(Model.) 4 Sheets—Sheet 1.

J. S. ROSS.

SIGNAL APPARATUS FOR TELEPHONES.

No. 246,344. Patented Aug. 30, 1881.

Fig. 1.

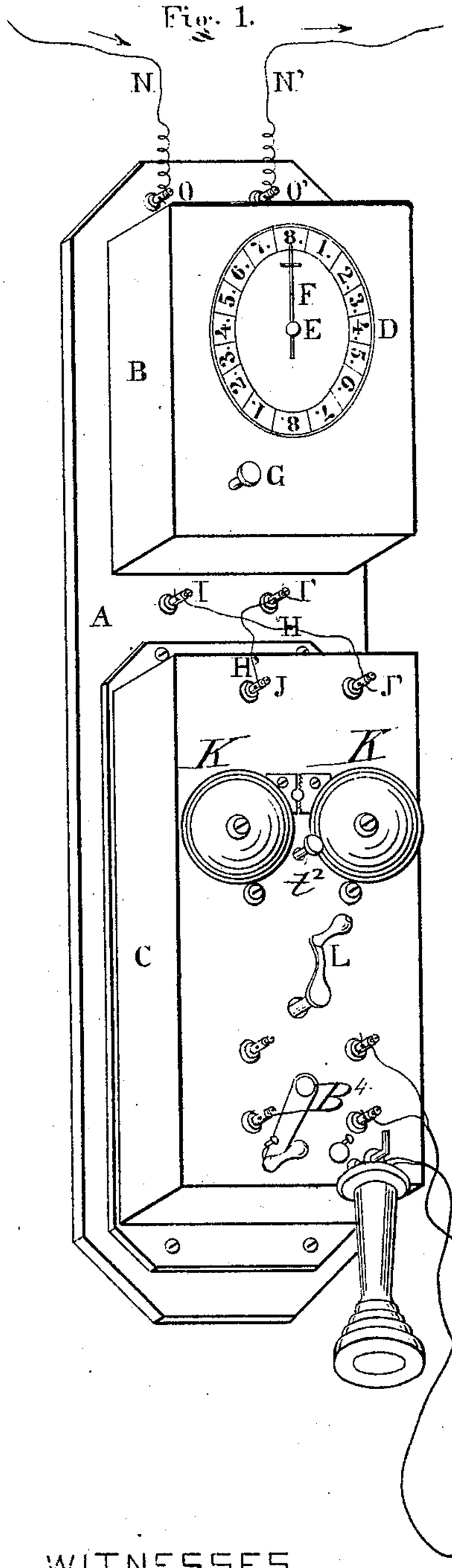


Fig. 2.

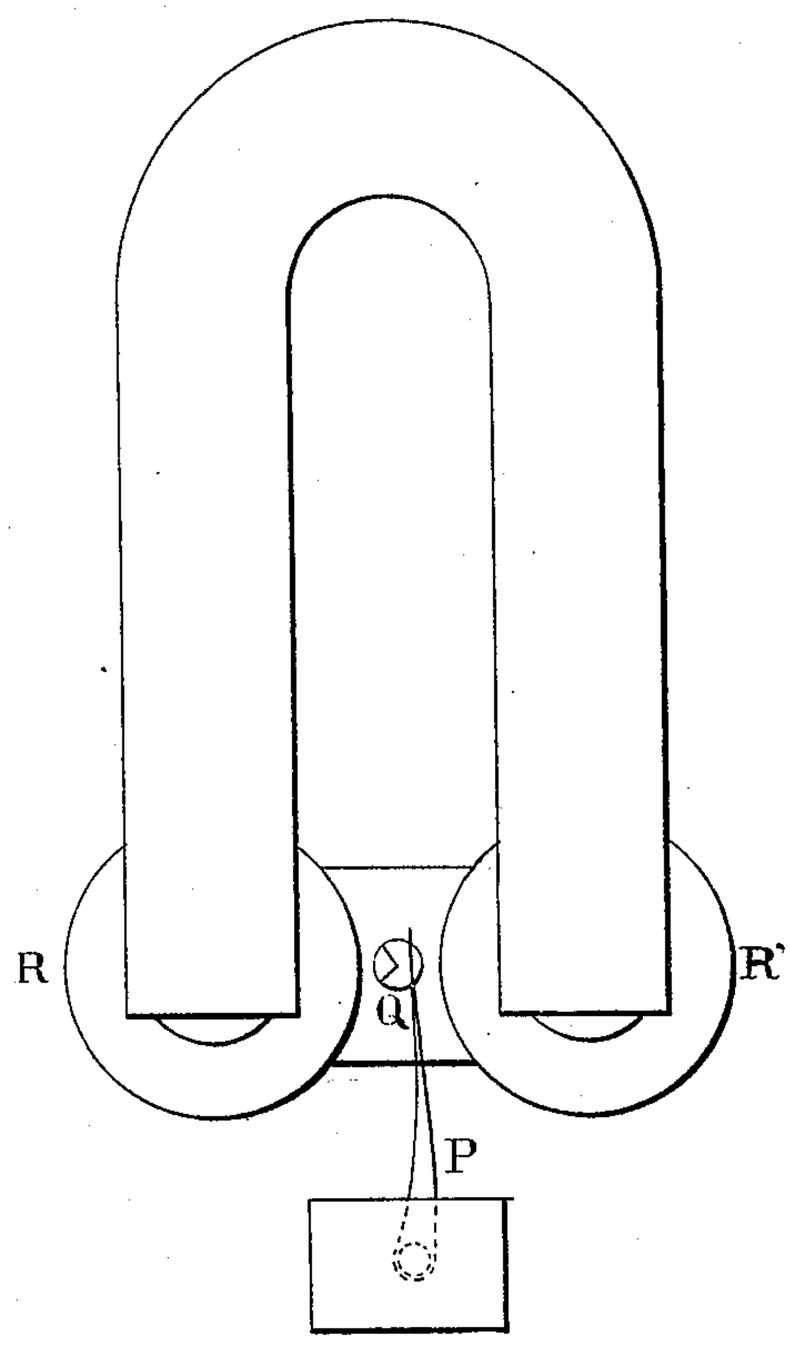
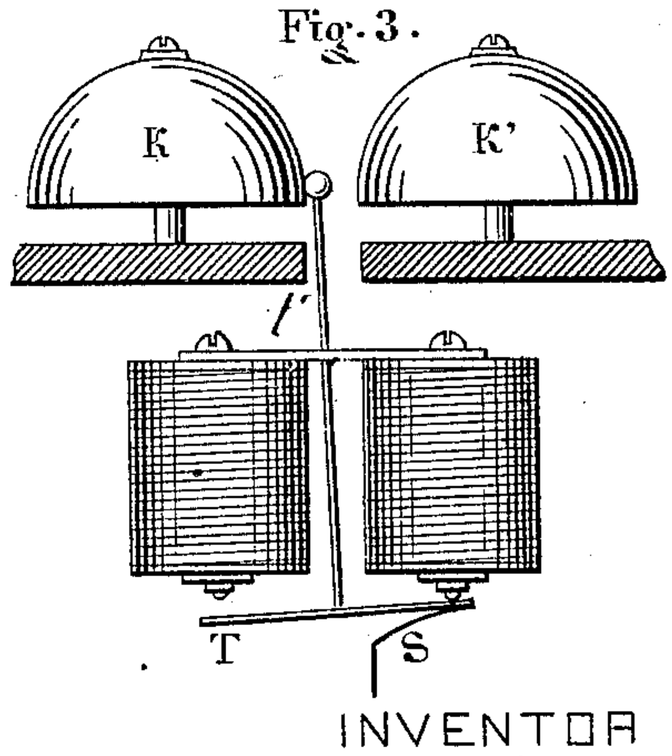


Fig. 3.



