

No. 656,336.

Patented Aug. 21, 1900.

M. I. BAIRD.

SWITCHBOARD FOR TELEPHONES.

(Application filed Mar. 1, 1900.)

(No Model.)

7 Sheets—Sheet 1.

FIG. 1.

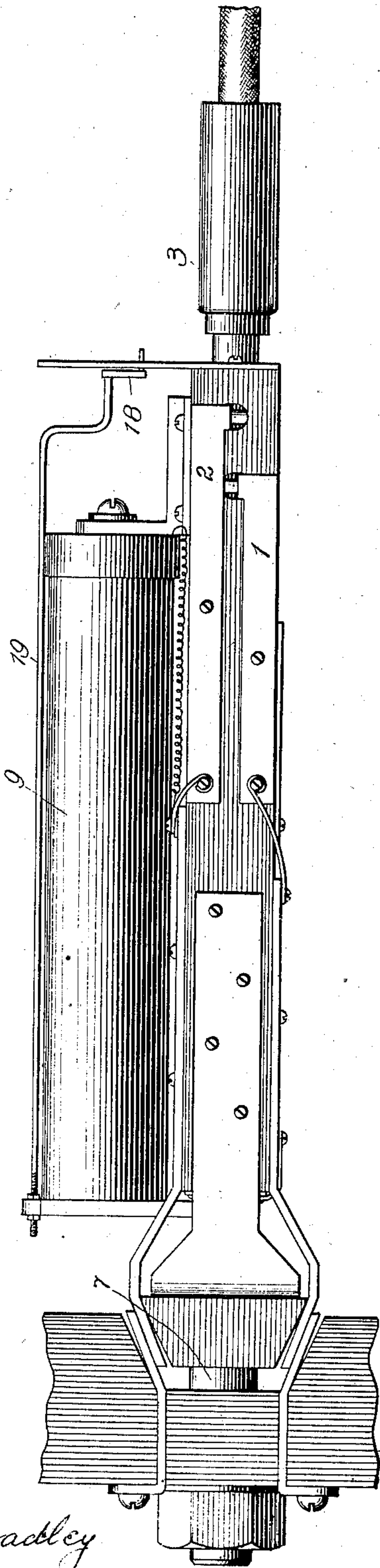
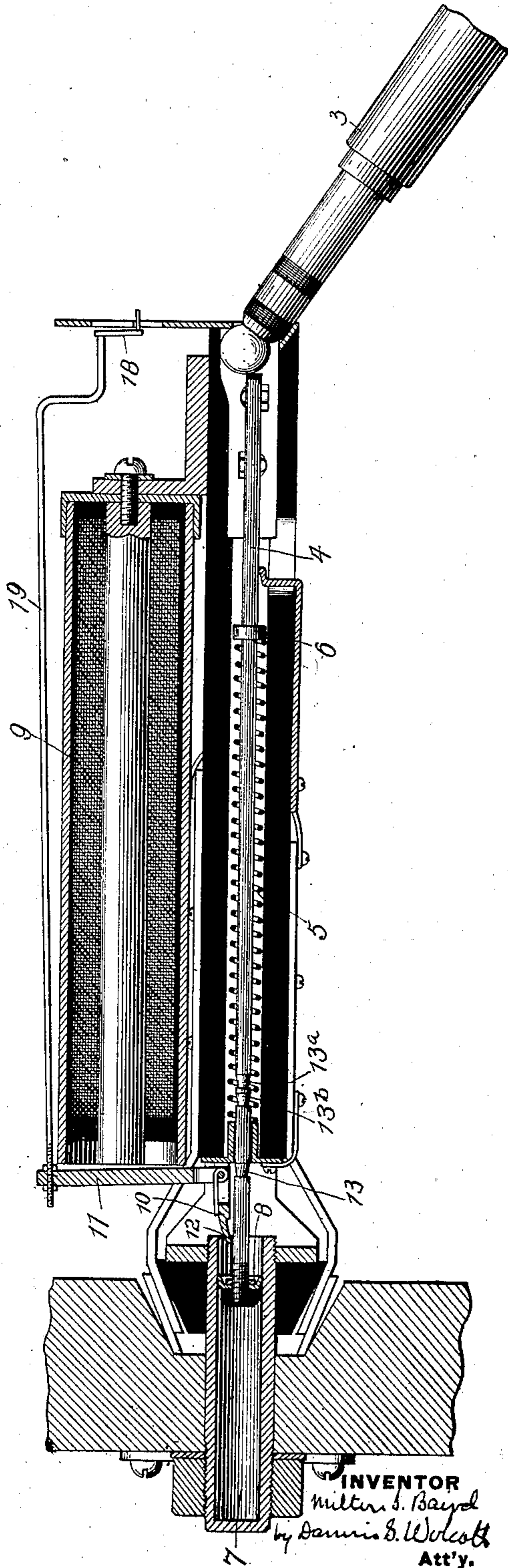


FIG. 2.



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FIG. 3.

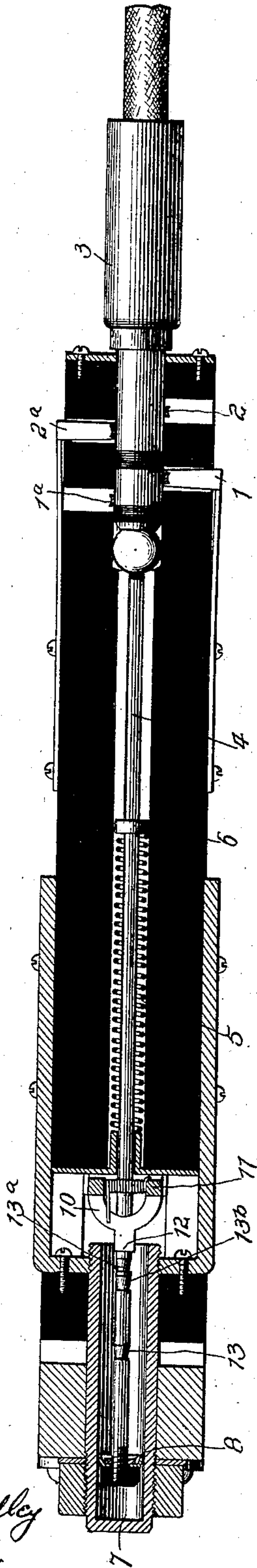
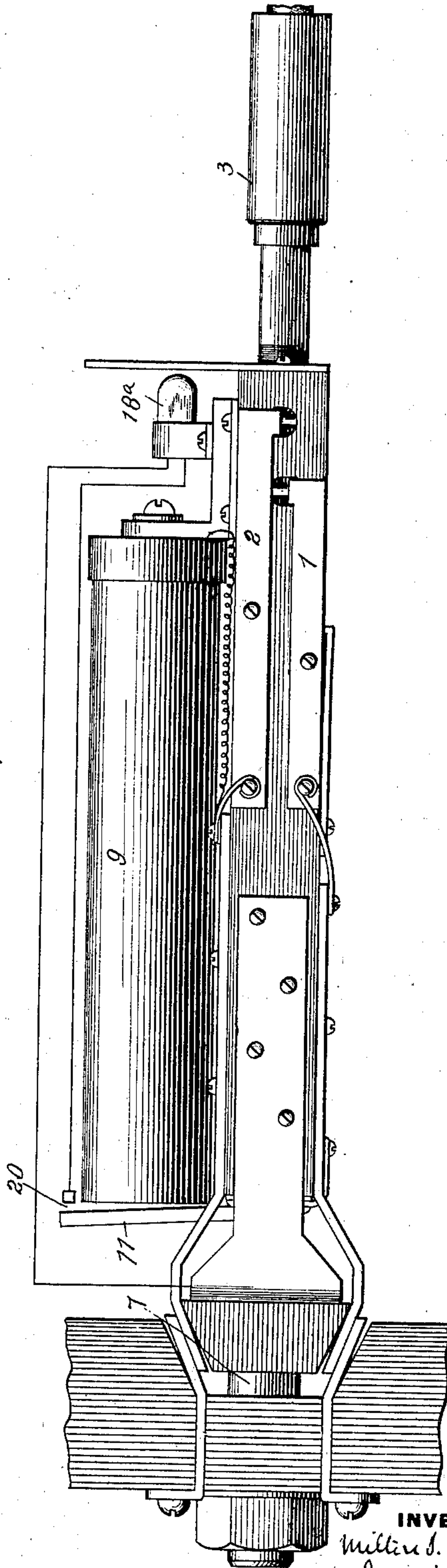


FIG. 4.



