

(No Model.)

3 Sheets—Sheet 1.

W. F. TAYLOR.  
TELEPHONE SYSTEM.

No. 559,874.

Patented May 12, 1896.

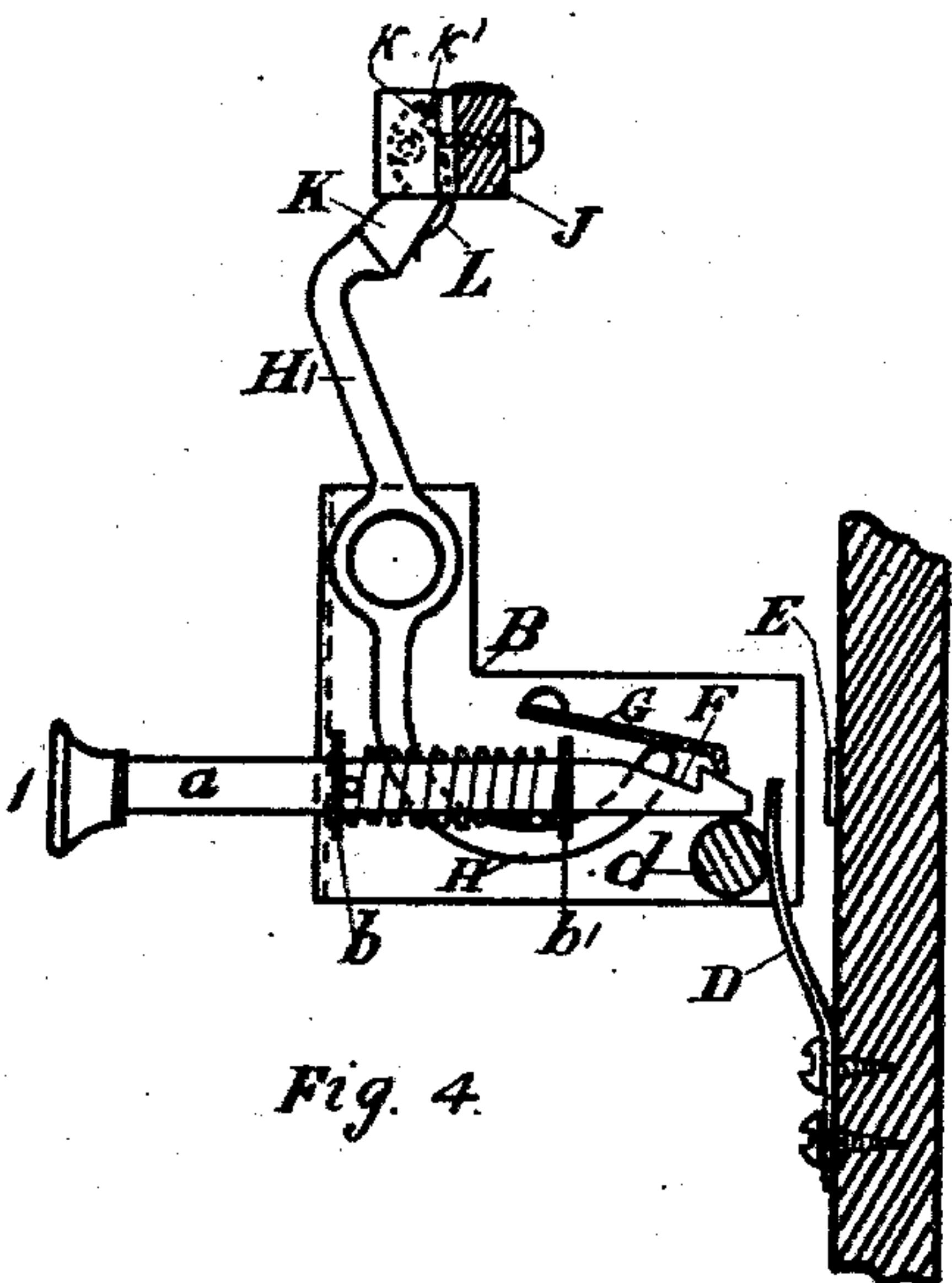


Fig. 4.