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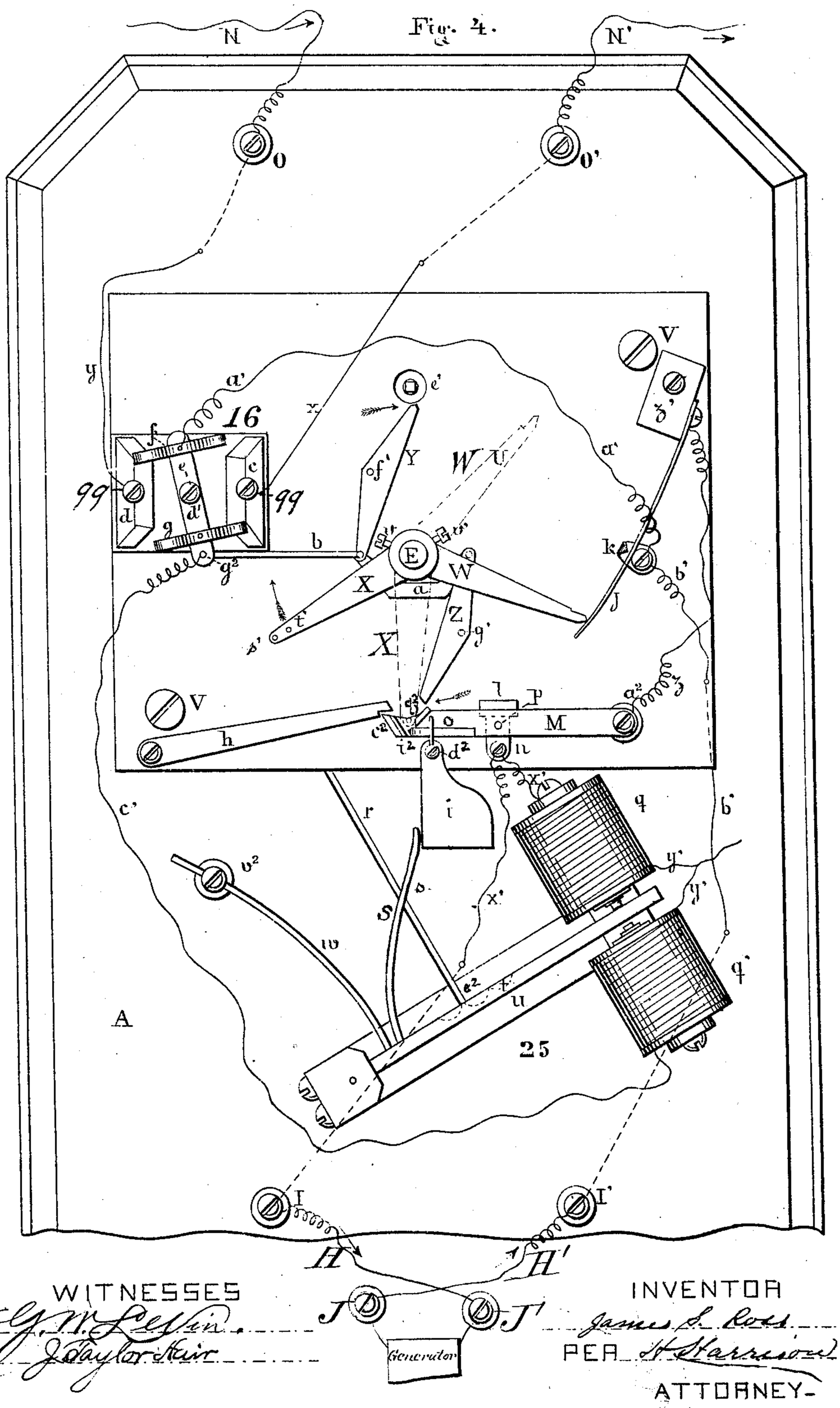
(Model.) 4 Sheets—Sheet 2.

J. S. ROSS.

SIGNAL APPARATUS FOR TELEPHONES.

No. 246,344. Patented Aug. 30, 1881.

Fig. 4.



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SIGNAL APPARATUS FOR TELEPHONES.

No. 246,344. Patented Aug. 30, 1881.

Fig. 5.

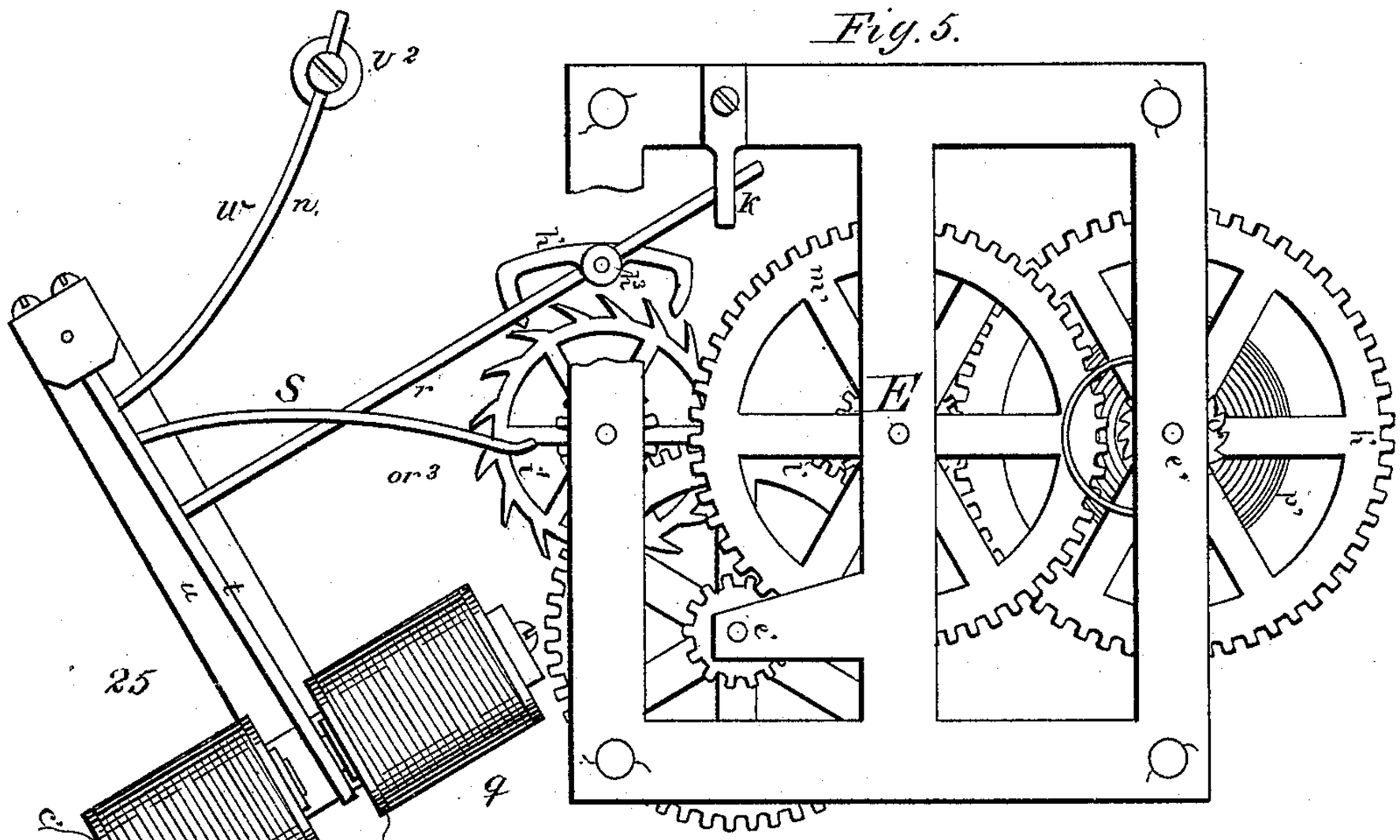


Fig. 8.