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FIG. 5.

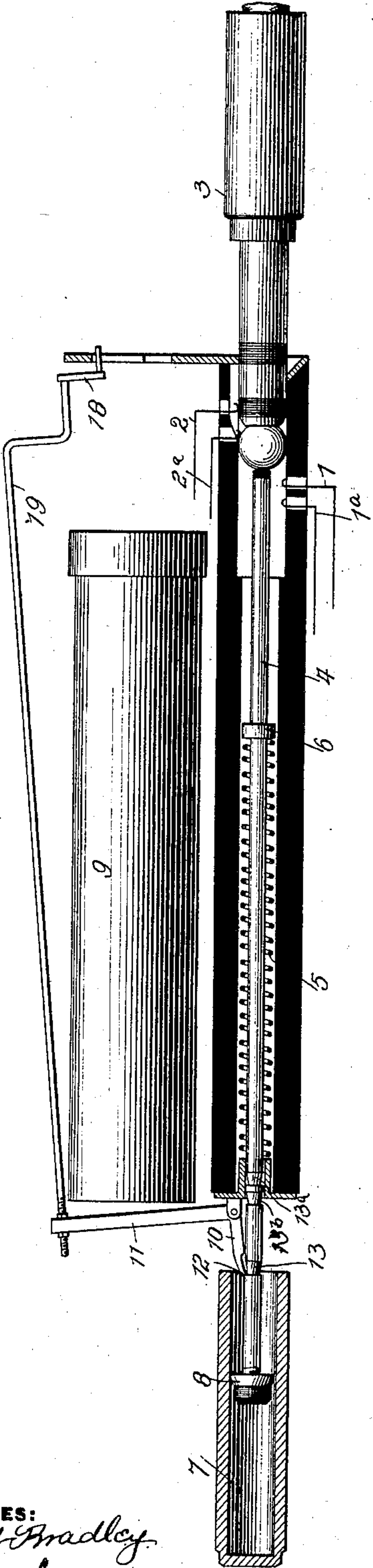
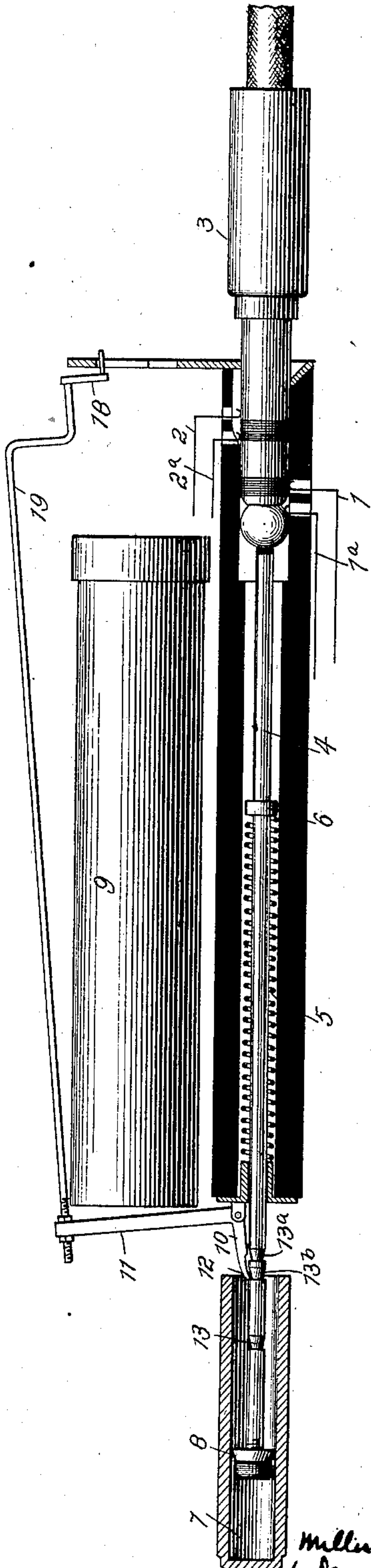


FIG. 6.



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FIG. 7.

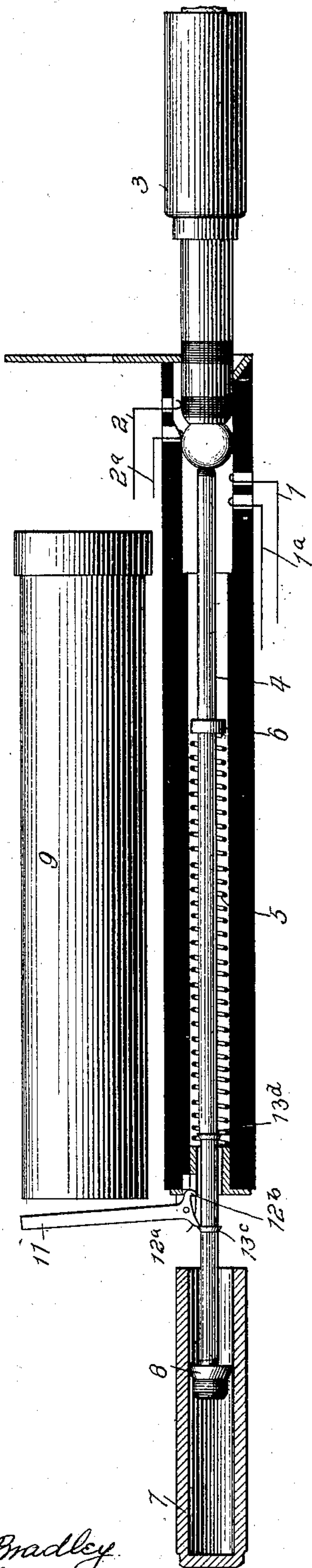
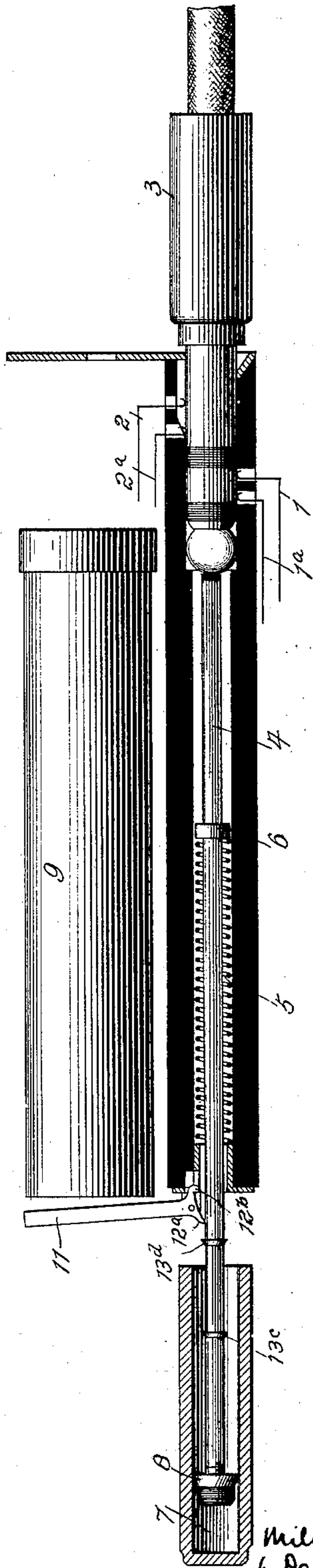


FIG. 8.



