No. 828,218. PATENTED AUG. 7, 1906.

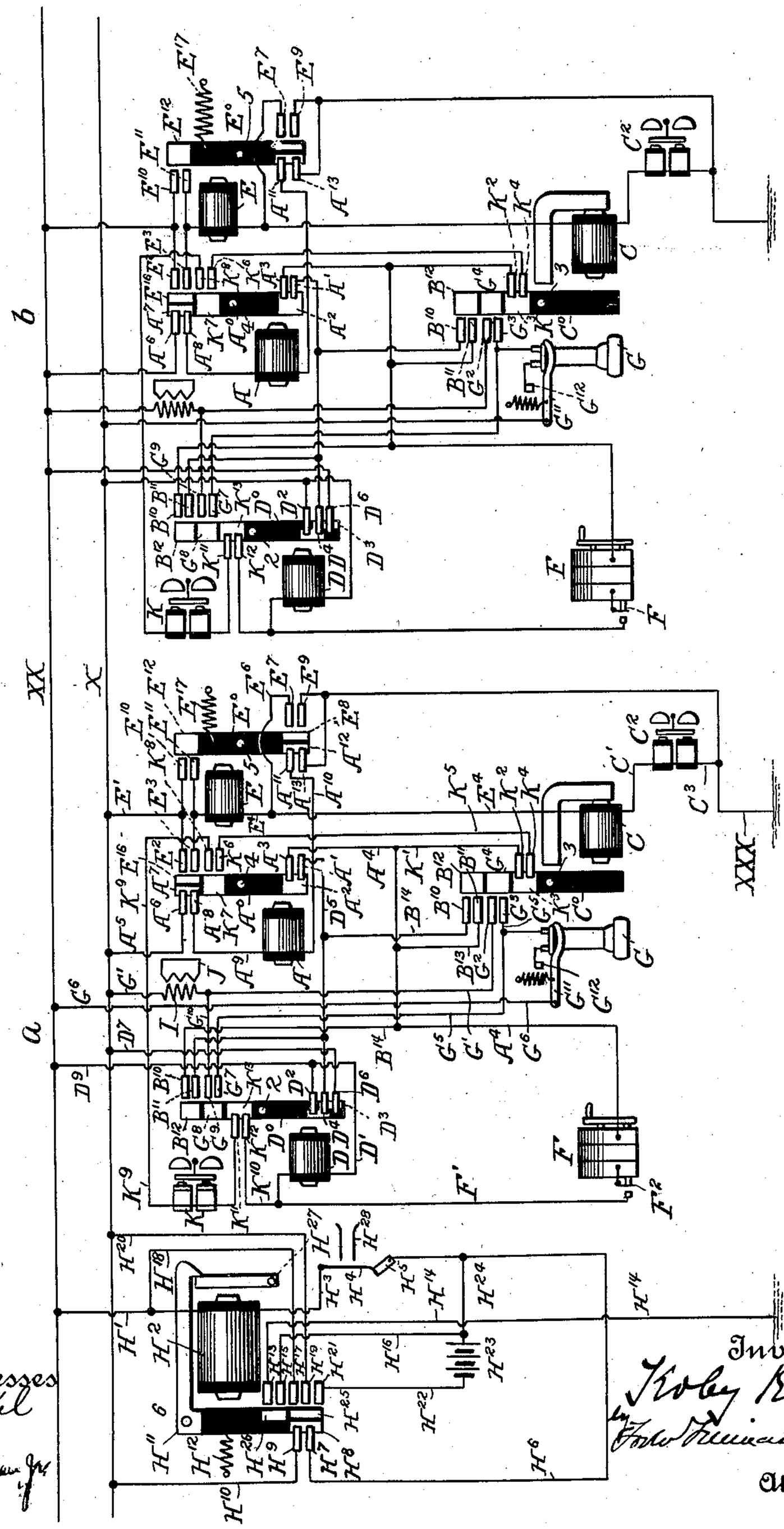
K. KOHN.

