No. 751,566. PATENTED FEB. 9, 1904.

C. E. SCRIBNER.

RINGING KEY FOR TELEPHONE SWITCHBOARDS.

APPLICATION FILED MAY 9, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.

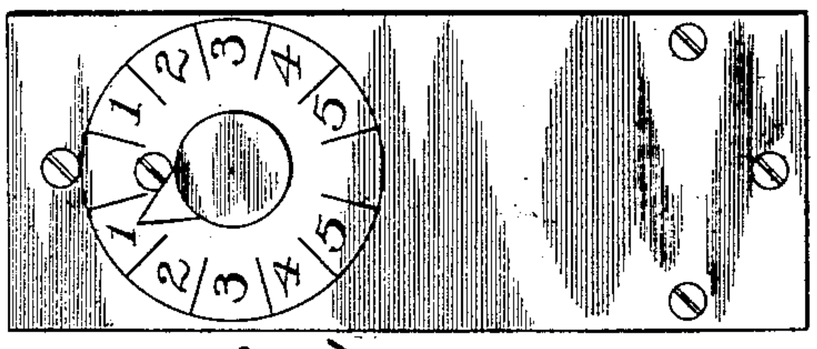


Fig. 5.

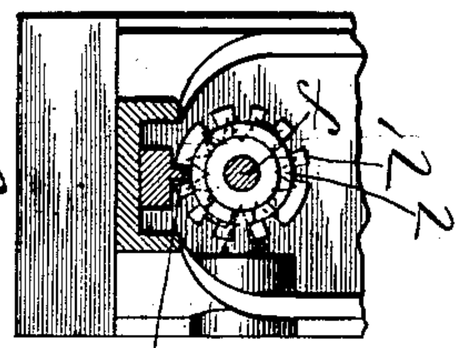


Fig. 2.

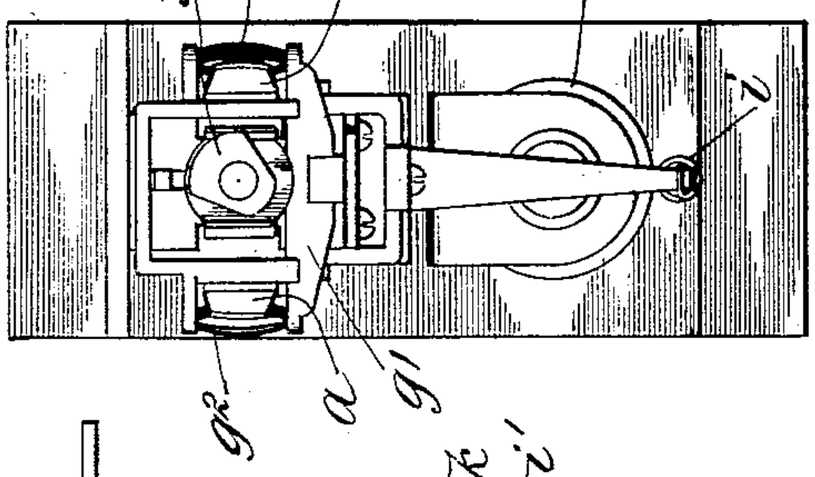


Fig. 6.