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FIG. 9.

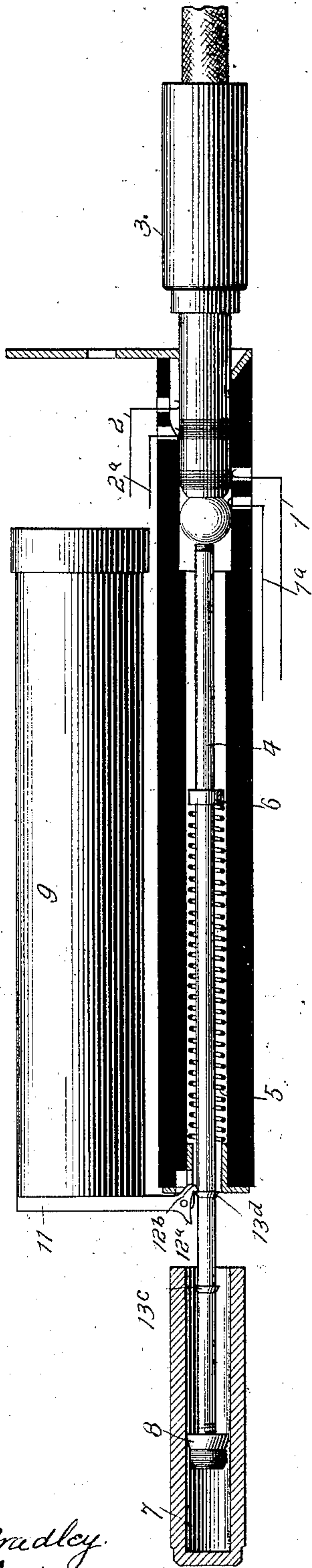


FIG. 12.

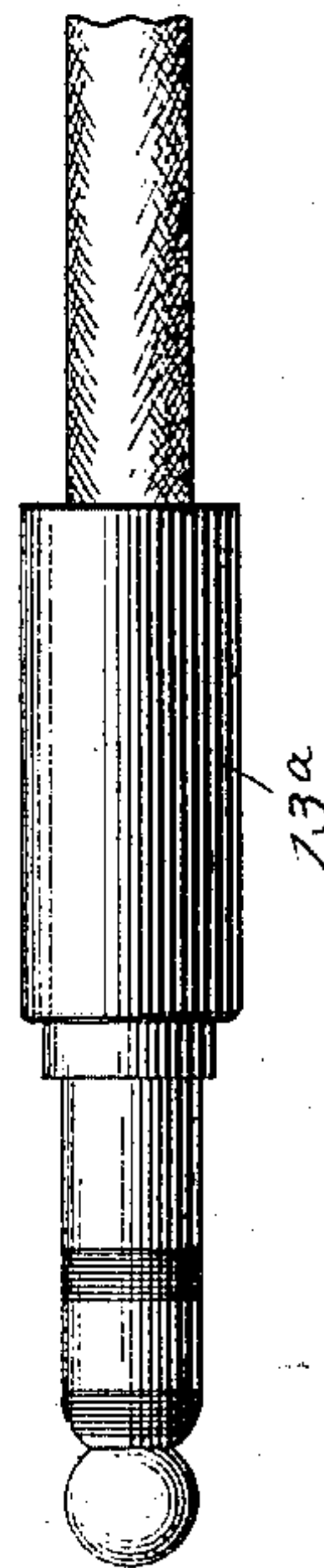
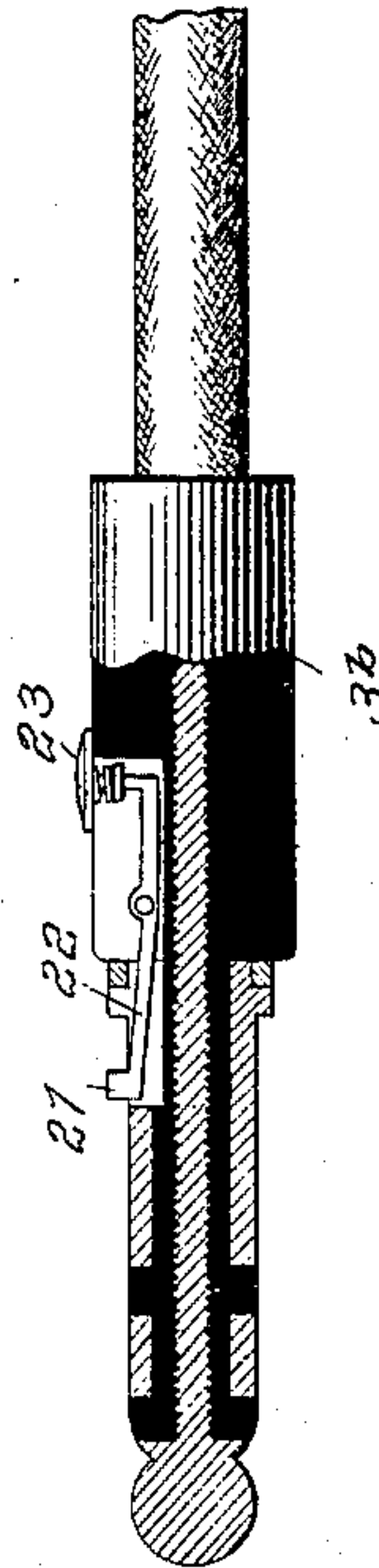


FIG. 13.



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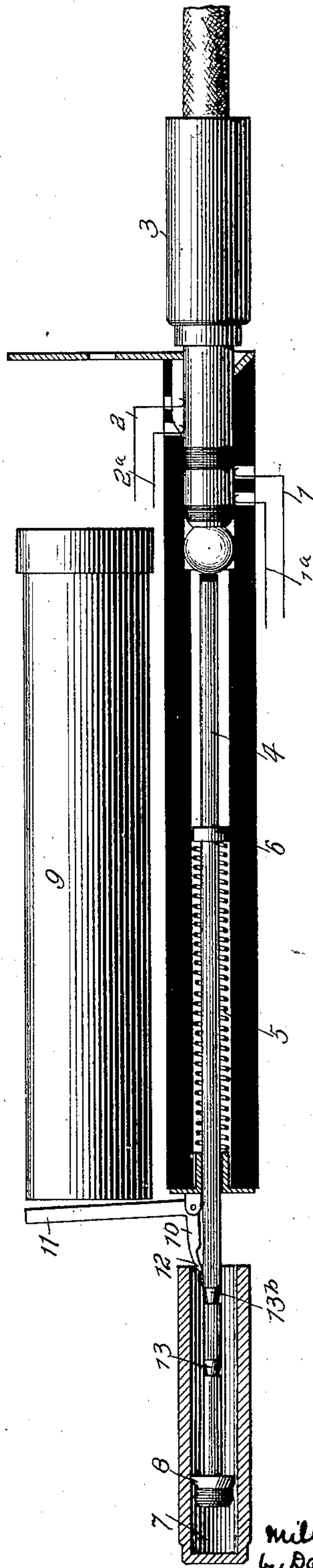
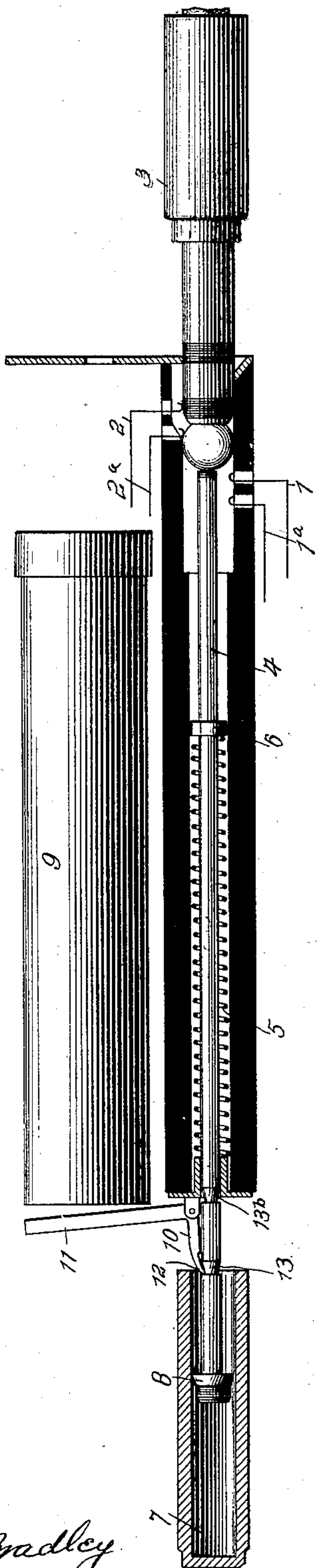
M. I. BAIRD.

