

No. 751,539.

PATENTED FEB. 9, 1904.

F. R. MCBERTY.

RINGING KEY FOR TELEPHONE SWITCHBOARDS.

APPLICATION FILED MAY 9, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 2.

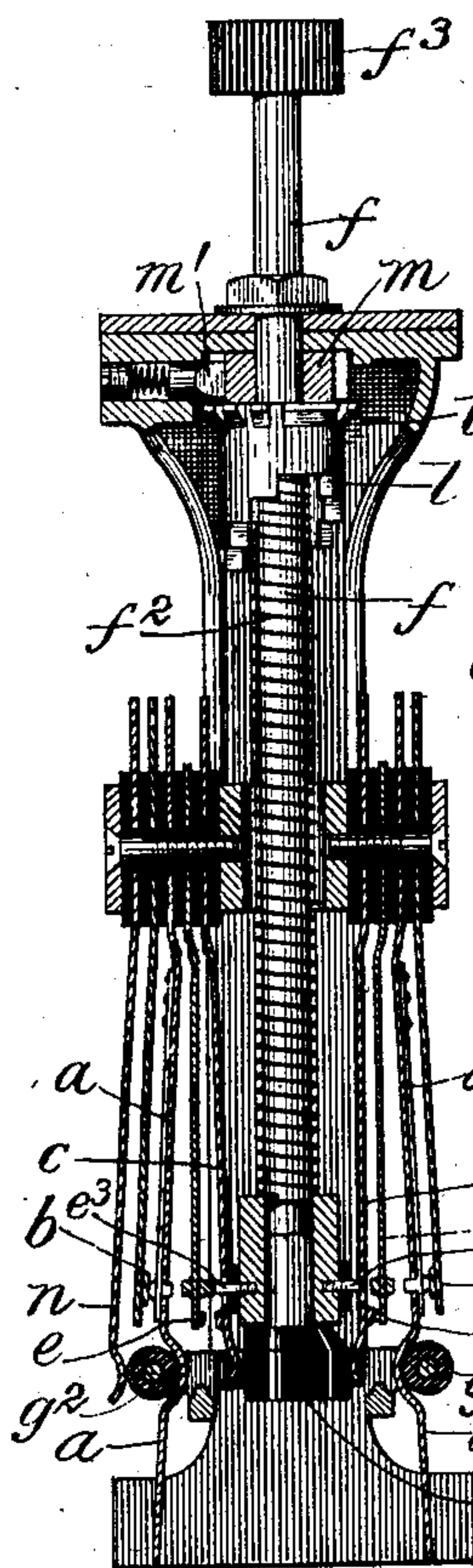


Fig. 1.

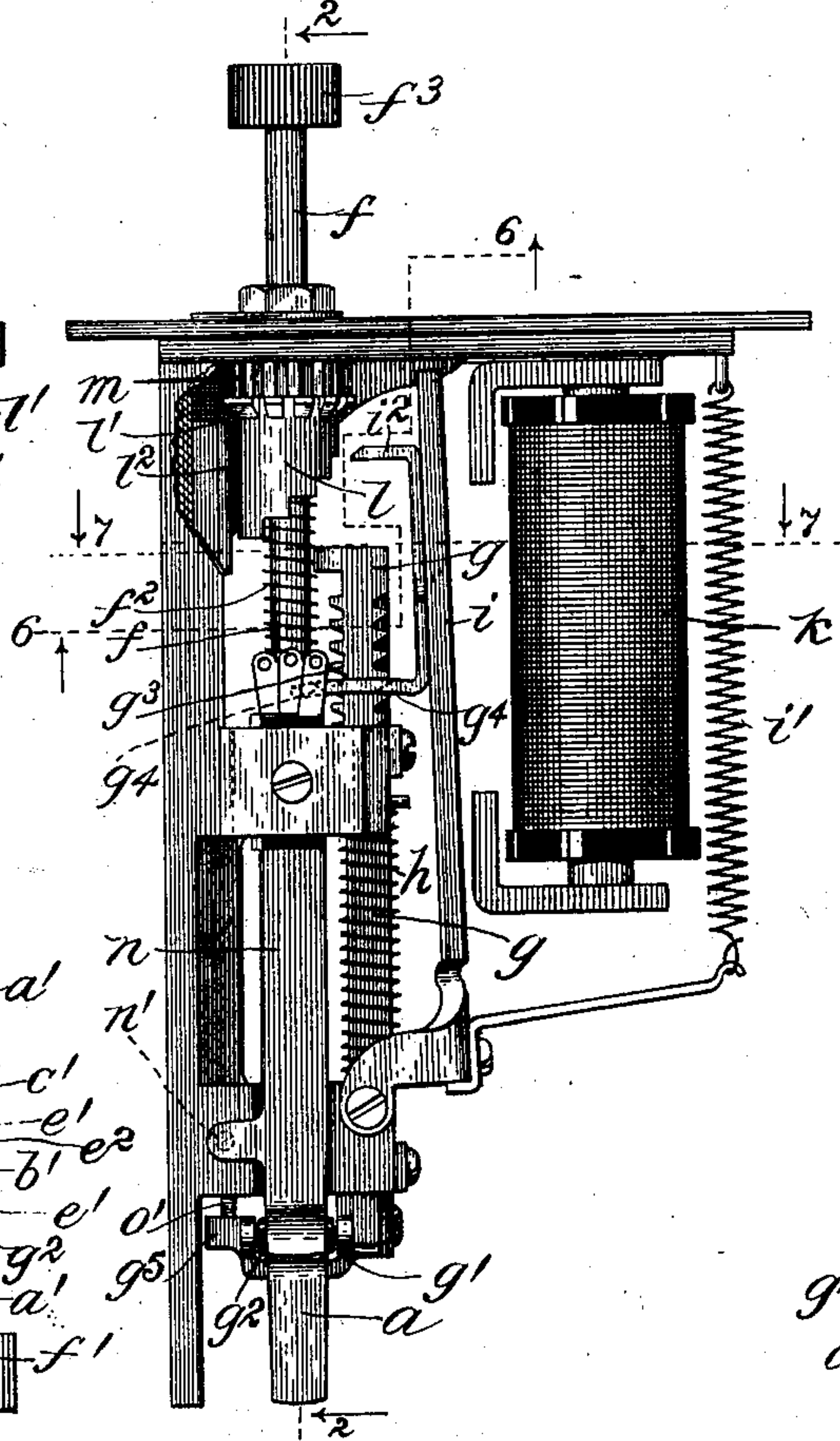


Fig. 3.