TELEPHONE APPARATUS.

APPLICATION FILED NOV. 20, 1903.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

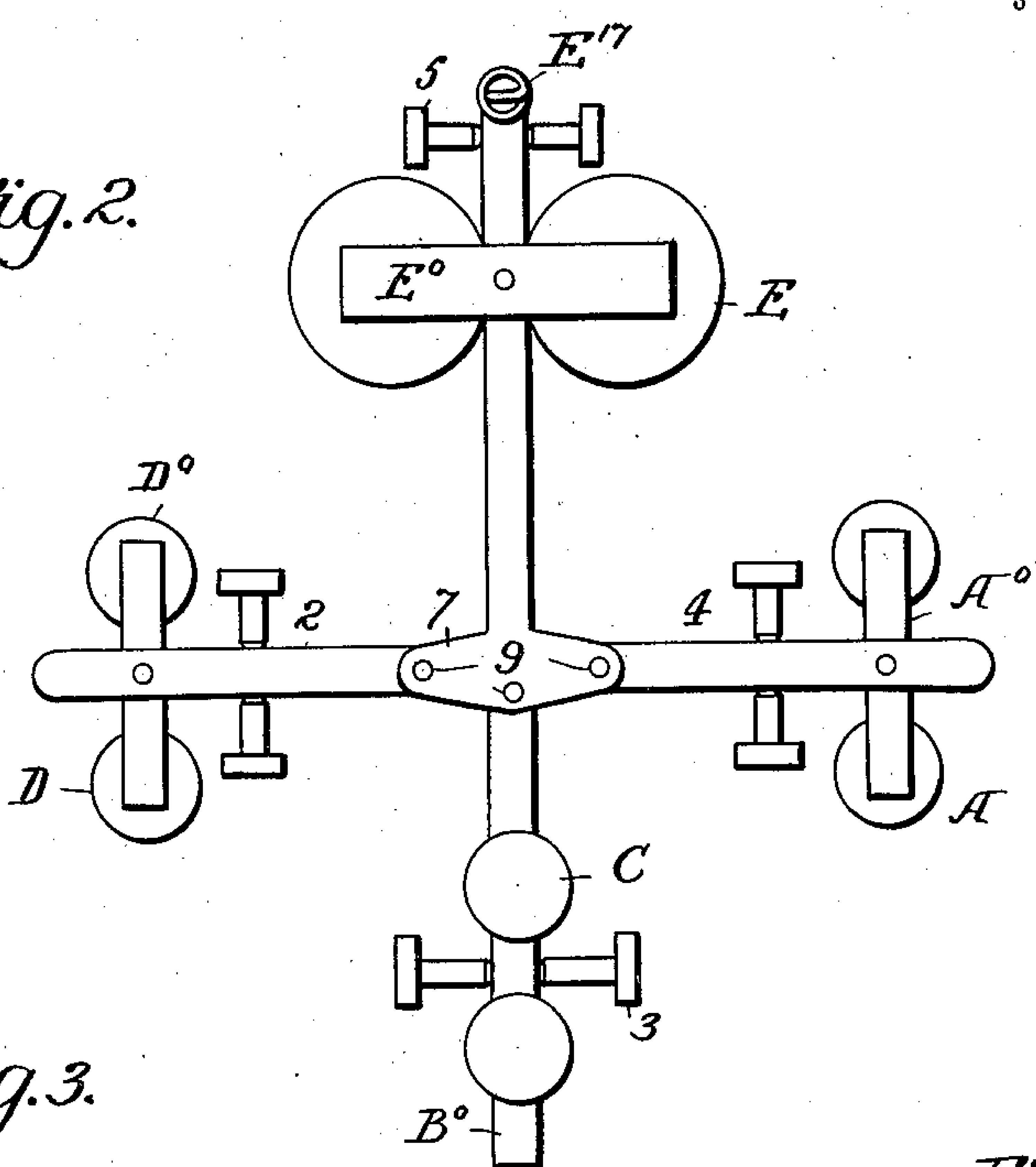


Fig. 3.