SWITCHBOARD FOR TELEPHONES.

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(No Model.)

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(Application filed Mar. 1, 1900.)

(No Model.)

7 Sheets—Sheet 7.

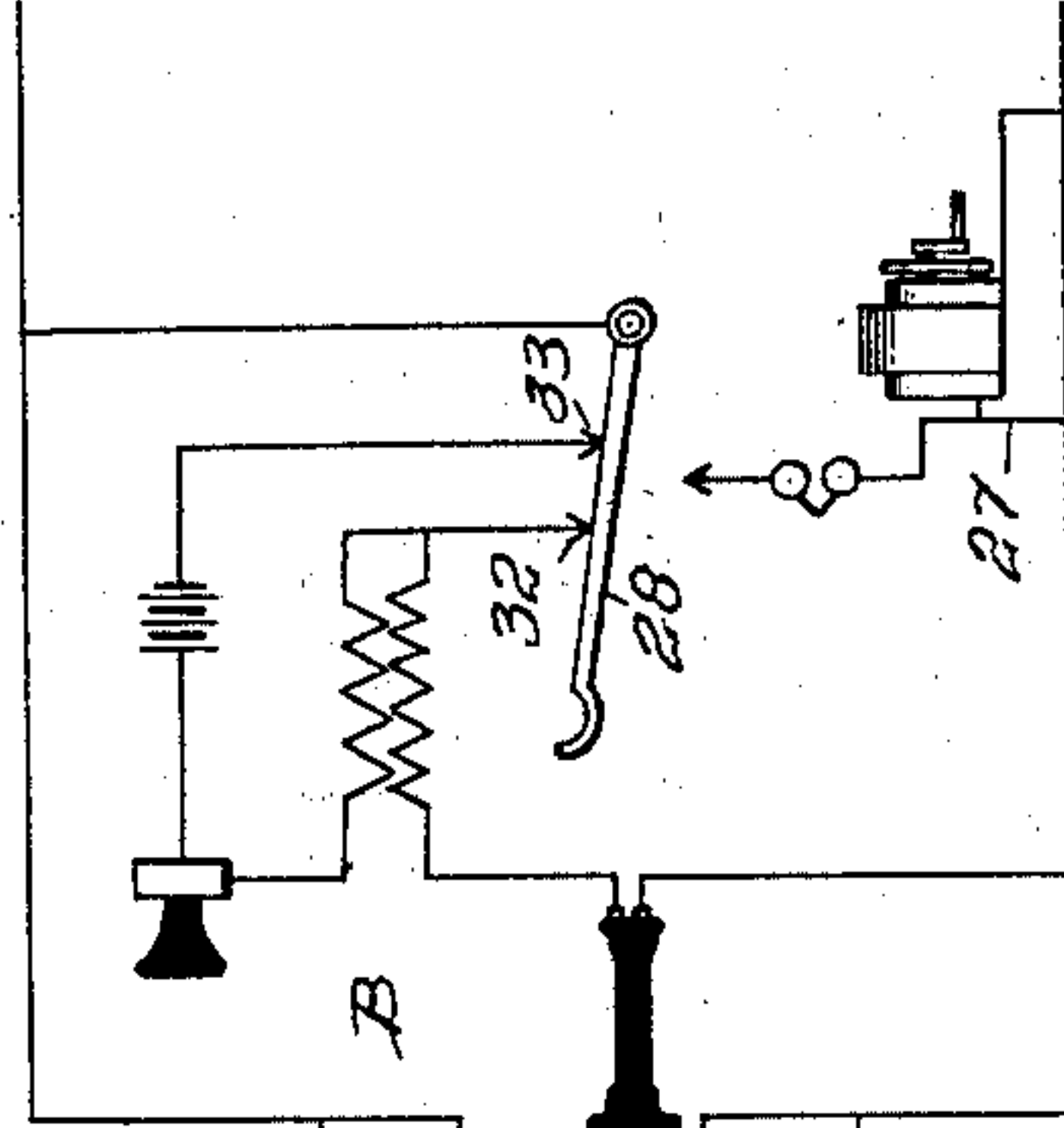
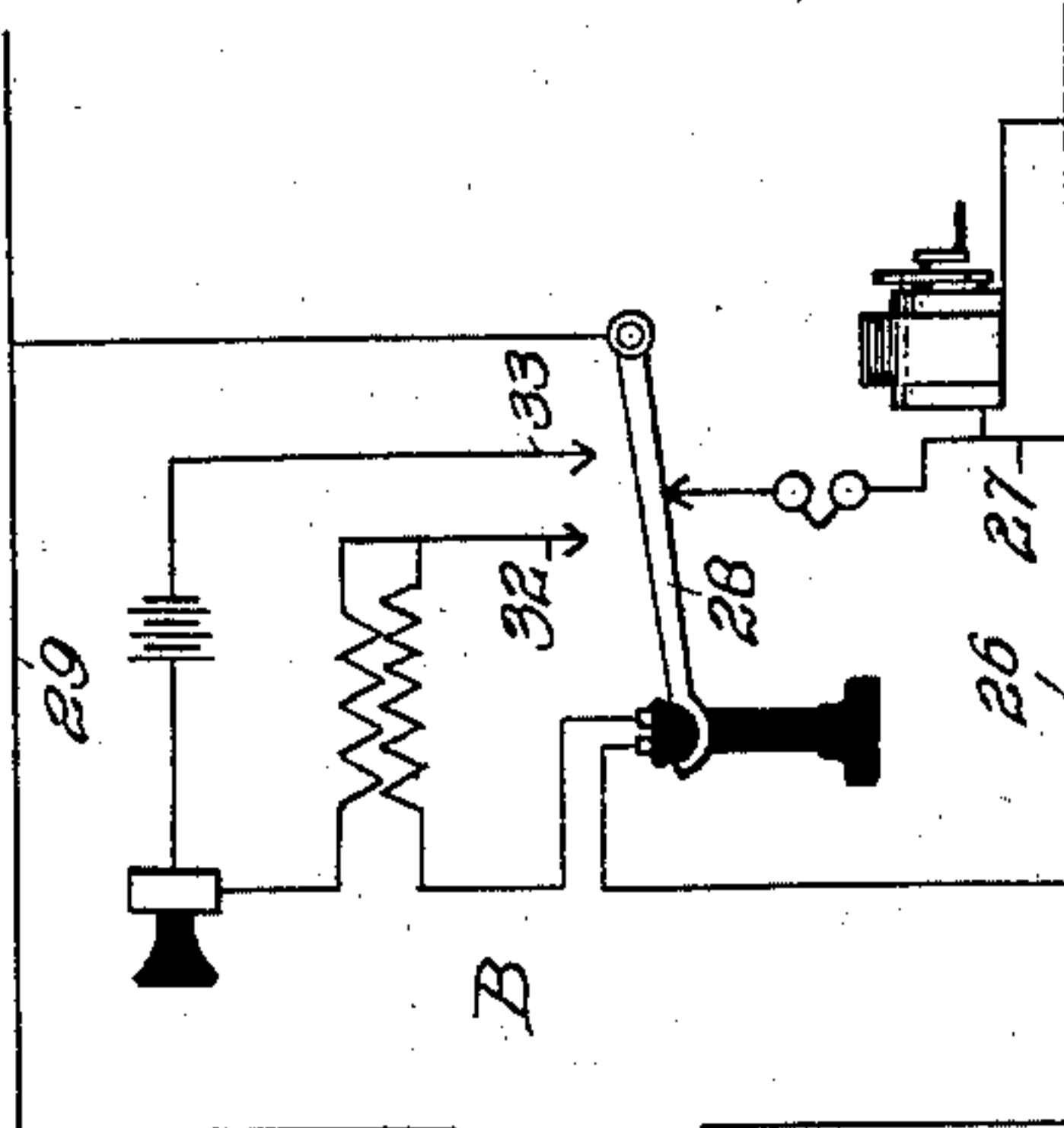
