(No Model.) 3 Sheets—Sheet 1.

# C. BURGHER.

## FIRE ALARM TELEGRAPHIC REPEATER.

No. 368,907. Patented Aug. 23, 1887.

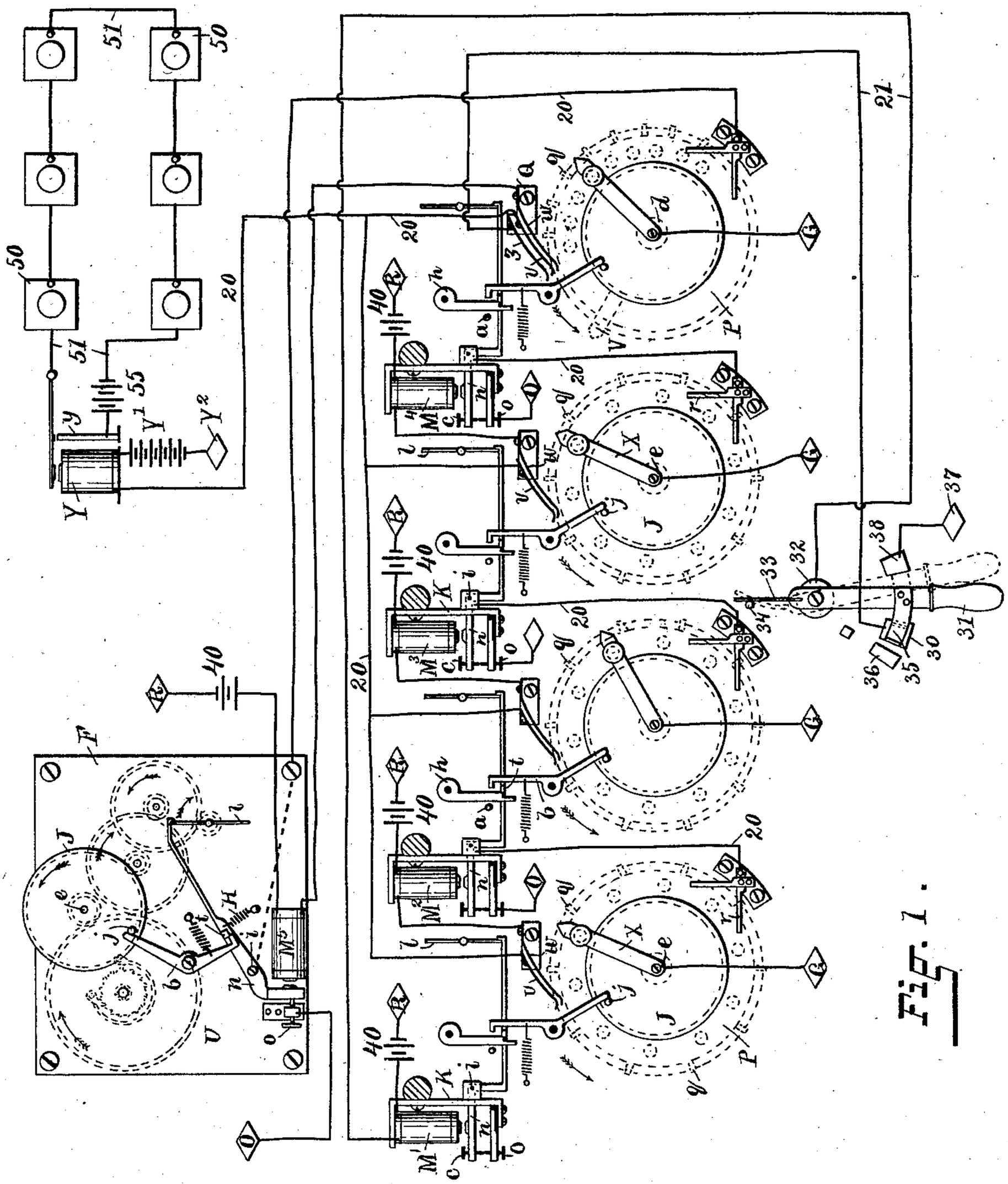

Fig. 1.