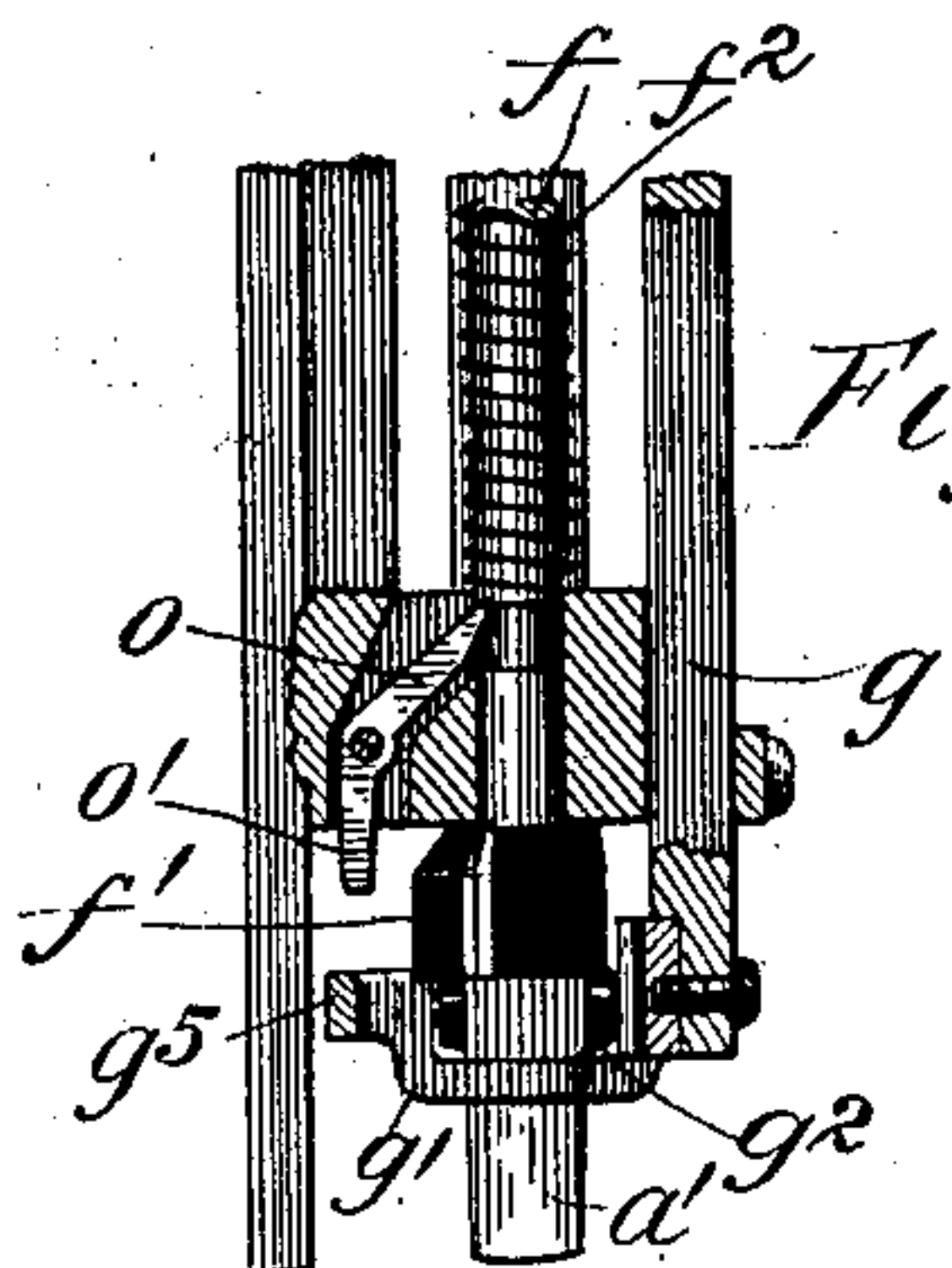
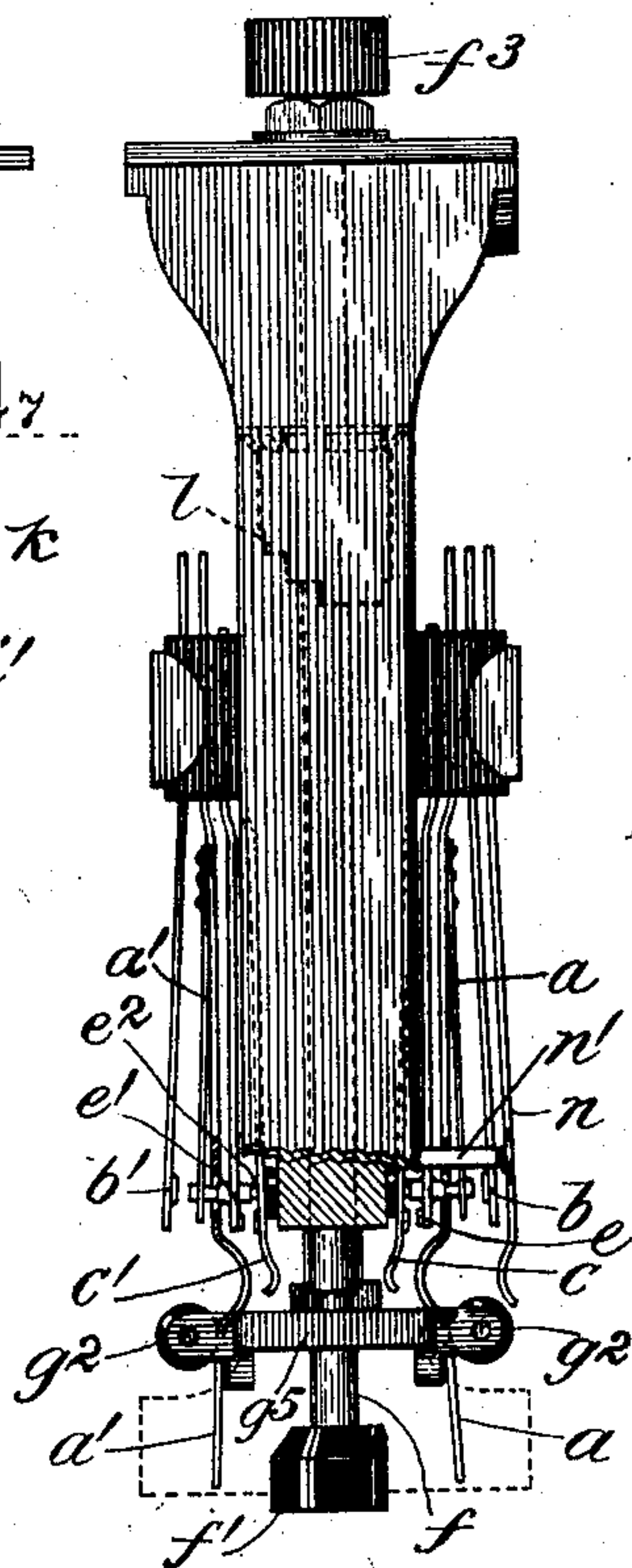