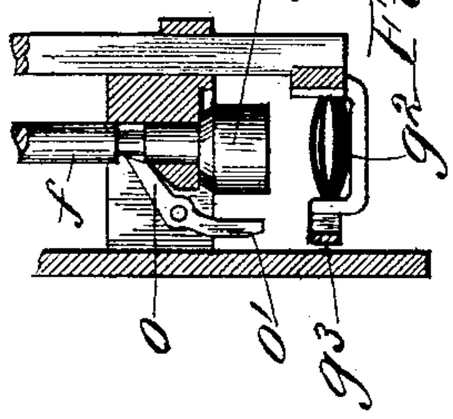
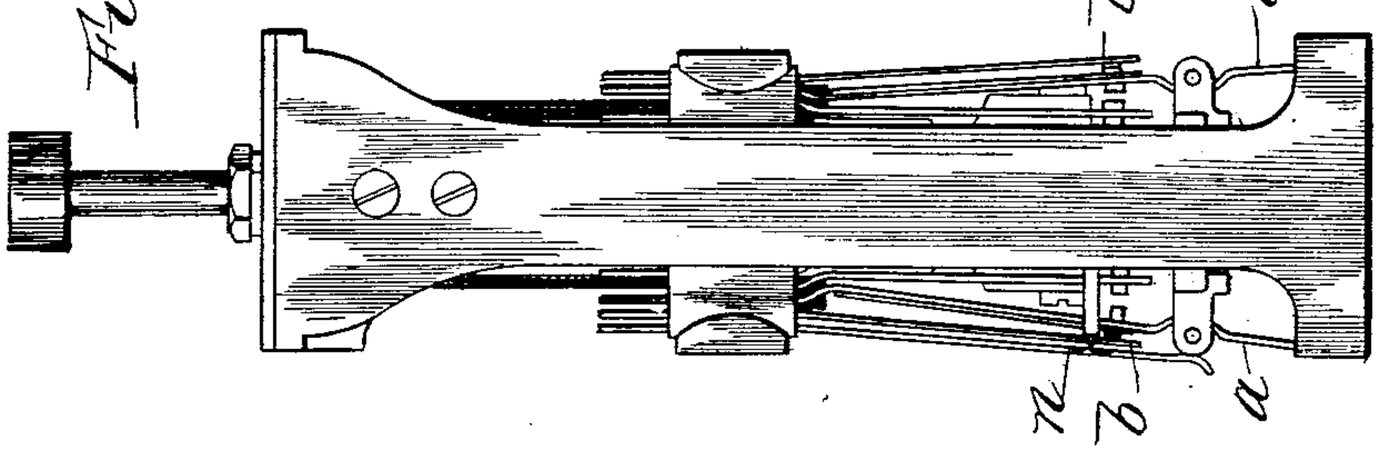


Fig. 3.

Fig. 4.



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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 7.

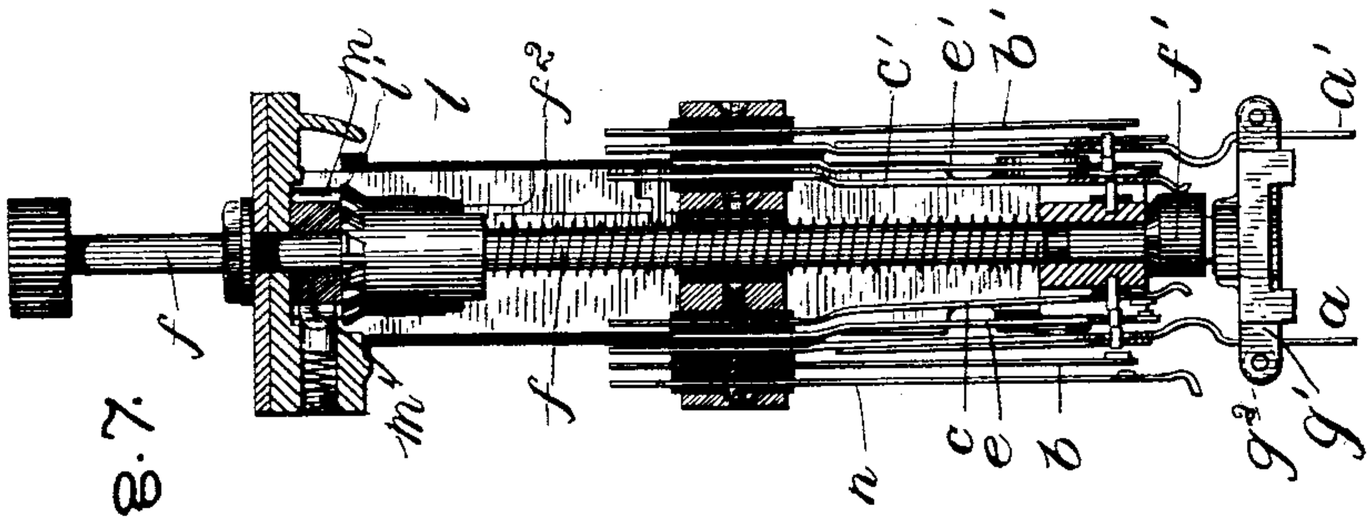


Fig. 8.