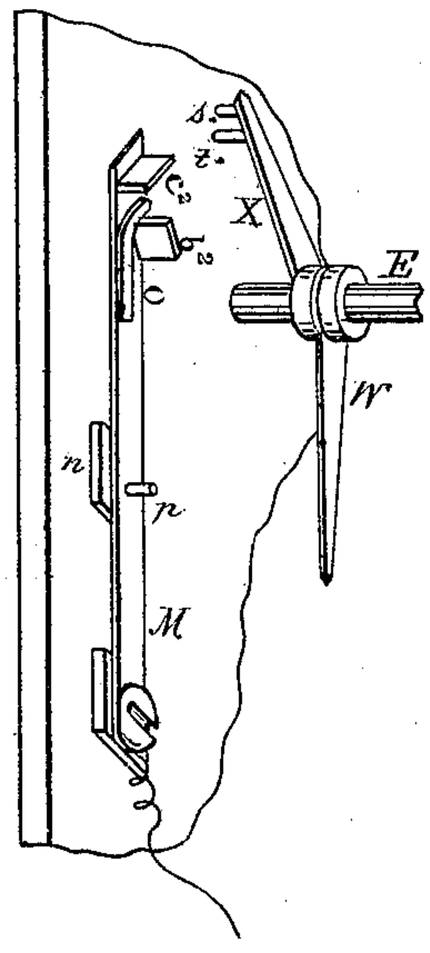


Fig. 7.

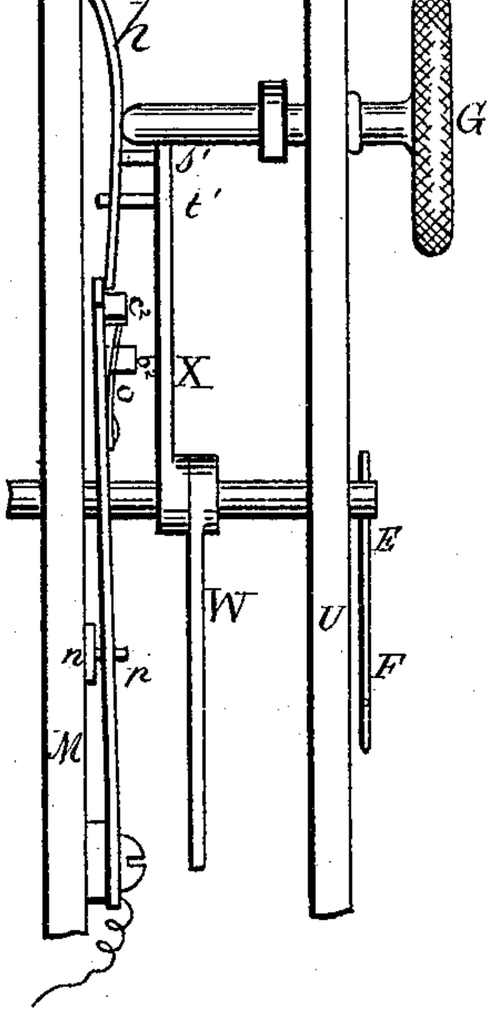
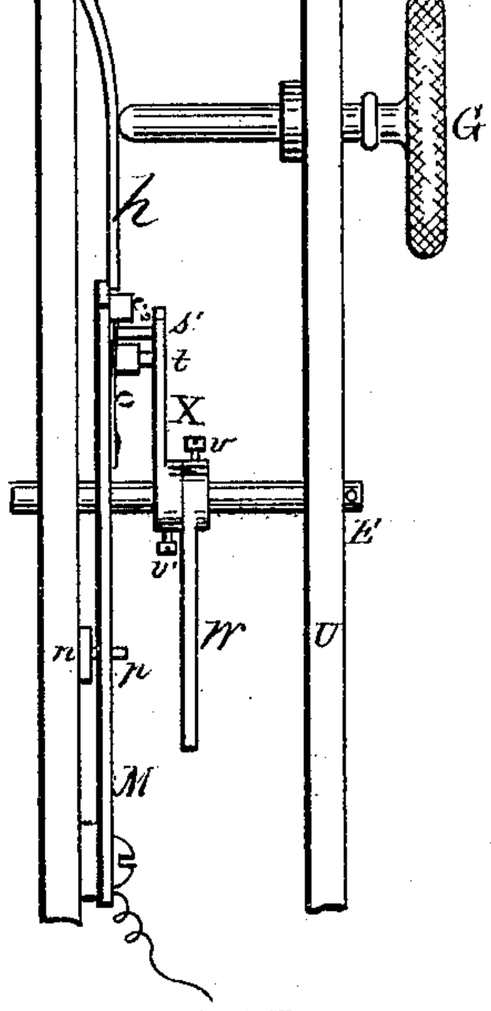


Fig. 6.



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(Model.) 4 Sheets—Sheet 4.

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SIGNAL APPARATUS FOR TELEPHONES.

No. 246,344. Patented Aug. 30, 1881.

Fig. 9.

