(No Model.)

2 Sheets—Sheet 1.

G. K. HUTCHINS.

AUTOMATIC TELEPHONE SYSTEM.

No. 547,755. Patented Oct. 8, 1895.

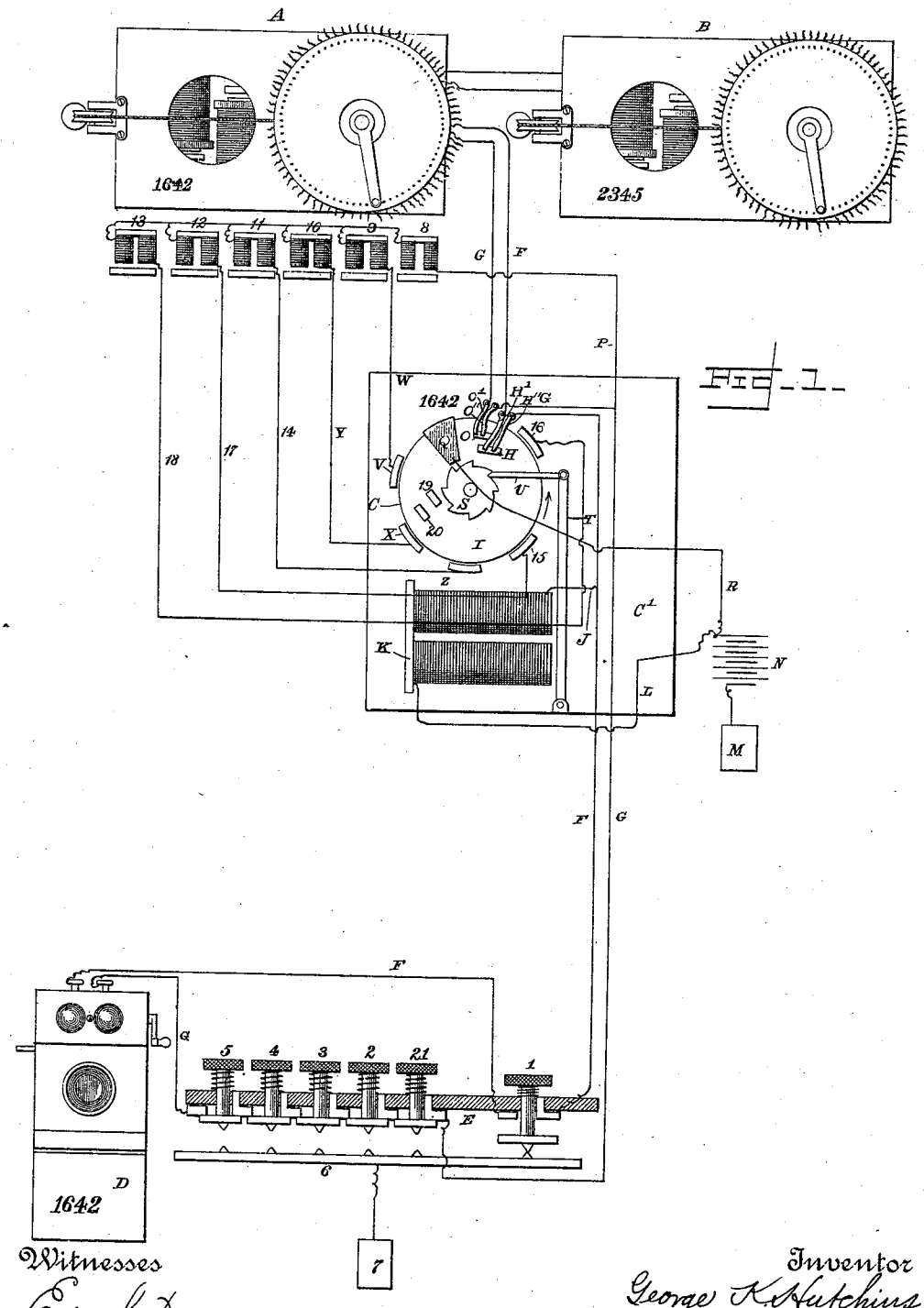

FIG. 1.

