

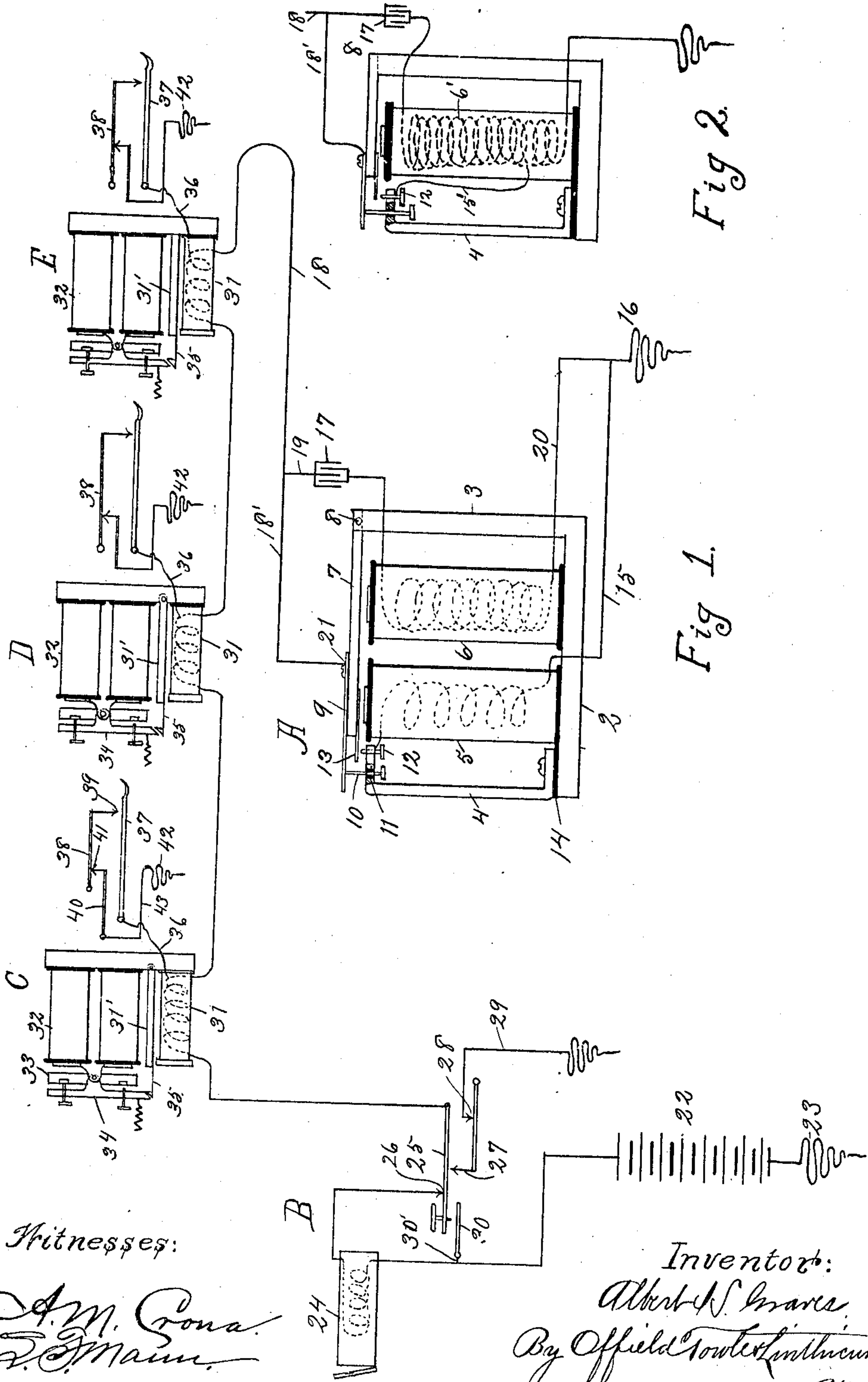
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CIRCUIT CATCHING DEVICE AND ELECTRICAL SYSTEM
FOR USE IN CONJUNCTION WITH THE SAME.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ALBERT H. GRAVES, a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Circuit-Catching Devices and Electrical Systems for Use in Conjunction with the Same, of which the following is a specification.