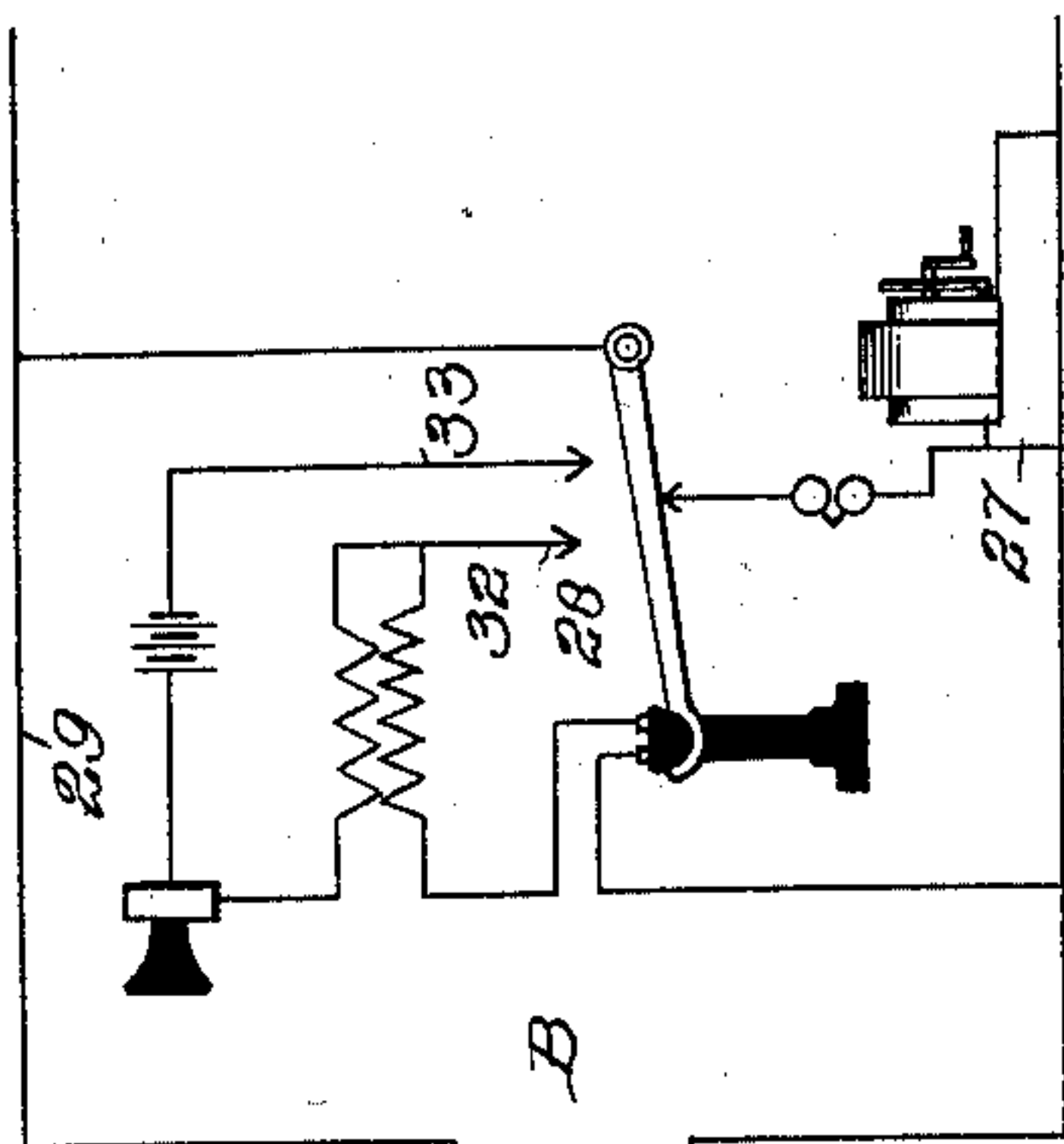
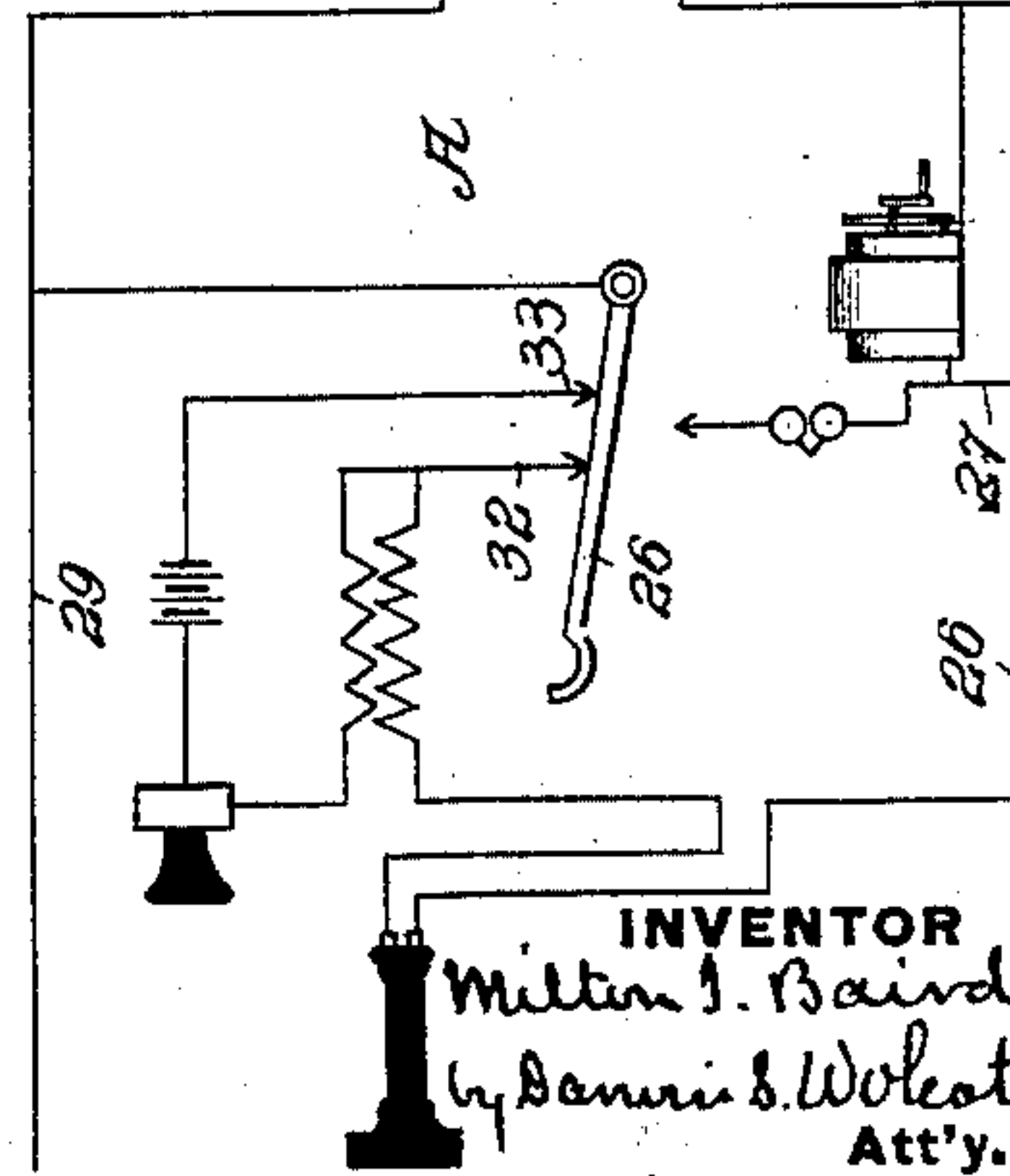
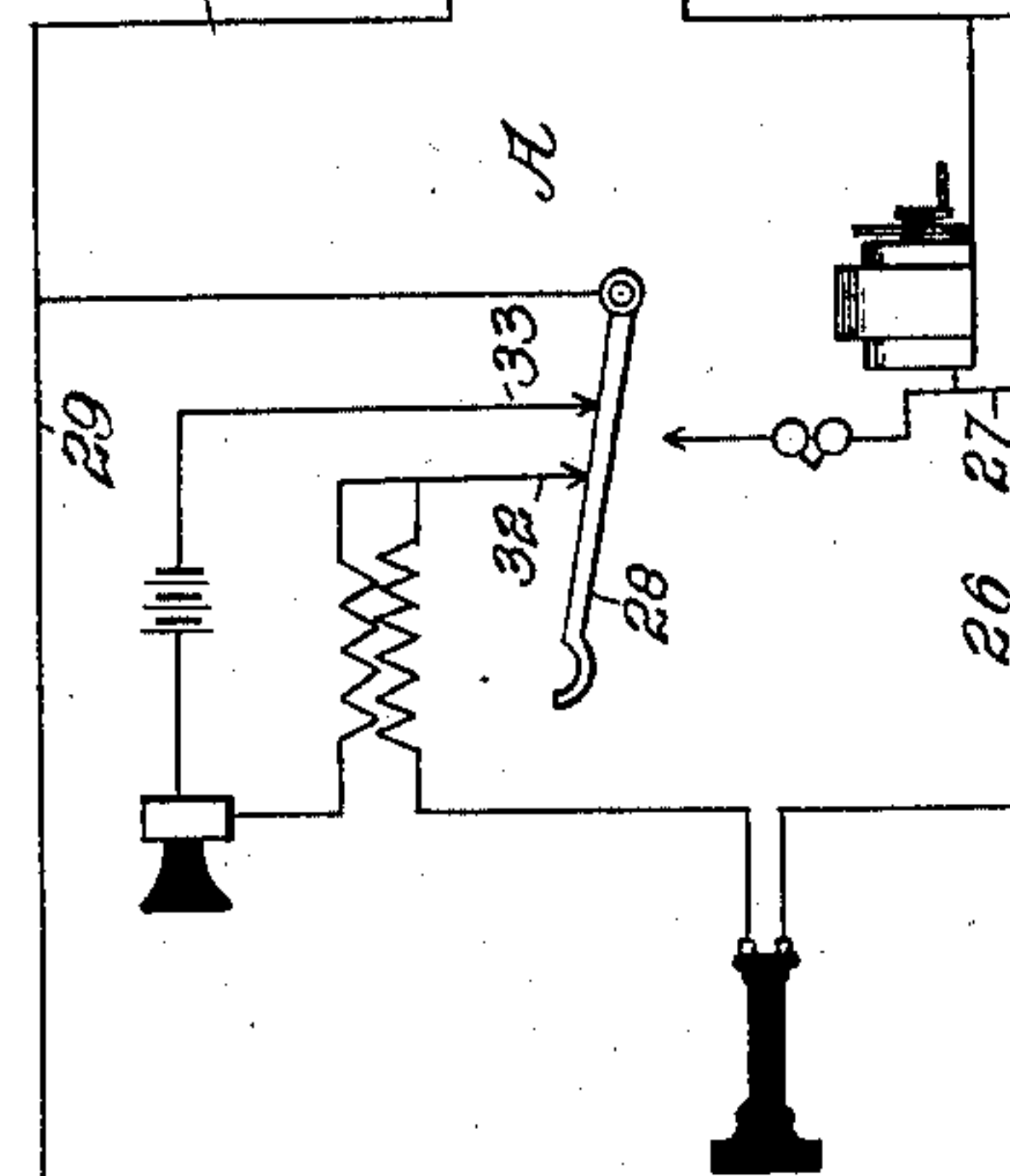
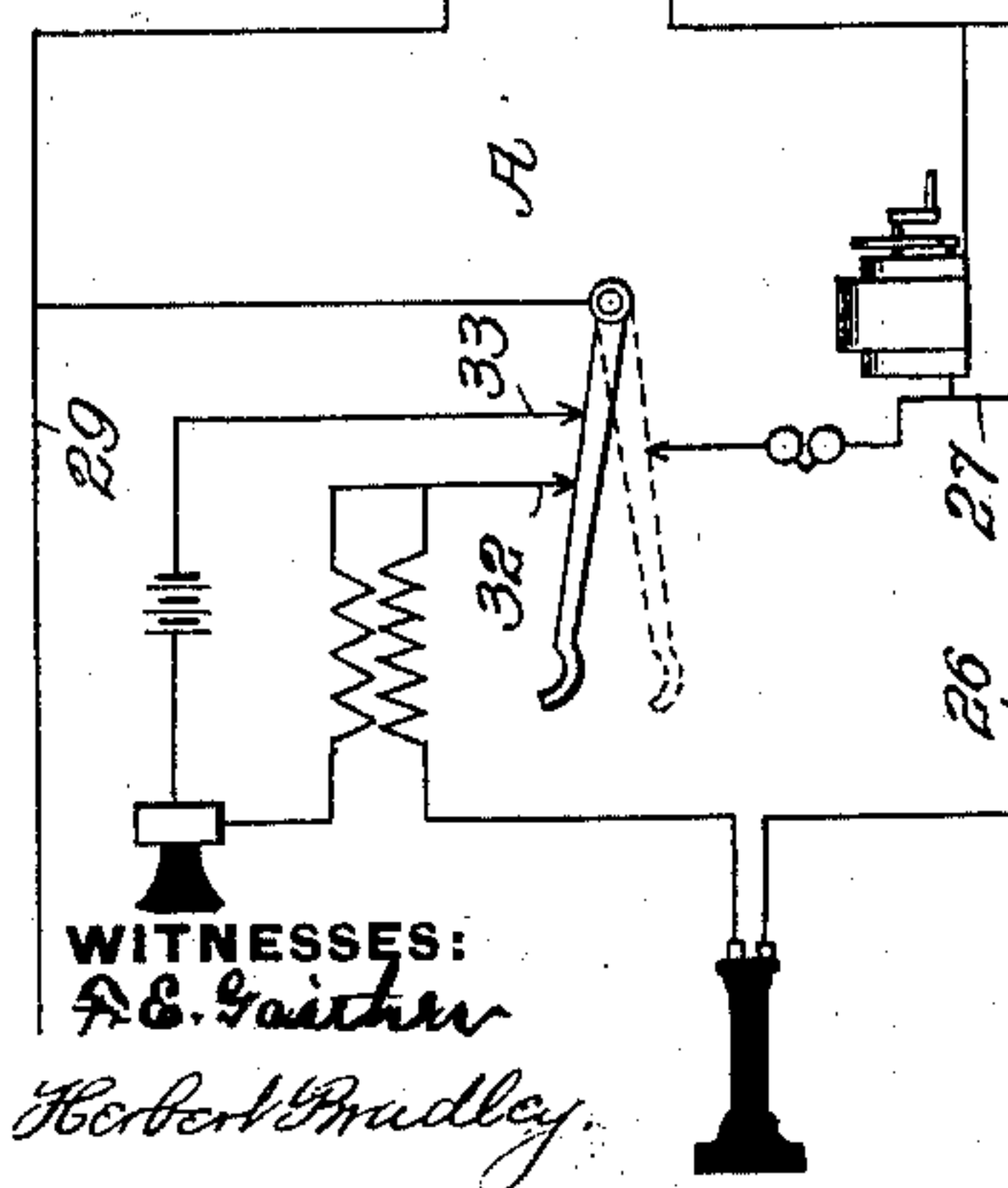