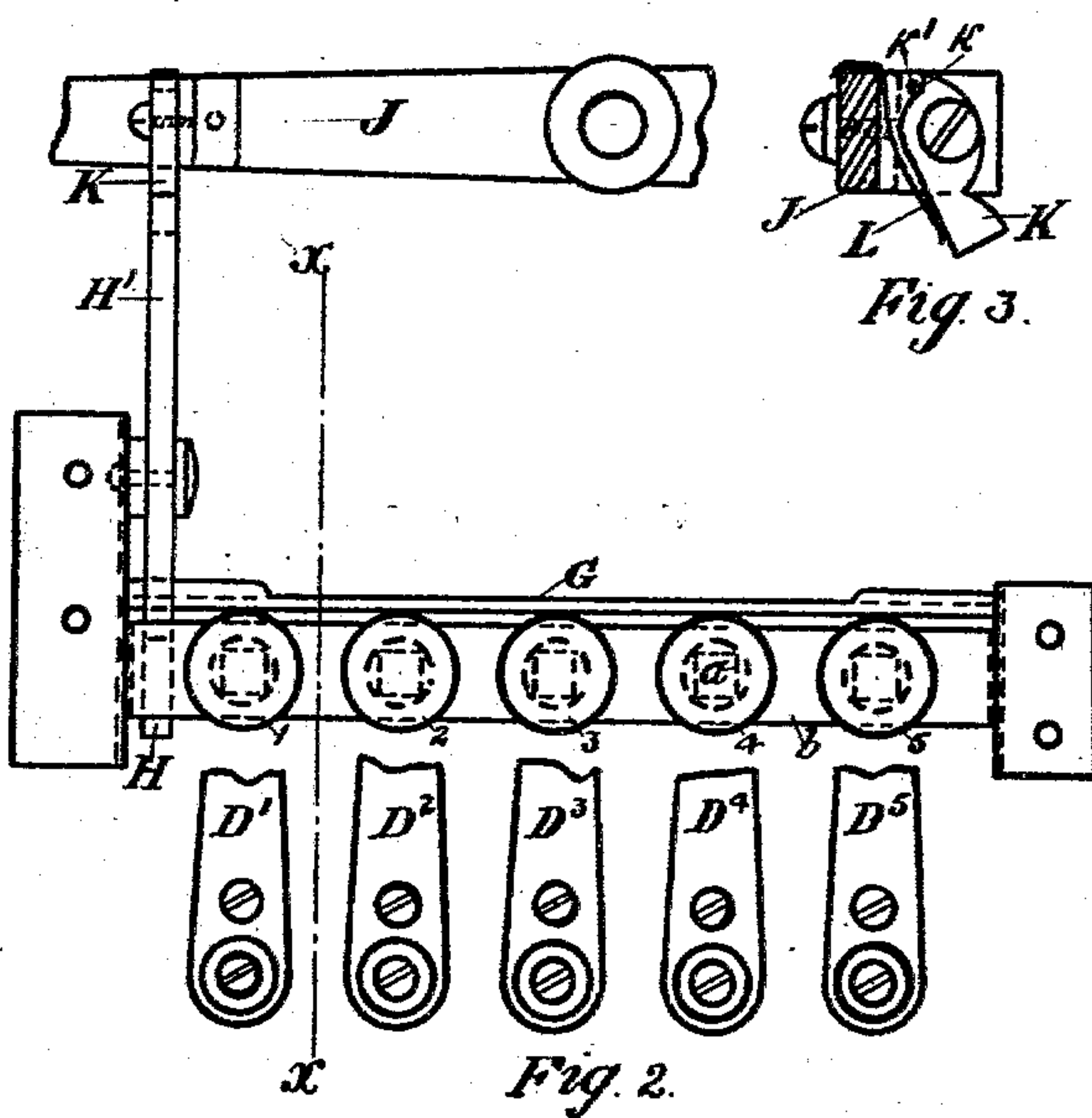


Fig. 2.

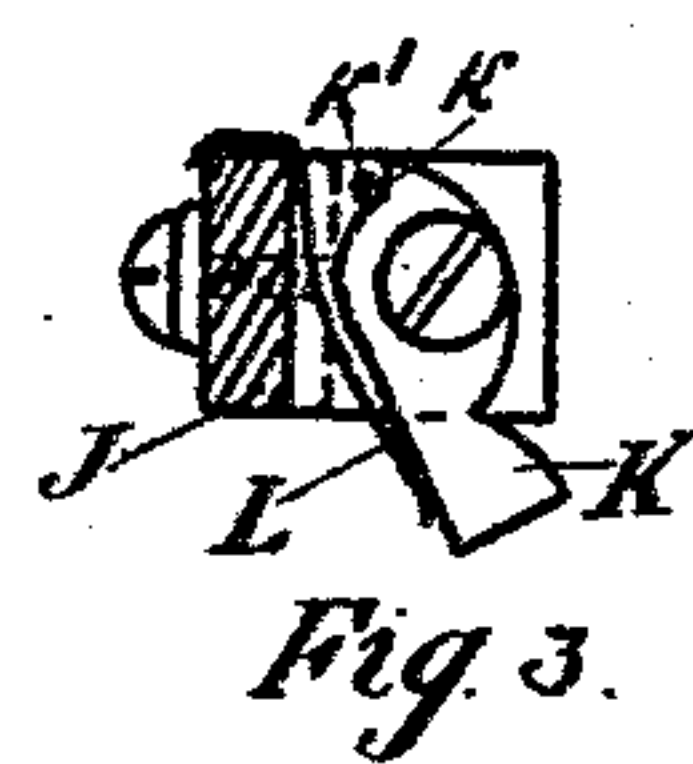


Fig. 3.