This invention relates to improvements in circuit-catching devices and electrical systems for use in conjunction with the same; and it has for its salient object to provide a simple electrically-operated device by means of which a normally open circuit may be made to close itself and be retained in closed position at the will of the operator, the invention being particularly applicable to those conditions in which it is desired to close a circuit at a point distant from the operating-station—as, for example, in telephone work. Subordinate objects are to provide a system of circuit connections in which the circuit-closing instrument plays an important part and enables the central-exchange operator of a telephone system to secure a ground connection for a line-wire at a point remote from the central station at will, to provide in a system of the character last referred to co-operating instrumentalities which permit one or more subscribers along the line between the circuit-catching device and central to ground the line without thereby forming a ground connection through the circuit-catching device, to provide an arrangement and connections whereby the ground connection through the circuit-catching device is automatically opened and remains open except when intentionally closed and so retained by the operator at central, and, in general, to provide an improved system of the character referred to.

To the above ends the invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and the invention will be readily understood from the drawings forming a part of the description, and in which the main Figure 1 illustrates one of the improved circuit-catching instruments in side elevation and diagrammatically a system of circuit connections, showing the instrument applied as a part of a party-line telephone system.

Fig. 2 illustrates a modification in which a single spool having a two-part winding performs the functions of the two-spool magnet illustrated at A, Fig. 1.

Describing, first, the construction of the circuit-catching instrument, (designated as a whole A,) 2 designates a suitable heel-piece constructed in the present instance to serve also as a frame member and for this purpose provided at each end with uprights, as 3 and 4, rigid with the heel-piece 2. Upon the heel-piece are mounted two magnet-spools 5 and 6, the former being relatively lower wound and the latter wound to a higher resistance for purposes hereinafter explained.

7 designates an armature pivotally mounted upon the upright 3, as indicated at 8, and arranged to extend in proximity to the pole-pieces of the two magnet-spools, so as to be acted upon by either or both of the latter. Upon the free end of the armature is mounted a spring 9, which rests in engagement at its outer end with an adjusting-screw 10, mounted within the upright 4 and insulated therefrom, as indicated at 11. The spring 9 determines the normal position of the armature relatively to the pole-pieces of the magnet.

12 designates a contact-point or screw adjustably mounted in the upright 4, and 13 designates a spring contact-strip mounted upon the armature 7 and adapted to contact with said screw 12 when the armature is drawn into closed position. The upright 4 is insulated from the remainder of the frame, as indicated at 14, and with said upright is connected a conductor 15, which extends to and through the magnet-spool 5 and thence to ground, as indicated at 16.

17 designates diagrammatically a condenser which may be of any usual form, one side of said condenser being connected with a main-line wire 18 through a conductor 19, while from the opposite side of the condenser leads a conductor 20, which extends to and through the windings of the magnet-spool 6 and thence to ground. A continuation 18' of the main line 18 beyond the branch 19 leads to and is connected with the armature-lever 7, as indicated at 21.

Describing now the circuit connections, B designates as a whole a central-station appa-

ratus, and C, D, and E a plurality of subscribers' stations, only so much of each of these stations being shown as is necessary to understand the application of the invention.

5 At the central station is provided a battery 22, one side of which is grounded, as indicated at 23, while the other side is connected with the main line 18. A signal device—as, for example, a drop 24—is interposed in said
10 main line, and between the drop and the extension of the line which leads to the subscribers' stations is interposed a key 25, normally closing the circuit through the drop at a back contact 26. The key 25 is arranged
15 to cooperate with a normally open contact 27 in such manner as to produce a momentary ground, and to this end the contact 27 is a yielding contact the body of which normally rests in engagement with a back contact 28,
20 connected to ground through a conductor 29.