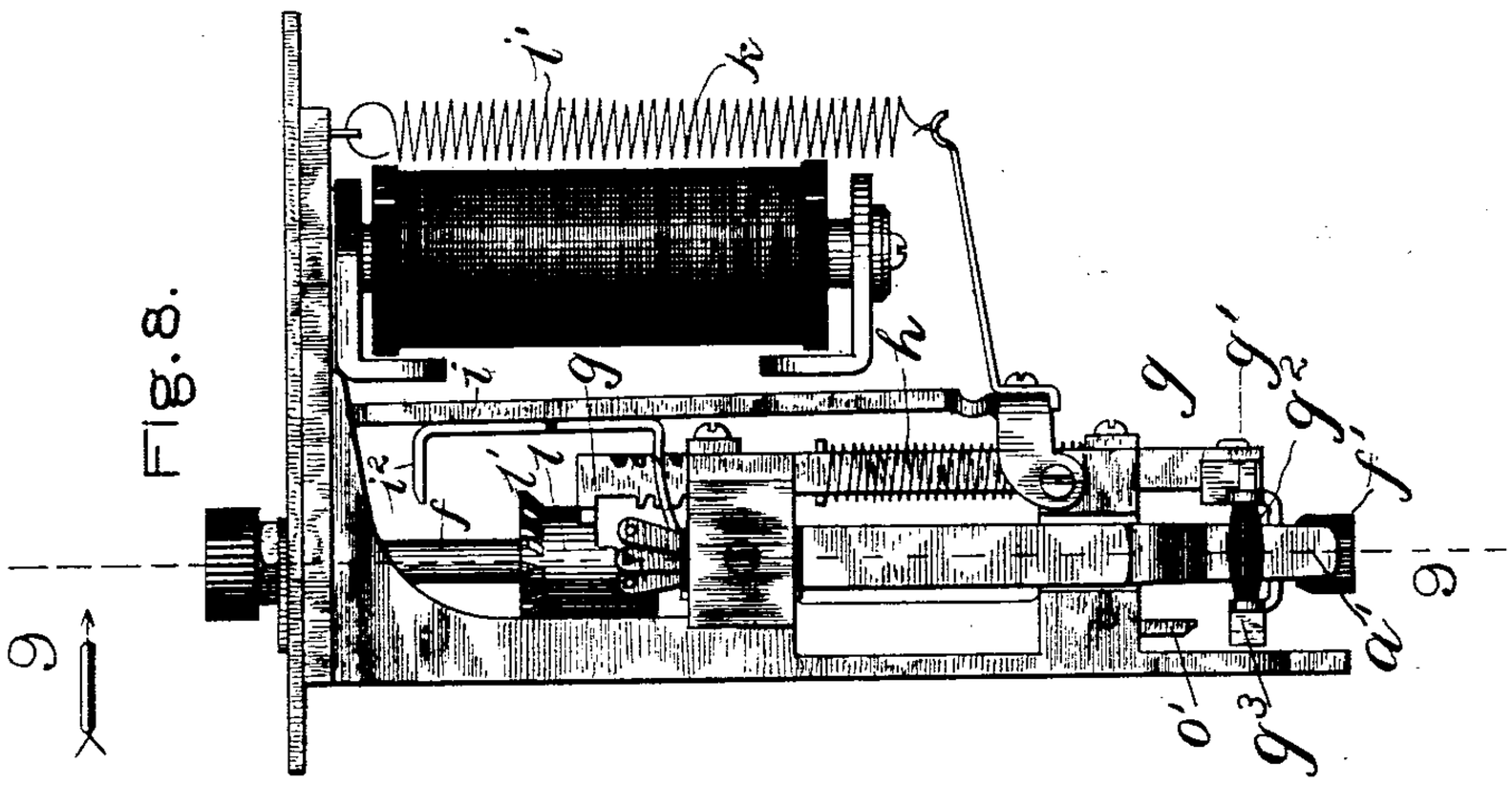
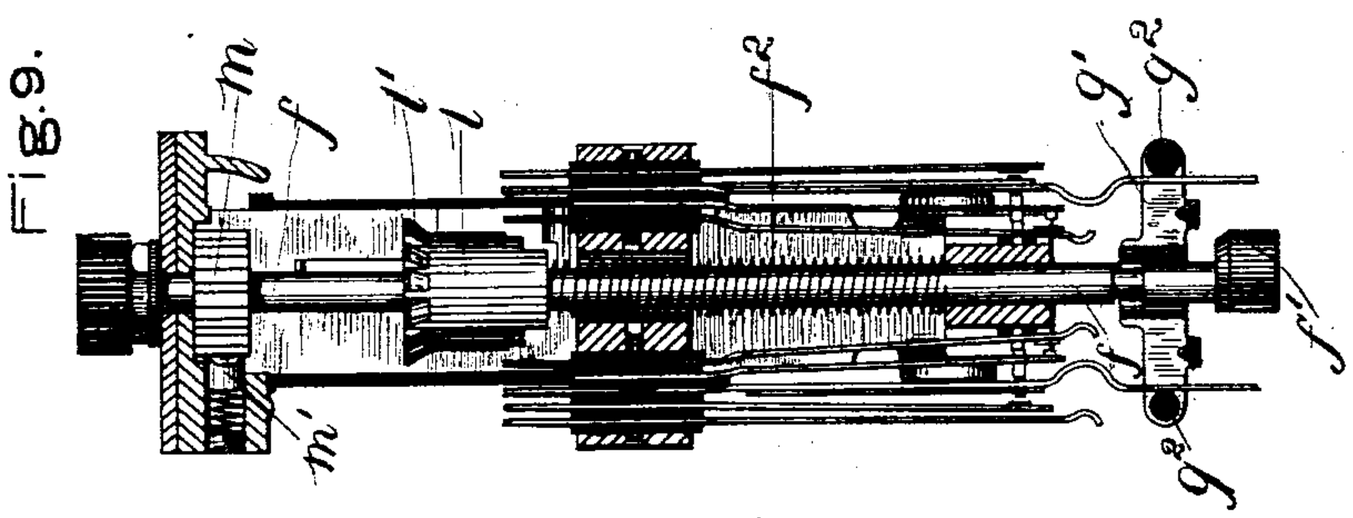