Witnesses
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(No Model.) 2 Sheets—Sheet 2.

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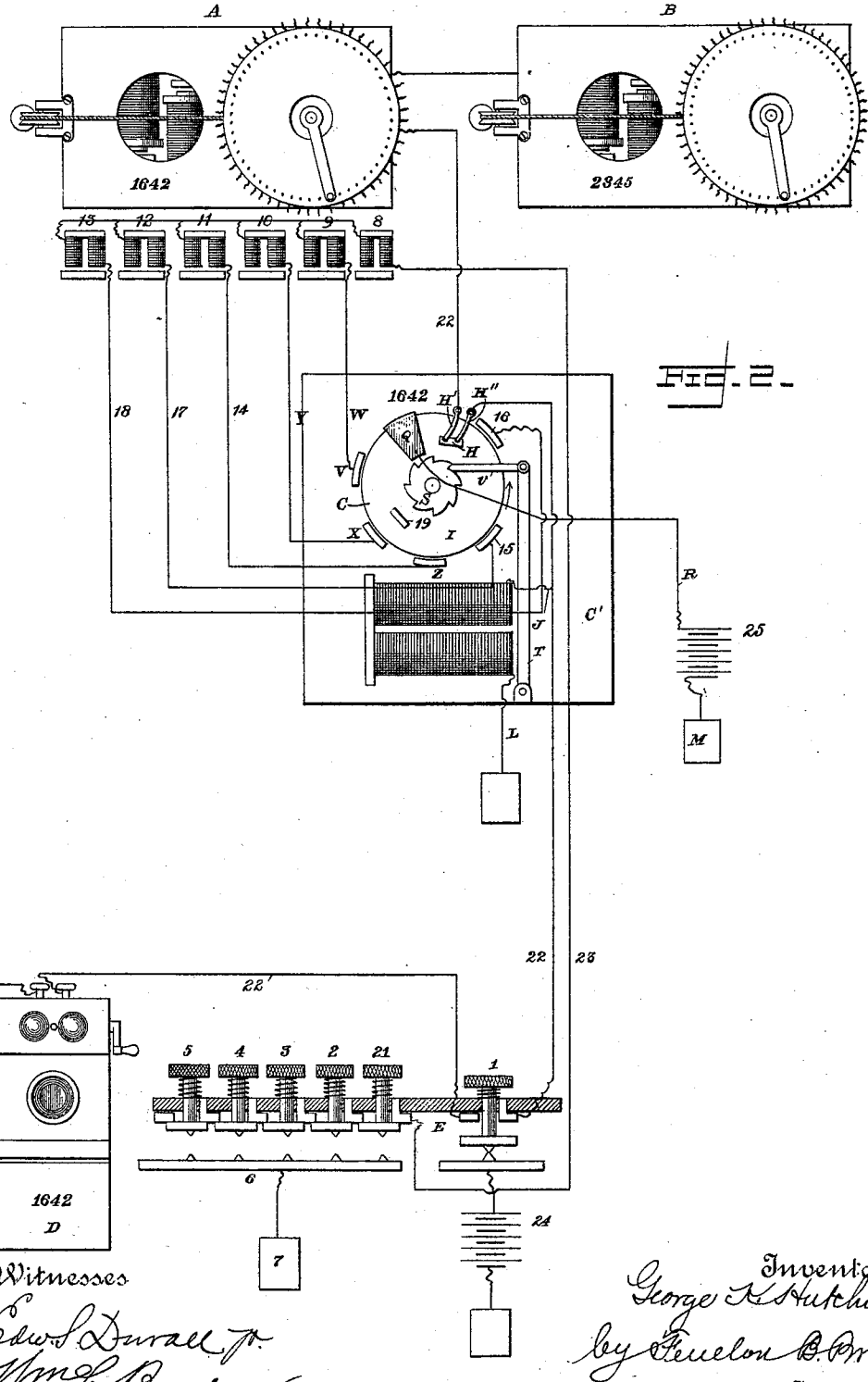

FIG. 2.