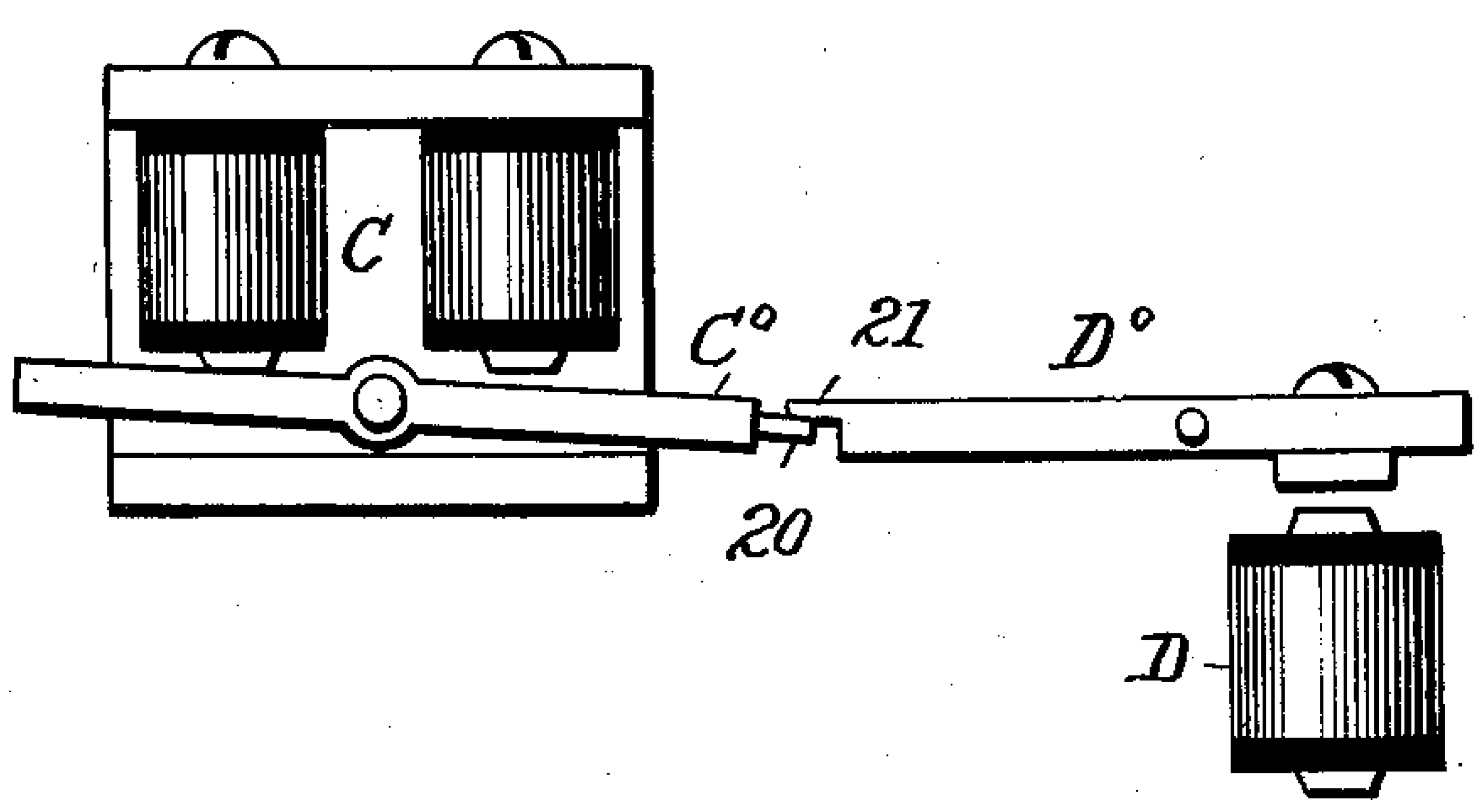


Fig. 5.

