

A. K. ANDRIANO.
TELEPHONE SYSTEM AND APPARATUS.
APPLICATION FILED JULY 3, 1909.

958,067.

Patented May 17, 1910.

3 SHEETS—SHEET 1.

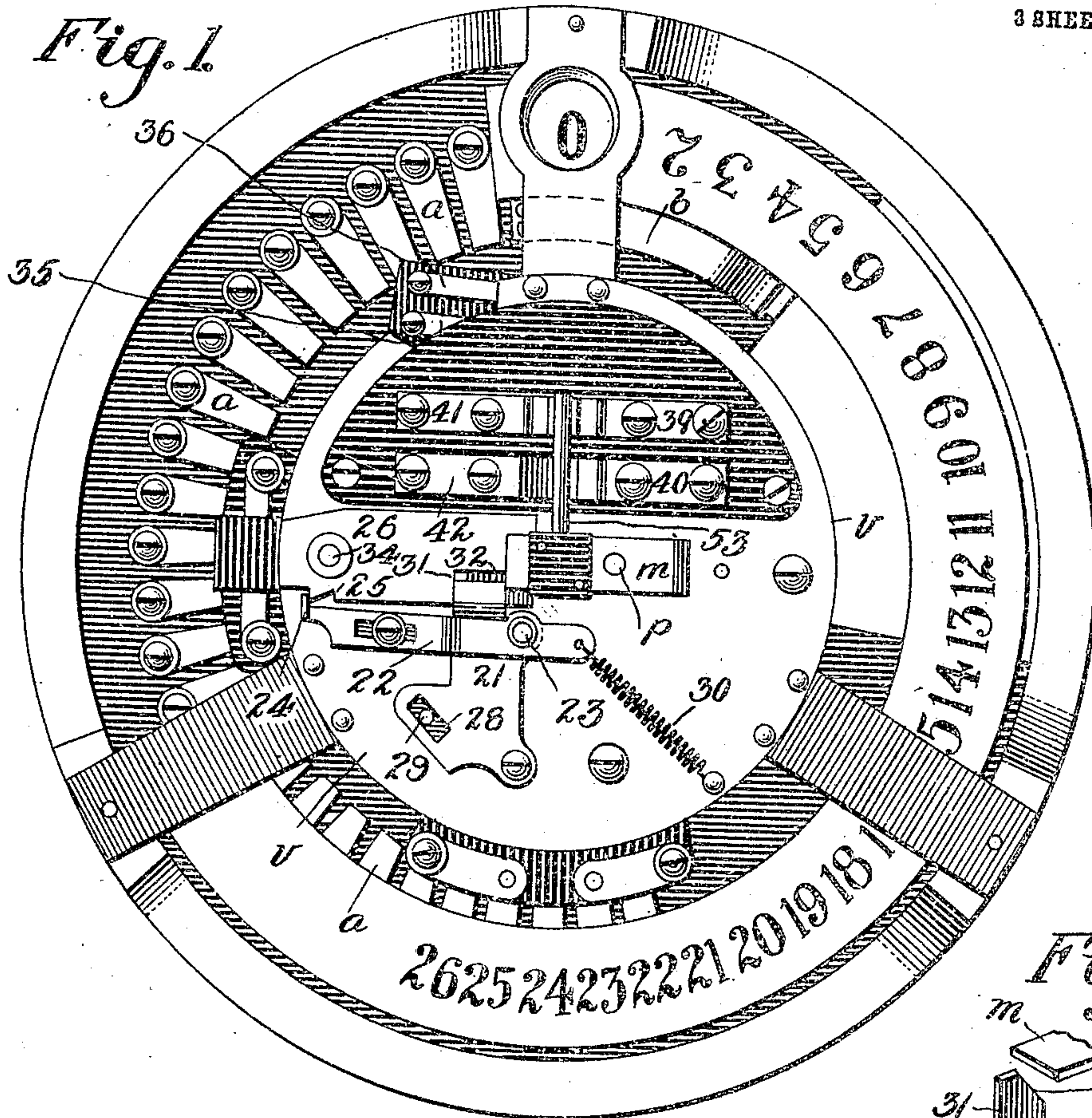
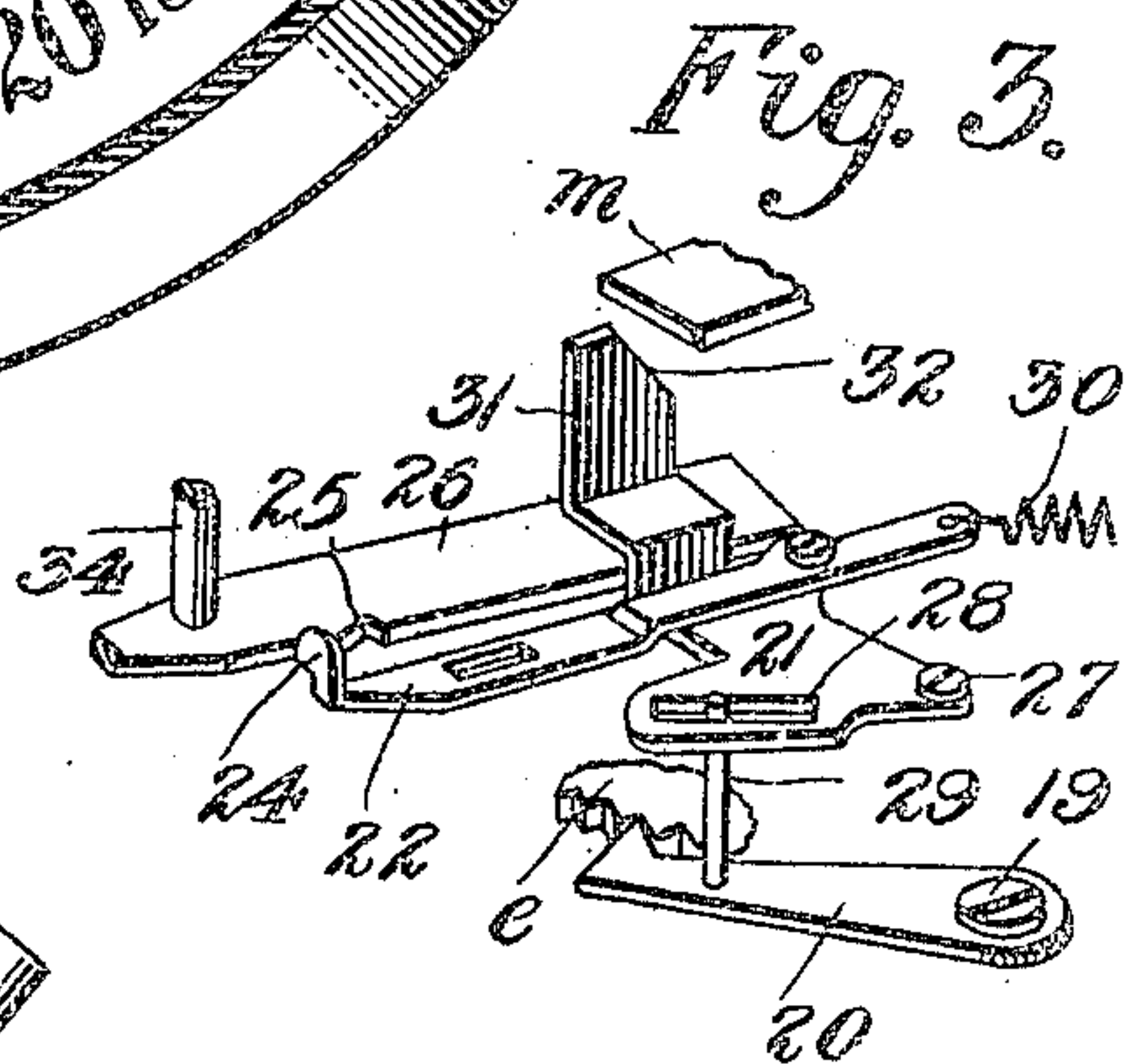
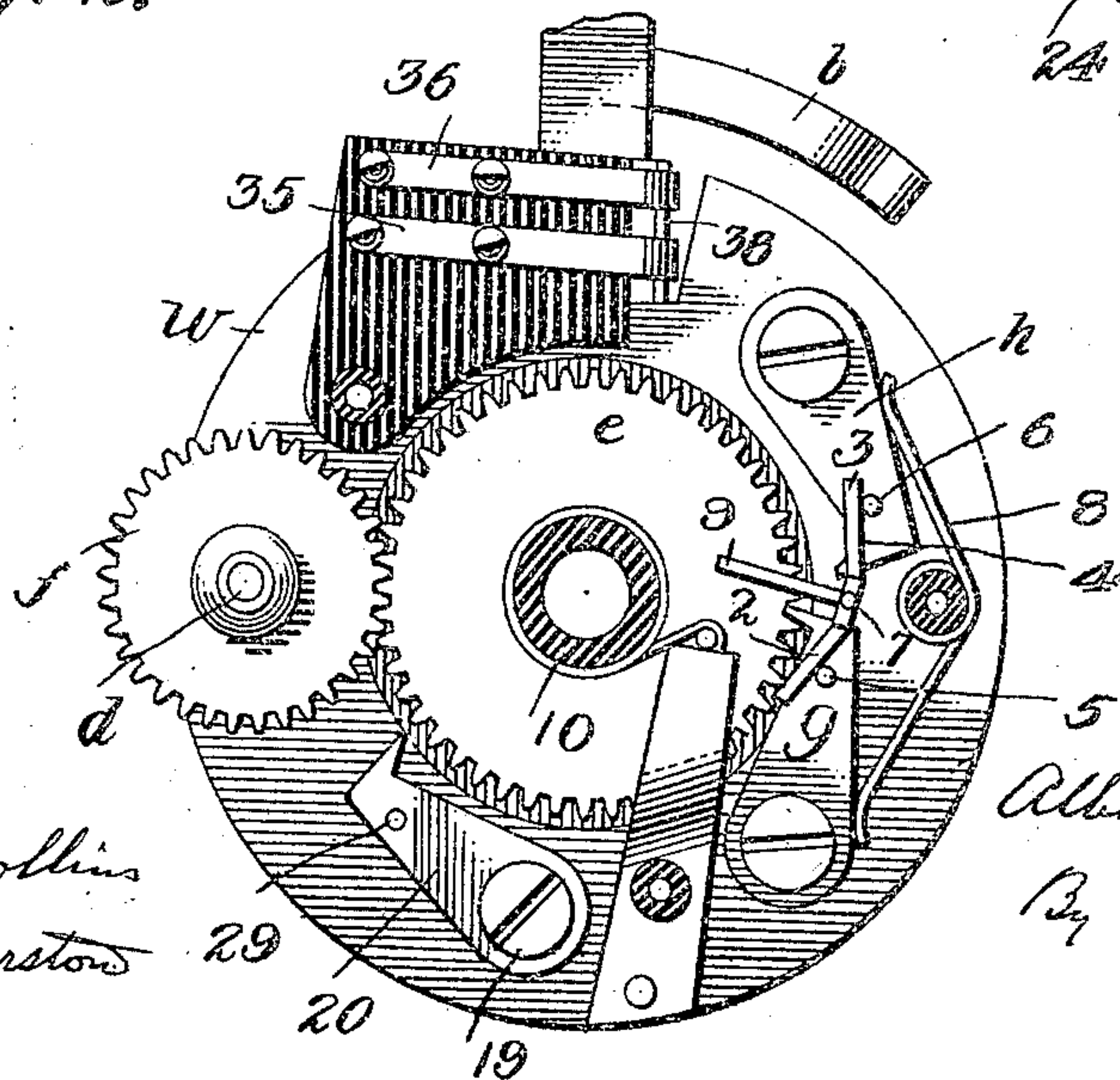