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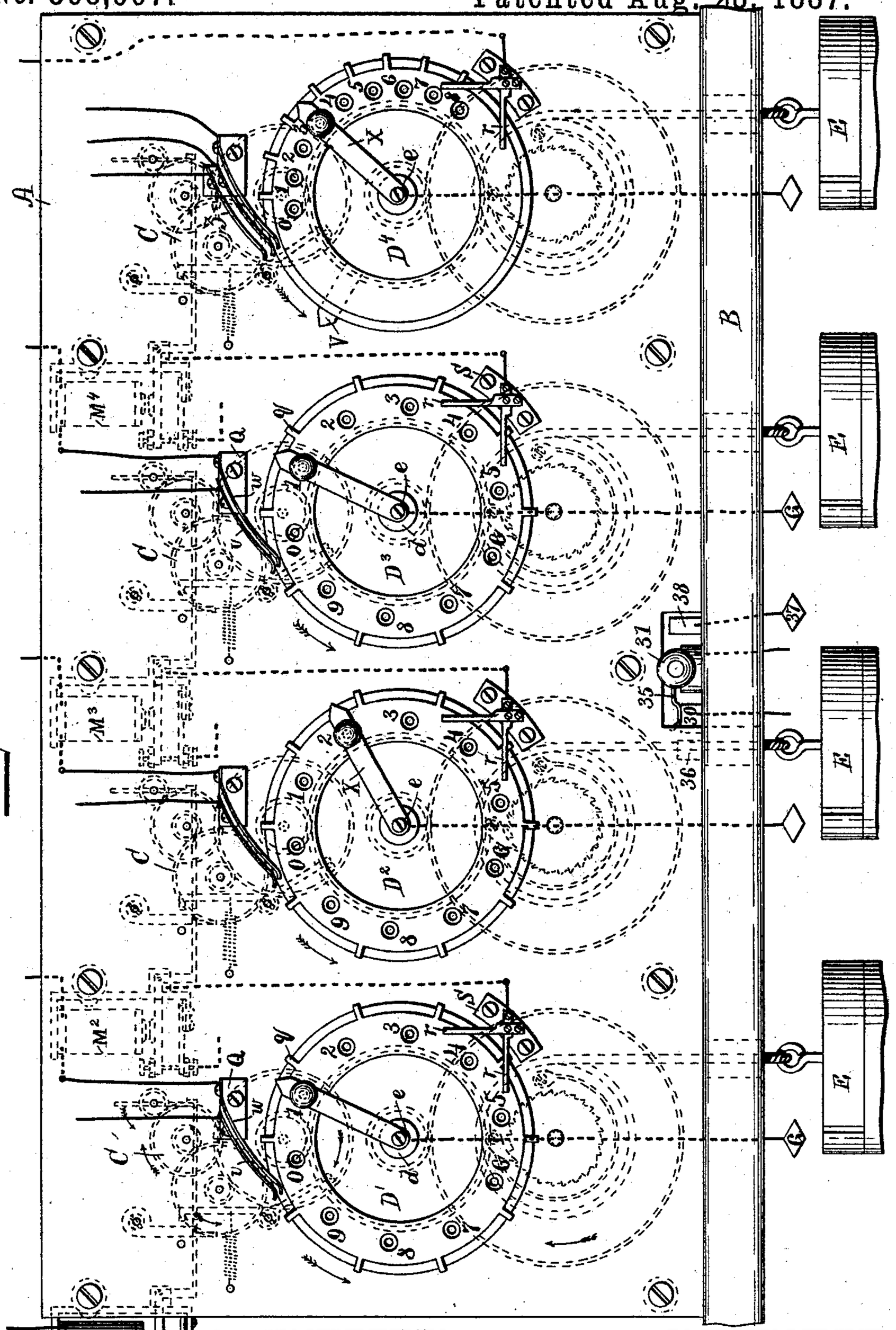
## FIRE ALARM TELEGRAPHIC REPEATER.

No. 368,907. Patented Aug. 23, 1887.

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

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## FIRE ALARM TELEGRAPHIC REPEATER.

No. 368,907. Patented Aug. 23, 1887.

Fig. 3.