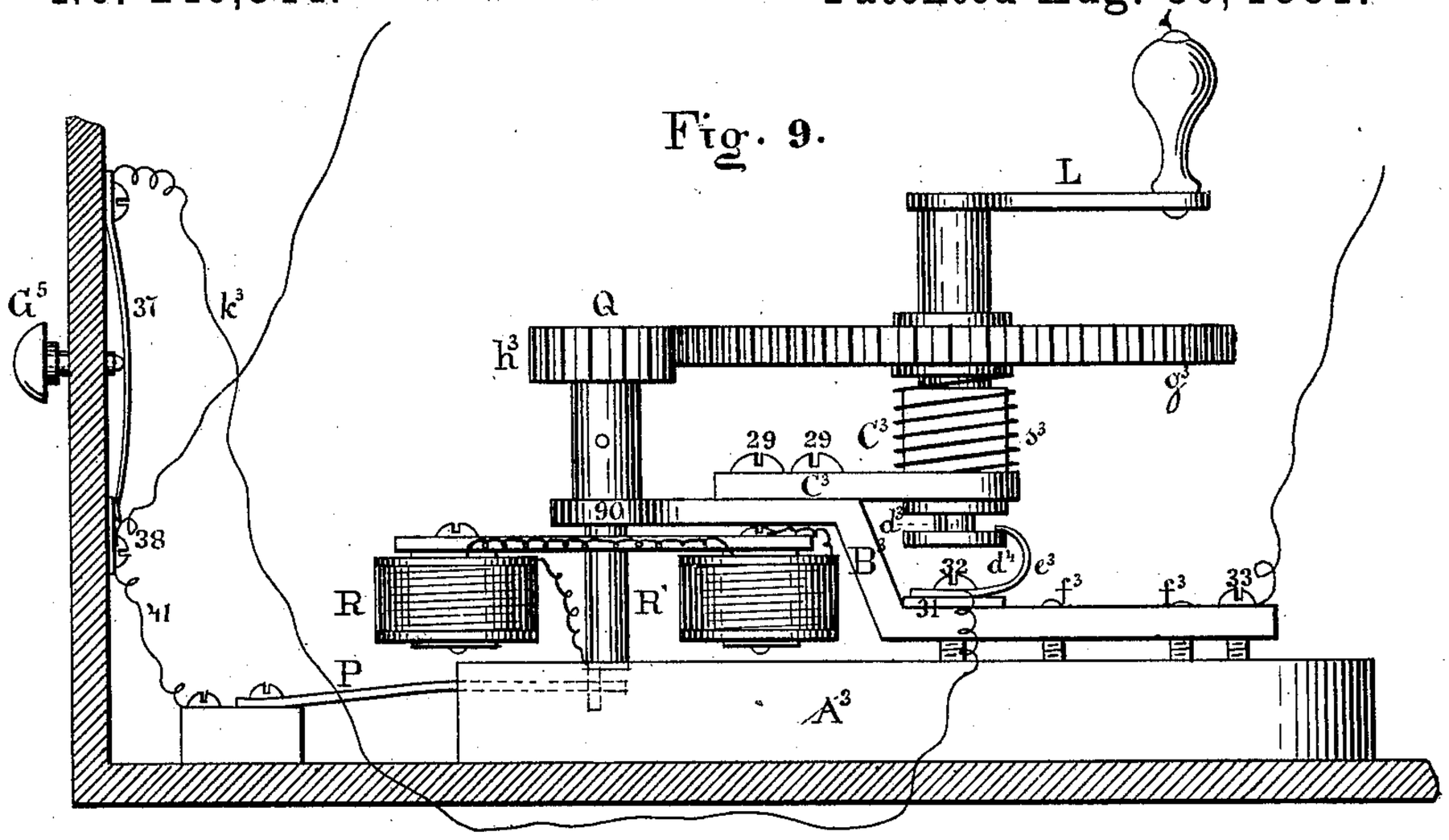


Fig. 10.

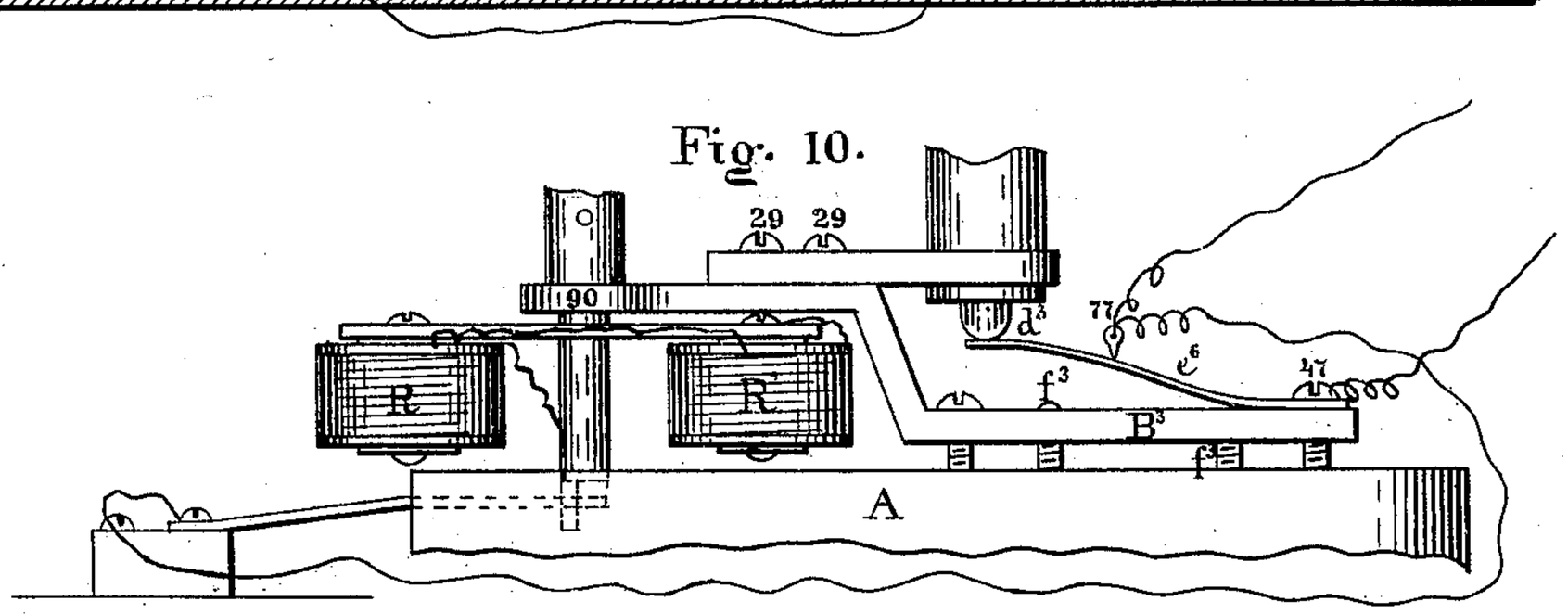


Fig. 11.

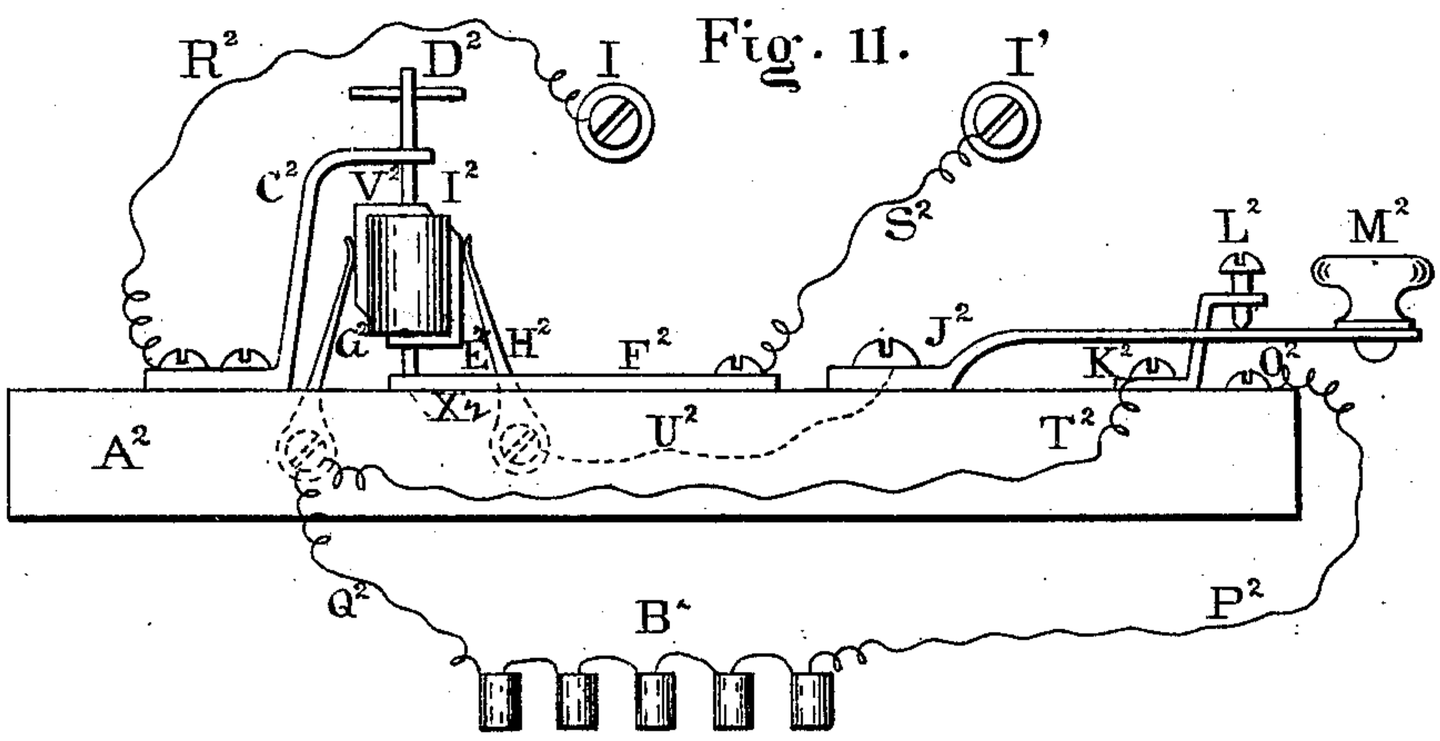
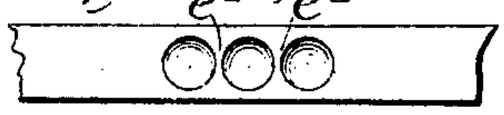