FIG. 14.

FIG. 15.

FIG. 16.



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UNITED STATES PATENT OFFICE.

MILTON I. BAIRD, OF GLENFIELD, PENNSYLVANIA.

SWITCHBOARD FOR TELEPHONES.

SPECIFICATION forming part of Letters Patent No. 656,336, dated August 21, 1900.

Application filed March 1, 1900. Serial No. 6,914. (No model.)

To all whom it may concern:

Be it known that I, MILTON I. BAIRD, a citizen of the United States, residing at Glenfield, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Switchboards for Telephones, of which improvements the following is a specification.

In an application filed December 1, 1899, Serial No. 738,836, I have described and shown certain improvements in switchboards for telephones, said improvements consisting, generally stated, in means whereby the plug may be automatically shifted from operative position, such movement being regulated. The invention described herein relates to certain further or additional improvements, having for their object a construction and arrangement of parts whereby all the connections necessary to be made to connect and disconnect two subscribers, except the insertion of the plugs, are effected automatically and in proper sequence on the removal or replacing of the receivers of the subscribers or the ringing of the bell, as the case may be.

In general terms the invention consists in the construction and combination substantially as hereinafter described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a side elevation of a socket or jack forming a part of a telephone-switchboard. Fig. 2 is a sectional elevation of the same. Fig. 3 is a sectional plan view. Fig. 4 is a view similar to Fig. 1, showing a lamp-indicator and its controlling-switch. Figs. 5 and 6 are diagrammatic views illustrating the operation of the construction shown in Figs. 1, 2, and 3. Figs. 7, 8, and 9 are diagrammatic views illustrating a modification desirable where the circuit-breaker in the circuit of the controlling-magnet is closed on the removal of the receiver and remains closed until receiver is returned to normal position. Figs. 10 and 11 are diagrammatic views illustrating a construction wherein the position is not employed. Figs. 12 and 13 are detail views of plugs. Figs. 14, 15, and 16 are diagrammatic views illustrating the operation of my improvements.

In the practice of my invention the switchboard is formed by or consists of a series of jacks or sockets, dependent upon the number

of subscribers. Each jack or socket is formed of wood or other insulating material and has attached thereto springs 1 1^a and 2 2^a, provided at their free ends with fingers projecting through the walls of the socket, so as to make contact with the surface of the plug 3 when inserted. A push-rod 4 is arranged within the socket, so as to bear on the end of the plug and shift the same outwardly. This rod is actuated by a spring 5, surrounding the rod and bearing at its ends against a collar 6 on the rod and a shoulder or abutment on the socket. In order to regulate the outward movement of the push rod and plug, a piston 8 is formed on or connected to the rear end of the rod, said piston being arranged with a cylinder 7. The piston or cylinder, or both, are so constructed, as by ports or otherwise, as not to obstruct or interfere with the easy inward movement of the push-rod, but to so restrain its outward movement when actuated by the spring that such movement will be comparatively slow and regular. The outward movement of the push-rod is controlled by a tooth 12 on an arm 10, adapted to be shifted by the armature 11 of the magnet 9, which is included in the subscriber's call-circuit. The tooth engages when the armature is deenergized one or the other of shoulders or abutments 13, 13^a, and 13^b in the push-rod. These shoulders or abutments will be termed in describing the operation the "normal," "supervisory," and "talking" shoulders, respectively.

The indicator may be formed by a plate or disk 18, carried by a rod 19, attached to the armature 11 in such manner that when the armature is attracted by the magnet the disk will be shifted in front of an opening in the front plate of the switch board, or, if desired, a small electric lamp 18^a may be arranged in visible position adjacent to the jack or socket, as shown in Fig. 4. When using the lamp, a make-and-break mechanism 20, adapted to be opened and closed by the armature 11, is arranged in the lamp-circuit. As shown in Fig. 4, the movable member of the make-and-break mechanism may be formed by the armature 11.

In some systems the subscribers call-switch is connected so as to be closed only momentarily, as during the ringing of the bell or

during the releasing movement of the receiver-arm. In such systems the construction shown in Figs. 2, 3, 5, and 6 is preferred. In describing the operation it will be supposed that the several parts are in normal position, as shown in Fig. 5. If the plug has not been removed from the socket, it will project out horizontally a considerable distance, as shown, indicating by its position that the parts are in normal position.

When a subscriber takes down his receiver or otherwise closes the call-circuit, the armature 11 will be shifted, raising the tooth 12 from in front of shoulder 13, thereby permitting the push-rod to be moved outward. This movement of the rod holds the armature, and consequently the indicator, in call position. In responding to the call the operator will insert a short plug 3^a in the calling subscriber's jack or socket, so that the push-rod will be shifted only sufficiently far to permit the tooth to drop into engagement with the talking shoulder or abutment 13^b, thereby avoiding the ringing of the calling subscriber's bell. Having ascertained the number of the party wanted, the operator pushes a long plug 3 into the proper jack or socket, thereby shifting the push-rod inward until the supervisory shoulder or abutment 13^a has passed a short distance beyond the tooth 12, thereby closing the call-circuit of the party wanted. After the plug has been pushed in it is released, so that the spring 5 can push the rod out until the shoulder 13^a engages the tooth 12. During the whole or a portion of this outward movement of the push-rod and plug the bell of party called will be rung; but the ringing will cease as soon as the tooth 12 engages supervisory shoulder 13^a. When the party called lifts the receiver or otherwise closes his call-circuit, the magnet 9 will be energized, momentarily shifting its armature and lifting the tooth 12 from shoulder 13^a, so that the push-rod will again move out until the tooth 12 engages the talking-shoulder 13^b. As soon as the connected parties hang up their receivers or otherwise close their signal or call circuit, the tooth 12 of both jacks or sockets will be shifted momentarily from the shoulders 13^b and the push-rods will move outward until the teeth 12 engage normal position shoulders 13. These outward movements will not push the plugs entirely out of the jacks or sockets, but their great projection will indicate that the parties have finished their conversation. If the operator should fail to remove the plug before the subscriber connected to the jack or socket calls, the outward movement of the push-rod, consequent on the lifting of the tooth 12 from normal shoulder 13, will push the plug out sufficiently far to permit its outer end to drop, as shown in Fig. 2; but the knob on the inner end of the plug will catch on the edge of the plate 22 and hold the knob in drooping position, thereby giving the operator an additional indication.