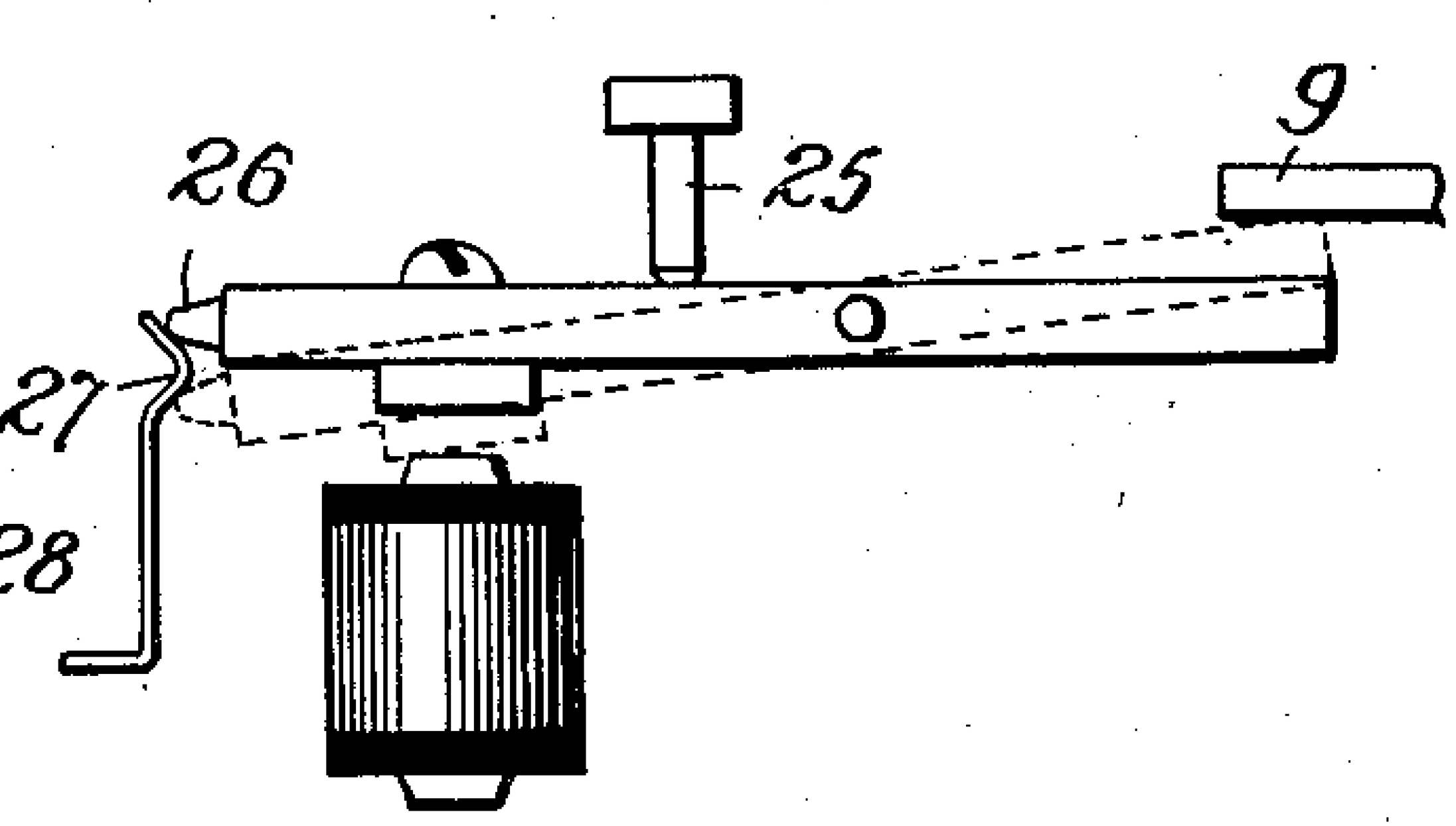