Fig. 12.



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UNITED STATES PATENT OFFICE.

JAMES S. ROSS, OF NASHVILLE, TENNESSEE.

SIGNAL APPARATUS FOR TELEPHONES.

SPECIFICATION forming part of Letters Patent No. 246,344, dated August 30, 1881.

Application filed December 18, 1880. (Model.)

To all whom it may concern:

Be it known that I, JAMES S. ROSS, of the city of Nashville, Davidson county, State of Tennessee, have invented a new and useful Improvement in Signal Apparatus for Telephones, Telegraph and other Purposes, of which the following is a specification.

The object of my invention is to provide an improved signal or call apparatus whereby any one office or station of a number of offices or stations connected together on an electric circuit may call the attention of any other office or station on that circuit for the purpose of telephonic or telegraphic communication, or for signaling or other similar purpose, by ringing a bell, or otherwise producing a sufficient sound or signal at the station or office wanted without at the same time making any similar ring, sound, or signal at any of the other offices or stations on the circuit, and to receive in the same manner an answer, signal, or communication from the office or station called; second, to enable any office or station on a line or circuit equipped with my apparatus to exchange calls or signals with any office or station on any other line or circuit likewise equipped with my apparatus without at the same time calling or signaling any other office or station on either of the two lines or circuits, the two lines or circuits having been connected for that purpose, and for the time being forming one line or circuit; third, to enable any office or station on any line or circuit equipped with my apparatus to ascertain, by inspection or otherwise, whether any other office or station on the line or circuit is using the line for making calls or signals or communications, and to ascertain whether the apparatus at that office or station may be used at that time for making calls, signals, or communications; fourth, to provide an apparatus whereby any office or station on a line or circuit may obtain exclusive control of the line and apparatus for the purpose of exchanging calls, signals, or communications with any other office or station on the line or lines as long as may be desired, without danger of interruption from or being overheard by any other office or station on the line or lines, but, if so desired, the apparatus being so arranged in any office or station as to give that office or station control of the line and apparatus at all times, in order to prevent a monopoly of the same by other offices or stations, and to enable that office or station to readjust the apparatus or line which may have been deranged by carelessness, neglect, or otherwise. I attain these objects by the mechanism and apparatus illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of my apparatus ready for use. Fig. 2 is a plan view, showing in reverse horseshoe-magnet and armature, collecting-spring, and end of armature-shaft. Fig. 3 is a perspective view, partly sectional, showing polarized armature, to which the bell-hammer is attached, bells, bell-hammer, electro-magnet, bobbins, and armature-spring. Fig. 4, Sheet 2, is a front view of my apparatus with the cover removed, without the magneto electric call. Fig. 5, Sheet 3, is a view of an automatic movement, with its controlling magneto-electric attachments. Figs. 6, 7, 8, Sheet 3, are different views, showing the construction and arrangement of the various parts of the "cut-out switch" and the press-button for operating the same. Fig. 9, Sheet 4, is a side view of a magneto-electric generator with my automatic "cut-out" attachment. Fig. 10, Sheet 4, is a side view of a magneto-electric generator, showing another arrangement of my automatic "cut-out," with attachments and connections. Fig. 11, Sheet 4, is a view of a device which may be substituted for the magneto-electric generator. Fig. 12 is a detail view of the polarized armature.

Similar letters indicate similar parts throughout the several views.

A is a base-board, to which the apparatus is attached.

B is a box or cover containing the automatic movement and system of switches and attachments, and is provided with a dial-face, D, and openings for shaft E and button G.

C is a magneto-electric call, arranged to work in connection with the other apparatus.

I I′ are binding-screws attached to A. J J′ are binding-screws attached to call C.

H H′ are conducting-wires, secured at their ends, respectively, by screws I I′ and J J′, whereby the call C is connected with the automatic switch arrangement.

K K′ are signal-bells on C.

L is a crank which operates the generator of the call C.

N N′ are line-wires, connected with the apparatus by binding-screws O O′ upon the base-board A.

P, Figs. 2, 9, is a spring acting in connection

with the shaft Q of the revolving armature, which carries the bobbins R R′ of the magneto-electric generator, and alternately makes and breaks electrical contact for the generator-circuit, the end of the shaft Q being so constructed that the spring is in contact with it through a part only of its full revolution, whereby currents of only one direction or polarity are furnished to a circuit by such contact.

S, Fig. 3, is a spring working against the armature T, and is intended to hold the armature in a certain position, from which it is to be drawn by currents of a particular direction for the purpose of operating the hammer t^2 against the call-bells K K′ in making signals.

U, Figs. 4, 6, 7, 8, is a board or table which has upon its outer face the various switch attachments, connections, and parts hereinafter described, and, being connected with the base A by screws V V′ or equivalent means, securely holds the automatic movement shown between U, its rear face, and the base A. The shaft E, projecting through the table U, carries the limbs W and X and index-pointer F, and is revolved by the action of the automatic movement. *v v′* are screws or their equivalents, securing the limbs W and X to the shaft E.

s′ t′ are pins or projections upon and near the end of limb X, and are provided for the purpose of operating the switch M and commutator 16, as hereinafter described.

