

No. 665,874.

Patented Jan. 15, 1901.

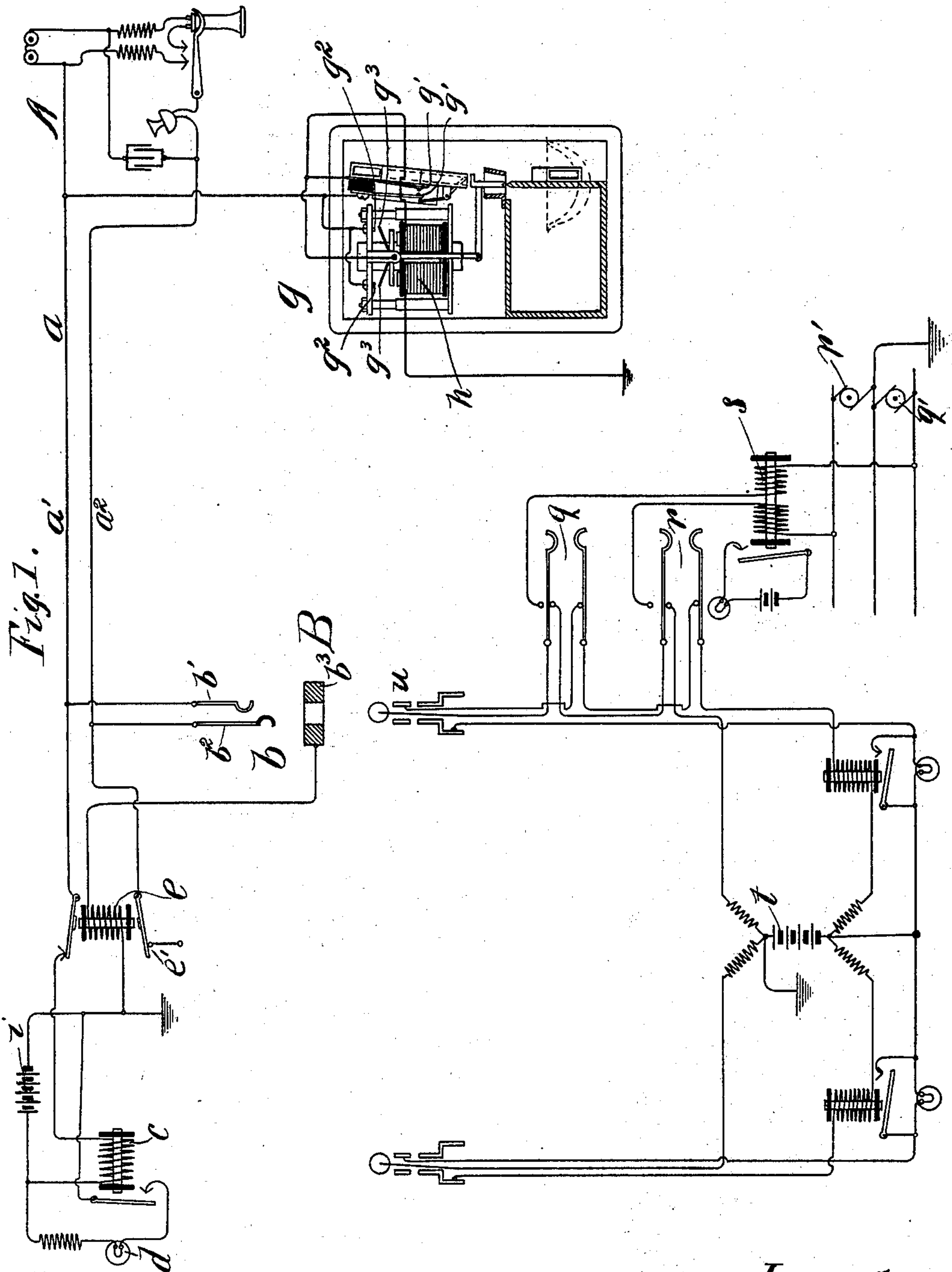
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APPARATUS FOR TELEPHONE TOLL LINES.