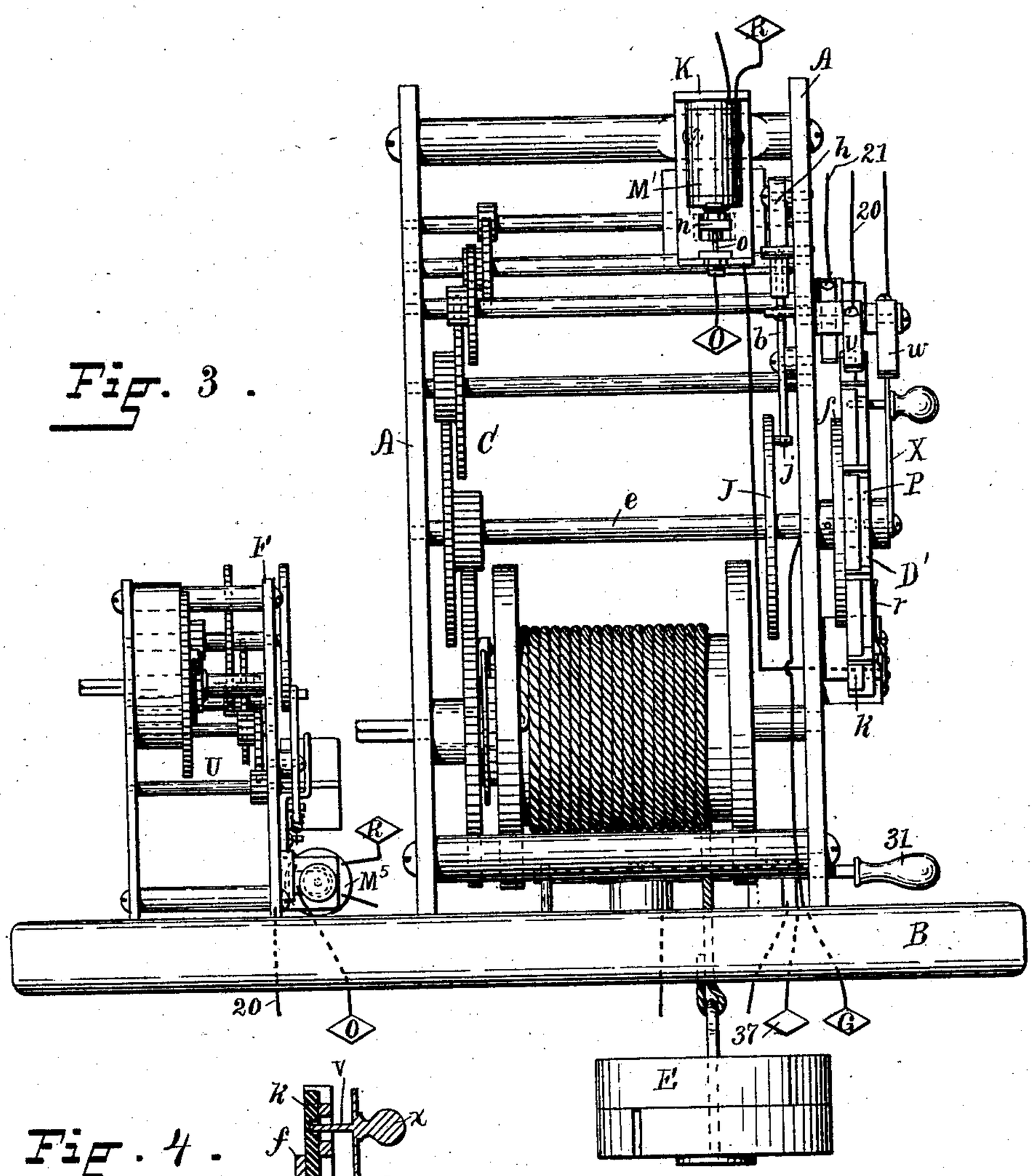
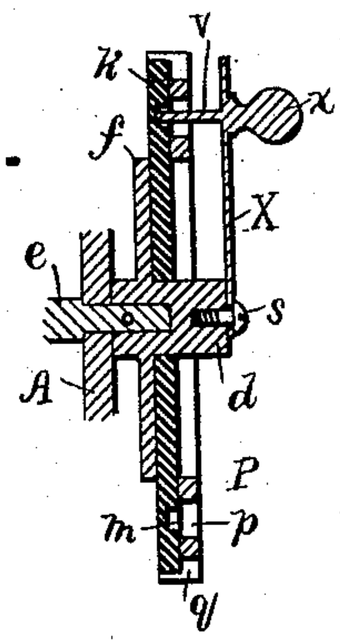



Fig. 4.