Fig. 2.



Witnesses

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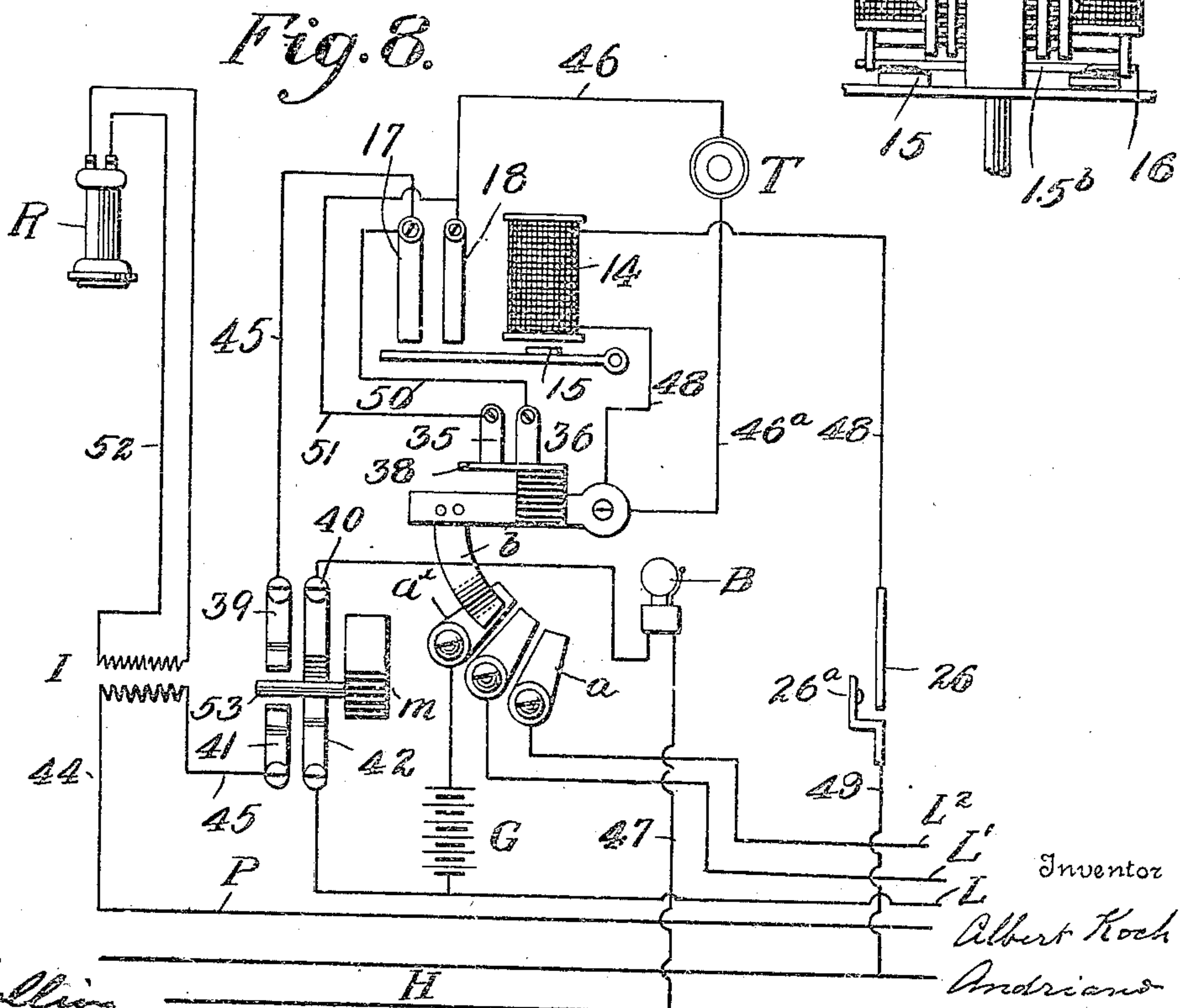
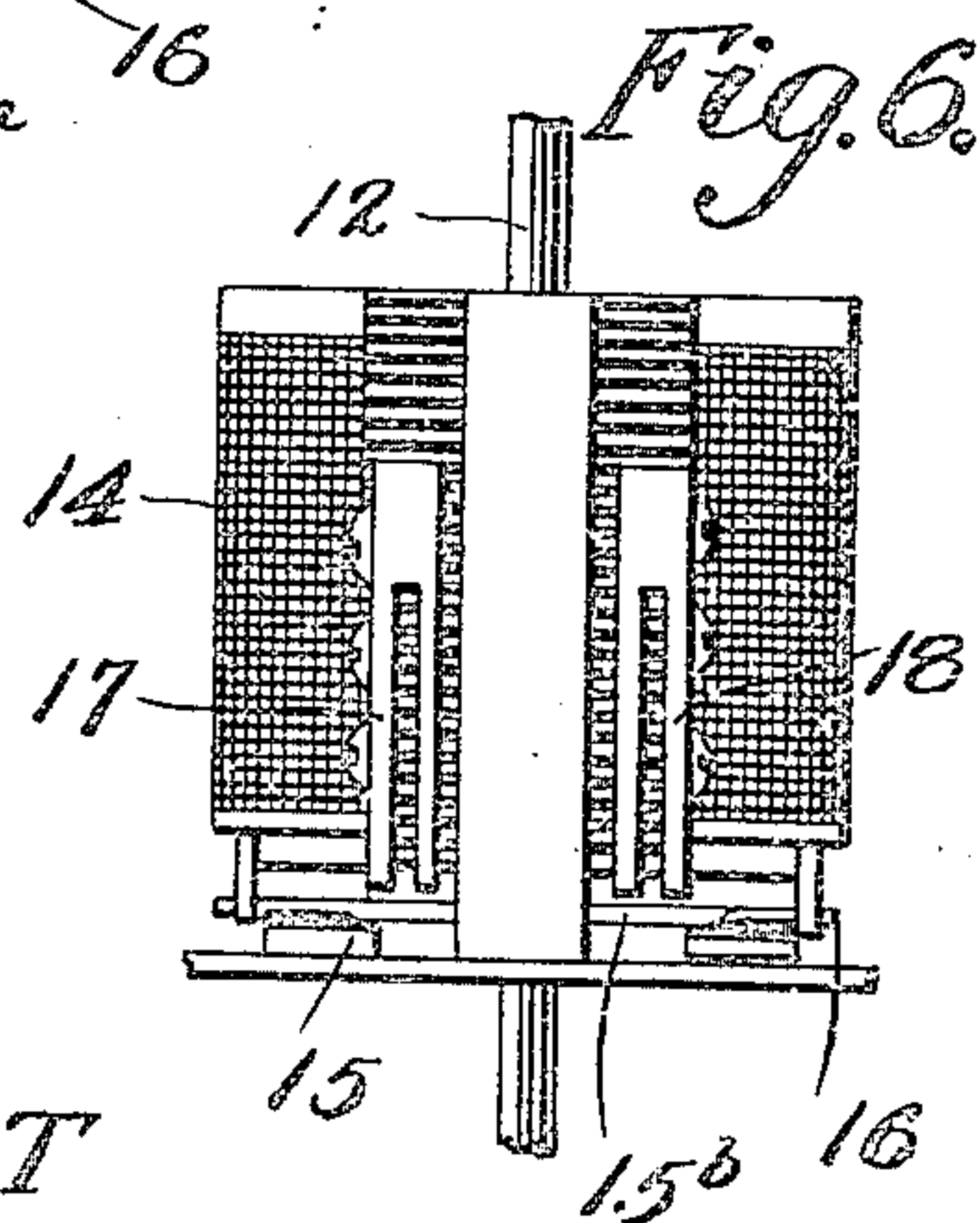
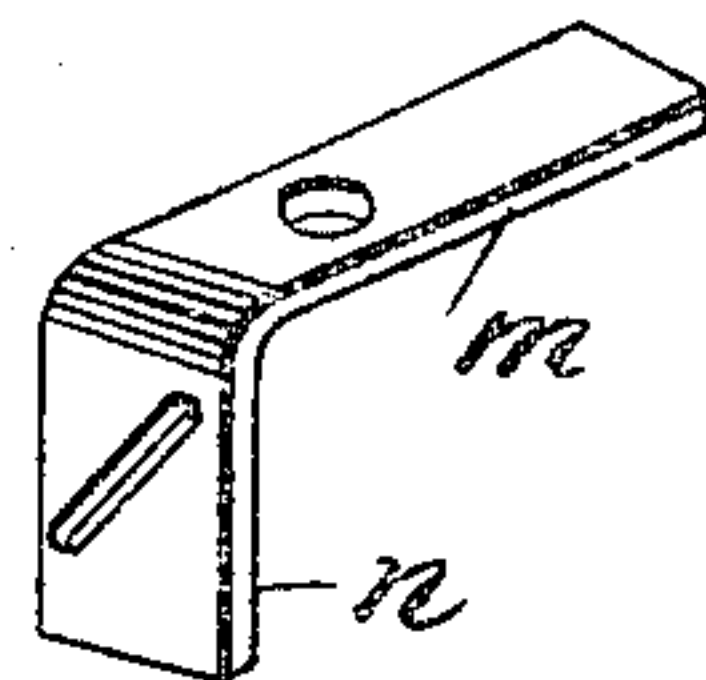