(Application filed June 7, 1899.)

(No Model.)

2 Sheets—Sheet 1.



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2 Sheets—Sheet 2.

Fig. 2.

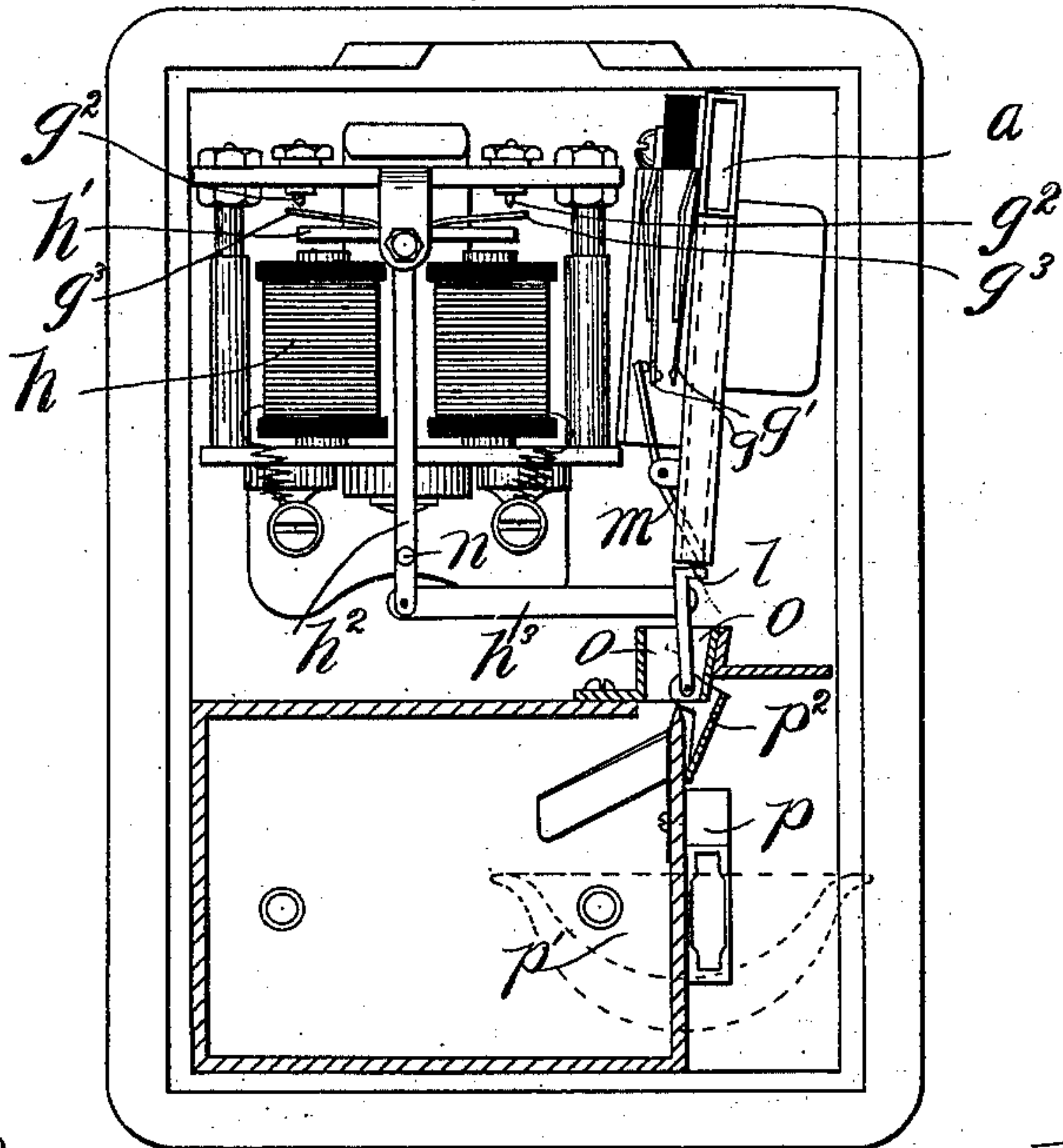