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# UNITED STATES PATENT OFFICE.

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## FIRE-ALARM TELEGRAPHIC REPEATER.

SPECIFICATION forming part of Letters Patent No. 368,907, dated August 23, 1887.

Application filed June 12, 1886. Serial No. 204,920. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES BURGHER, of the city of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Fire-Alarm Telegraphic Repeaters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to the class of fire-alarm-telegraphy apparatus designed to repeat or retransmit from the central station over a main alarm-circuit fire-alarm number-signals, which are received and recorded at the central station by the signaling-box circuit or otherwise.

The objects of my invention are to provide a repeater having a series of circuit-closers and a corresponding series of controlling mechanisms therefor which are set and started by hand, whereby they then act in succession upon each other to transmit or repeat the determinate set of number-signals, and whereby, the determinate set having been once transmitted, the repeater automatically acts a number of times over till checked or run down.

To the above purposes my invention consists in the certain novel combinations and sub-combinations of the different features, as hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 represents my invention in a diagrammatic view illustrating the arrangements of the circuits and construction of the apparatus. Fig. 2 represents an enlarged front view of the series of four circuit-closing dials, with the tripping index-hands and some of their adjuncts shown in full lines as disposed upon the outside of frame A, and with their individual releasing and actuating mechanisms shown in broken lines as within the frame. Fig. 3 represents the left-hand side view of Fig. 2, showing the frames A and F, with their contained mechanisms, mounted upon the base B. Fig. 4 represents an edge view of a diametrical section of a circuit-closing dial, with its adjustable index-hand or tripper, and as keyed upon a portion of a main arbor of a clock-work.

In the said drawings like letters and numbers designate corresponding parts throughout.

I show the use of four circuit-closing dials, each having an adjustable radial index-hand or tripping device. Three of these dials are similar and the fourth is analogous to the others. The actuating devices and controlling mechanisms and their adjuncts are quite similar in construction and arrangement. Therefore a description of one of these repeating mechanisms and adjuncts will suffice for all, and their co-operation will readily be understood by those familiar with the art to which they relate.

Referring to the drawings, the frame A is mounted on the base B and contains a series of four of the ordinary clock-works, C; but the number will vary with the number of circuit-closing dials used, and they are each actuated by a weight, E, the attached cable of which is wound upon a drum, and thereby operates the main arbor *e* to rotate it.

Each clock-work is directly controlled in operation by the electro-magnets $M'$ $M^2$ $M^3$ $M^4$, respectively. These magnets are each set in a bracket, K, made fast upon a cross-bar of the frame A. The magnet-armature *n* passes through an opening in bracket K, is pivoted at *i*, and provided with a hooked extension, which engages with the fly *l*, by which the motion of the clock-work is governed. The upper contact, *c*, is fixed upon an end of armature *n*, and coacts with a corresponding lower contact, *o*, normally in contact therewith and located upon the lower end of bracket K and provided with the ground O.

The gravity-detent *h* swings freely on its pivotal bearing, and when unobstructed assumes an oblique dependent position, and at the lower end, to one side, is provided with a shoulder, which obviously has two positions against the lug *t* on the extension of armature *n*. Normally the shoulder on detent *h* rests in its first position with its side against the lug *t*, as shown, and the contact end of armature *n* being heavier than the extended end holding the fly *l*, the extended and hooked end

will be elevated and will hold the fly, as shown The limit of oscillation of detent *h* is between lug *t* and stop *a*.