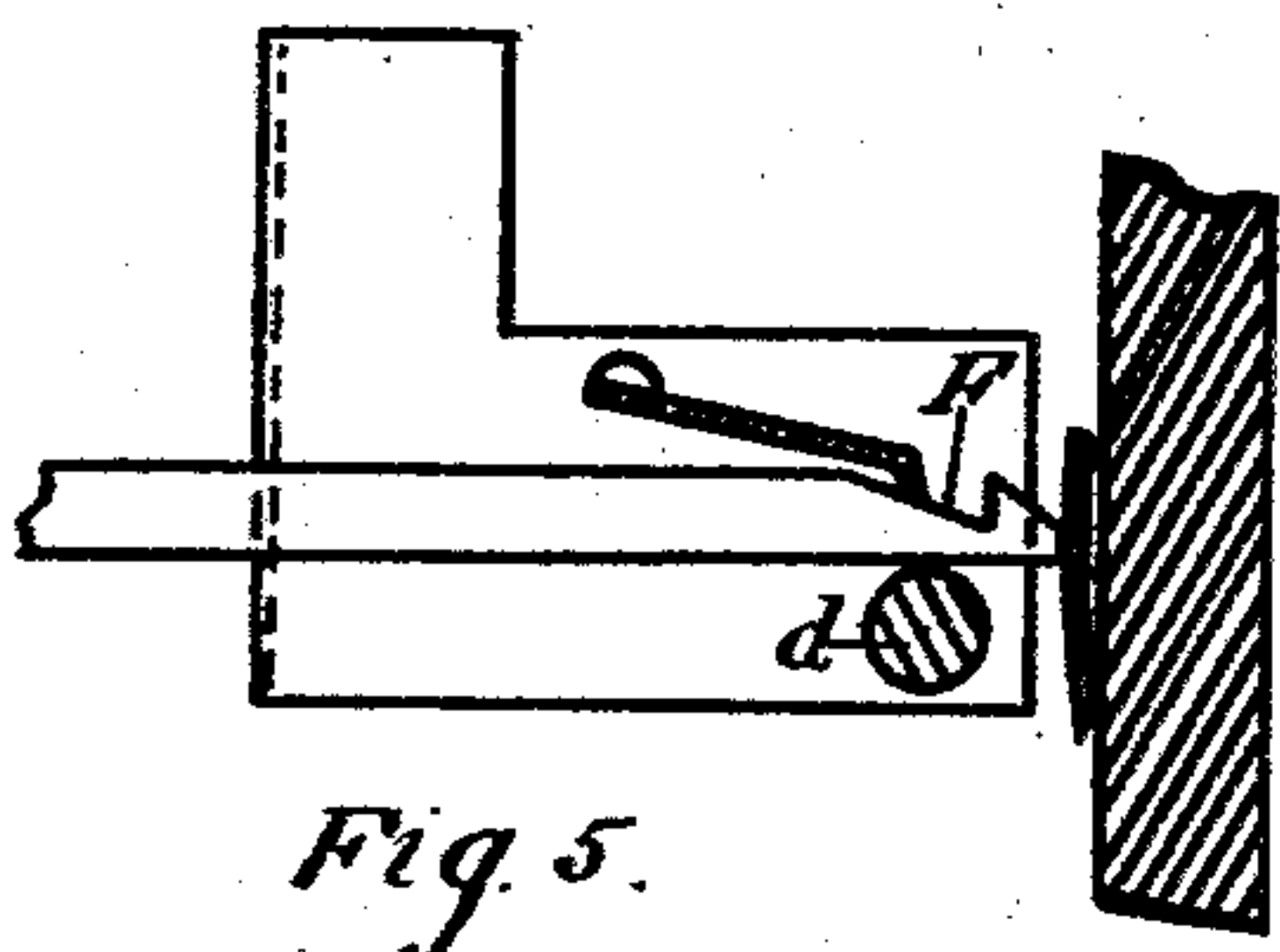


Fig. 5.

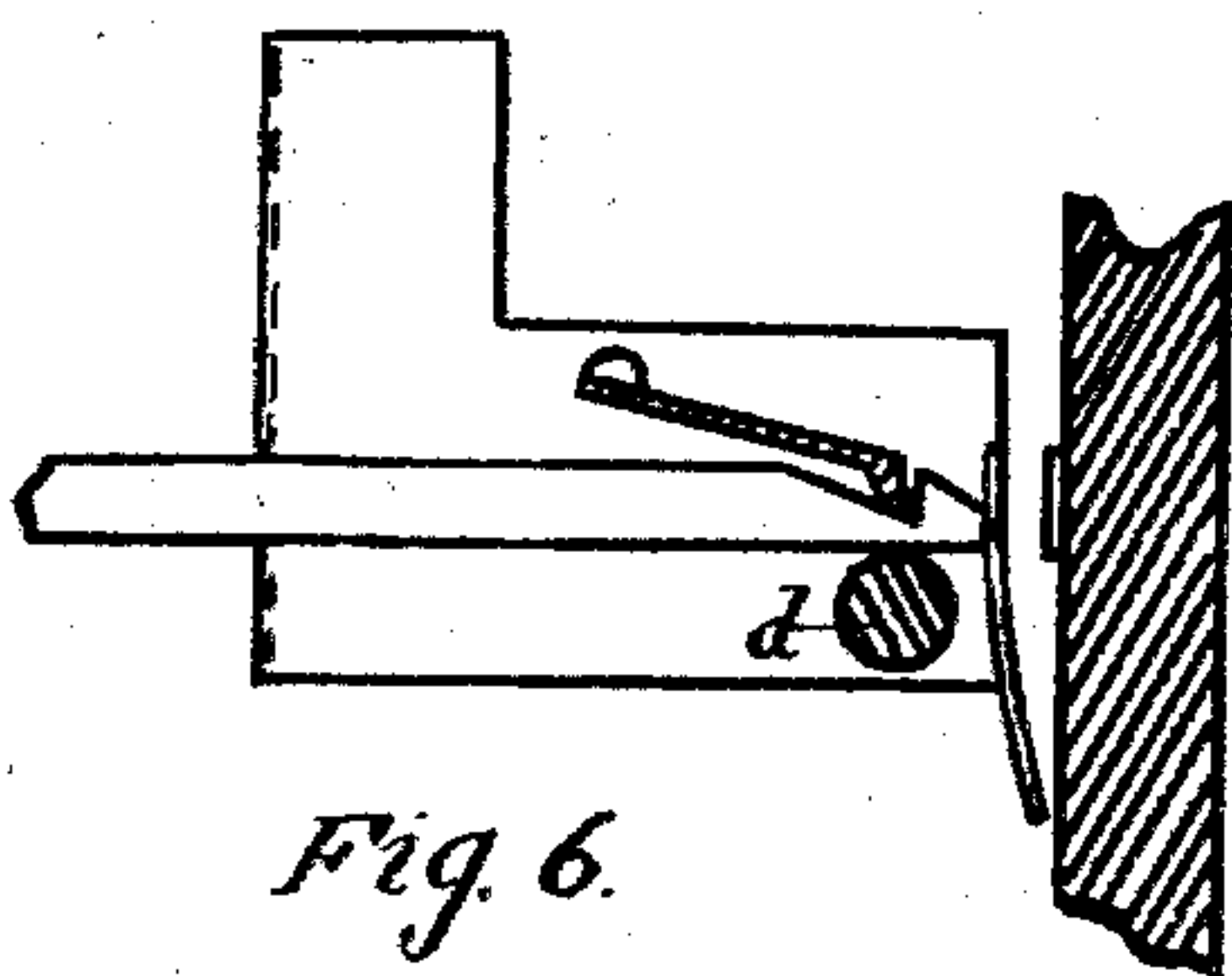


Fig. 6.