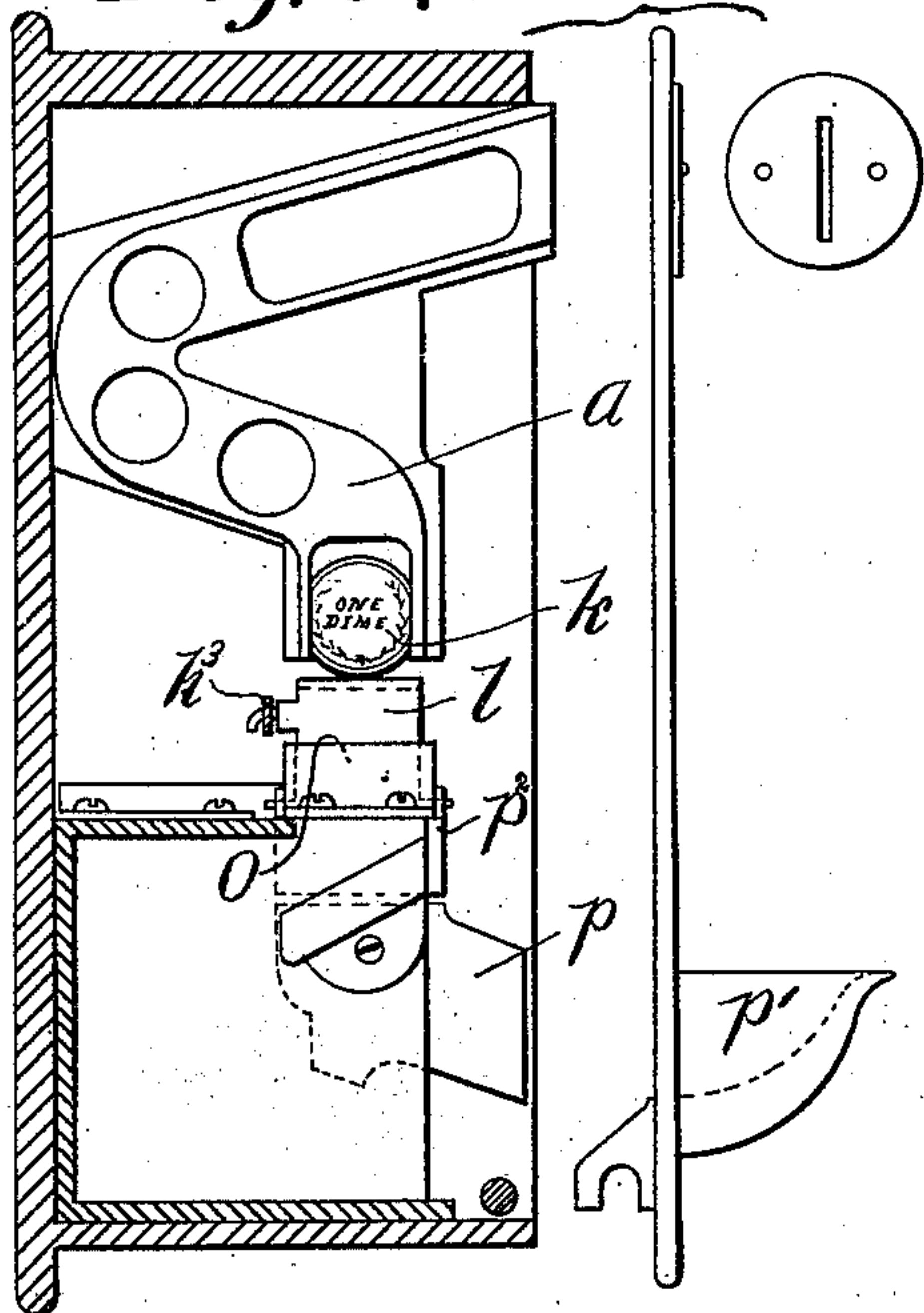
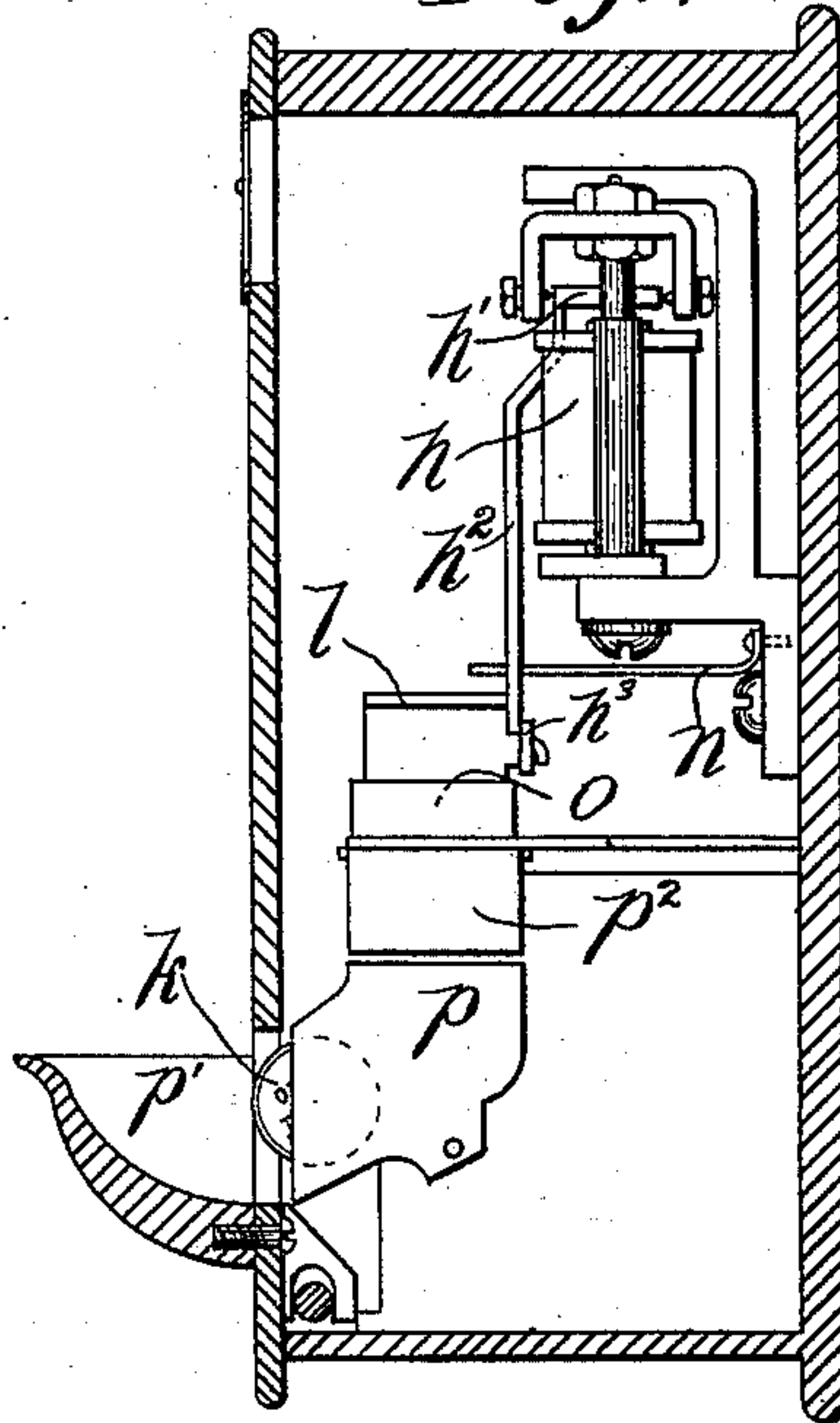


