose specified.

11. The combination, in an electrical instrument, of batteries A and A′, electro-magnets B, B′, and B^2, lever C, carrying non-conducting pawl E, lever C′, carrying pawl E′, provided with slotted plate e^4, arm K, having

tongue k, permutation-wheel F, having thereon pins f^5 and projections f^6, pulley f^2, weight f^4, lever C^2, carrying spring-arm c^3, contact I, pawl H, and signal P, connected and arranged substantially as and for the purpose specified.

12. The combination, in an electrical instrument, of batteries A A′, electro-magnets B B′, levers C and C′, pawls E, E′, and H, permutation-wheel F, provided with a pin f^7, and projections f^5 and f^6, arm m, and signal P, connected and arranged substantially as and for the purpose specified.

13. The combination, in an electrical instrument, of batteries A A′, electro-magnets B B′, levers C C′, pawls E, E′, and H, permutation-wheel F, provided with a pin f^8, and projections f^5 and f^6, standard N, and signal P, connected and arranged substantially as and for the purpose specified.

14. The combination, in an electrical instrument, of batteries A A′, electro-magnets B, B′, and B^2, lever C, carrying non-conducting pawl E, lever C′, carrying pawl E′, provided with slotted plate e^4, arm K, provided with tongue k, permutation-wheel F, provided with pins f^5, f^7, and f^8, and projections f^6, pulley f^2, weight f^4, lever C^2, carrying spring-arm c^3, contact I, pawl H, non-conducting arm g, and signal P, connected and arranged substantially as and for the purpose specified.

JAMES L. CUTLER.

Witnesses:
H. BERKSTRESSER,
R. S. MCCOPPIN.