Y is a lever, pivoted to U at or about *f′*, and is connected with the rod *b*, and by link or lever *a* connected with lever Z, lever Z being pivoted to U at or about *g′*.

d′ is a non-conducting bar, with its pivotal center at *e*, and carries the conducting-springs *f* and *g*, which alternately make and break electrical connections in acting as a commutator by being drawn respectively upon the conducting-plates *c* and *d*, the bar *d′* being connected with the lever Y by the rod *b*, which is pivoted at g^2.

e′ is the winding-post of the automatic movement.

j is a contact-spring fixed to the block *z′*, and makes electrical connection with the contact-point *k*, which is fixed to the table U.

h is a lever fixed to the table U, and, being operated by the press-button G, controls the action of the switch M at such times and in such manner and for such purpose as is hereinafter described. The switch M is pivoted to the table U, and is operated by the pin *s′* on the arm X to make and break electrical contact.

b^2 and c^2, near the end of switch M, (particularly shown in Fig. 8,) are projections, with which the pin *s′* on limb X engages to raise and depress the switch in breaking and making electrical contact.

n is a conducting-plate fastened to the table U under the switch M. *l* is a non-conducting plate fastened to the table U under switch M, and is in immediate contiguity to plate *n*.

p is a point fixed to the switch M and slides upon the plates *n* and *l*, to respectively make and break electrical contact.

o is a spring fixed to the switch M, and makes electrical connection with pin *s′*.

i is a weight pivoted to table U at or about d^2, and is provided with an arm, i^2, against which the limb X comes in contact while on its revolution, carrying *i* from its normal position and freeing the same at a suitable time and distance. The weight *i*, in recovering, moves beyond its original position and strikes against the arm *s*, for the purpose of throwing the armature *t* into such position that it will come in contact with and detain the escapement-lever *r*, as hereinafter set forth. The shaft of the escapement-lever *r* is provided with a crotch, that engages with an escapement-wheel, *i′*, of a clock-train, which is driven by the spring *p′*, acting through the wheels *h′ m l′* and their pinions, that are supported in a frame, *e′*, back of the board U. By this mechanism the shaft E, carrying the limbs W X, is made to rotate with a uniform speed, and through the lever *r* is started and stopped at will. The extent of oscillation of the lever *r* is limited by a stop, *k′*, on the frame *e′*.

25 is a polarized electro-magnetic receiver, of which *q q′* is the electro-magnet. *u* is the permanent magnet. *t* is a polarized armature. *s* is an arm fixed to the armature *t*, and is the arm against which the weight *i* strikes. *w* is an arm fixed to the armature *t* and carries counterpoise v^2.

O O′ are binding screws or posts for connecting the line-wires with the apparatus.

a′ is a wire electrically connecting spring *f* of commutator 16 with contact-point *k*.

b′ is a wire electrically connecting contact-point *k* with binding-screw I′.

z is a wire electrically connecting spring *j* on block *z′* with switch M.

x′ is a wire electrically connecting the electro-magnet *q q′* with plate *n* and binding-screw I, and is in electrical connection with limb X through the frame of the clock-train.

c′ is a wire electrically connecting *q′ q* with spring *g* of commutator 16.

y′ is a wire connecting the bobbins *q q′* of the electro-magnet.

x is a wire electrically connecting binding-screw O′ with plate *c* of the commutator 16.

y is a wire electrically connecting plate *d* of the commutator 16 with binding-screw O.

In Fig. 9 is shown the form of generator which I prefer, and in which A^3 is a permanent magnet.

B^3 is a frame fastened to A^3 by screws f^3 f^3, and operates as a bearing for the spindle of the revolving armature R R at or about 90. On the spindle Q is fixed a pinion, h^3, which gears with the driving-wheel g^3, which is driven by the crank L.

C^3 is a bearing for the spindle d^3, and is fixed to B^3 by screws 29 29.

d^3 is a shaft fixed to and passing through the hub of g^3, passes through the bearing C^3, and has at its lower end a disk, d^4.

s^3 is a spiral spring, working around and against the bearing C^3 and against the lower surface of the hub of g^3.

e^3 is a conducting-plate, fastened upon an insulating-plate at or about 31, which insulating-plate is fastened to the frame B^3.

32 33 are screws for the adjustment of the frame B^3.

G^5 is a press-button, which, upon being depressed, removes the spring 37 from the conducting-plate 38, thus breaking electrical connection.

41 is a wire connecting plate 38 with spring P.

k^3 is a conducting-wire connecting spring 37 with conducting-plate e^3. The generator is thus normally short-circuited, the current going from the coils to the spring P by screw 38, spring 37, wire k^3, spring e^3, disk d^4, and the frame of the machine to the other coil. This short circuit is broken at the point of contact between the spring e^3 and disk d^4 by pressing downward upon the handle L, or may be broken by the press-button G.

The crank L and its shaft d^3 may be used alternately with, or preferably as a substitute for, the press-button G^5, thus enabling the operator with one hand to generate electric currents by turning the crank, and send them through the line-circuit by depressing its shaft, his other hand being free for other uses.

In Fig. 10 the shaft or spindle d^3 is made (in modification of the construction as shown in Fig. 9) to bear upon the spring e^6, which is fastened to B^3 at or about 47, the generator short circuit being completed when the spring e^6 raises the shaft d^3 and makes electrical connection with the insulated contact-point 77. By this construction the spiral spring s^3 and disk d^4 are dispensed with, the spring e^6 subserving the purpose of spring s^3 and conducting-plate e^3, the operation in other respects being similar to that of the devices shown in Fig. 9, the short circuit being broken at the point of contact between e^6 and the point 77.

In Fig. 11 is shown a method of applying a battery to my apparatus, in which A^2 is a non-conducting base.

B^2 is a battery or source of electricity.

C^2 is a conducting-frame fastened to A^2, its upper end operating as a bearing, through which works conducting-shaft D^2, by which conducting-plate V^2 is fastened to non-conducting cylinder I^2.

F^2 is a conducting-plate fixed to base A^2, with a bearing at one end, through which works conducting-shaft X^2, by which conducting-plate E^2 is fastened to non-conducting cylinder I^2 in such a manner as to be normally insulated from plate V^2.

G^2 is a conducting-spring, resting upon V^2 when I^2 is in a certain position and upon plate E^2 when I^2 is in another position.

H^2 is a similar spring to G^2, and similarly rests alternately upon plates V^2 and E^2.

J^2 is a spring-key, fixed at one end to base A^2, and makes electrical contact normally with conducting-plate K^2 by resting against screw L^2. When the spring-key is depressed by bearing upon the button M^2, it breaks electrical connection with K^2 and makes electrical connection by coming in contact with point O^2.

R^2 is a wire electrically connecting C^2 with screw I, Fig. 1.

S^2 is a wire electrically connecting plate F^2 with screw I′, Fig. 1.

Q^2 is a wire electrically connecting spring G^2 with battery B^2.

T^2 is a wire electrically connecting spring G^2 with plate K^2.

U^2 is a wire electrically connecting spring H^2 with spring-key J^2.

P^2 is a wire electrically connecting contact-point O^2 with battery B^2, the operation of this pole-changing device being hereinafter described.

The operation of my apparatus is as follows: Let it be supposed there are two lines, each being provided with seven different stations, one station on each line being a central telephone-office located at the end of the line, and each station being provided with one set of my apparatus, as shown in Fig. 1, and, in addition thereto, a telephone with the necessary switches and connections for the same, as shown at B^4. Let it also be considered that each apparatus consists of two principal parts, which, for convenience herein, will be termed the "magneto," consisting of the generator and receiver with their various connections and attachments, and the "automatic," comprising the several parts confined within the box B, Fig. 1, as heretofore described.