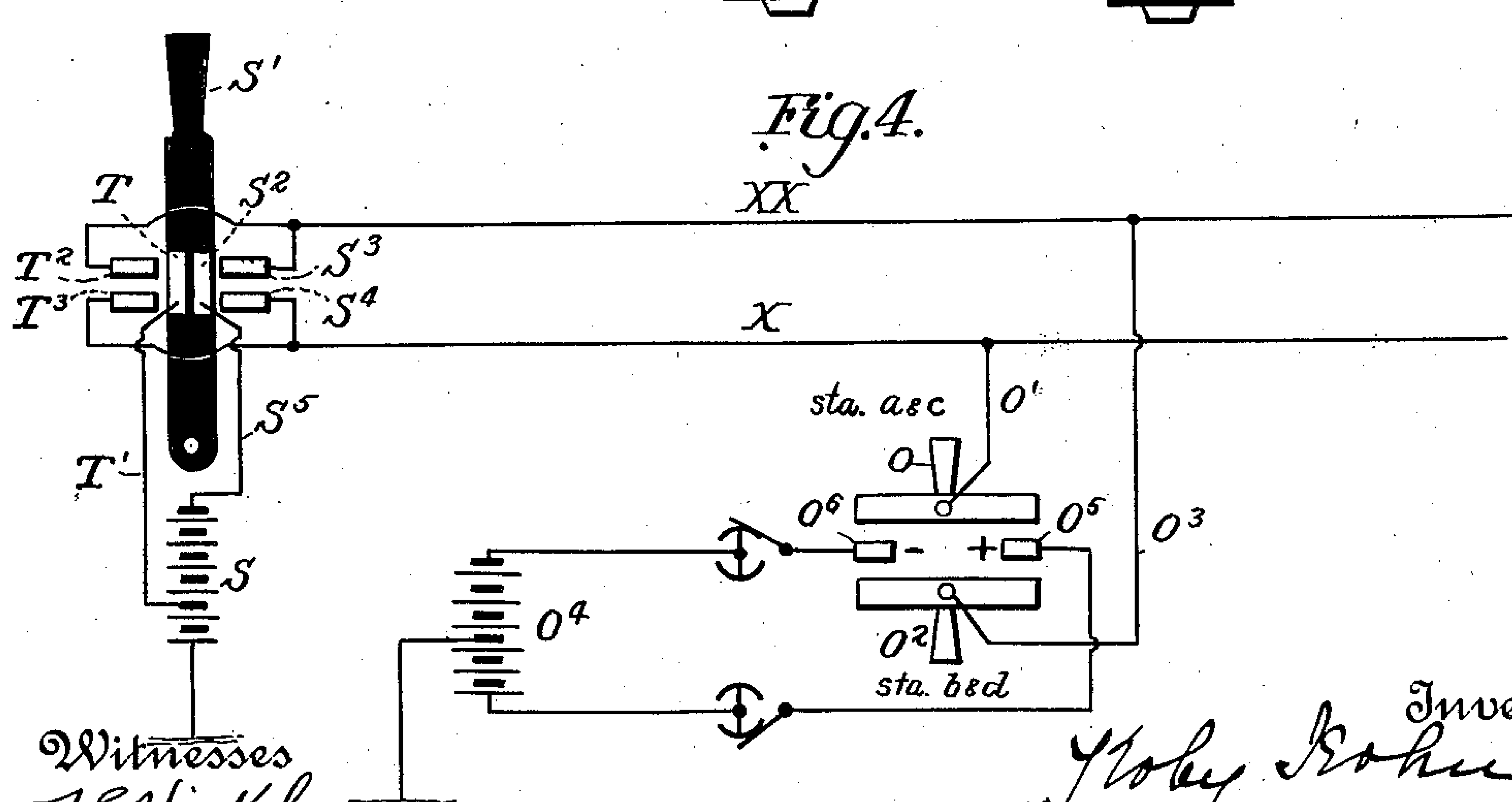