Fig. 9.



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No. 751,566. PATENTED FEB. 9, 1904.

C. E. SCRIBNER.

RINGING KEY FOR TELEPHONE SWITCHBOARDS.

APPLICATION FILED MAY 9, 1902.

NO MODEL. 3 SHEETS—SHEET 3.

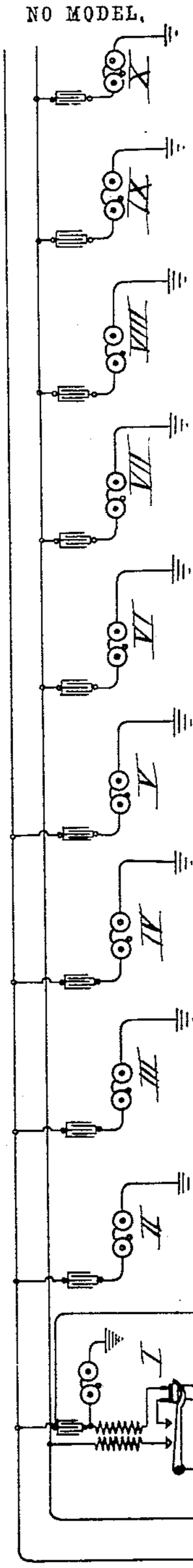
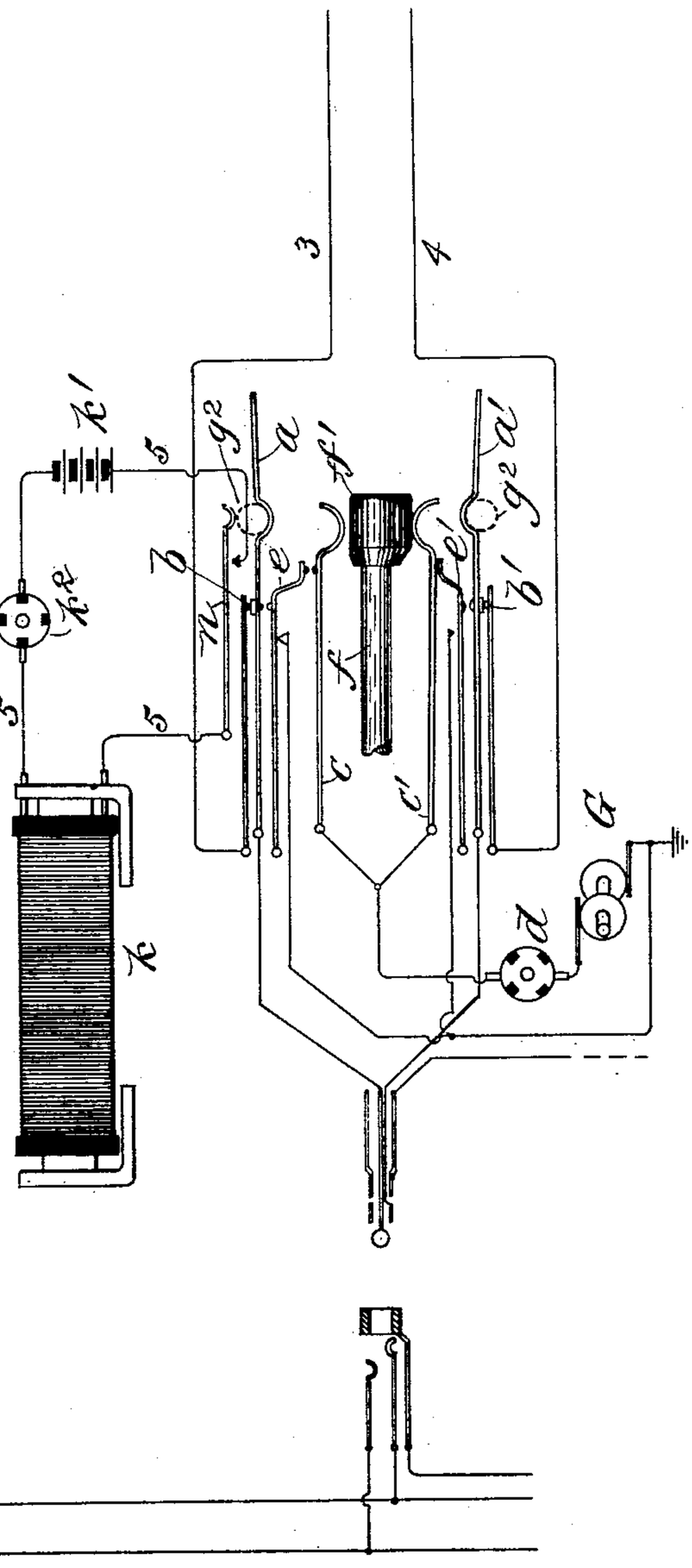