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UNITED STATES PATENT OFFICE.

GEORGE K. HUTCHINS, OF BALTIMORE, MARYLAND.

AUTOMATIC TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 547,755, dated October 8, 1895.

Application filed May 6, 1893. Serial No. 473,244. (No model.)

To all whom it may concern:

Be it known that I, GEORGE K. HUTCHINS, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Automatic Telephone Systems; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

For simplicity and directness of statement the description and operation of my invention will be limited in its application to its use in connection with a telephone system and exchange, after which its capabilities for a more extended use in the arts will be pointed out and referred to.

My invention contemplates an automatic telephone system, in which a central station is provided comprising, preferably, a primary automatic electromechanical switch for each sub-station or subscriber included in the system, each primary switch combined with a secondary automatic pilot-switch actuated from a substation and in turn actuating the primary switch, whereby any sub-station of the system may be enabled to establish connection with any one of the other sub-stations automatically and without the intervention of an operator or personal attendance at the central station. Along with the accomplishment of this result I am enabled, by the use of my secondary pilot-switch, to do away with the multiplicity of line-wires at present in use and perform all these operations over one preferably metallic circuit and battery. I further contemplate the use of two grounded line-wires having separate batteries, one line to talk over and including, preferably, a portion of the calling mechanism and the other to actuate the calling mechanism. The single metallic circuit heretofore referred to I also arrange to intermittently ground into two line-wires during the successive steps of the call, after which the metallic circuit is again restored.

Figure 1 represents in diagrammatic form an exemplification of my invention. Fig. 2 is a similar view of a modification of my improvements.

In Fig. 1, A represents the primary electromagnetic switch, of which there is one for each sub-station at the central station. B represents another switch, the same as A. The illustration of but two of these switches is deemed sufficient to clearly comprehend the invention.

C is the secondary pilot-switch—one for each switch, A, B, &c. But one switch C is shown for illustrative purposes. The switches A, B, and C are at the central station.

D is a telephone at a sub-station. In Fig. 1 this telephone has a series of make-and-break contacts E, located in the metallic line-circuit F and G, connecting the telephone D with the central station. These contacts 1, 2, 3, 4, 5, and 21 I have in this instance made in the form of push-buttons. Buttons 2, 3, 4, 5, and 21 are connected in series in line-wire G. Button 1 is included in line-wire F. Each push-button, upon being depressed, first breaks the respective line-wire in which it is included and then makes contact with the plate 6, which is grounded at 7. The depression of any one of the buttons, therefore, as at 1, (which is so shown,) serves to split the metallic circuit, breaking it into two separate line-wires, each of which is capable of being grounded in an earth-circuit, according to which button is depressed.

The circuit-changer switch A and pilot-switch C belong to the telephone D, and the metallic circuit F G leads to switch A through pilot-switch C. The wire F leads to a stationary electrode H″, supported by the pilot-switch-frame C′, normally resting upon an insulated plate H, secured to the moving switch-piece I. The wire F is again led away from said plate H through a similar stationary electrode H′ to the switch A. A branch J of wire F is looped in before it reaches plate H and connects with a spacer-electromagnet K, whose opposite terminal L is grounded at M through an intervening battery N. The other line G of the metallic circuit connects normally with another insulated plate O on switch-piece I, from which it is again led away and connected with the switch A.

O′ and O″ are stationary electrodes on frame C′, similar to H′ and H″, through which the

wire G is lead to and from plate O. The plates 19, 20, H, and O have a wiping contact with electrodes H′, H″, O′, and O″ during the rotation of wheel I.