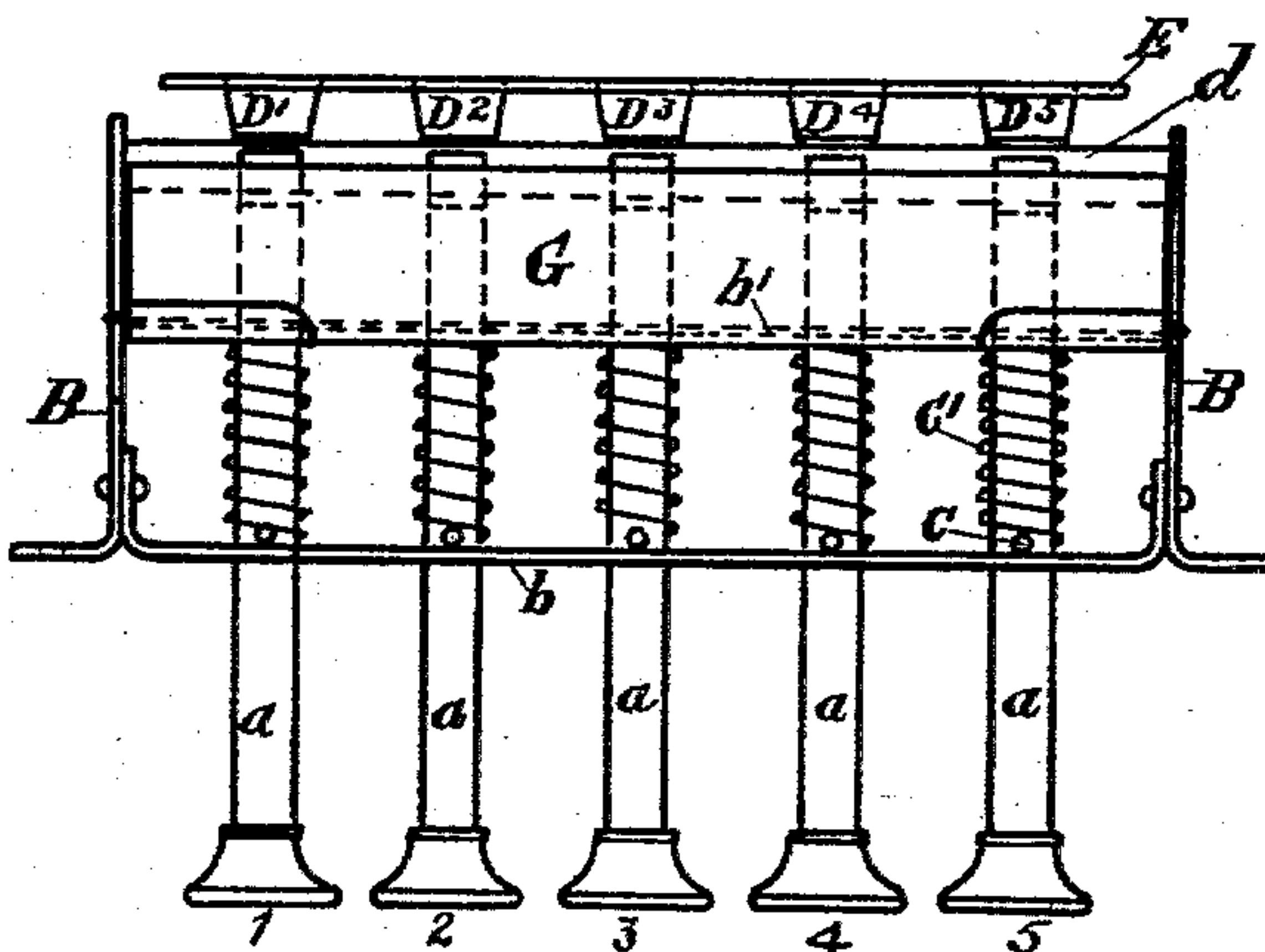


Fig. 1.

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Walter F. Taylor  
By his Attorney Louis M. Pirolet

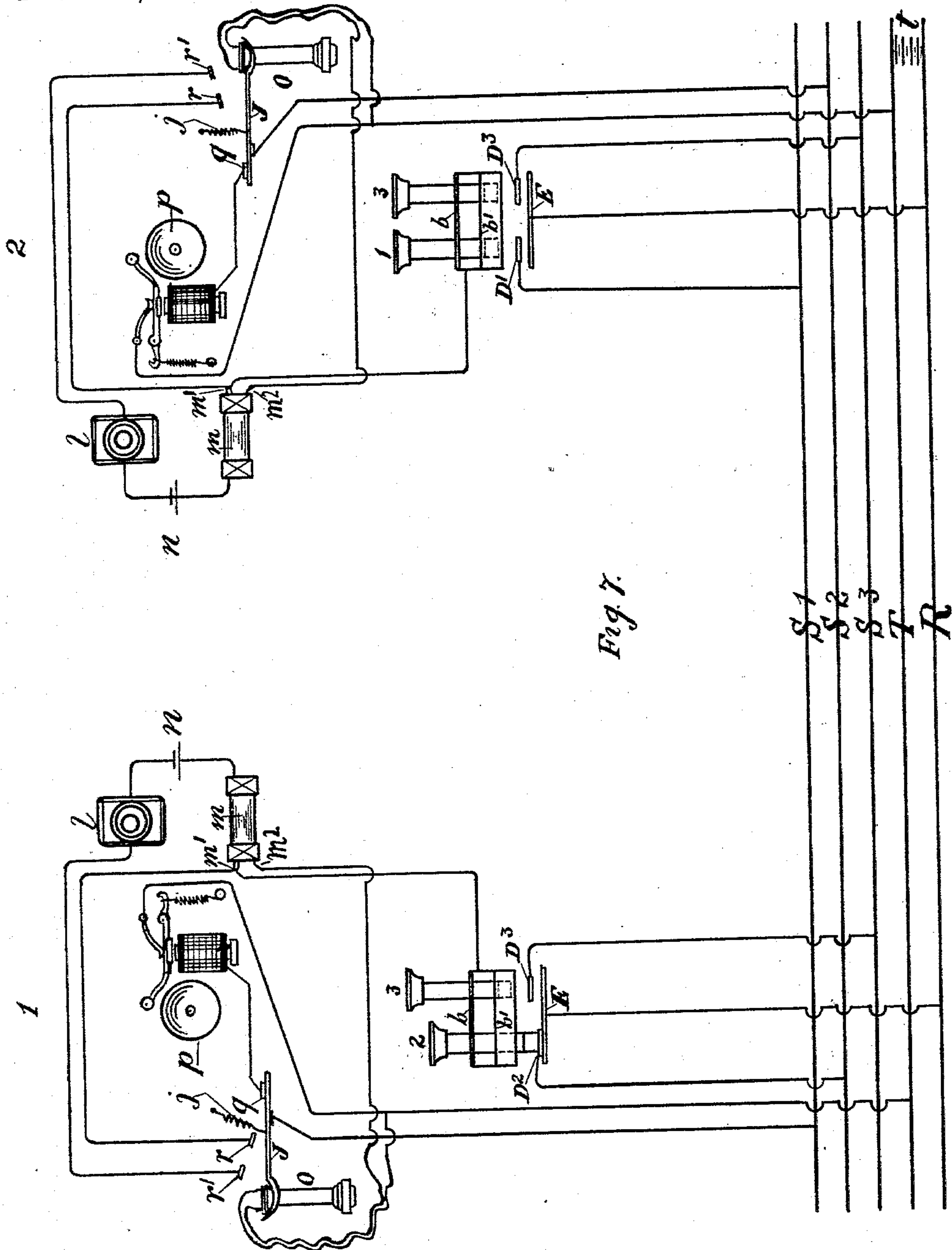
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3 Sheets—Sheet 2.