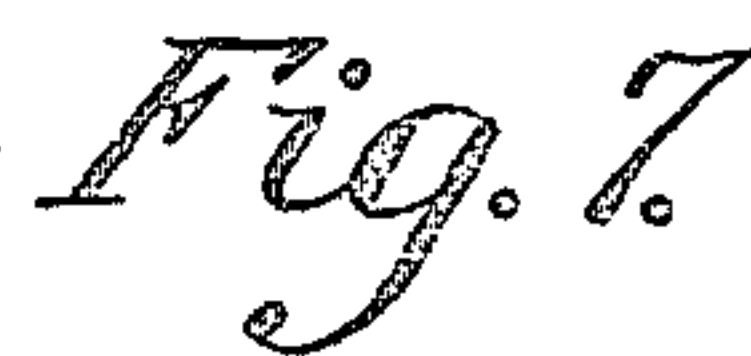
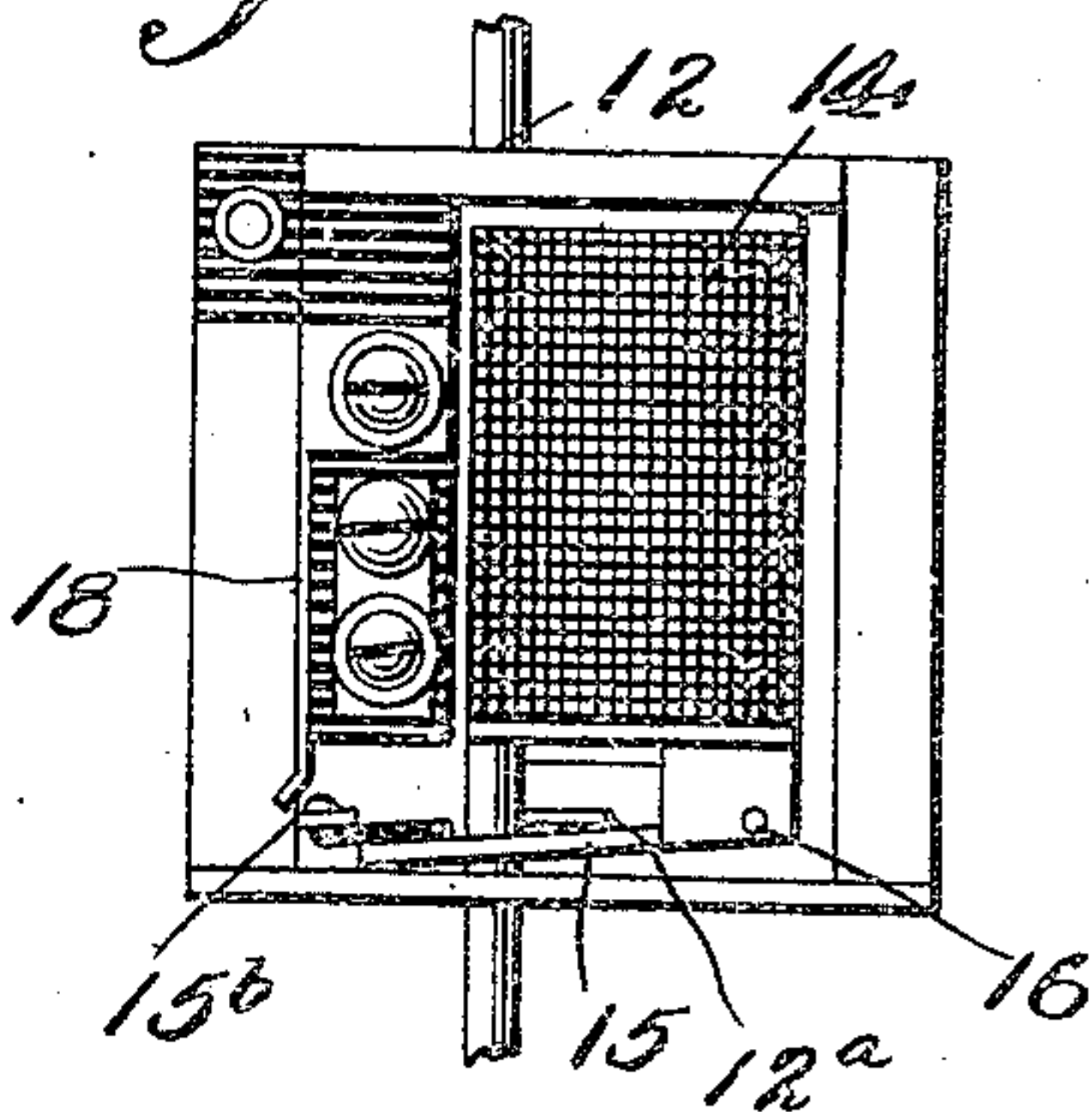
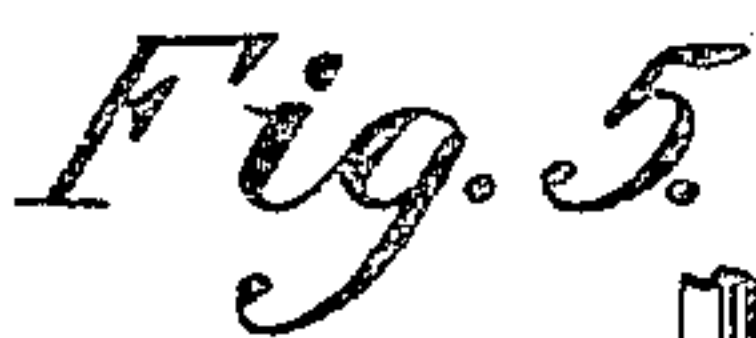
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3 SHEETS—SHEET 2.