The spring-acted trigger *b* tilts on its pivotal center, and its lower end is struck by a stud, *j*, placed on the face of the wheel J, mounted on and revolving with the main arbor *e*. The upper end of the trigger *b* strikes upon the lower end of the detent *h* and drives it against stop *a*, when the wheel J revolves in direction of the arrow and causes the stud *j* to strike the lower end of trigger *b*, and from the opposite side in which the drawings show it normally. When an electro-magnet attracts the armature *n*, the detent *h* gravitates to its second and oblique position, with the lower end of its shoulder resting upon the upper face of lug *t*, and serves to hold the extended end of armature away from fly *l*, which then releases the clock-work, which runs till stud *j* strikes trigger *b*, as described, knocks the detent from off lug *t*, and causes armature *n* to gravitate into normal position away from its magnet and to catch the fly and stop the clock-work motion. These parts compose the releasing devices for the actuating means.

The circuit-closing dials D' $D^2$ $D^3$ are precisely alike in construction, and each consists of a metallic wheel, *f*, with a hub, *d*. The disk *k* is of any suitable insulating material, and is imperforate, except at the central eye, by means of which it is mounted upon hub *d*, with one broad side against the outer face of wheel *f*, and is provided with ten cavities, *m*, disposed upon its outer face symmetrically near its circumference. The metallic annular plate P is provided with ten perforations, *p*, symmetrically situated, and from between which and nearer to one extend the peripheral radial teeth *q*, which are L-shaped. The plate P is placed concentrically upon the outer face of disk *k*, with its perforations *p* registering with cavities *m*, and is firmly held thereon by means of teeth *q* hooking over the edge of disk *k*.

The metallic index-hand or tripping device X is flexible, and is fastened upon the outer face of hub *d* by the screw *s*, about which it is turnable. Near the free end of hand X is fixed a knob, *x*, and an oppositely-projecting stud, *v*, designed to extend through any perforation, *p*, into cavity *m*, as desired, by the manipulator taking hold of knob *x*, bending the hand out from the dial, then moving the hand over the dial to the desired point, and then forcing the stud *v* into the cavity *m*, in which position the hand will remain fixed for further manipulation.

The circuit-closing dial $D^4$ is analogous in construction to the others, as described, with the difference of having the teeth *q* and perforation *p* one less each, and all located within the space of about one-third the circumference of the plate P, and with the extra trip-stud V extending radially from the periphery of wheel *f*.

The dials are each mounted upon the outer end of main arbor *e* by means of the hub *d* being keyed thereto, and are situated to the outside of frame A.

The two metallic contact-brushes *r*, set on the insulating-block S, mounted on frame A, are adjusted to bear upon the outer face of plate P, which brushes past them when the dial is revolved. A connected pair of these brushes are employed with each dial—one as a guard against a defect in the other to insure constant contact.

The insulating-block Q is set above the dial and carries the metallic contact-fingers *u* and *w*, the former arranged to make contact with teeth *q*, the latter with the tripping index-hand X when the dial revolves. The dial $D^4$ has an extra contact-finger, *z*, arranged upon block Q, and designed to make contact with the trip-stud V, projecting from dial $D^4$, for the purpose hereinafter described.

The frame F contains the so-called "interrupter," the office of which will be hereinafter explained, and consists of an ordinary spring-actuated clock-work, U, with its frame F. The operation of the clock-work is governed by a releasing device consisting of the electro-magnet $M^5$, the spring-retracted armature *n* of which holds by its extended end the fly *l*, while the other end of armature *n* maintains connection with contact *o*, having ground O. When armature *n* is attracted to its magnet $M^5$, the clock-work is released and the trigger *b* takes under lug *t* an armature, *n*, and holds the armature away from fly *l* until stud *j* on wheel J strikes upon the upper end of the trigger, which then lets go of the lug *t*, and the armature is retracted from its magnet into normal position by means of a spring, H.

The switch 31, situated below the series of circuit-closing dials, is pivoted at 32, and has the spring 33 projecting from the pivoted end and engaging with the pin 34. The switch 31 in the main is metallic, with an insulated handle, from near which extends the spring-arm 35, which plays upon the contact-point 30 and rest-point 36. The point 38 is connected with ground 37. The switch may be placed in three positions—first, with its spring-arm 35 resting on rest-point 36, when the switch will be open and out of contact; second, in the position of the full lines shown, when arm 35 rests on contact 30 and the switch is closed; third, in the position of the broken lines, when the switch will be on ground-contact 38 and grounded. When the switch is moved into the third position of the broken lines, the spring 33 is strained by bearing on pin 34 and tends to resume the full-line position and break the ground.