Fig. 4.

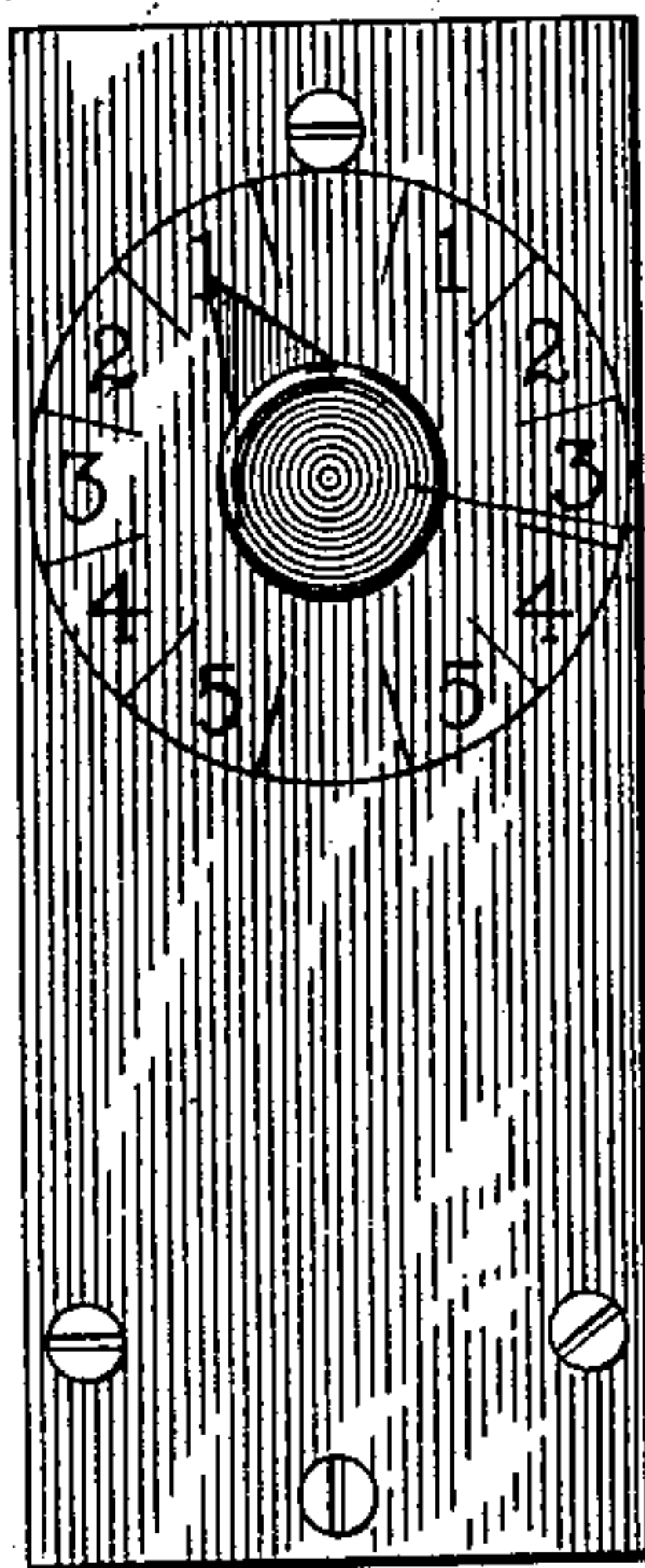


Fig. 5.