Fig. 4.



Witnesses

Inventor

Attorneys

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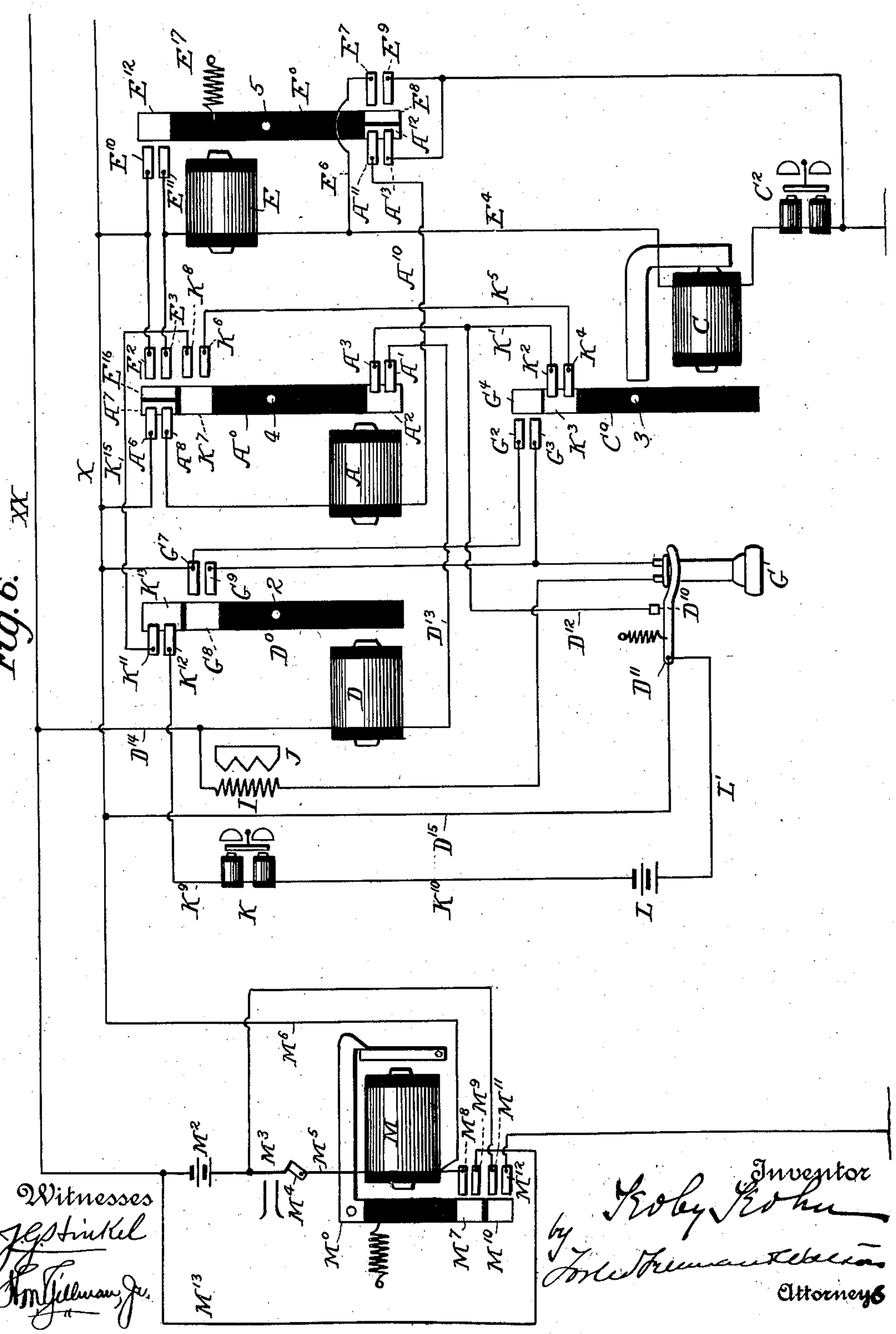
3 SHEETS—SHEET 3.