A branch line P connects line-wire G with magnet 8 in particular and in series with the electromagnets 8, 9, 10, 11, 12, and 13, belonging to and performing the several functions of the switch A. For purposes of perspicuity these electromagnets have been displayed diagrammatically, the switch A in itself not being my invention. Its detailed operation will be understood by the skilled electrician.

The movable switch-piece I in this instance is a rotary wheel having a primary electrode or contact Q, insulated from the wheel, which is in connection at all times with the wire R, battery N, and ground M. This wheel I has a ratchet S, impelled forwardly in the direction of the arrow, step by step, by the pulsations of the magnet K, acting through its armature T and pawl U.

V is a stationary electrode having a wire W leading to magnet 9. X is another electrode connected to magnet 10 by wire Y. Z is a third electrode communicating by wire 14 with magnet 11. 15 is a fourth and 16 a fifth electrode leading, respectively, to magnets 12 and 13 by wires 17 and 18.

The electrodes V, X, Z, 15, and 16 are supported by the frame C′ and arranged radially within the rotary path of the electrode Q, the latter making successive contacts and breaks therewith. The contacts of the line-wires F and G through the plates H and O are also made and broken. The second series of insulated plates 19 and 20 serve during the rotation of the wheel I to re-establish the connection of the pilot-switch C with switch A before the parts reach their normal condition again, whereby one may talk over the line in a manner hereinafter explained.

In certain forms of automatic switches the magnet 8 is essential to the proper performance of their functions. Where such a magnet is unessential, I dispense with the same.

The invention embodies a step-by-step movement of the pilot-switch C by means of a single circuit, whereby all the functions of its switch are brought into action.

The switch A in this instance is one which is adapted for any number of separate substation connections under ten thousand; but a switch having a less or greater capacity may be used.

It will first be understood that magnet 9 of switch A actuates the thousands mechanism; that magnet 10 operates the hundreds mechanism; that magnet 11 operates the tens mechanism; that magnet 12 moves the units mechanism; that magnet 13 actuates the release-movement, and that where, as in the present instance, a friction-minimizing agent is used magnet 8 actuates such agent.

Combined with and electrically connected to switch A and its magnet is the magnet K, which I term the "spacer-magnet," and which controls, through the pilot-switch C, No. 1,642, the movements of all the magnets of switch A, No. 1,642. At sub-station telephone D, No. 1,642, and at every other sub-station is a series of keys or buttons 1, 2, 3, 4, 5, and 21. Button 1 is the spacer-key; button 2, the units-key; button 3, the tens-key; button 4, the hundreds-key; button 5, the thousands-key, and button 21 the release-key. We will suppose switch A to be No. 1,642 and its telephone D, of course, to have the same number. Pilot-switch C may properly have, also, the same number. Assume, also, that switch B is No. 2,345 and that No. 1,642 wishes to call No. 2,345. No. 1,642 (telephone D) first depresses spacer-button 1, which first breaks the line F and then grounds said line-wire through plate 6, splitting the metallic circuit F G into two separate ground-circuits. The battery N is then closed through wire L, spacer-magnet K, wire J, line F, button 1, plate 6, and ground 7. Thus closed, the armature T moves pawl U, rotating wheel I and ratchet S one tooth or degree, bringing electrode Q in contact with electrode V in electrical connection with the thousands-magnet 9. At the same time the electrical contacts H and O are carried away to one side of the electrode H′ and H″ and the line connection F G with the switch A broken. This movement also brings line-wire G into connection with battery N through wire R. Telephone No. 2,345 and switch B being the sub-station wanted, the thousands button 5 is depressed twice, each time breaking the line G and then grounding it through plate 6, causing two pulsations from battery N and actuating the thousands-magnet 9 twice. During this time, the wire F being segregated, no movement of the wheel I ensues. Button 1 is again depressed, grounding line F, as before, actuating magnet K and wheel I, and bringing contact Q in connection with contact X, leading to the hundreds-magnet 10. Three depressions of the hundreds-button 4 and pulsations, similar to those described in connection with the button 2, registers through switch A the second number "3" of the call. Spacer-button 1 is again operated to bring contact Q against contact Z, leading to the tens-magnet 11 of switch A. The tens-button 3 is then depressed four times for the third number "4" of the call. The spacer-button is again depressed, bringing contact Q in connection with contact 15, leading to units-magnet 12, and button 2 is depressed five times registering the fourth number of the call, which is "5." Switch A, No. 1,642, is now in electrical connection with switch B, No. 2,345, by a wire or wires connecting both switches. Spacer-button 1 is again depressed, causing another impulse of magnet K, which brings the contacts 19 and 20 in the position where H and O are shown, contact 19 being in connection with electrodes H′ H″ and contact 20 with electrodes O′ O″, thereby re-establishing connection with the switch A. Telephone No. 2,345 may now be called by the usual magneto