Fig. 3.



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Fig. 4.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR TELEPHONE TOLL-LINES.

SPECIFICATION forming part of Letters Patent No. 665,874, dated January 15, 1901.

Application filed June 7, 1899. Serial No. 719,641. (No model.)

To all whom it may concern:

Be it known that I, ALBERT M. BULLARD, 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 Apparatus for Telephone Toll-Lines, (Case No. 1,) of which the following is a full, clear, concise, and exact description.

My invention relates to a coin-controlled toll-collection appliance for telephones and circuits therefor; and its object is to provide simple mechanism for permitting the subscriber to signal the central office upon depositing a coin and for permitting the central office to control the disposition of the coin without aid from the subscriber, and, further, to enable the central office to signal and converse with the subscriber's station without requiring the deposit of a coin.

Telephone-toll-station devices of the class requiring the deposit of a coin at the subscriber's station before the central office can be signaled ordinarily have two functions—namely, to drop the coin into the cash-box or to return it to the outside of the box, the disposal of the coin usually depending upon whether or not the desired telephonic connection can be obtained. Heretofore in devices of this character the telephone operator has complete control of only one of these two functions, usually that of putting money in the cash-box. To perform the other function, the coöperation of the subscriber must be had. He is asked either to hang up his telephone-receiver at a given moment or to press a plunger, lever, or both, or to combine these acts, or to assist in various other ways. In such devices use is frequently made of a simple electromagnet to accomplish one function, the energization of such electromagnet being controlled from the central office. For obvious reasons any toll-collecting contrivance whose operation can be made independent of assistance from the public is superior to one that cannot, and the less complex this contrivance can be made the better. Such a mechanism forms the subject-matter of this invention. I employ a polarized electromagnet whose armature is normally maintained in a central position, but which is adapted to

tilt to one side or the other, according to the direction in which electric current flows through the coils. The tilting armature of this polarized electromagnet is connected with simple mechanism, whereby its movement in one direction will serve to direct a coin which has been deposited into the cash-box, while a movement in the opposite direction will cause the coin to take a passage-way leading into a return-cup on the outside of the box. At the central station I provide means whereby the operator may impress upon the line of the subscriber electric current of the proper sign to throw the armature of the polarized electromagnet to one side or the other, as may be desired.

I will describe the apparatus and circuits of my invention more particularly by reference to the accompanying drawings, wherein—

Figure 1 is a diagrammatic view illustrating by means of conventional symbols the apparatus at a subscriber's station and the apparatus at the central office, together with the telephone-line circuit. Fig. 2 is a front elevation of the toll-box at the subscriber's station, the cover being removed to show the parts within. Fig. 3 is a vertical sectional view showing the cover removed a little distance for clearness, and Fig. 4 is a vertical sectional view looking in the opposite direction.

Similar letters of reference are used to designate the same parts wherever they are shown.

Referring to Fig. 1, a telephone-line a , consisting of two branches a' a^2 , extends from the subscriber's station A to the switchboard B at the central office of the exchange, the branches a' a^2 of the telephone-line terminating in line-springs b' b^2 , respectively, of the spring-jack b . The switchboard in connection with which I have chosen to illustrate my invention is of the type known to telephone engineers as a "relay-board"—that is, a board where a line-relay is associated with each subscriber's line—and is adapted to be actuated by the operation of certain apparatus at the subscriber's station, this relay when energized serving to close a local circuit containing an incandescent lamp d or other indicator. A cut-off relay e is also associated

with the subscriber's line and is adapted, when actuated, to remove the line-relay and indicator from circuit. This cut-off relay is included in a circuit from ground, terminating in the test-ring b^3 of the subscriber's spring-jack, so that when the usual plug whose sleeve-contact is connected with the ground-battery is inserted in the spring-jack the cut-off relay will be energized. At the subscriber's station the branch a^2 of the telephone-line terminates in the usual switch-hook, which is adapted to close circuit with the other branch, a' , of such line through the telephone instruments when the receiving-telephone is removed from its hook. A high-resistance signal-bell is connected in a bridge-circuit including a condenser across the two branches a' a^2 of the telephone-line.