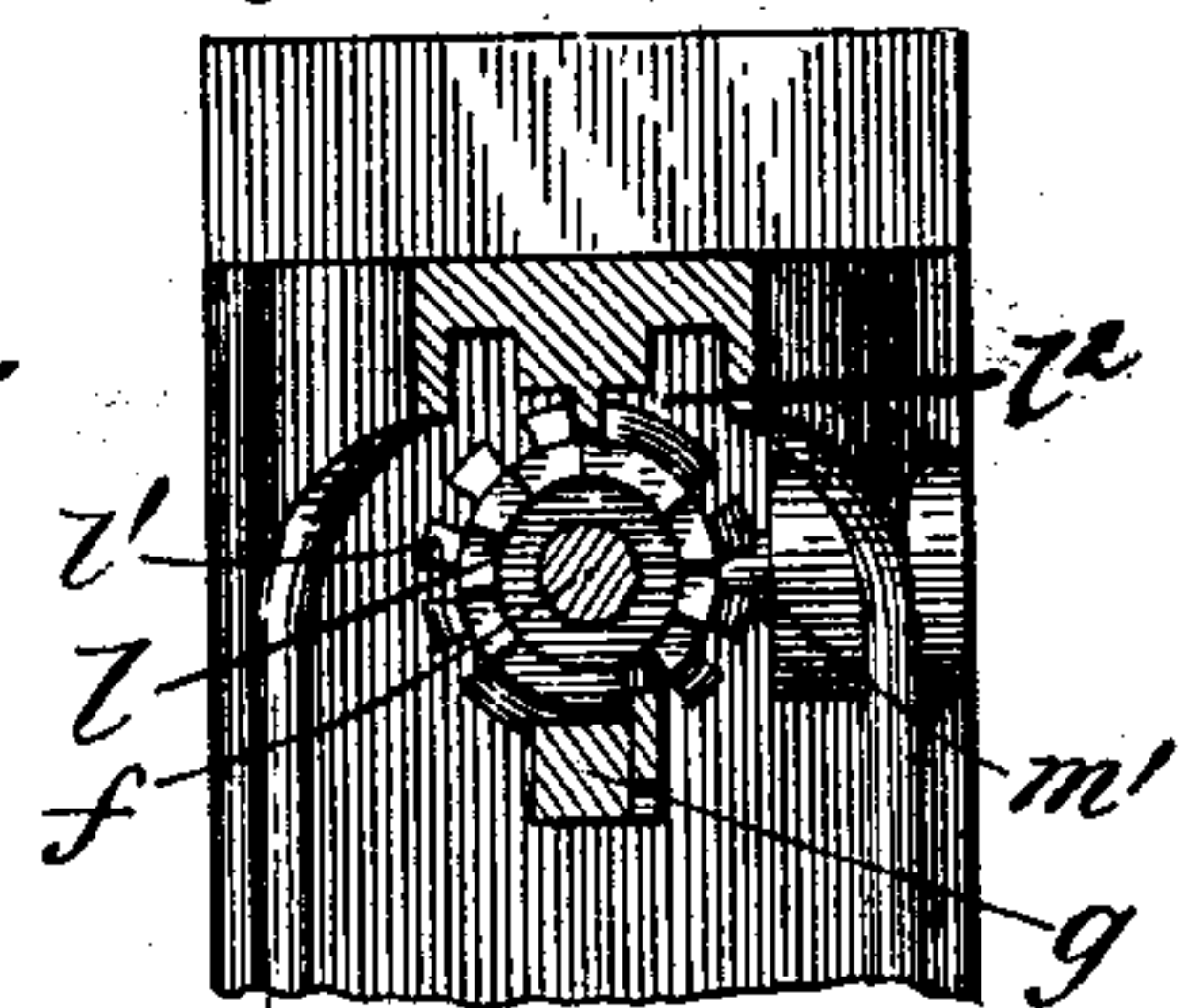


Fig. 6.

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2 SHEETS—SHEET 2.