In some systems the call-circuit is closed on the removal of the receiver and remains closed until the receiver is again hung up. In such a system the armature is provided with or is adapted to operate two teeth or detents 12^a and 12^b, and the push-rod is provided with two shoulders or abutments 13^c and 13^d, as shown in Figs. 7, 8, and 9. The several parts are shown in normal position in Fig. 7. When a subscriber closes his signal or call circuit, thereby energizing magnet 9, tooth 12^a will be raised from shoulder 13^c, permitting the rod to move out until said shoulder engages tooth 12^b, which was moved to operative position simultaneous with the shifting of tooth 12^a from operative position. The operator now inserts the short plug 3^a into the jack of the calling subscriber, forcing back the push-rod until the tooth 12^b engages shoulder 13^d, when the plug will be in talking position. Having ascertained the number desired, the operator inserts a long plug 3 in the proper jack or socket, thereby forcing the push-rod in until shoulder 13^d has passed beyond tooth 12^a. The plug is now released and the push-rod moves out until the shoulder 13^d engages tooth 12^a, the magnet 9 being deenergized. During the outward movement of the rod to engagement with tooth 12^a the called subscriber's bell will ring. By the closing of the call or signal circuit of such subscriber, due to the removal of his receiver or by other means, the magnet 9 of the jack or socket of such called subscriber will be energized, thereby shifting tooth 12^a out of and tooth 12^b into the path of movement of the push-rod, which will move out into engagement with tooth 12^b, thereby shifting the plug to talking position. When the subscribers hang up their receivers or otherwise break their signal-circuits, the magnets 9 will become deenergized, thereby shifting the teeth 12^b out of engagement with shoulders 13^d and moving the teeth 12^a into the path of movement of shoulders 13^c. When released from teeth 12^b, the push-rods will move out until shoulders 13^c engage teeth 12^a, or to normal position.

In some systems the supervisory position is not employed, and in such cases the rod 4 will be held only in normal and talking positions by shoulders 13 and 13^b engaging the tooth 12, as shown in Figs. 10 and 11. The constructions shown in Figs. 5, 6, 10, and 11 are adapted for use in connection with a system employing either a battery or magneto-generated currents for the call-circuit.

In lieu of employing a short plug 3^a for calling subscriber a long plug 3^b, with a movable stop 21, as shown in Fig. 13, may be employed. This stop is connected to one end of a lever 22, the opposite end of which is provided with a knob 23, which the operator presses in when the plug is to be inserted to talking position.

In describing the circuits and the operation of my improvement it will be supposed that

the calling subscriber A has rung up central and removed the receiver from the hook, as shown in Fig. 14. As soon as central receives the call the short or talking plug 3^a will be inserted into the proper jack, so that terminals or springs 1 and 2^a will bear upon the portions *a* and *c* of the plug, thereby partially completing the talking-circuit for A to the called party. Central then inserts a plug 3 in the proper jack for the called subscriber B to the full extent, so that the terminals 1 1^a will bear upon the portion *c* and the terminals 2 2^a will contact with the portion *b* of the plug, thereby completing the ringing-circuit to B, as shown in Figs. 8, 11, and 14. This circuit consists in starting from the generator C at central of the wires 24 and 25, terminal 1^a, portion *c* of plug 3 at B, terminal 1, wires 26 and 27, call-bell at B, switch formed in part by lever 28 or controlled by the lever, wire 29, terminal 2^a, portion *b* of plug, terminal 2, and wires 30 and 31 to generator at central. As the terminals 1 1^a and 2 2^a are in contact with the portions *c* and *b* only during the time the plug is moving from its inmost position, as shown in Fig. 14, until arrested by contact of the detent with shoulder 13^b, the ringing of the B's bell will occur only during such movement. The ringing-circuit from central to A is the same as that to B; but as the short talking-plug 3^a, which the operator placed in the jack connected to A, will not connect the terminals 1 1^a and 2 2^a, as described, A's bell will not be rung when B is called. The plug *a* at B will remain in supervisory position (shown in Fig. 15) after the ringing of B's bell until B's receiver is removed from the hook. On the removal of the receiver the movement of the lever 28 will break the ringing-circuit and come into contact with terminals 32 and 33 to close the talking-circuit. This circuit consists of the usual connections at both stations to the line-wires 26 and 29, which are connected to terminals 1 and 2^a at central. As the magnet 9 is bridged across the line-wires it will be excited and raise the detent 12 as soon as the lever 28 completes its movement, thereby permitting the plug 3 to be forced out. During this outward movement of the plug the portion *a* thereof will contact with the terminal 2^a and at the same time bring the insulated portions of the plug into contact with terminals 2 and 1^a. As the contact of terminal 2^a with portion *a* of the plug will occur before shoulder 13^b is in line with the detent and as the magnet 9 has a comparatively-high resistance it will be, in effect, cut out, so as to permit detent 12 to drop and hold the plug in talking position, as shown in Fig. 16. The talking-circuit in the central station consists in starting from line-wire 29 at subscriber A of terminal 2^a, portion *a* of plug 3^a, wire 34, portion *a* of plug 3, terminal 2^a, to line-wire 29, leading to subscriber B, line-wire 26 from subscriber B, terminal 1, portion *c* of plug 3, wire 35, portion *c* of plug 3^a,

and terminal 1 to line-wire 26, leading to subscriber A.

It will be readily understood by those skilled in the art that other means may be employed for controlling the action of the actuating-spring 5 and that by making the tension of the spring light the controlling means, such as the cylinder 7, may be omitted, the principal function of the controlling means being to afford opportunity for the teeth on the magnets 9 to engage the several shoulders on the push-rod and to avoid jars or shocks to the delicate mechanism.

In the majority of switchboards the change of circuits, the ringing of the bell of the call subscriber, and the disconnecting of the plug from the talking-circuit after the subscriber has finished talking are all manually accomplished by the action of the operator, often causing exasperating delays to the subscriber by reason of the neglect of the operator to immediately disconnect and answer the new calls.

It is characteristic of my improvements that they are readily applicable to all the various systems of telephoning now in use, such as the magneto-generator system or any of the various forms of the central-battery system, with or without the supervisory signals now used in some systems to indicate that the called subscriber is ready for talking. It is also characteristic of my improvement that the automatic ringing of the subscriber's bell, the cutting out of the generator or bell-ringing circuit, the setting of the plug preparatory for the reception of the supervisory signal when used, the reception of the supervisory signal, the automatic change of circuit from supervisory to talking position, and the automatic change of circuits from talking to normal position are effected automatically by the action of the subscriber or subscribers without the action of the operator other than the mere insertion of the necessary plugs into the proper jacks or sockets.

I claim herein as my invention—

1. In a telephone-switchboard, the combination of a jack or socket, a plug, means for shifting the plug, and means for checking the outward movement of the plug and holding the same in two or more positions, substantially as set forth.

2. In a telephone-switchboard, the combination of a jack or socket, a plug, means for shifting the plug, mechanism for holding the plug in normal or non-operative position and mechanism for holding the plug in talking position, substantially as set forth.

3. In a telephone-switchboard, the combination of a jack or socket, a plug, means for shifting the plug, and means for holding the plug in called or supervisory and talking positions, substantially as set forth.

4. In a telephone-switchboard, the combination of a jack or socket, a plug, means for shifting the plug, means controlled by the

subscriber for holding the plug in normal, called or supervisory and talking positions, substantially as set forth.

5 In a telephone-switchboard, the combination of a jack or socket, a spring-actuated rod for shifting the plug, means for checking the movements of the push-rod and holding the same in two or more positions and a magnet in a circuit controlled by the subscriber
10 for controlling the detent mechanisms, substantially as set forth.

6. In a telephone-switchboard, the combination of a socket or jack, a spring-actuated rod for shifting the plug, a series of two or
15 more shoulders or abutments on the push-rod, and an electrically-controlled tooth for engaging said shoulders or abutments, substantially as set forth.

7. In a telephone-switchboard, the combination of a socket or jack, a plug, means for
20 shifting the plug, means for checking the

movements of the plug, and means for regulating the rate or speed of the plug movements, substantially as set forth.

8. In a telephone system, the combination
25 of two sockets or jacks, means in each jack or socket for shifting the plugs, detent mechanisms controlling the plug-actuating mechanisms and arranged to hold the plugs in normal, supervisory and talking positions, a plug
30 provided with a stop or shoulder to prevent its movement beyond talking position and a plug constructed to enter the socket beyond supervisory position, substantially as set forth.

In testimony whereof I have hereunto set
35 my hand.

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