The stations on each of the two lines are numbered consecutively from 1, which is the number of the station most distant from the central office, to 7, which is the number of the central office on each line. All the automatics are at rest, each with its armature t, Fig. 4, detaining, by its position nearest the bobbin q, the arm or lever r. The arm r is detained by coming in contact with ridges on the upper surface of the armature t, said ridges being formed by making cup-like depressions e^2 in the armature, as shown in Fig. 12. The limb X is in its normal position, as shown in dotted lines in Fig. 4, with its pin s' having just passed under and beyond the sliding shoulder b^2 of the switch M, and thereby having moved switch M, with its contact-point p, off the conducting-plate n onto the insulating-plate l. Limb X is at rest, with the pin s' half-way between the sliding shoulders b^2 and c^2, with the foot of the pin s' in electrical connection with the spring O. The limb W, in its revolution, comes in contact with the spring j and breaks contact at k whenever the pointer at a station points to the number of that station. The limbs W are so set upon their shafts E that none of them at this time are holding the springs j from their contact with point k. The index-pointers F are resting at upper 8 of their dials D, and the pin t' has just displaced the end of lever Z, so as to throw the spring g of the commutator 16 onto plate c and the spring f on-

to the plate *d*, as shown in Fig. 4. The line-circuit is from the binding-screw O, through the wire *y*, to plate *d*, through spring *f*, wire *a'*, to contact-point *k*, from contact-point *k*, through spring *j*, wire *z*, switch M, spring *o*, pin *s'*, limb X, frame of automatic movement, wire *x'*, electro-magnet *q q'*, wire *c'*, spring *g*, plate *c*, wire *x*, to binding-screw O', thence through line-circuit, and similarly through other apparatus, back to the binding-screw O. When the contact at *k* is broken by the limb W the circuit is by line *y* to commutator 16, wires *a' b'*, binding-screw I', signal apparatus, binding-screw I, wire *x'*, magnets, wire *c'*, commutator, and line *x*, to binding-screw O', to line N'. The magneto-circuit is from binding-screw J, through wire H', to binding-screw I'; thence by wire *b'* to contact-point *k;* thence through spring *j*, wire *z*, switch M, spring *o*, pin *s'*, limb X, frame of automatic movement, wire *x'*, to binding-screw I; thence through wire H to binding-screw J'; thence through the magneto and its connections back to binding-screw J. Station No. 2 wants to communicate with station No. 5. No. 2 presses the button G, which, by means of the lever *h*, depresses and throws the switch M out of reach of pin *s'*, Fig. 7, and at the same time removes spring *o* from its contact with foot of pin *s'*. The magneto being thus deprived of its short circuit through spring *o*, and the generator being deprived at the same time of its short circuit by a downward pressure of the crank L, the shaft of which carries the disk d^4 away from the contact-point e^3, the generator, when the armature R R is revolved, must send the current or currents produced therein to point *k;* thence through wire *a'* and over the line-circuit, as described, back to wire *x';* thence to the magneto, as described. The crank L being turned to the left, a current or currents are sent in such a direction through the electro-magnets *q q'* as will draw all the armatures *t* from detaining the arms or levers *r*, thereby permitting all the automatic movements to simultaneously start and put in revolution the limbs W and X and index-pointer F. The button G having been held down until and released when the pin *s'* has passed clear of plate c^2, (which is indicated by the pointer F reaching space 1 on the dial D,) the switch M is left on the insulating-plate *l*, and the pin *s'* has passed away from its connection with spring *o* and away from any chance to throw the switch M onto conducting-plate *n* by pin *s'* coming in contact with the plate or shoulder c^2; the magneto current or currents necessarily pass over the line-circuit, and the operator may, by turning the depressed crank L to the right, send through all the electro-magnets *q q'* a current or currents of such a direction as will draw all the armatures *t* to *q'*, the position in which the automatic movement is stopped by detaining the escapement-lever *r*, and, by stopping all the apparatus when the limb W breaks contact at *k* at the proper station, can hold them in this condition and communicate or signal at will.

At all the other stations on the line where the button G was not depressed at the moment of starting, the pin *s'* has, by sliding on and over the sliding shoulder c^2, moved the switch M, so that the point *p* is resting on and is in contact with the conducting-plate *n*, which completes a short circuit, or common conducting-road, from point *k*, through spring *j*, wire *z*, switch M, plate *n*, to wire *x'*, whereby the magneto is electrically cut off or separated from the line-circuit. When switch M moved on to plate *n* it also moved away from its primary position contiguous to lever *h*, so that in the position thus secondarily occupied by switch M depression of the lever *h* fails to reach or affect the switch. Therefore station No. 2, being the only one to depress the switch M at the moment of starting the automatics at work, is the only one which can in any way affect or control the line-circuit until such time as the apparatus is brought back to its original position, which is indicated by the index-pointer F.

The telephone apparatus at each station being cut into the magneto-circuit by the usual switch attachments, B^4, Fig. 1, depends upon the said magneto-circuit, so that it will be inoperative except at such stations where the magneto short circuit has been severed, as described. Therefore no station other than No. 2 and No. 5 which has been called can for the time being operate either the telephone or other apparatus to send or receive signals or communications.

In all the automatics on a line the index-pointers F and limbs X occupy the same relative position to each other, and with the limbs W travel over equal arcs in approximately equal times, the index-pointers F passing correspondingly over the numbers or spaces on the dials D *seriatim.* The limbs W are fixed upon their shafts E in such position relative to their index-pointers so that in each automatic from No. 1 to No. 7 the limb W will antagonize with spring *j*, pushing it away from its contact with point *k* during the time that the pointer F is passing the number on its dial corresponding with the number of its station and position on the line. Hence No. 2, to call No. 5, has started all the automatics at work. Waiting until his index-pointer F has reached about the middle of space 5 on his dial, he presses on the crank L, at the same time turning it to the right, sends a current or currents in such a direction as stop all the pointers F at No. 5 on the dials, the limb W at station No. 5 only, by reason of its special adjustment, stopping in such position that the spring *j* is held off from its contact with point *k*, thereby severing the short circuit of No. 5 and cutting in its magneto-circuit. Communication between No. 2 and No. 5 being finished, either station again starts all the automatics on the line by depressing and turning crank L to the left. The limb

X in each apparatus, by the pin t' displacing the levers Y and Z, reverses the line-connections twice through the commutator 16 before coming to rest—once when the pointer F is passing lower 8, and again immediately before stopping at upper 8 of the dial D. The pin s', having passed under the sliding shoulder b^2, moves the point p of the switch M off conducting-plate n onto the insulating-plate l, leaving the end of switch M under the end of lever h, the point of pin s' having made electrical contact with spring o, and the adjustable limb W having passed the contact-spring j. When the pointer F indicates upper 8 on the dial D each apparatus is brought to rest by the action of the weight i, which, having been forced from its normal position by the displacement of its arm i^2 through antagonism with the end of moving limb X, when freed from such antagonism by the limb passing beyond necessary contact, falls back through and moves beyond its arc of displacement, and, colliding with arm s, throws the armature t to the position in which it detains the escapement-lever r.