Witnesses
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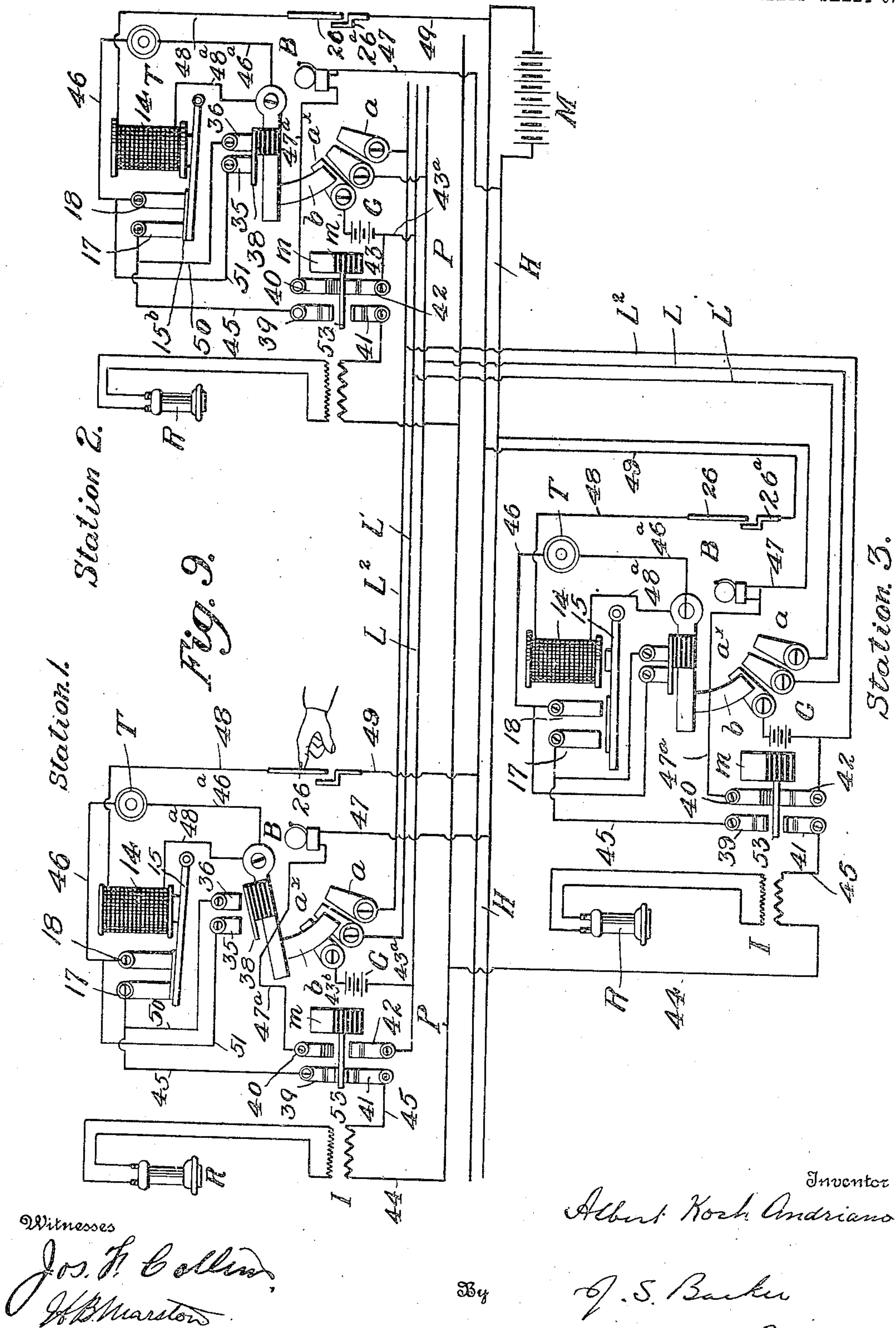
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3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