Fig. 6.



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TELEPHONE APPARATUS.

No. 828,218. Specification of Letters Patent. Patented Aug. 7, 1906.

Application filed November 20, 1903. Serial No. 181,944.

To all whom it may concern:

Be it known that I, KOBY KOHN, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Telephone Apparatus, of which the following is a specification.

This invention relates to telephone systems; and the object of the invention is to provide means whereby when one subscriber on a telephone party-line either calls central or receives a call from central all other subscribers on the line will be prevented from cutting in, thereby preventing any other subscriber on the line from overhearing the conversation or any part of it, and thus insuring absolute privacy on the line while in use.

One of the essential features of my invention is that all receivers on the party-line are in open circuits until a subscriber calls or is called, when his receiver-circuit will be closed and all other receiver-circuits on the line be prevented from being closed by the respective subscribers until the calling or called subscriber has finished the conversation and "central" has restored all parts to normal position.

The invention, which may be used with either the local-generator system or the central-energy system for calling, will be fully described hereinafter, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating my invention as used in a system employing local generators for calling central. Fig. 2 is a plan view of the armature resetting apparatus. Fig. 3 is a view showing the means for controlling the armature D^0 mechanically by the movement of armature C^0. Fig. 4 is a diagram showing the devices for sending currents over the main line-wires by the operator at central. Fig. 5 is a detail view showing means for preventing accidental movement of the armatures. Fig. 6 is a diagram illustrating my invention as used in conjunction with the central energy system.

It is to be understood that the present invention may be embodied in an apparatus which may form an attachment to telephones at present in use or it may be a part of the telephone.

In Fig. 1 I have illustrated diagrammatically the devices employed at the central office and also those for two stations *a* and *b*. It is to be understood, however, that the invention may be used with four stations, of which two will be connected to the line-wires the same as *a* and two the same as *b*.

The line-wires are indicated by X and XX, and F is a generator of any known style, one of such generators being at each station, and when the generator is not in use its armature is cut out at F^2, which may be considered its normal condition.

In my prior application five magnets A, B, C, D, and E are employed at each station, the function of B being to close the receiver-circuit at its station after D is energized to close a circuit through B. In the present case the magnet B is dispensed with, together with the circuits necessary to energize it from D, and the magnet D is utilized to directly close the receiver-circuit at its station and break a local circuit for a bell, in addition to performing its other function of closing a circuit through central, as in the other application. By the omission of the magnet B and its circuits I am enabled to materially simplify and reduce the expense of the construction of the apparatus of the said prior application, and this is one of the principal objects of the present invention.

Referring now to Fig. 1 and assuming a subscriber desires to call central, the generator F is operated and the circuit is closed at F^2, thereby establishing a circuit as follows: from generator F to wire F′, magnet D, wire D′, brush D^2, contact D^3, brush D^4, wire D^5, brush A′, contact A^2, brush A^3, wire A^4 to the generator. This will result in energizing D and attracting its armature D^0, which results in engaging the contact G^8 with brushes G^7 and G^9, contact B^{12} with brushes B^{10} and B^{11}. Brush D^2 will be disengaged from contact D^3 and brush D^6 be engaged with it. Current from the generator will then pass to wire F′, magnet D, wire D′, wire D^9, wire XX, wire H′, magnet H^2 at central, wire H^8, spring-contact H^4, contact H^5, wire H^6, brush H^7, contact H^8, brush H^9, wire H^{10}, wire X, wire D^7, brush D^6, contact D^3, brush D^4, wire D^5, brush A′, contact A^2, brush A^3, wire A^4 to generator. The magnet H^3 will thus be energized, and its armature H^{11}, pivoted at 6, will be attracted, thereby releasing the drop H^{27} to notify central and engaging the contact H^{25} with brushes H^{17}, H^{19}, and H^{21} and the contact H^{26} with brushes H^{13} and H^{15}. It also

disengages contact H^8 from brushes H^7 and H^9, so that no current from any generator on the party-line can be again sent through central until after the armature H^{11} is restored to normal position.