The above general description of the telephone system illustrated in Fig. 1 will be sufficient, I believe, to enable one skilled in the art easily to understand its ordinary mode of operation and will serve as an introduction to the description of the apparatus and circuits I have added and modified to accomplish the functions hereinbefore specified.

The branch a' of the telephone-line is connected at the subscriber's station with a grounded branch circuit g , which includes the helices of the polarized electromagnet h , and is normally open, being controlled by the contact-springs $g' g'$. The engagement of these two contact-springs with one another to close the circuit to ground is controlled by the deposit of a coin in the manner which I will hereinafter describe, and at the central office the branch a' of the telephone-line with which the ground branch g is associated is connected to a grounded battery i through the coils of the line-relay c and the back contact of the cut-off relay e . It will be understood, then, that the closing of the branch circuit g at the subscriber's station through the contact-springs $g' g'$ by the deposit of a coin will complete the circuit of the grounded battery i through the line-relay, and thereby cause the signal-lamp d to be lighted, thus notifying the operator that subscriber A desires a connection.

Referring to Figs. 2, 3, and 4, a coin-chute a , equipped with the usual means for rejecting undersized coins, is adapted to conduct the coin k downward to a point where it is stopped by the valve or shutter l . The coin resting here presses against one end of the rocking lever m , the other end whereof engages one of the springs $g' g'$ and presses it against its mate, thereby completing the circuit to signal the central office, as above described. The valve l is pivoted at its lower edge, so that it may be rocked in either of two directions. The movement of the valve is controlled by the polarized electromagnet h , the armature h' of said magnet being provided with an extension or arm h^2 , which is connected with the valve by means of link h^3 . A centralizing-spring n is fastened at one

end of the box, and the other end engages with the arm h^2 , passing through a hole therein, so that the said arm h^2 and armature-lever h' are normally held in a central position. Normally then the parts are in the position illustrated in Fig. 2, the valve being interposed in the path of the coin. Referring to Fig. 2, it will be seen that if the armature of the polarized electromagnet is tilted in a contra-clockwise direction the valve l will be tilted to the right, so that it no longer prevents the coin from falling, but guides it into the passage-way o , leading into the cash-box. Should the armature be tilted in a clockwise direction, the valve will be moved to the left, guiding the coin into the passage-way o , which leads to the return-chute p , so that the coin rolls into the return-cup p' , from which it may be taken out by the subscriber. A swinging guard p^2 is provided in connection with the return-chute for the purpose of preventing the insertion of a wire through the return-chute or other fraudulent interferences with the mechanism. I preferably make the polarized electromagnet in the form illustrated, which is very similar to that ordinarily used for polarized signal-bells—that is, a U-shaped electromagnet-core attached to one pole-piece of a C-shaped permanent steel magnet; but it is evident that any other form of polarized electromagnet may be used for the same purpose. At the central office the tip-strand of the answering-plug u is connected with two keys $q r$, one of which is adapted to connect the tip-strand with a grounded generator q' , whereby direct current at one hundred and ten volts and positive in sign may be impressed upon the circuit. The coils of the polarized electromagnet h at the subscriber's station are so wound that when positive current is sent out from the central station the armature will be tilted in a direction to guide the coin into the cash-box. The other key r is connected with the generator r' , so that when this key is depressed direct current of negative sign at a pressure of one hundred and ten volts will be connected with the line of the subscriber and so with the polarized magnet, so that the armature of the latter is tilted in a direction to guide the coin into the passage-way o , and so through the return-chute to the cup on the outside of the box. A relay s , having two windings, is preferably provided at the central office, one winding being included in the circuit from generator q' and the other winding included in the circuit from generator r' . This relay may control a local circuit including a signal-lamp, so that when either key is operated the lamp will be lighted. The operator on seeing this signal-lamp lighted may thus be reasonably certain that circuit has been completed through the polarized magnet h and the coin properly disposed of. Two contacts $g^2 g^2$ are preferably provided, one at either side of the armature h , and the armature carries contact-springs $g^3 g^3$, which are adapted to make contact with