ALBERT KOCH ANDRIANO, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO DIRECT-LINE GENERAL TELEPHONE COMPANY, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF CALIFORNIA.

TELEPHONE SYSTEM AND APPARATUS.

958,067.

Specification of Letters Patent.

Patented May 17, 1910.

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To all whom it may concern:

Be it known that I, ALBERT KOCH ANDRIANO, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Telephone Systems and Apparatus, of which the following is a specification.

This invention relates to improvements upon switching devices and circuit-controlling means for telephone systems of which the devices and mechanism shown and described in the Letters Patent of the United States, No. 692,189 granted to me on January 28, 1902 may be taken as the type or class.

The improvements are applicable more particularly, therefore, to what are included under the general term of interconnecting or direct-line telephone systems, wherein each station or telephone is furnished with means for making connection with and calling up any other station or telephone without going through a central station, thereby dispensing with the services of an operator and the connections required in a central station system.

The general object of these improvements is to more effectively insure the privacy of the line completed for talking between two stations or telephones at the time of use, and especially to prevent a person at a third telephone from switching his receiving circuit on to a line already in use and overhearing the conversation unknown to the parties using the line. And with this end in view the invention comprises novel means of controlling the switch by the movement of the ringing-key as well as the arm of the telephone-hook, the parts being arranged so as to operate in such manner that after the switch has been set it will be locked by the act of calling up another station and its position cannot be changed after the signal has been sent in until the telephone is disconnected by hanging up the receiver.

The invention includes, secondly, a novel construction of circuit-controlling means in combination with the local circuit of the receiving and transmitting instruments, whereby the circuit is broken on the instant that

the movable-member of the switch is moved from its normal position of rest on its own line, but, through the operation of ringing up another station the circuit, is put in condition for talking with the station being rung up.

In both of these points or features the present improvements are especially applicable to the switching-circuit controlling means embraced in the Letters Patent No. 692,189 above referred to. The movable-member of the switch in that patent is so controlled by locking devices that it cannot be moved until the receiver is first taken off the hook. When that is done, the switch can be set to the line of another station; but after being thus set to one line, it is possible to move the switch in that patent forward from one contact point to another; because in the locking means that are brought into play by taking down the receiver no provision is made for preventing the movable-member of the switch from being moved in a forward direction and set to another line, although it cannot move back to its own line-contact until the receiver is hung up.

The switching device in the present invention is controlled against return movement in the same manner, and is movable in a forward direction from point to point in the switch at any time before ringing, after the receiver is taken from the hook. But when the ringing-key is pressed to call the station at the other end, the switch is instantly locked and remains where it was set before the ringing-key was pressed. From that position it can be moved only by returning the receiver to the hook; by which operation the switch is automatically returned to and locked on its own line-contact, and it cannot be moved again until the receiver is taken off its hook. The effect of this additional locking means is to prevent a party from moving his switch to another line after he has closed the break in his local circuit, by going through the operation of switching to and ringing up a station.

The locking-out means which is embraced in the second feature of the present invention, comprising circuit-closing contacts arranged in the pillar of the telephone-sup-

port or stand, electrically actuated means including an electro-magnet connectible in the ringing-circuit through the ringing-key of the instrument, and mechanically operated circuit opening means through which the movement of the telephone-hook under the weight of the receiver, as the latter is placed on the hook, opens the circuit previously closed by the act of ringing up another station; these parts of the present improvements being constructed with a view to place them in the pillar of the stand and thus reduce the size of the base in which they have heretofore been placed.