The relay Y has a battery, Y', and ground $Y^2$ for battery. The armature of relay Y has a contact, *y*, which makes and breaks the loop alarm-circuit 51, leading from poles of battery 55, and containing the bell-alarms 50, situated at different local points distant from the central station, which contains all the herein-described apparatus, with the exception of the

main alarm-circuit 51 and its contained bell-alarms.

The controlling-circuit 20 leads from battery $Y^2$ over relay Y to contact-fingers *u*, from where it passes to ground O, when the circuit-closing dials revolve, by means of teeth *q*, plate P, brushes *r* over armature *n*, upper and lower contacts, *c* and *o*, to ground O. Whenever this circuit finds ground O, relay Y closes, thereby making alarm-circuit 51, whose bell-alarms respond to said relay.

The magnets $M^2$ $M^3$ $M^4$ $M^5$ are each included in a local circuit leading from ground R, battery 40, over said magnets to contact-finger *w*, from where it finds ground G, over the tripping index-hand X, when the circuit-closing dials revolve. When this circuit finds ground G, armature *n* is attracted, and the upper and lower contacts, *c* and *o*, respectively, are separated, thereby breaking ground O and releasing its accompanying actuating clock-work C.

The initial magnet M′ is in circuit 21, leading from ground R to battery 40, over said magnet, to switch 31, thence by point 38 to ground 37, or by point 30 to the extra contact-finger *z*, which coacts with the terminal controlling mechanism of the terminal circuit-closing dial $D^4$, and from finger *z* when the dial revolves, by stud V, wheel *f*, hub *d*, to ground G.

The terminal circuit-closing dial $D^4$ is connected with the interrupter located in frame F by one part of controlling-circuit 20, leading from ground O to contact *o*, over armature *n*, pivot *i*, frame F, to brushes *r*, and plate P to teeth *q*, which close circuit over finger *u*, when dial $D^4$ revolves and transmits a signal over alarm-circuit, as before described. The magnet $M^5$ is contained in the circuit leading from ground R, through battery 40, over said magnet to finger *w*, from where it finds ground G, by means of the tripping index-hand X of dial $D^4$, when the dial revolves. When this circuit finds ground G over hand X of dial $D^4$, magnet $M^5$ attracts its armature *n*, thereby starting clock-work U and breaking ground O by contact *o* being left open.

The circuit-closing dials D′, $D^2$, and $D^3$ have the resting-holes, formed as described, for the stud *x* on the tripping index-hand X to rest in, numbered, consecutively, from 0 to 9, and are used to designate the assigned number-signal of a certain building located in the signaling-box circuit connected with the central station. The dial $D^4$ has the resting-holes numbered similarly from 0 to 8, and is used to designate a certain floor located in the aforesaid building.

The tripping index-hands X are normally fixed in the zero-holes, so that no signal can be transmitted over the alarm-circuit, because one ground O is off of the controlling-circuit 20 as soon as the tripping-hand X makes contact with finger *w*, as before explained, and this will obviously be before the front tooth, *q*, will close on finger *u* to send a signal.