call-bell of telephone D, No. 1,642. When subscriber D, No. 1,642, is through, the spacer-button 1 is again pressed, carrying contact Q under contact 16, leading to the release-magnet 13, when release-button 21 is operated, causing the magnet 13 to restore the members of its switch A to their normal position. Spacer 1 is finally touched, which restores the members of the controlling pilot-switch C to its original condition, re-establishing the line F G to switch A and leaving the telephone No. 1,642 free to be called by any sub-station.

I do not confine myself to any form of primary circuit-changer switch. I may use any for which my invention is adapted or I may adapt my secondary pilot-switch for any style of circuit-changer. The primary switch illustrated in this instance is that known as the "Strowger," and one is illustrated in his Patent No. 498,291, dated May 30, 1893. It need not therefore be further described.

I have described the moving switch-piece I as of rotary or wheel form; but the electrodes Q, H, O, 19, and 20 may be stationary and the corresponding stationary ones be made to rotate. The pilot-switch C may be of other form than rotary, such as oscillating or rectilinearly reciprocating, the present form simply exemplifying a way of carrying out the invention.

I have shown a series of push-buttons at sub-station D, No. 1,642. These keys may, however, be of any known suitable form. I may, if desired, substitute one button or key for the series 2, 3, 4, 5, and 21, or more than one. Separate keys, however, for the thousands, hundreds, tens, units, and release simplify the operation by the subscriber, preventing confusion and liability of mistake.

In Fig. 2 I show a modified form of my invention. Instead of a single metallic circuit I provide two earth-circuits 22 and 23, each having a battery 24 and 25, respectively. Line 22 is the main wire and serves to operate the spacing mechanism through the spacer-key 1 and to talk over, while auxiliary line 23 serves to operate the various magnets of the primary switch, both lines operating through the pilot-switch for establishing these connections in a manner similar to that described in connection with Fig. 1.

Thus far I have described my invention for use in connection with a telephone; but it is obvious that the devices may be used telegraphically in a system which does not employ the telephone. The pilot-switch may be used at a terminal instead of at an intermediate point in the line.

I have already stated that I do not confine myself to any particular form of pilot-switch. As an illustrative modification I may use a spring or weight for executing all the functions of this switch and use a magnet or magnets and connections for operating an intermittent escapement or release mechanism for such switch. In like manner I may provide the primary switch with similar springs or weights for all its movements and use the magnets to actuate the release mechanisms of such springs.

Any source of electrical energy may take the place of the battery.

By the word "pilot" switch is meant any switch-circuit changer or selector capable of governing or controlling the action of an apparatus or the movements of a primary switch for the purposes indicated, and it is given the switch for convenience in referring to the same.

I may employ, in connection with the two earth-circuits illustrated in Fig. 2 branch wires in connection with each telephone, pilot, and primary switch normally idle through the use of cut-outs, but which, if desired, may be brought into use to change the two earth-circuits into one metallic circuit, working precisely like the elements shown by Fig. 1.