The preferred embodiment of my improvements is explained at length in the following description and is illustrated in the accompanying drawings in which—

Figure 1 is a top-view of those parts of the switching-mechanism and circuit-controlling devices that are situated in the base of the telephone support and switch-stand, the connection blocks and wires being omitted, and some of the upper works such as the head of the ringing-key being removed. Fig. 2 is a plan or top-view of the mechanism that moves and controls the switch, showing the bottom-plate of the frame with the top-plate removed. Fig. 3 is a detail, in perspective, of the parts through which the movement of the ringing key is made to lock the switch. Fig. 4 is an elevation of those parts of the mechanism which are located in the pillar of the stand, showing the pillar in longitudinal section. Fig. 5 is a side-view on an enlarged scale of the circuit-closing contacts and the electro-magnet removed from the pillar. Fig. 6 is an elevation of the same parts taken from the left side of Fig. 5. Fig. 7 is a detail of the slide-plate that operates the rocking-piece of the locking-device. Fig. 8 is a diagram of the internal or local circuits of the instrument, including the transmitter and receiver, the talking battery and the ringing-key. Fig. 9 is a diagram illustrating the local circuits of three stations in the system and the connecting lines and common ringing circuit. This diagram represents station No. 1 connected for calling up and talking with station No. 2.

The principal parts of the switch consist of the contact-points *a* at which the lines of different stations terminate in the base of the stand; the movable-member *b*; the spindle *d* connected to the movable-member by a spur gear *e* and a pinion *f*; and the two loosely pivoted dogs *g*, *h*. One of these dogs, *g*, by engaging the teeth of the gear *e* holds the movable-member *b* from turning backward under the reaction of the spiral spring 10, but does not prevent the switch from being moved in a forward direction from one contact to another after the receiver has been removed from the hook. The other dog *h*,

operates to engage the spur-gear and thereby lock the switch as long as the receiver is left on the hook. It will be seen that these parts in their general arrangement and operation do not differ from the locking devices in the Letters Patent No. 692,189, already referred to, but as they are required to be shown in connection with the present novel features, it is necessary to describe the general construction of the mechanism for setting the two dogs *g*, *h* alternately in and out of action.

As heretofore constructed, the movable-member *b* of the switch could be set forward after being unlocked by taking the receiver from the hook; and except that it could not turn backward, there was nothing to prevent a party after having switched to and called up one station, from switching from one line to another until he found the line that was being used and on which he desired to listen.

In the present invention the switch is positively locked wherever it may be set, on the instant that the ringing-key is pressed for the purpose of calling up the other station and no further adjustment of the switch is possible until it is first set back to its own line-contact by hanging up the receiver, and is afterward released for switching again by taking down the receiver. This additional lock consists of a dog 20 movable in an arc on a pivot 19 on the frame with its point in close relation to, and held normally away from, the teeth of the gear *e*, by the movable-contact or stop 26 of the ringing-key, through the medium of a swinging-plate 21 and a latch-piece 22. This last-named piece is pivotally attached to the swinging-plate, and is provided on one end with an upwardly-turned catch 24, which by engaging a notch 25 in the side of the movable-stop 26 holds the swinging-plate stationary against the pulling force of a coil-spring 30 attached to the opposite end of the latch-piece, the other end of the spring being made fast to a fixed point on the frame behind the swinging-plate.

A pin 29 fixed in the dog 20 and extending upward through an opening in the top-plate *v* of the frame, and also through a slot 28 in the swinging-plate 21, connects the dog with the latter piece; and the slot being inclined with reference to the curve in which the plate moves on its pivot 27, the effect of its throw in one direction is to set the point of the dog 20 into the teeth of the gear, and in the opposite direction to disengage the dog from the gear. On one side of the swinging-plate an upwardly bent foot 31 with an angular edge 32 extends under one end of the vertically movable slide-plate *m* and when set across the path of that piece is forced back by the downward movement of the slide-plate *m* under the weight of the receiver.

The movement of the swinging-plate 21 in

the direction required to throw off the dog 20 is thus effected by hanging the receiver on its hook, and the contrary movement to lock the gear is produced by a spring 30.

5 While the receiver is on the hook the plate 21 holds the dog 20 away from the gear, and in that position the plate 21 is retained by the latch-piece 22, which holds the plate
10 catching in the notch 25 on the movable stop 26. This holds the lock off the gear until the ringing-key 34 is depressed. The pulling force of the spring 30 being applied diagonally to the latch-piece holds the catch
15 24 of that piece against the edge of the stop 26, so that the former is released by pressing down the stop below the head of the catch, and when allowed to rise the stop returns to position in line with the catch, causing the
20 latter to drop into the notch 25 as the plate 21 is again moved to the left. By virtue of this construction it will be seen that the lock 20 is set ready for action whenever the receiver is hung up and is left on the hook, and
25 the lock being controlled from the movable-stop of the ringing-key, the lock is thrown into action by the movement of the stop in ringing up. When that step in the operation of making connection with another sta-
30 tion takes place the switch is positively locked against moving forward as well as backward, and it cannot be set to the line of any other station until the motions of re-
35 taking it down to unlock the switch are carried out.

The improvements in the electrically-actuated means for controlling the circuit of the instrument will be described with reference
40 more particularly to the detail Figs. 4, 5, 6 and 7, and the diagrams, Figs. 8 and 9. The circuit-closing springs 17 and 18 together with the magnet 14 and armature-piece 15 are situated in the pillar *s* of the stand in
45 which sufficient space is provided to contain the parts and also afford room for running the wires from the switch and connections in the base of the stand to the magnet and the transmitter and receiver above; the last-
50 named parts of the instrument being of well-known form are not particularly described and shown.

The windings of the spools of the magnet 14 are connected into the local circuit
55 through the movable-member *b* of the switch by a wire 48 carried from one side of the windings to the front-stop 26 of the ringing-key. The armature-piece 15 carries an insulated contact-strip 15^b that serves to connect
60 the two contact-springs 17, 18 when the armature piece is attracted to the magnet.

The length of the armature-piece from the pivot 16 to the contact-strip 15^b being somewhat greater than the shortest distance be-
65 tween the pivot and the free ends of the cir-

cuit-closing springs 17, 18, the armature-piece will be held in position by the pressure of the parts 17, 18 against the front edge of the contact-strip as often as it is drawn up, and it will be held up by the springs 17, 18
70 after the circuit is opened through the magnet. As often as a current is passed through the magnet, which takes place when a circuit is completed for ringing another station and the ringing-key is pressed, the strip 15^b
75 is brought against the contact-springs 17, 18, and the break in the circuit at that point remains closed as long as the armature-piece is retained in that position. The movements of the contact-strip are controlled through the
80 arm *t* of the telephone-hook in such manner that the receiver must be removed from the hook before the armature-piece can rise, and on returning the receiver to place after use the contact 15^b, if previously drawn up by
85 the magnet, will be mechanically separated from the springs 17, 18. This is done by the same movement of the push-rod 12 that operates the slide *m* of the switch-locking means.
90

The rod 12 being attached by a loose joint 13 to the arm *t* of the telephone-hook extends downward through the pillar to the vertically movable slide-plate *m, n*, on which its lower end rests. A pin 12^a projecting
95 from one side of the rod above the armature-piece prevents that piece from rising, while the weight of the receiver holds down the hook, and also presses the armature-piece away from the contact-springs 17, 18 when-
100 ever the receiver is returned to place.