the said contact-points when the armature is tilted to one side or the other. A shunt-circuit is established about the contact-springs $g' g'$, this shunt-circuit being controlled by the contacts $g^2 g^2$. The object of this is to permit the current to flow from branch g through the coils of the polarized electromagnet to ground after contact has been broken between the springs $g' g'$ by the falling of the coin. Otherwise the armature would snap back too suddenly as soon as the coin fell a sufficient distance to break the contact between springs $g' g'$ and would be liable to throw the coin to one side. The centralized battery t , which is included between the strands of the cord-circuit at the central office to supply current for talking purposes, is preferably adapted to supply current at a pressure of twenty-four volts. This, of course, will be insufficient to energize the polarized magnet h , since the latter is wound to respond to current having an electromotive force of one hundred and ten volts, so that no interference will be liable from the talking-battery.

The operation of the device is as follows: When the subscriber at substation A desires a connection, he is compelled to deposit a coin before he can signal the central office. Upon doing so the coin closes the circuit of the grounded branch g by making contact between springs $g' g'$, so that current from the grounded battery i flows through the line-relay out over the branch a' of the telephone-line through the conductor g and coils of the polarized magnet h to ground. Current from this battery, while insufficient to affect the polarized magnet at the subscriber's station, is strong enough to energize the line-relay c , which closes its local circuit and causes lamp d to light. The operator, observing the signal, inserts her answering-plug u into the spring-jack b and makes the desired connection in the usual manner. If the called subscriber is busy or if for any reason the desired connection cannot be obtained, the operator depresses the refund-key r , sending out negative current at a pressure of one hundred and ten volts, which energizes the polarized magnet h , as above described, and returns the coin. Otherwise the operator depresses the other key q , sending out positive one-hundred-and-ten-volt current from generator q' and causing the coin to be guided into the cash-box.

It will be observed that the circuit is wholly free from relays and permanent grounds on the line at the subscriber's station. The line-relay c , which controls the signal-lamp d , is included in the branch a' of the telephone-line and the usual ground connection is removed from the other cut-off relay-contact e' . This prevents the toll-station from signaling the exchange by simply lifting the receiver from its hook. The subscriber's station may, however, at all times be signaled from the central office, since the alternating-current signal-bell is bridged across the two branches

of the subscriber's line in the well-known manner.

My invention should not be confounded with those toll systems wherein a simple electric magnet is employed to control one disposition of the coin and wherein the assistance of the subscriber is required in pushing a button or plunger to dispose of the coin or to alter electric circuits. Neither should it be confounded with the employment, as in certain existing toll devices, of polarized signal bells or ringers of the telephone instrument, which are made to perform one of the functions required in disposing of a coin and making a connection. In the latter device the "flutter" of the armature-lever to and fro is caused to act precisely like the armature of a simple electromagnet in other devices of the same character.

Having thus described my invention, what I claim as new, and desire to secure by these Letters Patent, is—

1. The coin-distributing apparatus, consisting of a coin-chute, a valve therein adapted to be given alternative positions to direct a coin to one side or the other, a polarized electromagnet, an armature therefor adapted to tilt to one side or the other according to the character of the current flowing through the coils of said magnet, and a connection between said armature and the valve, whereby the valve is caused to direct the coin to one side or the other according to the character of the current sent through the coils of the magnet, substantially as described.

2. In a coin-actuated telephone toll device, the combination with a chute for receiving the coin, of a distributing-electromagnet and mechanism connected therewith for directing the course of the coin, a circuit including said electromagnet and terminals controlling the continuity of such circuit, the coin being adapted to close circuit between said terminals when it reaches a given position, and a shunt-circuit around said terminals, said shunt-circuit being controlled by the armature of said electromagnet, substantially as and for the purpose set forth.