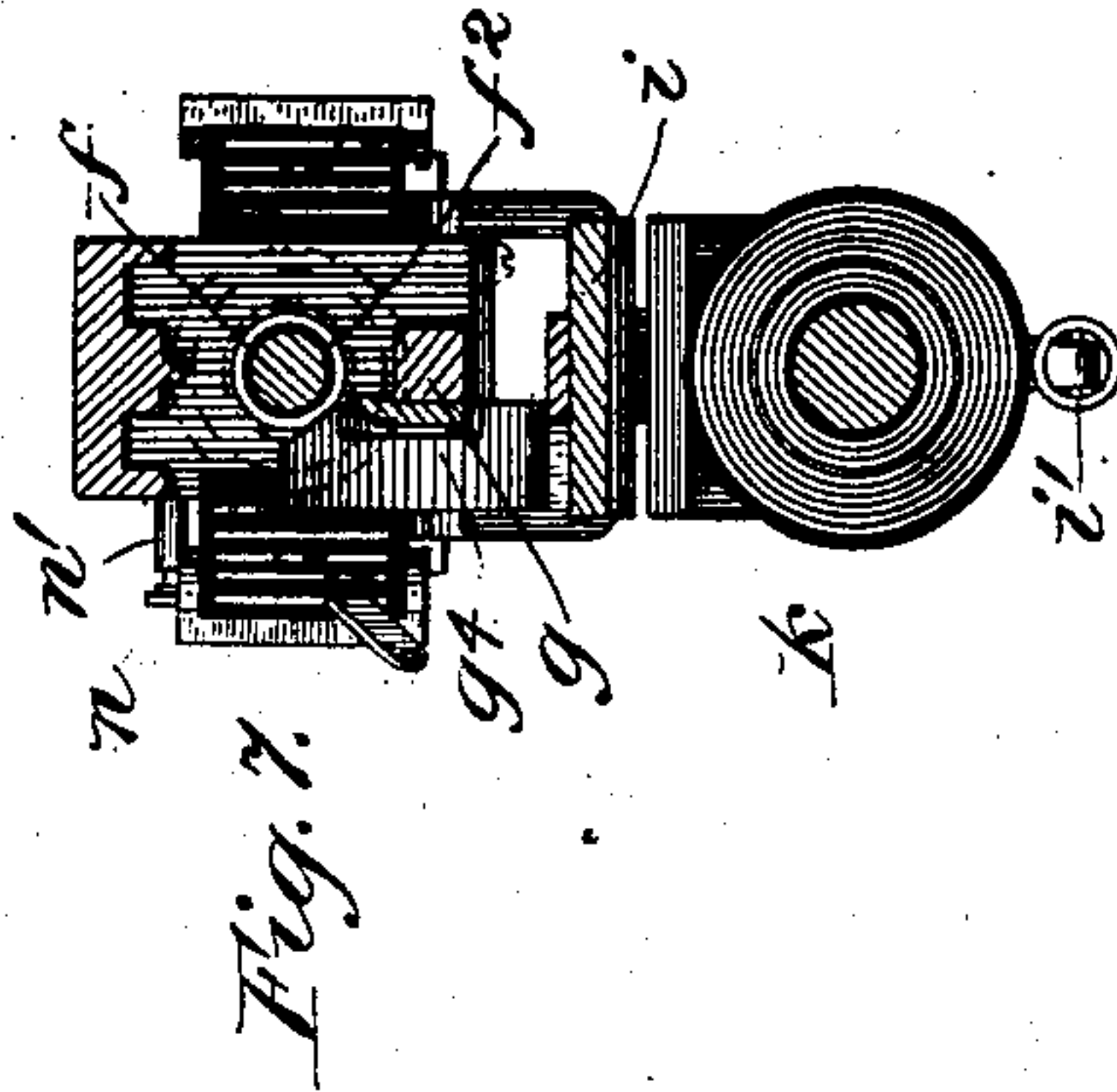
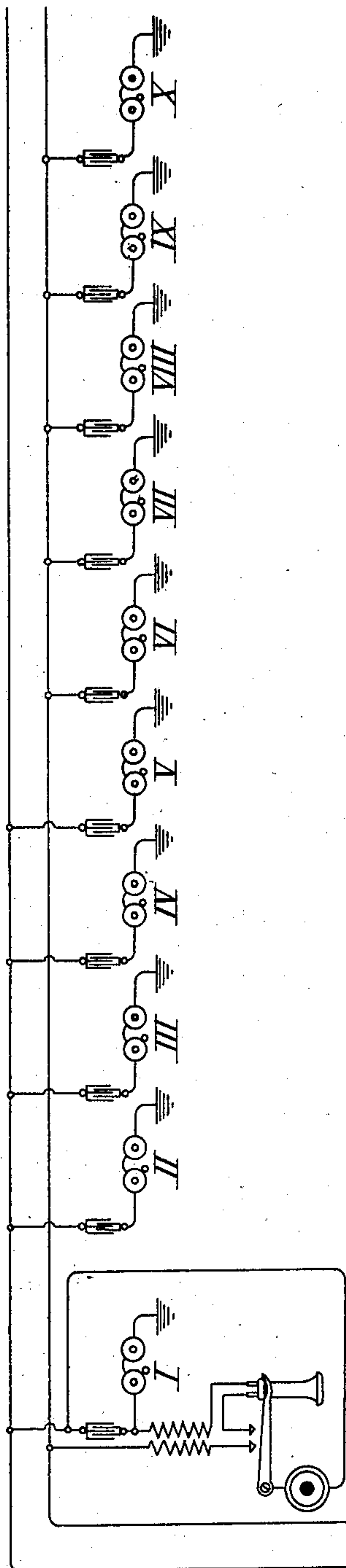
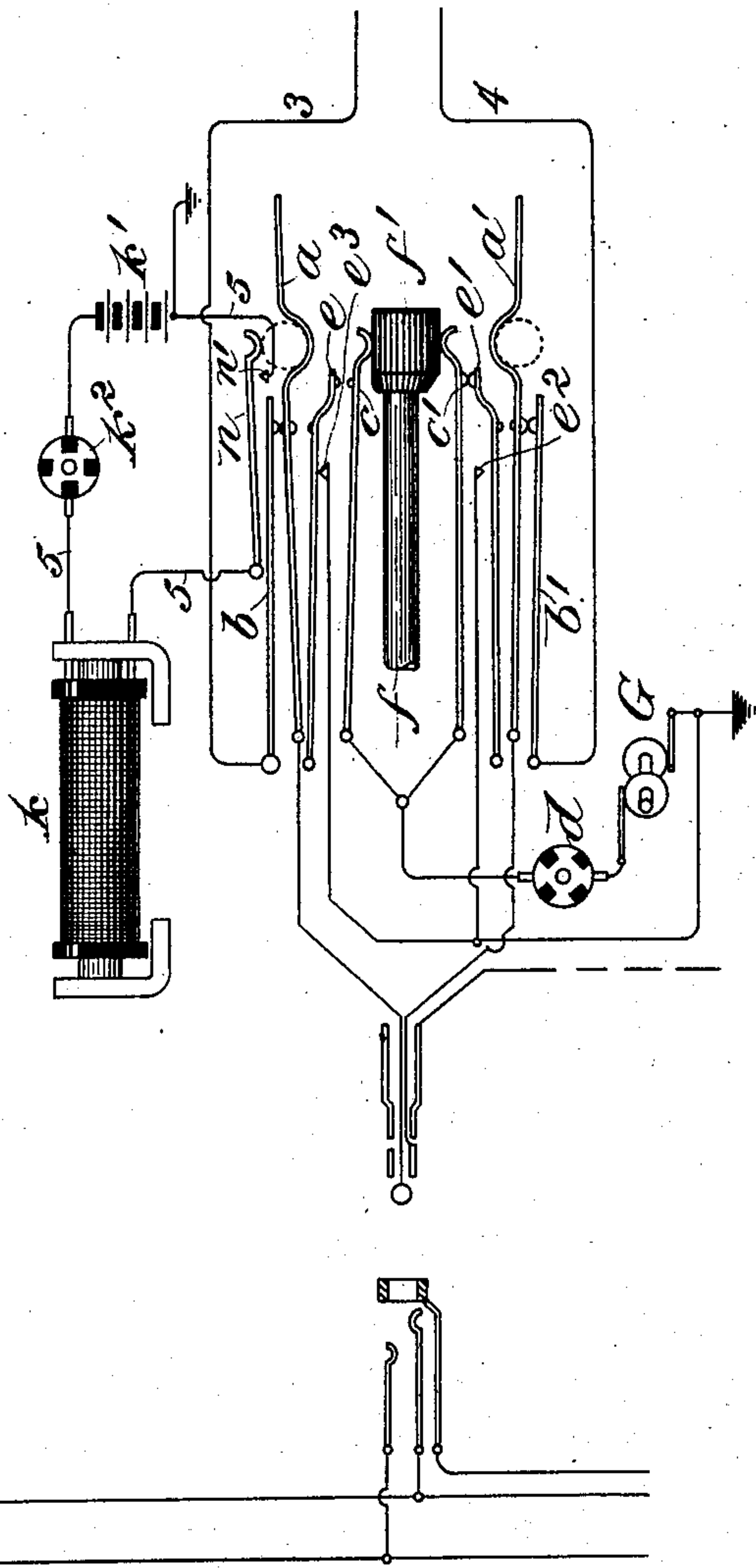