In operating the circuit-catcher the drop 24, which is wound to a comparatively high resistance, is cut out or short-circuited, and to this end a second contact member 30 is arranged in the path of the key 25 and connected with the main wire 18 at a point between the drop and battery, as indicated at 30'. The contact member 30 is so arranged
25 that the engagement of the key therewith will occur after the momentary ground through contacts 27 and 28 has been made.

C, D, and E represent the instruments which are operated over the main line 18 after the latter has been closed to ground by means of the circuit-catcher. The particular function performed by the instruments C, D, and E is immaterial to the broader scope of the invention; but in the present instance said instruments represent selecting
35 devices which when operated place certain parts in definite position from which they are restored by means of clearing-magnets 31. These clearing-magnets are operated through the main line 18, and it is the function of the
40 circuit-catching device to close a circuit for this purpose. Each selector instrument comprises in addition to the clearing-magnet a second magnet 32, an armature 33, and a contact-lever 34, and a latch 35, mounted
45 upon the armature 31' of the clearing-magnet. By means of circuit connections (not shown) the magnet 32 operates to place the lower end of the contact-lever 34 in latched engagement with the latch 35. When the
50 clearing-magnet is energized, its armature is drawn down, thus releasing the contact-lever, which thereupon returns to its normal position under the action of a spring. The main line 18 is employed in operating the
55 signaling device or drop 24 from each subscriber's station. To this end a branch conductor 36 is connected with said main line at each subscriber's station and extends thence to the hook-lever 37.

38 designates a spring-contact mounted 65 above the hooked lever and provided with a contact-point 39, which is engaged by the hook-lever as the latter rises, but normally stands open.

40 designates a contact device with which 70 the yielding contact 38 normally rests in engagement at a point intermediate its length, as indicated at 41, and which contact 41 is open when the hook-lever raises the contact 38. The contact 40 is connected 75 to ground, as at 42, by a conductor 43. It will be obvious that the foregoing arrangement produces a momentary or "flush ground" each time the hook-lever rises.

The operation of the apparatus may be 80 briefly described as follows: Tracing the main-line circuit and the branches thereof from ground at central through the battery 22, it will be seen that the circuit is open at the remote end of the line at the condenser 85 17 and that all of the several branches thereof at the subscribers' stations are likewise open. In this condition any subscriber can operate the signal or drop 24 by removing his receiver from the hook-lever, thus 90 closing a circuit from ground at said subscriber's station to ground at central through the battery. The placing of the line to ground at any subscriber's station will obviously discharge the condenser, and thus 95 cause the high-wound coil 6 of the circuit-catcher to operate the armature; but inasmuch as the subscriber's ground is interposed between the battery and the circuit-catcher the latter will simply make a single "kick" 100 and immediately return to its normal open position. The interposition of the high resistance 24 insures that upon the operation of the circuit-catcher by the momentary grounding at a subscriber's station the hold- 105 ing-circuit through the low-wound coil of the instrument will not be effective in making a permanent ground, although the holding-circuit is for an instant closed. The several subscribers may therefore signal in 110 to central for connections with impunity and without thereby establishing a ground connection through the circuit-catcher. Assuming, however, that one or more of the selector instruments have been operated 115 and it is desired to "clear" the selector or selectors, the operator at central accomplishes this by depressing the key 25. The first part of the downward movement of the key opens the main line through the drop 120 and immediately thereafter closes it to ground through the contacts 27 and 28. This instantly discharges the condenser; but since at this moment the circuit through the battery 22 is open the circuit-catcher 125 will instantly return to its open position. The further depression of the key 25 closes the main line through the contact 30, which

contact, it will be noted, is between the resistance 24 and the battery, so that the condenser becomes instantly charged under the full voltage of the battery, and in so becoming charged the circuit-catcher is closed by the flow of current from ground to the condenser through the high-resistance coil thereof. Since the battery is now on the line, it follows that as soon as the holding-circuit is established by the closing of the armature of the circuit-catcher the latter will remain in its closed position as long as the key 25 is held depressed, thereby operating the clearing-magnets. Obviously as soon as the pressure of the key is released and the main-line circuit opened between the contact 30 and the key the circuit-catcher will return to its open position, thereby opening the holding-circuit from the low-wound coil thereof and restoring the line to its normal condition.