I claim—

1. The combination, in a system of the character described, with a primary switch, a pilot switch, and a station, of a single metallic circuit connecting the three, both wires passing through the pilot-switch, whereby the movements of the primary switch are controlled from the station through the pilot switch.

2. The combination, in a system substantially as described, with a primary switch, a pilot switch and a station, of a single metallic circuit connecting the three, both wires passing through the pilot-switch, and means for splitting and grounding each wire of the circuit, whereby the movements of the primary switch are controlled from the station through the pilot switch.

3. The combination in a telephone, telegraph or like system, of a primary switch, a pilot switch, a double-line wire passing through the pilot-switch, and means for governing the movements of said primary switch through the pilot switch.

4. In a telephone, telegraph or like system, the combination of a primary switch, a pilot switch, a station, and double wires passing through the pilot switch connecting the same whereby the movements of the primary switch are controlled from the station through the pilot switch.

5. A telephone, telegraph or like system, having two line circuits, a primary switch and branch circuits leading thereto, a pilot-switch through which both line circuits pass, one of which operates the primary switch, and the other the branch circuits thereof.

6. A telephone, telegraph, or like system having a metallic circuit, a pilot switch, a primary switch, a key or circuit-breaker, a battery, and a ground connection on the key whereby the key first breaks the metallic line and then grounds it.

7. A telephone, telegraph, or like system, having a metallic circuit, a primary switch, a pilot-switch through which both wires of the metallic circuit pass, branch circuits, a key or circuit-breaker, a battery, and a ground connection on the key, whereby the key first

breaks and then grounds the circuit dividing the metallic circuits into two legs, one of which actuates the primary switch, and the other the circuits so changed.

8. A pilot switch consisting of a series of stationary electrodes, a moving piece carrying an electrode and a line wire circuit breaker, and an impelling agent for operating the moving piece combined with a double wire circuit passing through said switch for making and breaking both wires.

9. In an automatic system a primary switch having magnets actuating release, units, tens, and the like mechanism, electrodes connected therewith, an electrode having a battery connection, and means for successively bringing the latter electrode in contact with the former electrodes combined with a double wire circuit passing through said switch for making and breaking both wires.

10. In an automatic system, a primary switch having magnets actuating release, units, tens, and the like mechanism, electrodes connected therewith, an electrode having a battery connection, a line wire, a circuit breaker, and means for successively bringing the latter electrode in contact with the former electrodes and simultaneously breaking and making the line wire combined with a double wire circuit passing through said switch for making and breaking both wires.

11. In an automatic system a primary switch, a pilot switch controlling the primary switch line, a circuit breaker on the pilot switch connected with the metallic line and adapted to move therewith, both wires of the metallic line passing through the pilot-switch.

12. In an automatic system, a primary switch, a pilot switch controlling the same, two line wires, both passing through the pilot-switch and circuit breakers on the pilot switch for making and breaking both line wires.

13. In an automatic system, a rotary pilot switch having stationary electrodes, a rotary piece having an electrode in constant connection with a battery, a circuit breaker upon the rotary piece, two line wires both passing through the pilot-switch, and means for rotating said piece.

14. The combination of a primary switch with a pilot switch having stationary electrodes, and a movable electrode carrying two sets of circuit breakers and makers, combined with two line wires, and battery and line connections.

15. The combination of a primary switch with a pilot switch comprising a rotary piece, having an electrode and circuit breaker thereon, a battery connection for said electrode, a magnet for moving the rotary piece, stationary electrodes adapted to be wiped by the moving electrode, and a line wire having connections through said movable circuit breaker.

In testimony whereof I affix my signature in the presence of two witnesses.

GEORGE K. HUTCHINS.

Witnesses:
LOUIS KINN,
B. W. BALDWIN, Jr.