Fig. 8



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UNITED STATES PATENT OFFICE.

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RINGING-KEY FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 751,539, dated February 9, 1904.

Application filed May 9, 1902. Serial No. 106,564. (No model.)

To all whom it may concern:

Be it known that I, FRANK R. McBERTY, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Ringing-Keys for Telephone-Switchboards, (Case No. 108,) of which the following is a full, clear, concise, and exact description.

My invention relates to switchboard ringing-keys of the type intended for the automatic transmission of signals, and more particularly to a type of key adapted automatically to transmit definite and distinctive signals to selectively call the various stations connected with a party-telephone line.

My invention is embodied in a structure in which the switch for controlling the application of the ringing-current is operated through the agency of a plunger to be depressed by the operator, the return of the plunger and the opening of the switch being controlled by an escapement or step-by-step device, which may be adjusted and set in the operation of the plunger to control the length of time during which the ringing-current shall be applied to the line. The ringing-current may be periodically interrupted, in which case the adjustment of the escapement in the operation of the plunger may be made to determine the number of impulses of ringing-current which will be applied to the line by means of the key. The escapement or step-by-step device is actuated by an electromagnet energized by periodically-interrupted current, the periods of which may coincide with the intervals or periods of the ringing-current, and after the mechanism has moved a certain number of steps determined in setting the key the ringing-current is automatically cut off.

An improvement of my invention lies in the construction of such an automatic key so that the current will always be applied the full time for each ring to prevent the transmission of uncertain signals by giving the first ring shorter than the others, as would be the case if the current were connected to the line to be signaled in the middle of a period.

Another feature of my invention consists in means for preventing the depression of the key until a signal previously started has been completed.

Another feature lies in the construction whereby the operator by simply twisting the plunger from one side or the other before depressing it may determine which side of the line the ringing-current shall be applied to. This will be useful in connection with party-lines where the substation signal-bells are connected in grounded branches from each side of the line.

My invention will be explained in detail and further features thereof set forth by reference to the accompanying drawings, which illustrate a ten-party-line ringing-key constructed in accordance therewith.

Figure 1 is a side elevation of the ringing-key. Fig. 2 is a vertical sectional view thereof on line 2 2 of Fig. 1. Fig. 3 is a rear view, partially in section, showing the plunger depressed. Fig. 4 is a detail vertical sectional view of the lower portion of the key. Fig. 5 is a plan view of the ringing-key as it would appear to the operator. Fig. 6 is a detail sectional view looking up on line 6 6 of Fig. 1. Fig. 7 is a sectional plan view on line 7 7 of Fig. 1; and Fig. 8 is a diagram illustrating the circuits and connections of the switching mechanism controlled by the key and also showing a party-telephone line of ten stations any one of which may be automatically signaled from the central office by properly setting the key.

The same characters of reference are used to designate the same parts wherever they are shown.

The principal circuit-changing mechanism for applying the ringing-current to the line consists of two springs $a a'$, which, as shown in Fig. 8, are connected with the tip and sleeve contacts, respectively, of the operator's calling-plug. Said springs normally rest against back contacts $b b'$, respectively, which form the terminals of the conductors 3 4 of the plug-circuit, so that said conductors are normally connected to the tip and ring contacts of the

plug through said switch-springs. When the plunger of the key is depressed, the springs $a a'$ are moved toward one another, as will hereinafter be described, so that they are separated from their normal resting contacts and thrust against alternate contacts connected with the source of calling-current. As long as the said springs $a a'$ are maintained in their alternate or "set" position the ringing-current may be applied to the calling-plug. The metallic circuit telephone-line (shown in Fig. 8) extends from ten substations to a spring-jack terminal at the central office, into which the calling-plug may be inserted to make connection with the line. At five of the substations the bells are connected in grounded branches from the limb 1, and at the other five stations the bells are connected in grounded branches from the other limb 2.

The operator's ringing-key is provided with two contact-springs $c c'$, which are both connected with the free pole of the grounded generator G through the interrupting device or commutator d . The alternate contacts $e e'$, respectively, of the springs $a a'$ are springs which normally rest against contact-anvils, which are connected to the grounded pole of the generator G . The plunger f of the key carries an insulating-wedge f' , which is adapted to engage alternatively with the spring c or the spring c' to determine which of the springs $e e'$ shall be connected to the free pole of the generator. If the wedge engages the spring c' , for instance, it pushes it over against spring e' , which is moved itself far enough to separate from its normal resting contact, as shown in Fig. 2. Now when springs $a a'$ are forced toward each other circuit will be completed from the grounded generator G , through the interrupting device on commutator d to the springs c', e' , and a' , and thence to the ring of the plug, the tip of the plug being grounded through springs $a e$ and the resting anvil of spring e , which may be a stud e^3 on the grounded framework of the key. Similarly the wedge f' may be turned to engage the spring c instead of the spring c' , so that the generator is connected to the tip of the plug through the springs $c e a$, while the ring of the plug is grounded through springs $a' e'$, spring e' normally resting upon a grounded stud e^3 . Each of the springs $a a'$ is preferably made in two strips fastened together, as shown in Figs. 2 and 3.