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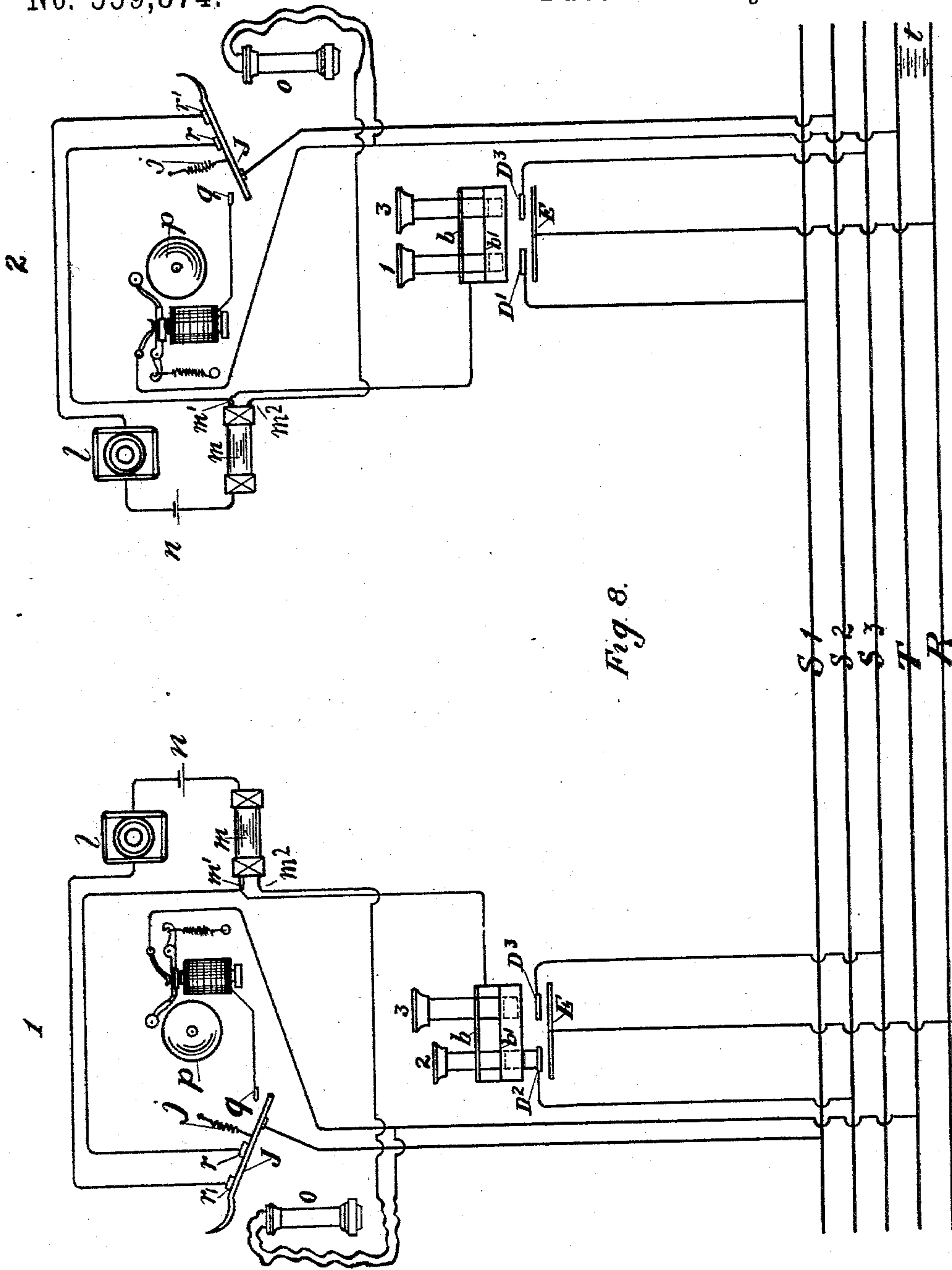


Fig. 8.

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# UNITED STATES PATENT OFFICE.

WALTER F. TAYLOR, OF MONTREAL, CANADA, ASSIGNOR OF ONE-HALF TO  
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## TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 559,874, dated May 12, 1896.