The tripping index-hand is set back of the tooth corresponding to the determinate number-signal to be transmitted—that is, if the number-signal 5 is to be sent by any dial, the tripping index-hand is moved from zero and set in resting-hole 5, located back of tooth *q*, corresponding to 5, which is thus allowed to send a signal over alarm-circuit before the tripping-hand X takes off ground O, as described. The drawings show the dials set to transmit the determinate number signal 121 for the building by means of dials D′, $D^2$, and $D^3$, respectively, and the number-signal 3 for the floor by means of dial $D^4$. The remainder of the apparatus is in normal condition. Let it be supposed that the above set of number-signals, 121 and 3, have been recorded at the central station by the signaling-box circuit connected therewith, and are to be repeated upon alarm-circuit 51. The operator moves by hand the tripping-hand X of dial D′ from the zero-hole to hole 1. Likewise he sets dial $D^2$ to hole 2, and dial $D^3$ to hole 1, and dial $D^4$ to hole 3, as shown. He then grounds the hand-switch 31 on point 38, and thereby energizes magnet M′, which attracts its armature and operates the releasing device of the actuating clock-work C, and so operates the first of the series of controlling mechanisms. As the circuit-closing dial D′ revolves in direction of arrow the first tooth *q* thereof, on making contact with finger *u*, closes the controlling-circuit 20 by giving it ground O, as described, and records 1 on relay Y, and the responding bell-alarms 50 in circuit 51. Then next the tripping index-hand X of dial D′ trips finger *w*, and thereby gives ground G to magnet $M^2$, as described, and said magnet attracts its armature, thereby breaking ground O of controlling-circuit 20 and preventing all the rest of teeth *q* on dial D′ from recording on relay Y, as described. Dial D′ continues to revolve for one revolution, when stud *j* strikes trigger *b* and resets the releasing device to stop the clock-work C.

When magnet $M^2$ attracts its armature, the connected releasing device is operated and dial $D^2$ acts to transmit its assigned number-signal 2 upon the alarm-circuit, in the manner described for dial D′, likewise with dial $D^3$. The dial $D^4$ operates in a manner similar to that described for the other dials, with the slight difference that when its tripping-hand X trips finger *w* to take ground O off of the controlling-circuit the magnet $M^5$ is energized by giving it ground G, and starts the interrupter in frame F, which makes one revolution of its main arbor *e*, when it comes to rest before the revolving dial $D^4$ has revolved its stud V around to make contact with finger *z*, so the switch having sprung back into the full-line position the contact of stud V and finger *z* will bring current from ground R, battery 40, over the initial magnet M′, to switch 31, therethrough to finger *z*, to stud V, wheel *f*, to ground G, and thereby start anew the series of dials to send over again the number-signals, as described. The apparatus, having been thus set by hand and then grounded, will transmit

the set of number-signals once and then act automatically to repeat them over again until the actuating devices run down or the apparatus is checked by opening switch 31. Of course any number of alarm-circuits may be placed under the control of relay Y for the number-signals to be repeated or transmitted over, or the relay Y may be arranged to operate upon several other relays, each acting upon an alarm-circuit.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In combination, an alarm-circuit, a relay operating upon said circuit, a controlling-circuit including said relay, a series of circuit-closers, substantially as described, for closing the controlling-circuit and transmitting the determinate number-signal over the alarm-circuit, and controlling mechanisms therefor predeterminately set, the controlling mechanisms acting each in turn upon the operation of the initial mechanism to start the next succeeding mechanism and to operate in succession the said circuit-closers, whereby said circuit-closers act successively upon said controlling-circuit.

2. In combination, an alarm-circuit, a relay operating upon said circuit, a controlling-circuit including said relay, a series of circuit-closers, substantially as described, for closing the controlling-circuit and transmitting the determinate number-signal over the alarm-circuit, a series of controlling mechanisms and tripping devices therefor predeterminately set, the controlling mechanisms each provided with a local circuit containing an electro-magnet for breaking the controlling-circuit, and the tripping devices located one in each of the said local circuits for making and breaking the same, whereby said controlling mechanisms automatically act upon each other *seriatim*, and whereby said circuit-closers act successively upon said controlling-circuit.

3. In combination, an alarm-circuit, a relay operating upon said circuit, a controlling-circuit including said relay, a series of circuit-closers, substantially as described, for closing the controlling-circuit and transmitting the number signal over the alarm-circuit, and actuating and releasing and tripping devices therefor, said tripping devices each independently and previously adjusted, whereby the effect of an acting fellow circuit-closer is destroyed, and whereby the next following releasing device is started, and so on successively.