To operate the switch-springs $a a'$, a vertically-reciprocating plunger g is provided, carrying at its lower end a yoke-piece g' , which embraces the projecting lower ends of said springs $a a'$. Insulating-rollers $g^2 g^2$ are provided on said yoke-piece to ride on the outer surfaces of the springs. When the plunger g is in its normal position, as illustrated in Figs. 1 and 2, the rollers $g^2 g^2$ rest in depressions of the springs $a a'$, so that said springs are unconfined; but when the plunger is depressed said rollers ride over the lower ex-

tensions of the springs, whereby said springs are forced toward one another. The upper end of the plunger g carries the rack-bar or ratchet g^3 of an escapement, which is adapted to cooperate with teeth or pawls g^4 , carried by a rocking escapement-lever i . Said escapement-lever is mounted in position to form the armature of an electromagnet k and is normally held away from the poles of said magnet by a spring i' . The plunger g once depressed is held by the teeth of the escapement-lever, and then as the magnet is intermittently excited said plunger g will be moved up step by step by a spring h until it is finally returned to the normal position. The plunger f projects through the upper framework of the ringing-key and is furnished with a button f^3 to facilitate its manipulation by the operator. Said plunger f besides being capable of reciprocation is also mounted to rotate in its mountings. The upper portion of the plunger f carries a "stepped" cylinder l , which is adapted to engage the top of the plunger g , so that as the plunger f is depressed the plunger g will also be carried down, the extent of depression of the plunger g being dependent upon the angular position of said stepped cylinder—that is to say, upon which of the steps is brought into position to strike the upper end of said plunger g . A spring f^2 is provided for returning the plunger f after it has been depressed. A dog i^2 , however, carried by the upper end of the lever i , is adapted to engage a projecting rim of the stepped cylinder as the same is returned to prevent the plunger f from rising sufficiently to bring the wedge f' between the springs $c c'$ until the dog or detent i^2 has been withdrawn. After the plunger f has once been depressed, therefore, the first movement of the lever i by the magnet k will release the plunger f and allow the same to return to its normal position, after which the plunger g will be returned step by step as the magnet is intermittently excited.

On the face of the switchboard a dial is provided, and a pointer is keyed to the plunger f to be moved over this dial and indicate the angular position of the plunger and of the stepped cylinder l and wedge f' carried thereby. A star-wheel m may be keyed to the shaft or plunger f in position to be engaged by a dog m' , so that as the plunger is rotated to determine the position of the stepped cylinder it will come to rest naturally in the proper position. The rim l' of the stepped cylinder l is slotted to slide along a rib l^2 , which prevents the cylinder and shaft or plunger from being rotated while depressed. The magnet k is preferably included in a local circuit 5 with a battery k' and interrupter k^2 , said local circuit being controlled by a contact-spring n and an anvil n' therefor. When the plunger g is in its normal position, one of the insulating-rollers g^2 , carried by the yoke-piece

at the lower end of said plunger, engages the spring n and separates it from its anvil; but when the plunger is depressed the roller is withdrawn from engagement with the spring, so that the circuit 5 is closed at the contact n . The interrupters d and k^2 are so related that the circuit 5 will be completed at the interrupter k^2 to operate the step-by-step mechanism during the periods when the generator-circuit is broken at the interrupter d , and both are continuously rotated at the same speed. This can readily be arranged—for example, by mounting the interrupting commutators upon the same driving-shaft.

As shown in Fig. 4, I provide a dog or detent o in the framework of the ringing-key, which is arranged to engage an annular channel in the plunger f to prevent said plunger from being depressed while the step-by-step mechanism is still in motion as a result of a previous depression of the plunger. The dog o has an extension o' , which is adapted to be engaged by a portion g^5 of the yoke-piece g' when the plunger g is in its normal position, whereby said detent is held normally removed from engagement with the plunger to permit the movement of the latter.

The operation of the device is as follows: Each party-line substation will be assigned a particular number of rings as its signal, one ring for stations I and VI, two rings for stations II and VII, &c., up to five rings for stations V and X. When ringing-current is applied to one of the limbs of the line, only the five bells which are connected to that limb will be rung, and any one of the ten stations may thus be signaled by ringing the proper number of times on the proper side of the line. The operator, therefore, desiring to signal one of the stations of the party-line first rotates the plunger f until the pointer rests in the proper division of the dial, then depresses the plunger as far as it will go and releases it. The ringing-key will then automatically apply the proper number of impulses of ringing-current to the proper side of the line without further manipulation by the operator. Suppose it be station III that is to be signaled. When the plunger f is rotated to bring the pointer into the division 3 of the right side of the dial, the cylinder l will be brought into such an angular position that when depressed the third step of the cylinder will be brought into position to engage the upper end of the plunger g . The depression of the plunger f will first move the wedge f' from between the springs c c' , so that both said springs are separated from the springs e e' , respectively, as shown in Fig. 3, and then as the plunger f moves down the third step on the cylinder will engage the upper end of the plunger g and carry said plunger down with it, so that four teeth of the escapement-rack will be moved past the dogs of the escapement-lever. As soon as the plunger g is depressed the cir-

cuit 5 is closed by the switch-spring n , so that battery is applied through the interrupting-commutator k^2 to the magnet k . Said commutator, which is constantly rotating, sooner or later completes the circuit 5, so that the magnet k is excited and attracts its armature-lever i . The detent i^2 is thereby withdrawn from engagement with the rim of the stepped cylinder, so that the plunger f may return to its normal position, thrusting the wedge f' against one or the other of the springs c c' . It was assumed that station III was being signaled. At this station the bell is connected in a grounded branch from the limb 1 of the telephone-line, which is connected at the central office through the tip of the plug with the spring a . Consequently the operator before depressing the plunger f has rotated it until the pointer rests in division 3 on the right-hand side of the dial. (Shown in Fig. 5.) When the plunger is released, therefore, the wedge f' will engage the spring c , leaving the spring c' in its normal position. Circuit will thus be completed from the generator through the interrupting device d and springs c , e , and a , to the tip of the plug and thence over limb 1 of the telephone-line to earth through the bells at stations I to V, inclusive.