Application filed August 3, 1894. Serial No. 519,393. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER F. TAYLOR, a subject of the Queen of Great Britain, residing at Montreal, in the Province of Quebec, Dominion of Canada, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification.

My invention relates to improvements in telephone systems composed of more than two telephone instruments provided with terminals, each electrically connected with one of the other instruments. A person at one of the instruments can communicate with another person at any of the other instruments without the intervention of a central-station operator by closing a circuit through the terminal on his instrument, which is electrically connected with the other instrument.

The object of my invention is to provide a simple and convenient device for closing the circuit through the terminals, which device is automatically reset when the conversation is finished and the telephone-receivers hung upon their hooks.

Referring to the drawings, which form a part of this specification, Figure 1 is a top view of the device. Fig. 2 is a front view of the same. Fig. 3 is a section of the telephone-hook, showing the details of the pawl. Fig. 4 is a section of Fig. 2 on the line X, looking toward the trip-lever. Fig. 5 is a view of Fig. 4, showing the spring-terminal pressed in contact with the bar-terminal by the key. Fig. 6 is a view of Fig. 4, showing the catch engaged with the notch in the key. Figs. 7 and 8 are diagrams of the electrical circuits of a system with three telephone instruments. In Fig. 7 instrument No. 1 is represented as calling up instrument No. 2, and Fig. 8 represents the same instruments when afterward communicating together.

The drawings represent the invention as applied to a telephone system suitable for use in stores, factories, and other similar places, in which system one battery serves each telephone instrument to ring the bell of another instrument to call up the person there; but those versed in the art could easily apply the device to other systems from the instructions herein contained.

In the drawings, 1, 2, 3, 4, and 5 are keys having square shafts, which slide in guides  $b$   $b'$ , connected by the side pieces B, the shafts, the guides, and the frame being made of an electrical conductor, such as a metal. Pins C in the shafts by their action on the guide  $b$  prevent the shafts from being pulled out of their places in the guides and also limit the distance which the keys can move outward. Spiral springs C' around the shafts bear against the pins C and the guide  $b'$  and by their tension tend to keep the keys in their normal position with the pins in contact with the guide  $b$ .

D' D<sup>2</sup> D<sup>3</sup> D<sup>4</sup> D<sup>5</sup> are spring-terminals resting normally against a bar  $d$  of insulating material, which is located between the ends of the shafts and the springs, so as to keep the springs in alinement and out of contact with the ends of the shafts. One of the spring-terminals is located in the path of each key, D' being in the path of key 1, D<sup>2</sup> in the path of key 2, and so on. A bar-terminal E, of conducting material, crosses the paths of the spring-terminals D, being separated from the terminals by a short space, so that when one of the keys which has been pushed in far enough to cause the end of its shaft to make contact with the opposite spring-terminal is pushed in farther to any predetermined distance the said spring-terminal will be brought into contact with the bar-terminal. F F are notches near the ends of the shafts and in the upper sides thereof, the portions of the shafts beyond the notches being tapered to a point.

G is a catch, both ends of one side being pivoted to the side pieces B. The other side, which is free, rests normally by its weight upon the tapering ends of the shafts  $a$ , beyond the notches F, so that its edge is lower than the edges of the notches. When one of the keys is pushed in a predetermined distance, the catch will engage with its notch and prevent the spring C' from returning the key to its normal position. The catches and the notches must be so located relatively to one another that when a key is pushed in far enough for the catch to engage with its notch the end of its shaft is in contact with the opposite spring-terminal, but the spring-ter-



minal must still be out of contact with the bar-terminal.

H' H are the upper and lower arms, respectively, of a pivoted trip-lever. The lower arm H extends under the catch G and curves upward, so that its end is under the free side of the catch and close thereto. The upper arm H' of the lever has a projection *i* on one side thereof, the end of the arm sloping downward to the end of the projection.

J is a pivoted telephone-hook upon which the telephone-receiver O is hung. The hook is provided with a retractile spring *j*, which is so adjusted as to elevate the outer end of the hook when the receiver is removed, and when the receiver is replaced on the hook its weight overcomes the tension of the spring and depresses the outer end of the hook. A pawl K, having a shoulder *k*, is pivoted to the outer end of the hook. On the hook is a pin *k'* in the path of the shoulder on the pawl. A spring L, attached to the hook, bears against the pawl, so as to keep its shoulder normally in contact with the pin and keep the pawl in a vertical position. The pawl and the upper arm H' of the lever are so located relatively to one another that the projection on the arm is in the path of the pawl. The lower side of the pawl slants so that its slope corresponds with that of the end of the upper arm H'. When the outer end of the telephone-hook is depressed, the lower end of the pawl is below the upper end of the arm H'.

On removing the telephone-receiver from the hook the hook is elevated and the pawl in passing the projection *i* engages yieldingly therewith, for the pressure between the pawl and the projection is against the spring, which yields and allows the pawl to pass the projection without moving the lever. When the hook is depressed by the replacing of the receiver, the pawl engages unyieldingly with the projection and pushes upper arm of the lever to one side, for the pressure between the projection and the pawl is against the pin *k'*, which prevents the pawl from moving by its action on the shoulder *k*. This movement causes the lever to turn on its pivot and raises the lower arm, which in turn raises the free side of the catch G above the edges of the notches F. Thus any key whose notch was engaged with the catch is released and is returned to its normal position by the spring C'.

The electrical circuits are as follows, referring particularly to Figs. 7 and 8: 1 and 2 are two telephone instruments. As the apparatus at each telephone instrument is a duplicate of that at the other instruments, but two are shown for simplicity. In each of the instruments, 1 is a telephone-transmitter, *m* is an induction-coil having the terminals *m'* *m*<sup>2</sup> to its secondary coil, *n* is a local battery, and *p* is a self-interrupting electro-magnetic bell, which serves as an electric call for the instrument. It is immaterial whether a single receiver be used for speaking and hearing or a regular telephone instrument comprising a

transmitter, a receiver, and an electric call; but as the latter arrangement is usually the best the device or invention is represented as applied to a system containing such telephone instruments.