Fig. 10.



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No. 751,566. Patented February 9, 1904.

UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

RINGING-KEY FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 751,566, dated February 9, 1904.

Application filed May 9, 1902. Serial No. 106,556. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, 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. 500,) of which the following is a full, clear, concise, and exact description.

My invention relates to a ringing-key for telephone-switchboards; and its object is to provide a key for automatically sending call-signals on party-telephone lines.

It is usual to connect a number of substation-telephone instruments with a single telephone-line, which extends from the several substations to a spring-jack terminal at the central-office switchboard. The telephone instruments are connected in bridges of the line, and the signal-bell at each station is usually connected in a grounded branch from one or the other of the limbs of the metallic circuit. When one of these substations is to be signaled from the central office, it is usual for the operator to depress her ringing-key a predetermined number of times, whereby a corresponding number of current impulses are applied to the line to give the proper number of rings, according to the substation wanted—that is to say, twice for one station, three times for another, and so on. The signal-bells at all the substations will be rung, but the signal will be recognized as intended for only the particular station which has been assigned that particular number of rings as its call.

In accordance with my invention the operator is provided with a key, which she may set to give any one of the characteristic signals required to call any party-line substation and which when set will automatically transmit the signal without further attention.

My invention contemplates a source of ringing-current with means for periodically interrupting the same and a ringing key or switch adapted to be set to apply such ringing-current to the line with adjustable retarding mechanism—for example, a step-by-step device—arranged to control the release of the switch, said retarding mechanism being set in the actuation of the key, whereby the number of impulses of ringing-current applied may be determined. After the ringing-current has been applied for a given period, which may be determined in setting the key, the ringing-current is automatically cut off.

In the preferred form of my invention the main plunger of the ringing-key is arranged to be rotated in its bearings, as well as to reciprocate longitudinally, the rotation thereof determining the setting of a step-by-step device, which controls the period of application of the ringing-current.

I will describe my invention particularly by reference to the accompanying drawings, which illustrate the preferred embodiment thereof, and the features or combinations which I consider novel with me will be pointed out in the appended claims.