In order to secure uniformity in the working of the apparatus, it is necessary that all the automatics should be started or stopped by a current or currents of a particular direction, which may be supposed to be in the direction toward the central office. From this it will be seen, if line No. 1 should be connected at the central office into one circuit with line No. 2, that a current which would be in a direction toward the central office on line No. 1 would at the same time be in a direction from the central office on line No. 2. Therefore a current or currents which would start the apparatus on line No. 1 would operate in such a manner upon the automatics on line No. 2 as to stop the apparatus on that line. This difficulty must be overcome in order to allow the apparatus on one line to be operated with similar apparatus on another line, and in order to allow a station on one line to call any station on the other line, without at the same time calling a similarly-numbered station on his own line. To accomplish this I devote a half or sufficient part of the revolution of the limbs W and X and pointer F, and provide the commutator 16, as described in the automatic, for calling on other lines, the apparatus being arranged and operated as follows:

The dial D being divided into similarly-numbered halves, the apparatus at no station on either of the two lines is arranged to respond to any call or signal sent over the lines while the apparatus is in the position in which the pointer F is on the second half of the dial D. A station on line No. 1, in order to signal a station on line No. 2, calls the central office, which is station No. 7. The central office first moves forward all the apparatus on line No. 1 to the position in which the limbs X have reversed for the first time the connections of the apparatus to the line by means of the commutator 16, in which position the apparatus on line No. 1 is stopped with their index-pointers on lower 8 of their dials D, at which time lines Nos. 1 and 2 are connected into one circuit with all the apparatus on line No. 1 one-half revolution ahead of all the apparatus on line No. 2; hence the apparatus on the two lines, being reversed to each other, (once by the relative positions of their commutators and again by the manner in which the lines are connected,) are "double reversed" or straight to each other, and may all be started or stopped together by the central office, or the station on line No. 1 which originally called, or any other station on line No. 2, where the button G may be depressed at the moment of starting. The apparatus on both lines having been started, the said station on line No. 1 has only to wait until his pointer has reached the number on the second half of his dial corresponding to the number wanted on the first half of the dials on line No. 2, when the apparatus may be stopped and the said stations exchange signals in the manner heretofore described herein. All the apparatus on line No. 1 being on the second half of their revolution, no station on line No. 1 can respond to the call intended for the station on line No. 2, and therefore no station on either line can respond to the call other than the station wanted on line No. 2. In any case where two such lines are connected into one circuit with all the apparatus in its normal position, any station on either line may start the apparatus on that line, and then, by again sending starting-currents at the moment when the pointers on that line are passing lower 8 on their dials, may start the apparatus on the other line, so that the apparatus on both lines will then move together in the proper manner for making a signal from one line to the other, as heretofore described. When such signals or communications are ended all the apparatus on both lines may be started, so as to resume their normal position.

A line equipped with my apparatus may work or be operated as one circuit, or, being grounded or otherwise separated into more than one circuit, signals or communications may be exchanged between the several stations on either one of the circuits thus separated independent of the other circuits, the same as when all were together in one circuit, thus rendering the apparatus of advantage for "through-lines," or lines which are generally left connected together in one circuit, either one of which may be connected to a third line, while the other of the two, for the time being, is left as a complete circuit of itself.

The automatic movement for operating my apparatus may be of any kind or manner of construction as may be capable of being started and stopped by any of the methods described, and which will revolve their shafts with sufficient uniformity of speed so as to carry the necessary attachments thereto simultaneously over corresponding arcs or spaces with sufficient force for the purpose intended, as shown.

In Fig. 11 the battery, key, and commutator are shown to illustrate the manner in which

my apparatus may be used and operated without the employment of the generator shown in Figs. 9 and 10. By depressing the key M^2 a current is sent from the battery B^2 to the binding-screws I I′, and thence to the automatic mechanism, in a direction determined by the position of the plates on the non-conducting cylinder I^2, currents in one direction starting the apparatus and currents in the opposite direction stopping the same, and being used for signals in a similar manner as the currents produced by the magneto apparatus.

It being understood that the source of electricity is in no manner the subject of my claim herein, any apparatus may be used which will furnish currents of sufficient power to produce the effect desired, such apparatus being furnished with a commutator which will control the direction of the currents conveyed to my apparatus, and having also a key or other switching device which is capable of making and breaking successive currents necessary for the operation of the signaling apparatus, as described.

I do not desire to claim at this time a polarized armature provided with a spring, as shown by the construction of parts in Fig. 3, nor an automatically-broken short circuit around a generator, nor the special devices for accomplishing the same, as shown in Figs. 9 and 10, such being reserved for a future application.

Having thus described the nature, construction, and operation of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric signaling apparatus, the combination, with an automatic switching-movement and main and subsidiary circuits, of a polarized armature, an electro-magnet, and a magneto-electric generating-machine, whereby the automatic movement may be started and stopped at will by a current or currents of different direction or polarity operating upon the polarized armature, and causing it to act as a break for the automatic movement, substantially as set forth.

2. In an electric signaling apparatus, the combination, with an automatic movement and an electro-magnet, of a commutator and an electric circuit or circuits, whereby the connections of a circuit are reversed for the purpose of securing the same effect from a current of definite direction when sent over a circuit composed of two connected lines the instruments of which would otherwise be reversed to each other, substantially as set forth.

3. In an electric signaling apparatus, the combination of an automatic switching-movement which may be started and stopped at will by electricity with a magneto-electric generator and an electro-magnetic receiving or signaling apparatus provided with a polarized armature and spring or its equivalent for holding said armature normally in position, from which position the armature is drawn by the successive currents of electricity of such a direction as operate to stop the automatic movement, the action of the spring and successive currents giving the armature an alternating movement to and from its position, substantially as shown and described.

4. In an electric signaling apparatus, the combination, with an electric switch, of a limb for controlling and operating said switch, fixed to the shaft of an automatic movement, and a press-button, whereby, when said limb is in its normal position of rest, the switch may be operated by means of said press-button, substantially as and for the purpose specified.

5. In an electric signaling apparatus, the shaft of an automatic movement which may be started and stopped at will by electricity, in combination with the limb X, provided with pins s' and t', or their equivalents, switch M, provided with sliding shoulders b^2 and c^2, spring o, contact-point p, insulating-plate l, conducting-plate n, lever h, and press-button G, substantially as shown and described.

6. In an electric signaling apparatus the automatic movement of which may be started and stopped at will, the combination of the shaft E, adjustable limb W, contact-spring j, contact-point k, wires b' z, switch M, contact-point p, and conducting-plate n, for the purpose of cutting the line-circuit into the magneto-circuit, substantially as described.

7. In an electric signaling apparatus, the shaft of an automatic movement which may be started and stopped at will by electricity, in combination with the limb X, weight i, provided with arm i^2, polarized armature t, operated by electro-magnet q q', arm s, lever r, detent e^2 of armature t, counterpoise-arm w, and counterpoise v, substantially as shown and described.

8. In an electric signaling apparatus, the combination, with an automatic movement the shaft of which carries a limb, X, having pin s', of the pivoted weight i, lever r, armature t, having arm s, switch M, having shoulders b^2 c^2, plates l n, lever h, and press-button G, substantially as and for the purposes described.

9. In electric signaling apparatus in which an automatic movement is employed, the shaft E, carrying limb X, provided with point t', commutator 16, provided with conducting-plates d c, binding-screws 99 99, non-conducting bar d', pivoted at c, with its conducting-springs f and g, connecting-wire a', wires x and y, bar b, lever Y, link a, and lever Z, substantially as shown and described.

10. The combination of the shaft E, provided with arm X, having pin t', the pivoted levers Y Z, connecting-links a b, and commutator 16, with its dependent circuits, substantially as shown and described.

11. The switch M, having contact-point p, spring o, and sliding shoulders b^2 and c^2, substantially as shown, for the purpose specified.

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Witnesses:
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