As the commutators d and k^2 continue to rotate current is thus intermittently applied to the limb 1 of the line, and in the intervals between the impulses of ringing-current the magnet k is excited. The armature-lever i is thus periodically attracted, so that the plunger g is automatically returned step by step to its original position. The last step of the upward movement of the toothed plunger g brings the rollers g^2 g^2 into their original positions, so that the springs a a' are released, cutting off the generator and establishing the circuit from conductors 3 and 4 through to the tip and ring contacts, respectively, of the plug. The ringing-current is not connected to the springs of the ringing-key until after the first movement of said step-by-step mechanism has been made, and the last movement of said step-by-step mechanism restores the springs a a' to their normal positions. The cylinder l is therefore adjusted so that it will depress the plunger g one tooth farther than the number of rings to be given—that is, to give three rings the plunger g is depressed through four teeth and ringing-current is applied over the first, second, and third steps of its return movement, the fourth step cutting off the ringing-current and breaking the circuit 5 at the contact n .

Having thus described my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. A ringing appliance for telephone-switchboards comprising a source of periodically-interrupted ringing-current, a switch a for applying the same, a manual key through the agency of which said switch may be set, step-

by-step mechanism set in actuating the key, means for actuating said step-by-step mechanism during the interruptions of the ringing-current, and a second switch *c* actuated by the
 5 initial movement of said step-by-step mechanism controlling the application of current by the first-mentioned switch, whereby the interrupted ringing-current is automatically applied for a definite number of full periods.

10 2. The combination with a ringing-key having a plunger, switching mechanism set in the depression of said plunger, and automatic step-by-step mechanism controlling the release of the switch, of a stop *o* for preventing the de-
 15 pression of the plunger, controlled through the agency of said step-by-step mechanism, said stop being held in engagement with the plunger during the operation of the step-by-step mechanism, whereby each signal auto-
 20 matically transmitted by the key must be completed before the key can be operated to transmit another signal.

3. A ringing appliance comprising a source of current, two switches *a a'* for applying the
 25 same, automatic step-by-step mechanism set in setting the key, controlling the release of said switches, switches *c c'* controlling the application of current to said first-mentioned switches, a reciprocating and rotating plunger
 30 *f*, mechanism moved in depressing the plunger for actuating the first-mentioned switches, and a cam *f'* rotated in the rotation of the plunger for alternatively actuating either of said switches *c c'*, whereby the angular position of
 35 the plunger when depressed determines which of the switches *a a'* shall be connected to the source of current.

4. A signaling appliance comprising a source of periodically-interrupted current, a
 40 switch *a* adapted to be set to apply said current, an escapement brought into operation in the setting of said switch, controlling the release thereof, a magnet and means controlled in the actuation of said switch *a* for exciting
 45 said magnet during the interruption of said ringing-current, and a switch *c* actuated in the initial response of said magnet adapted to connect said source of current with the switch *a*, whereby the current is automatically ap-
 50 plied for a definite number of full periods.

5. In a ringing appliance for telephone-switchboards, the combination with a source of periodically-interrupted ringing-current, of a plunger *f* adapted to be manually rotated and
 55 reciprocated, switching mechanism brought into action by the return of the plunger after a depression thereof for applying the ringing-current, automatic step-by-step mechanism

and a switch controlled thereby for determining the application of the current, means for
 60 periodically actuating said step-by-step mechanism during the interruptions of the ringing-current, said step-by-step mechanism being set by the depression of the plunger, a device
 65 adjusted in the rotation of the plunger preliminary to its depression for determining the extent of operation of the step-by-step mechanism, and a detent for preventing the return of the plunger, adapted to be released by said
 70 step-by-step mechanism, whereby ringing-current is always applied at the beginning of a period.

6. The combination with a source of intermittent current, of a ringing-key and a push-
 75 button for closing said key to apply the ringing-current, an electromagnet and a switch set in operating the button in engagement therewith, a circuit of said magnet and a source of intermittent current therein of like period
 80 to the ringing-current, and an escapement controlling said ringing-key also operated by the magnet, as described.

7. The combination with a manually-operated ringing-key, an escapement controlling
 85 the return of said key to its normal position, and an electromagnet actuating the said escapement, of a source of intermittent current independent of said ringing-current in a circuit including said magnet, substantially as
 90 described.

8. The combination with a source of ringing-current, and a commutator periodically
 95 interrupting said current, of a key for applying said source of current, an electromagnetic switch in the circuit with said source, an actuating-circuit for said magnet, and a commutator closing said actuating-circuit periodically, the periods coinciding with the periods
 100 of ringing-current, said switch being adapted to remain in position when operated, as described.

9. The combination with a source of periodically intermittent ringing-current, of a ring-
 105 ing-key for controlling the application of said source, an electromagnetic switch in the circuit for applying said periodic current, means for operating said switch during an intermission of the ringing-current, said switch being adapted to remain in its changed position when
 110 operated; whereby partial signals are avoided.

In witness whereof I hereunto subscribe my name this 26th day of March, A. D. 1902.

FRANK R. McBERTY.

Witnesses:

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 HOWARD B. HOLMES