Figure 1 is a plan view of my improved ringing-key as it would appear to the operator. Fig. 2 is a view of said key from underneath. Fig. 3 is a side elevation. Fig. 4 is an end view. Fig. 5 is a detail sectional view, on line 5 5 of Fig. 3. Fig. 6 is a detail view, partially in section, of the lower end of the key. Fig. 7 is a vertical sectional view on line 7 7 of Fig. 3. Fig. 8 is a side elevation similar to Fig. 3, but showing the key in its depressed position. Fig. 9 is a vertical sectional view on line 9 9 of Fig. 8. Fig. 10 is a diagram illustrating the circuits and connections of the switching mechanism controlled by the key, this view also showing a party-telephone line of ten stations, any one of which may be automatically signaled by means of the key.

The principal circuit-changing mechanism for applying the ringing-current to the line consists of two springs a a', which, as shown in Fig. 10, 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 sleeve 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 adapted to be 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. 10, 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 alternately with the spring *c* or the spring *c'* to determine which of the springs *e e'* shall be connected to 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. Circuit is thus completed from the grounded generator G through the interrupting device or commutator *d* to the spring *a* and thence to the tip of the plug, the sleeve of the plug being grounded through springs *a' e'* and the resting anvil of spring *e'*. Similarly the wedge *f'* may be arranged to engage the spring *c'* instead of the spring *c*, so that the generator is connected to the sleeve of the plug through the springs *c' e' a'*, while the tip of the plug is grounded through springs *a* and *e*.

To operate the switch-springs *a a'*, I provide a vertically-reciprocating plunger *g*, which carries at its lower end a yoke-piece *g'*, which embraces the projecting lower ends of said springs. 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 Fig. 3, 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 extensions of the springs, whereby said springs are forced toward one another. The upper end of the plunger *g* carries the rack-bar or ratchet of an escapement which is adapted to coöperate with teeth or pawls 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 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 tip 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-table 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 *i* 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 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 preferably so related that the circuit 5 will be completed at the interrupter k^2, while 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. 6, a dog or detent *o* may be provided in the framework of the ringing-key to fall into an annular channel of the plunger *f* and prevent said plunger from being depressed, while the step-by-step mechanism is 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^3 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, 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 circuit 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* is immediately returned 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. 1.) 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 intermittently 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 the 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*.

I claim as my invention—

1. A calling appliance for telephone-switchboards comprising a source of signaling-current, a switch for applying the same, a key for setting said switch, automatic step-by-step mechanism controlling the release of the switch, and mechanism adjusted in actuating the key for determining the operation of the step-by-step mechanism.

2. A signaling appliance comprising a source of periodically-interrupted signaling-current, a manually-actuated key for applying the cur-

rent, an electromagnetic step-by-step device and means for operating the same to correspond with the periods of said current, mechanism controlled by said step-by-step device for cutting off the current, and means actuated in setting the key for determining the extent of operation of said step-by-step device, whereby distinctive signals may automatically be transmitted, the character of the signal being determined in setting the key.

3. A signaling appliance for telephone-switchboards comprising a source of periodic signaling-current, a manually-actuated reciprocating and rotating plunger, a switch adapted to be set by the reciprocation of the plunger, step-by-step mechanism controlling the release of the switch, and a device adjusted in rotating the plunger for determining the operation of the step-by-step mechanism.

4. A signaling appliance for telephone-switchboards comprising a source of periodically-interrupted current, a reciprocating and rotating plunger *f* adapted for manual operation, a toothed member of a step-by-step device and a switch operated thereby for applying the current, a stepped cylinder carried by the plunger *f* adapted to engage said toothed member to depress the same as the plunger *f* is depressed, the angular position of said stepped cylinder determining the extent of movement of said toothed member, an electromagnet and means for exciting the same periodically to correspond with the periods of the ringing-current, and an armature for said magnet-carrying dogs which engage the said toothed member to move the same step by step, whereby the switch is restored after a definite number of excitations of the magnet, determined in setting the key.

5. The combination with a ringing-key, of a source of ringing-current, a switch adapted to be set to apply said current, an adjustable retarding mechanism controlling the release of the switch, and a continuously-acting commutator independent of said switch for periodically interrupting said ringing-current, whereby current is intermittently applied a given number of times, dependent upon said retarding mechanism.

In witness whereof I hereunto subscribe my name this 21st day of March, A. D. 1902.

CHARLES E. SCRIBNER.

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