The circuit-closing springs 17, 18 are interposed in the local circuit of the instrument between the induction coil *I* and the transmitter *T*, and in the arrangement of
105 the wires and connections shown in the diagram Fig. 8 the contact 18 is the terminal of a conductor 46 having the other end terminating at the movable-member *b* of the switch, the transmitter *T* being situated between
110 these two points. The other spring 17 is the terminal of a conductor 45 leading to the induction coil and in which is situated the circuit-closing contacts 39—41 that are commonly provided in these instruments to hold
115 open the local talking circuit while the instrument is not in use, and to close the circuit when the receiver is removed for use. The break in the circuit at the points 39, 41 is closed, therefore, by the act of taking the
120 receiver off the hook, but upon moving the movable contact *b* from the contact *a*^x, individual to the station, to any one of the contacts *a* the circuit is broken at 35, 36 and, being open at the contacts 17, 18, remains
125 broken at this point until the magnet 14 can be brought into circuit with the ringing battery.

An insulated circuit-closing piece 53 carried by the slide *m*, connects the two springs, 130

39, 41, when the slide is allowed to rise, but moves from between them leaving the circuit open at this point when the slide is held down by the rod. Other contacts, 40, 42, which are also opened and closed by the movements of the slide *m*, *n*, and the circuit-closing piece 53, but in a contrary order or sequence to that described for the contacts 39, 41, control the bell-circuit in the well known way, that is, by closing the circuit through the bell B of the station while the receiver is on the hook, and opening it to cut out the bell whenever the receiver is removed for use. In the present arrangement of the circuit and connections this is required to be done before the switch can be set, and consequently the first movement of the parts as the receiver is taken from the hook is to close the local-battery circuit at the contacts 39, 41 and open the bell-circuit at 40, 42. The switch may then be moved to connect the local circuit of the station with the line of another selected station, the movable-member *b* being set off its own line-contact *a*^x to the proper one of the remaining contacts *a* in the switch for giving the required connection. The station at the opposite end of the selected line will be in condition for being called and for completing the circuit through both sets of transmitters and receivers for talking, provided the selected station is not already in use, and if its switch *b* is standing on its own line-contact. Under all other conditions the circuit that includes the primary of the induction-coil will be open at the contacts 17, 18, although it may be closed at 39, 41 by the receiver being off the hook. And as the circuit must be closed either at or around the breaking point 17, 18 at the called station, as well as at the station from which the switching and ringing is being done, before the same is in condition for use, an additional set of contact-springs 35, 36, set in such relation to the movable-member of the switch *b* that they will be in metallic contact or connection while the switch *b* is on its own line-contact *a*^x, constitutes a supplementary circuit-controlling means that bridges the breaking-point 17, 18 as long as the switch is left undisturbed, and leaves the circuit broken or open at the contacts 17, 18 when the switch is moved away from its own line. The contacts 35, 36 are connected into the conductors 45, 46 around the breaking-point 17, 18, by the connections 50, 51, and are in metallic contact with a circuit-closing piece 38 on the switch *b* but insulated from it. The operation of these improvements will be understood by referring to the diagram Fig. 9 which illustrates the circuits and connections of the instruments at three stations in a system, and also the direct and return lines and a common ringing-battery.

One side of the local circuit of each station is connected into the return line P by a wire 44 leading from one side of the primary of the induction-coil I, and the other side is connected to the movable-member *b* of the switch. The line-wire individual to the station runs out from the stationary contact *a*^x in its switch and has a terminal at a contact *a* in the switch of every other station, after the well-known manner. The local battery G is placed on the line outside the contact *a*^x, and the receiver R is arranged in closed circuit with the secondary of the induction-coil I. The bell B is permanently connected by the wire 47 into one side of the ringing-battery circuit H, and by the wire 47^a into the line individual to the station. One stop of the ringing-key is connected with the movable-member *b* of the switch and in that connection is located the circuit-closing magnet 14, while the other stop is connected directly in the circuit H of the ringing-battery. Under this arrangement a circuit for ringing up one station from another, as station No. 2 from station No. 1 in the diagram Fig. 9, for example, will be traced as follows: From the ringing-battery M over the line H and connection 47 to the bell B at station No. 2, thence by the conductor 47^a, through the contacts 40, 42, and over the connections 43, 43^a to the line L' individual to station No. 2, with the terminal *a* of which at station No. 1 the movable-contact or switch *b* has been moved into engagement. From the switch the circuit is continued through connections designated 48^a, 48, which include the electro-magnet 14, to the ringing-key which, when the movable-member thereof is pressed, closes the break in the circuit at this point, the circuit continuing thence by the wire 49 to the line H, leading back to the ringing-battery. As the magnet 14 at station No. 1 is included in this circuit, it will be seen that the local circuit of the calling-station is closed at the breaking-point 17, 18 on the instant that the ringing-key is pressed, and the instruments are properly connected at both stations. The talking-circuit thus completed between the two stations includes only the battery G on the line of station No. 2, which supplies the necessary current for both induction-coils, as the corresponding battery at the calling-station is cut out when the switch *b* is moved away from its line-contact *a*^x.

The talking-circuit between the two stations will be traced from the battery G at station No. 2 to the line-contact *a*^x individual to that station, and the switch *b* resting thereon, over the conductor 46^a to the transmitter T, over the conductors 46 and 51, contacts 35 and 36 bridged by the circuit-closing piece 38, the conductors 50 and 45, and through the contacts 39 and 41 to the primary windings of the induction-

coil at station No. 2, which is connected by the conductor 44 with the return line P. The primary windings of the induction-coil at station No. 1, are likewise connected with the return line, and from this point the circuit may be further traced over the conductor 45, through the contacts 41, 39, closed by the connecting piece 53, over the conductor 45 to the contact 17, thence along the circuit closer 15^b to the other contact 18, over the conductor 46 to the transmitter, thence by the conductor 46^a to the movable member *b* of the switch that rests upon the contact *a* of line L' individual to station No. 2, and by it back to the battery G, at station No. 2, thus completing the circuit, which remains closed until the receivers are returned to their hooks, by which operation the movable-member of the switch at the calling station is caused to return to its own line circuit, and the parts restored to normal conditions of rest with the circuit again open at the contacts 17, 18 and closed at contacts 35 and 36 at station No. 1.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a telephone switch a plurality of line-contacts, a movable-contact, locking devices therefor, a movable support for the telephone instrument when not in use, means operatively connecting the locking devices with the telephone-support to lock the movable-contact when the telephone is hung on the support and to unlock the said contact when it is returned to place, a ringing-key, a supplementary locking-device, means operatively connecting it with the ringing-key to bring the same into action when the ringing-key is pressed, and means to throw off the supplementary locking-device by the act of returning the telephone instrument to place after use.

2. In a telephone switch, a plurality of line-contacts, a movable contact, locking-devices therefor, means operatively connecting said locking-devices with the user's telephone hook whereby the movable-contact is locked when the telephone is hung up and is released for use by the act of taking down the telephone, a supplementary locking-device and controlling means connecting the same with the user's ringing-key and operating to bring the said locking-device into action to lock the movable-contact when the ringing operation takes place, and means operatively connecting said controlling means with the telephone-hook to throw off said supplementary lock when the telephone is hung up.