While in the preferred embodiment thus far described the circuit-catching instrument is shown as comprising two separate coils or magnets, yet it will be seen on tracing the circuits that a single magnet may be made to accomplish exactly the same functions as do the two, the latter construction being adopted simply as a convenience in manufacture. Accordingly in Fig. 2 I have shown a modification in which a single magnet is arranged to perform the functions of both those illustrated in Fig. 1. The construction and arrangement are identical, with the exception that that part of the holding-circuit consisting of the conductor 15', leading from the contact-screw or the support 4, upon which it is mounted, extends to and through a part of the windings of the single magnet 6'.

It will be obvious from the foregoing that the details of construction and arrangement are not essential and that they may be modified without departing from the spirit of the invention. It will be further obvious that, as hereinbefore intimated, the invention is not limited to the particular application herein shown, but, on the contrary, it may be found useful for a variety of purposes, and especially in various relations in telephone systems. However, it will be seen that the invention possesses special utility in the particular system described herein, and accordingly it is claimed both broadly or independently of the system and in combination therewith.

I claim as my invention—

1. A circuit-catching mechanism, comprising an electric circuit and source of current-supply, a condenser interposed in said circuit, a magnet, having an automatically-returning armature, and arranged in circuit with the condenser, said magnet being provided with a main winding of high resistance, and a retaining-winding of a resistance sub-

stantially as low as is consistent with retaining the armature reliably in closed position, and a shunt leading around said condenser, including said retaining-winding, and controlled by said armature.

2. A circuit-catching mechanism, comprising an electric circuit and source of current-supply, a condenser interposed in said circuit, a magnet, having an automatically-returning armature, and arranged in circuit with the condenser, said magnet comprising two spools, of which one is provided with a main winding of high resistance and the other with a retaining-winding of a resistance substantially as low as is consistent with holding the armature reliably in closed position after closing, and a shunt leading around said condenser, including said retaining-winding and controlled by said armature, said armature being arranged to extend in operative relation to the cores of both members of said magnet.

3. A circuit-catching mechanism, comprising an electric circuit and source of current-supply, a condenser interposed therein, a retaining-magnet in circuit with the condenser and having an automatically-returning armature, said magnet being provided with two coils, and self-maintaining circuit connections controlled by said armature and comprising a normally open shunt leading from the main line around the condenser and through a part only of the coils of the retaining-magnet and normally open at a contact controlled by said armature.

4. In a telephone system, the combination of an electric circuit, a source of current-supply connected with said circuit, a condenser and a circuit-catcher magnet interposed in said circuit, a resistance and key-controlled circuit connections whereby said resistance may be interposed between the source of current-supply and the condenser and cut out of the circuit at will, an armature operable by said circuit-catcher magnet, and self-maintaining circuit connections controlled by said armature and including a branch conductor leading around the condenser, as and for the purpose set forth.

5. In a telephone system, the combination of a line conductor extending from an operator's station to a remote station and grounding connections at each station, a battery interposed in said line, a signaling device interposed in the line at the operator's station, a key arranged to open the circuit as to the said signaling device and as to the battery, and arranged to close the circuit to ground at the operator's station, a condenser interposed in the circuit, and a circuit-catcher magnet likewise interposed in the circuit in series with the condenser and at a point beyond said remote station, an armature controlled by said circuit-catcher magnet, self-maintaining

shunt-circuit connections controlled by said
armature and including a branch conductor
leading from the main line around the con-
denser and to ground, said shunt-circuit con-
5 nections forming when closed a circuit of sub-
stantially as low resistance as is consistent
with maintaining the magnet energized and

circuit closed and means for grounding said
line conductor at said remote station.

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