T R S' S<sup>2</sup> S<sup>3</sup> are electrical conductors, of which T serves as a return-conductor for all the telephones of the system. Branch electrical conductors lead from the main conductors to the telephone instruments. Provision is made by conductor S<sup>3</sup> for connection with a third instrument, which is not represented for the reason above stated. *t* is an electric generator or battery, one pole of which is connected electrically with the bar-terminals E in each instrument and the other pole with the return-conductor T.

One terminal of the electric call in each instrument is connected with the return-conductor T, and the other terminal is connected electrically with the contact *q*, with which the telephone-hook makes contact when the hook is depressed by reason of the telephone-receiver being thereon. The telephone-hook in each instrument is connected electrically with the particular wire for that instrument. For example, the hook in instrument 1 is connected with conductor S', the hook in instrument 2 is similarly connected with conductor S<sup>2</sup>, and so on.

One terminal of the telephone-receiver in each instrument is connected electrically with the return-conductor T, and the other terminal is connected with the terminal *m*<sup>2</sup> of the secondary coil. The terminal *m'* of the secondary is connected electrically with the guides *b b'* and in this way with the keys, which are thus in circuit with their respective telephone instrument. The terminal *m'* of the secondary is also connected with the contact *r*.

The primary of the induction-coil *m*, the transmitter 1, and the local battery *n* are included in a local circuit having two contacts *r r'*. This circuit is normally open at the contacts; but when the telephone-hook is elevated by the removal of the receiver the two contacts are electrically connected by the hook and the circuit is closed. One of the spring-terminals in each instrument is connected with a particular conductor. For example, all the terminals D' are connected with conductor S' and thus with instrument 1, the terminals D<sup>2</sup> are connected with conductor S<sup>2</sup> and thus with instrument 2, and so on, the other terminals being connected with a particular instrument. There is no spring-terminal in instrument 1 connected with conductor S', nor in any of the other instruments is there a spring-terminal connected with the conductor for that particular instrument, for such a terminal would be useless, as it is obvious no one would desire to call up his own instrument.

The operation of communicating between two instruments is as follows: Suppose, for example, a person at instrument No. 1 wishes



to speak with some one at instrument 2. He presses in as far as it will go key 2 on his instrument. The shaft of this key presses the spring-terminal  $D^2$  against the bar-terminal E and thus establishes a current through the electric call  $p$  in instrument 2. The current causes the bell to ring and notifies the person there that some one desires to speak with him. The current which has been established has the following course: from the positive pole of the battery  $t$  along conductor R to the terminal bar E, through the spring-terminal  $D^2$ , conductor  $S^2$ , to and through the electric call, thence back to the negative pole of the battery by the conductor T. On removing pressure from the key 2 the spiral spring  $C'$  moves the end of the key-shaft away from the terminal bar E till the further movement of the key is stopped by the engagement of the catch G with the notch F in the key-shaft. The above-described circuit through the electric call is thus opened and the bell stops ringing; but the spring-terminal still remains in contact with the end of the key-shaft.

When the persons at both instruments remove the receivers from the telephone-hooks J, the hooks are raised by the springs  $j$  and move off the contacts  $q$  and onto the contacts  $r$  and  $r'$ . This opens the circuits through the electric calls and closes the local transmitter-circuit, and also connects the terminal  $m'$  of the secondary with the telephone-hook. A circuit for talking between instruments 1 and 2 is thus established, as follows: starting from  $m'$  of the secondary coil of instrument 1, through the guides  $b b'$ , key 2, spring-terminal  $D^2$ , conductor  $S^2$ , telephone-hook J, contact  $r$ , to and through the secondary coil of instrument 2, thence through its telephone-receiver O to the return-conductor T, through the receiver O in instrument 1, and thence to the other terminal  $m^2$  of the secondary coil in instrument 1, from which the circuit was first traced. When the conversation is finished and the receivers are hung upon their hooks, the consequent depression of the hooks causes the pawl on each hook to turn the trip-lever and thus raises the lower end H of the lever. The lower end of the lever in turn lifts the catch G out of the notch in the key 2 with which it had been engaged. The key is thus released and returned to its normal position by the action of the spiral spring  $C'$ . At the same time the spring-terminal  $D^2$  resumes its normal position against the insulating-bar  $d$  and out of contact with the key. The depression of the telephone-hook also opens the circuits through the contacts  $r r'$  and reestablishes the circuit through the electric call.

I claim as my invention—

1. A telephone system comprising telephone instruments included in circuits between a return-conductor and a set of spring-terminals, each instrument being connected to a separate spring-terminal; a generator of elec-

tricity, one pole of which is connected with the return-conductor and the other pole with a bar-terminal in open-circuit relation with the set of spring-terminals; and a telephone instrument included in a circuit between the return-conductor and a set of normally open circuit-closing keys, having a separate key for each spring-terminal of the set, the spring-terminals being so located that a key when moved from its normal position closes successively the circuits between the said key and a spring-terminal of the set and between the said spring-terminal and the bar-terminal which is connected with the generator of electricity, and electric calls in circuits which are normally open between the bar-terminals and the spring-terminals.

2. In a telephone system, the combination of movable keys provided with springs whose tension keeps them in their normal position; spring-terminals, one located in the path of each key which is normally out of contact with the said terminal; a bar-terminal crossing the paths of the spring-terminals; a catch which engages with the keys when they are in contact with the spring-terminals and the spring-terminals are not in contact with the bar-terminal; means for disengaging the catch from the keys; a telephone instrument in circuit with the keys and a return-conductor; other telephone instruments in circuit with the return-conductor and the spring-terminals, each instrument being connected to one of the terminals; and an electric generator, one pole of which is connected electrically with the return-conductor and the other pole with the bar-terminal, and electric calls in circuits which are normally open between the bar-terminal and the spring-terminals.