3. In a telephone switch, a plurality of line-contacts, a movable-contact, means for setting and holding the movable contact to any selected one of the line-contacts, a spring to return the movable-contact, a ringing-key, a locking device actuated by the move-

ment of the ringing-key to lock the movable-contact, whereby the switch cannot be moved after the ringing-key has been pressed, and means operatively connecting the locking-device with the user's telephone-hook to throw off the lock by the act of hanging up the telephone.

4. In a telephone switch having a plurality of line-contacts, a movable-contact, means for setting and holding the movable-contact to make a switch, and spring-actuated means for returning the movable-contact to its normal position when released; the combination of a locking-device for the movable-contact, means operated by the user's ringing-key to throw on the locking-device when the ringing-key is operated, and means operatively connecting the switch-locking device with the user's telephone-hook whereby the movable-contact is released and returned to position by the return of the telephone to the hook.

5. In a telephone switching-mechanism, a plurality of line-contacts, a movable-contact adjustable to any selected one of the line-contacts, a setting spindle to which the movable contact is connected by gears, a spring to return the movable-contact to normal position, a detent engaging the setting gears to hold the movable-contact against the reactive force of the spring, a locking-device holding the movable-contact normally locked, controlling means connecting said locking device with the user's telephone-hook, whereby the said lock is set off and the movable-contact is released for operation by removing the telephone from the hook, a ringing-key, a second locking-device normally held out of action by the ringing-key, a spring-actuated means for throwing the last-named locking device on the movable-contact by the act of pressing the ringing-key, and means operated by the movement of the telephone-hook on hanging up the telephone to reset the second locking-device for action.

6. In a telephone switching-mechanism, the combination with a plurality of line-contacts and means adapted by adjustment to connect the talking-circuit of the station with another selected station through the line-contact individual thereto; of a ringing-circuit, including a main battery and a ringing-key and a signal at each station, means adapted by the movements of the movable-contact in making a switch to complete the ringing-circuit over the line connecting the calling station with the station being called, a circuit-closing spring in the local circuit of the station between its switch and the transmitting telephone adapted to hold the said circuit open, an electro-magnet in the ringing-circuit between the main battery and the ringing-key of the station, a circuit-closing armature thereto situated with relation

to the circuit-closing springs to be held in contact therewith by the resilience of the springs and mechanically-actuated means connected with the user's telephone-hook to
 5 separate the armature and the circuit-closing springs by the movement of the hook when the telephone is returned to place.

7. In a telephone switching-mechanism, the combination with the circuit-closing contact-springs, of an electro-magnet in open
 10 circuit with a battery, a circuit-closing key, an armature-piece pivotally attached at one end to a fixed support, and having a contact-strip on the free end to engage the said contact-springs under the attraction of the
 15 armature-piece by the magnet, the contact-strip being so arranged with relation to the said springs that they act to retain the contact-strip in position to close the circuit
 20 when the armature is attracted by the magnet, and means for separating the contact-strip from the springs comprising the pivoted-arm, the push-rod, the stop on the rod, and a spring for raising the rod.

8. In a telephone system, the combination of a plurality of line-contacts, means arranged to be set into engagement with any
 25 one thereof, a locking device for holding the said means positively upon the line-contact to which it may be set, means arranged to
 30 bring the said locking device into operation when a call is given, and means for releasing the locking device when the telephone instrument is restored to place after use.

9. In a telephone system comprising line wires and a calling circuit with circuit-closing devices in the latter at the stations, the
 35 combination of a plurality of line-contacts, means arranged to be set into engagement with any selected one thereof, a lock for positively holding the said means upon the line-
 40 contact to which it may be set, and means arranged to hold the said lock in releasing position, comprising parts operating when
 45 the telephone instrument is hung up and at rest, and other parts operated from the local circuit-closing device of the calling circuit.

10. In a telephone system, the combination of a connecting switch comprising a
 50 plurality of line-contacts, and means arranged to be set into engagement with any selected one thereof, a local circuit at the station including the telephone instruments, a circuit-closer controlled by the movable
 55 elements of the connecting switch and arranged to close a break in the local circuit when connection is made with the line-contact of its individual station but to open the circuit when connection is made with another
 60 line-contact, and means for closing the said break in the local circuit whenever a call is given.

11. In a telephone system, the combination of a connecting switch comprising a

plurality of stationary line-contacts, and
 65 means arranged to be set into engagement with any selected line-contact, a local circuit at the station including the telephone instruments, a circuit-closer arranged to close a
 70 break in the local circuit when connection is made with the line-contact of its individual station, but to open the circuit when connection is made with another contact, and
 75 electro-magnetically-operated means for closing the said break in the local circuit whenever a call is given.

12. In a telephone system comprising a plurality of lines between stations and a
 calling circuit with means at each local station for giving a call, the combination of a
 80 selecting switch comprising a series of line-contacts and means arranged to be set into engagement with any selected line-contact, a local circuit at the station including the
 85 telephone instruments, a circuit-closer controlling a break in the local circuit, an electro-magnet for controlling the circuit-closer, situated in the calling circuit and arranged
 90 to cause the break in the local circuit to be closed when a call is given, and means for maintaining the circuit-closer in position to close the brake after the call is given and the
 electro-magnet has become deenergized.

13. In a telephone system comprising a plurality of lines between stations and a call-
 95 ing circuit with means at each local station for giving a call, the combination of a selecting switch comprising a series of line-contacts and means arranged to be set into engagement with any selected line-contact, a
 100 local circuit at the station including the telephone instruments, a circuit-closer controlling a break in the local circuit, an electro-magnet for controlling the circuit-closer, situated in the calling circuit and
 105 arranged to cause the break in the local circuit to be closed when a call is given, means for maintaining the circuit-closer in position to close the break after the call is given and the electro-magnet has become
 110 deenergized, and means for moving the circuit-closer to open the local circuit, operated when the telephone instrument is hung up.

14. In a telephone system comprising a plurality of lines between stations and a
 115 calling circuit with means at each station for giving a call, the combination of a selecting switch comprising a series of line-contacts and means arranged to be set into engagement with any selected line-contact, a
 120 local circuit at the station including the telephone instruments, in which circuit are two breaks, a circuit-closer controlling one break in the local circuit arranged to close the circuit whenever connection is made with
 125 the line-contact individual to that station but to open the circuit whenever connection is made with another line, another circuit-

closer controlling the other break in the local circuit arranged to normally leave the break open, an electro-magnet controlling the last said circuit-closer, situated in the
5 calling circuit and arranged when a call is sent from the local station to attract the said circuit-closer and cause the local circuit to be closed thereby, and means for holding the last said circuit-closer in closing position after the magnet has ceased to act thereupon. 10

ALBERT KOCH ANDRIANO.

Witnesses:

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