3. The combination with a signaling-circuit a' including an indicating device c , of a pair of contacts $g' g'$ controlling the continuity of said signaling-circuit, a chute associated with said contacts and adapted to receive a coin, the relations of said contacts being adapted to be altered thereby to change the condition of the circuit and so to actuate the indicating device, a polarized electromagnet included in said circuit, an armature for said polarized electromagnet, means connected therewith for directing a coin to one side or the other according to the movement of said armature, and means for supplying current of either positive or negative sign to the coils of said electromagnet, substantially as set forth.

4. The combination with a telephone toll-line extending from a subscriber's station to the central office, of a coin-receiving appa-

ratus at the subscriber's station, a polarized electromagnet included in a branch circuit of said telephone-line, an armature for said polarized electromagnet, mechanism operated
 5 by said armature for directing a coin to one side or the other according to the position of said armature, and means at the central office for impressing upon the telephone-line positive and negative direct current for ener-
 10 gizing said polarized magnet and causing the same to deflect its armature to either side, substantially as described.

5. The combination with a telephone toll-line extending from a subscriber's station to
 15 the central office, of a coin-receiving apparatus at the subscriber's station, a polarized electromagnet associated with the coin-receiving apparatus and connected with the telephone-line, an armature for said polar-
 20 ized electromagnet, and mechanism operated by said armature for directing a coin to one side or the other according to the position of said armature, a signal-indicating device at the central office, contacts at the subscriber's
 25 station controlling the telephone-line circuit and adapted to be actuated by the deposit of a coin to change the electrical condition of the telephone-line and actuate said signal-indicating device, and means at the central
 30 office for impressing positive or negative direct current upon the telephone-line to influence said polarized electromagnet and cause the same to direct the coin in either of two directions, substantially as described.

35 6. The combination with a telephone toll-line extending from a subscriber's station to the central office, of a coin-receiving apparatus at the subscriber's station, a polarized electromagnet associated therewith and in-
 40 cluded in a grounded branch circuit of said telephone-line, a tilting armature for said electromagnet and mechanism operated thereby to direct a coin in either of two directions according to the movement of said armature,
 45 a grounded branch at the central office including a signal-indicator and a source of signaling-current, contacts at the subscriber's station controlling the grounded circuit in which said polarized magnet is included, said
 50 contacts being adapted to be actuated by the deposit of a coin to alter the circuit condi-

tions and thereby affect said signal-indicator, a shunt about said contacts controlled by the armature of said magnet and adapted to be
 55 closed when the armature is tilted in either direction, and means at the central office for impressing upon the telephone-line positive or negative direct current to operate said polarized electromagnet, substantially as set forth. 60

7. The combination with a telephone-line extending from a subscriber's station to the central office, of a coin-receiving apparatus at the subscriber's station, a polarized elec-
 65 tromagnet associated therewith, an armature for said electromagnet and mechanism connected therewith for directing a coin to one side or the other according to the position of said armature, a normally open branch circuit from one side of the telephone-line to ground
 70 and including the coils of said electromagnet, a grounded branch circuit of the telephone-line at the central office, including a signal-indicator and a source of signaling-current, means controlled by said coin-receiving appa-
 75 ratus for closing the branch circuit to ground through said polarized electromagnet, and means at the central office for connecting the telephone-line with a grounded source of positive or negative direct current, substantially
 80 as described.

8. In combination with a coin-actuated telephone toll device, an electric circuit normally open to ground at the subscriber's station and grounded at the central office through an in-
 85 dicator and a source of current, a coin-distributing magnet at the subscriber's station included in said circuit, means, controlled by a deposited coin, for closing said circuit to ground, thereby transmitting a signal and pro-
 90 viding a grounded connection for said magnet over which operating-current may be sent, and means at the central office for sending current from ground over said circuit to operate the magnet, substantially as set forth. 95

In witness whereof I hereunto subscribe my name this 18th day of May, A. D. 1899.

ALBERT M. BULLARD.

Witnesses:

DE WITT C. TANNER,
 GEORGE P. BARTON.