4. In a signal-transmitting system, the combination, as hereinbefore set forth, of an alarm-circuit and a relay acting thereupon, a controlling-circuit including the relay, a series of circuit-closers, substantially as described, for closing the controlling-circuit and transmitting the number-signal over the alarm-circuit, controlling mechanism predeterminately set for the circuit-closers, each controlling mechanism provided with a local circuit containing an electro-magnet, which acts to break the controlling-circuit and to operate the next succeeding circuit-closer and controlling mechanism *seriatim*, the terminal controlling mechanism included in the local circuit of the initial mechanism, whereby the operation of the said terminal may act to restart the initial mechanism, substantially as and for the purpose herein described.

5. In a signal-transmitting system, the combination, as hereinbefore set forth, of an alarm-circuit and a relay acting thereupon, a controlling-circuit including the relay, a series of circuit-closers for closing the controlling-circuit and transmitting the number-signal over the alarm-circuit, and a series of controlling mechanisms predeterminately set for the circuit-closers, each said mechanism provided with a local circuit containing an electro-magnet acting to break the controlling-circuit and to operate the next succeeding circuit-closer and mechanism *seriatim*, the terminal mechanism of the series included in the local circuit of the initial mechanism, and a hand device in the latter local circuit for governing the initial magnet by hand, substantially as and for the purpose herein described.

6. In a signal-transmitting system, the combination, as hereinbefore set forth, of an alarm-circuit and a relay acting thereupon, a controlling-circuit including the relay, a series of circuit-closers for closing the controlling-circuit and transmitting the number-signal over the alarm-circuit, and a series of controlling mechanisms predeterminately set for said circuit-closers, each controlling mechanism provided with a local circuit containing an electro-magnet acting to break the controlling-circuit and to operate the next succeeding circuit-closer and mechanism in turn, an interrupter, substantially as described, included in the controlling-circuit and provided with an electro-magnet for breaking and making the controlling-circuit, the local circuit of the terminal controlling mechanism including the magnet of the interrupter, the terminal controlling mechanism included in the local circuit of the initial mechanism, substantially as and for the purpose herein described.

7. In combination, an alarm-circuit, a relay operating upon said circuit, a controlling-circuit including said relay, a series of releasing electro-magnets, a series of circuit-closers and controlling mechanisms therefor predeterminately set, a circuit including the initial magnet and the terminal mechanism of said respective series, and a switch, said switch provided with an adjacent ground and contact, whereby said initial magnet is governed directly and the succeeding magnets indirectly, and whereby said terminal mechanism governs directly said initial magnet.

8. In a system for transmitting signals, the combination, as hereinbefore set forth, of an alarm-circuit and a relay acting thereupon, a controlling-circuit including the relay, and a series of rotating circuit-closing dials for clos-

ing the controlling-circuit and transmitting the number-signal over the alarm-circuit, each dial having a controlling mechanism provided with a local circuit containing an electro-magnet and predeterminately set to close the said local circuit and to open the controlling-circuit, thereby preventing the circuit-closer from further transmitting and starting the next succeeding circuit-closer and mechanism, an interrupter included in the controlling-circuit and having a magnet located in the local circuit of the terminal dial, and mechanism for breaking the controlling-circuit, the local circuit of the magnet of the initial mechanism including the terminal mechanism, and the said local circuit closed thereby, whereby upon the operation of the initial circuit-closing dial the series of dials may act successively upon the controlling-circuit and the controlling mechanisms may act upon each other *seriatim* and the terminal mechanism may act upon the interrupter and the initial mechanism to restart the latter, substantially as and for the purpose herein described.

9. In a system for transmitting signals, the combination, as hereinbefore set forth, of an alarm-circuit and the relay Y, acting thereupon, the controlling-circuit 20, including the said relay and a series of electro-magnets, M′ $M^2$ $M^3$ $M^4$ $M^5$, also included therein, a series of circuit-closing dials, D′ $D^2$ $D^3$ $D^4$, for closing the controlling-circuits, and having motors therefor governed, respectively, by the armatures *n* of the said magnets, and the armatures *n*, preserving the continuity of the controlling-circuit, each of the said magnets provided with a local circuit having the tripping index-hands X contained therein for making and breaking the said circuits containing them, means intermediate the controlling mechanisms of the terminal dial $D^4$ and the magnet M′, whereby the latter may be actuated to restart the series of dials and their respective mechanisms.

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