3. In a telephone system, the combination of movable keys provided with springs whose tension keeps them in their normal position; spring-terminals, one located in the path of each key which is normally out of contact with the said terminal; a bar-terminal crossing the paths of the spring-terminals; a catch which engages with the keys when they are in contact with the spring-terminals and the spring-terminals are not in contact with the bar-terminals; a lever connected with a telephone-hook and adapted to disengage the catch from the keys when the hook is depressed; a telephone instrument in circuit with the keys and a return-conductor whose telephone-hook operates the lever for disengaging the said catch from the said keys; other telephone instruments in circuit with the return-conductor and the spring-terminals, each instrument being connected to one of the terminals and an electric generator, one pole of which is connected electrically with the return-conductor and the other pole with the bar-terminal, and electric calls in circuits which are normally open between the bar-terminal and the spring-terminals.

4. In a telephone system, the combination



of telephone instruments, included in circuits between a return-conductor and a set of spring-terminals, each instrument being connected to a separate spring-terminal; a generator of electricity, one pole of which is connected with the return-conductor and the other pole with a bar-terminal in open-circuit relation with the set of spring-terminals; a telephone instrument included in the circuit between the return-conductor and a set of normally open circuit-closing keys provided with springs which tend to keep them in their normal positions and having a separate key for each spring-terminal of the set, the spring-terminals being so located that a key when moved from its normal position closes successively the circuits between the said key and a spring-terminal of the set and between the said spring-terminal and the bar-terminal which is connected with the generator of electricity; and a catch adapted to engage with and retain any key which is moved into the position in which it closes the circuit between itself and a spring-terminal of the set, and electric calls in circuits which are normally open between the bar-terminal and the spring-terminals.

5. In a telephone system the combination of telephone instruments included in circuit between a return-conductor and a set of spring-terminals, each instrument being connected to a separate spring-terminal; a generator of electricity, one pole of which is connected with the return-conductor and the other pole with a bar-terminal in open-circuit relation with the set of spring-terminals; a telephone instrument included in a circuit between the return-conductor and a set of normally open circuit-closing keys provided with springs which tend to keep them in their normal positions and having a separate key for each spring-terminal of the set, the spring-terminals being so located that a key when moved from its normal position closes successively the circuits between the said key and a spring-terminal of the set and between the said spring-terminal and the bar-terminal which is connected with the generator of electricity; a catch adapted to engage with and retain any key that is moved into the position in which it closes the circuit between itself and a spring-terminal of the set; and means for automatically disengaging the catch from the keys after a conversation is finished consisting of a movable hook and a lever whereby the movement of the hook when the receiver of the telephone in circuit with the keys is placed thereon moves the catch out of engagement with the keys, and electric calls in circuits which are normally open between the bar-terminal and the spring-terminals.

6. In a telephone system, the combination of movable keys provided with springs whose tension keeps them in their normal position; terminals, one located in the path of each key which is normally out of contact with the said terminal; a catch which engages with the

keys when they are moved into contact with the terminals; a pivoted lever adapted to disengage the catch from the keys when caused to turn on its pivot; a telephone instrument having a pawl on its hook which, when the hook is depressed, engages unyieldingly with the lever and causes it to turn and when the hook is elevated engages yieldingly therewith, the said instrument being in circuit with the keys and a return-conductor; and other telephone instruments in circuit with the return-conductor and the terminals, each instrument being connected to one of the terminals.

7. In a telephone system, the combination of sliding keys, provided with springs whose tension keeps them in their normal position and having shafts with notches therein, the shafts beyond the notches being tapered; terminals, each in circuit with a separate telephone instrument and located in the path of one of the keys which is normally out of contact with the said terminal; a pivoted catch whose free side rests normally upon the tapered parts of the shafts, but which engages with the notches when the keys are moved so that the shafts are in contact with the terminals; a pivoted lever having an upper and a lower arm; the lower arm being under the free side of the catch and the upper arm being provided with a projection; and a telephone instrument having a telephone-hook with a pawl thereon which, when the hook is depressed, engages unyieldingly with the projection and pushes the upper arm of the lever to one side and, when the hook is elevated, engages yieldingly therewith.

8. In a telephone system, the combination of movable keys; spring-terminals, one located in the path of each key and normally in open-circuit relation therewith; means for keeping the spring-terminals in alinement consisting of an insulating-bar located between the keys and the said terminals; a telephone instrument included in a circuit between the keys and a return-conductor; and other telephone instruments included in circuits between the return-conductor and the spring-terminals, each telephone being connected to a separate terminal.

9. In a telephone system, the combination of movable keys; spring-terminals, one located in the path of each key; a bar-terminal crossing the paths of the spring-terminals; a telephone instrument in circuit with the keys and a return-conductor; other telephone instruments in circuit with the return-conductor and the spring-terminals, each instrument being connected to one of the terminals and having an electric call in its circuit; and an electric generator, one pole of which is electrically connected with the return-conductor and the other pole with the bar-terminal.

10. In a telephone system of any number of stations and having an electric call and telephone at each station, electric generators for the electric circuits of the calls and tele-



phones, spring-terminals at each station, and a bar-terminal in the path of the spring-terminals for closing the circuits of the electric calls, when the springs are brought in contact with the bar, and key-terminals movable to and from the spring-terminals, the said keys and springs being in circuit with the telephones, and circuit-closers governed by the telephones for opening and closing the circuits thereof.

11. In a telephone system of several stations, a switchboard at each station both for calling another station and effecting telephonic communication therewith, consisting of terminals movable to and fro, spring-ter-

minals in the paths thereof, a single bar-terminal in the paths of all the springs, a single catch, so located as to retain any key on its return movement in contact with one of the springs after the latter has left contact with the bar, a device controlled by the telephone, for tripping the catch, for the purpose as set forth, of permitting the key to return to its normal position, and a circuit-closer controlled by the telephone for closing the circuit thereof.

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