The operation of the magnet H^2 results in sending current from the battery H^{23} over both lines X and XX and through the magnets A at all the stations on the line, causing their armatures to be attracted, and thus disengaging the respective contacts A^2 from their brushes A^3 and A′, and this will prevent current being sent from any generator F through its magnet D to close any other receiver-circuit on the line.

To operate the magnet A at station *a*, current will flow from the battery H^{23} to wire H^{22}, brush H^{21}, contact H^{25}, brush H^{19}, wire H^{20}, wire X, wire A^5, brush A^6, contact A^7, brush A^8, wire A^9, magnet A, wire A^{10}, brush A^{11}, contact A^{12}, brush A^{13}, wire XXX, to the ground, thence up wire H^{14} at central to brush H^{13}, contact H^{26}, brush H^{15}, wire H^{16} to battery H^{23}.

To operate magnet A at station *b*, current will flow from battery H^{23} to wire H^{22}, brush H^{21}, contact H^{25}, brush H^{17}, wire H^{18}, wire H′, wire XX, wire A^5, brush A^6, contact A^7, brush A^8, magnet A to the ground and back to battery H^{23} at central, as before described. Some of the current from battery H^{23}, which passes over wire H^{18}, will pass through magnet H^2 to wire H^3, spring-contact H^4, contact H^5, wire H^{24} to the battery H^{23}, thus keeping the magnet H^2 energized after the current from generator F has ceased, and thereby holding the armature H^{11} attracted until the circuit from battery H^{23} through said magnet is broken, as will be hereinafter described. A metallic circuit to central will also be established for the receiver at the calling-station as follows: from wire XX to wire G^6 to receiver G to wire G^5, brush G^7, contact G^8, brush G^9, wire G^{10}, wire G′ to wire X, and the calling subscriber is thus enabled to talk with central, and all the other subscribers on the line are prevented from closing their own receiver-circuits and cannot, therefore, hear any conversation that may be carried on.

In Fig. 1 I have illustrated the receiver G supported on a hook G^{11}, connected to wire G^6. The wire G^5 is directly connected to the receiver, as is also a contact G^{12}. When the receiver is removed from the hook, the latter will be drawn by its spring into engagement with the contact G^{12} and complete a circuit through the receiver from wire G^6 to wire G^5. The receiver-circuit will still be open, however, until either magnet D or magnet C is operated.

As shown, the receiver-circuits are each provided with the usual secondary induction-coil I in close proximity to the usual primary induction-coil J; but these coils form no part of the present invention and are illustrated merely to show that my invention can be applied to telephones now in use without the necessity of mutilating them in any way.

When central answers the call from the person at station *a*, a jack or plug is inserted in H^{28}, which will force the contact-spring H^4 away from H^5, thereby breaking the circuit from the battery H^{23} and deënergizing the magnet H^2, which will release its armature, and the latter will be restored to normal position by the spring H^{12}. The drop H^{27} may also be restored to its normal position, and then the operator at central may withdraw the jack from H^{28} and permit the spring-contact H^4 to engage H^5, and then the circuit from the generator F at station *a* will be complete to enable the person using the phone at such station to ring off.

We will now assume that central desires to call up station *b*. A current will first be sent over lines X and XX to energize all the magnets A and cause them to attract their armatures A^0, and thereby cause the contact E^{16} to engage brushes E^2 and E^3, and thereby establish a circuit at each station from one or the other of wires XX or X to wire E′, brush E^2, contact E^{16}, brush E^3, magnet E, wire E^4, magnet C, wire C′, bell C^2, wire C^3, wire XXX to the earth to central and then to the respective wires X or XX.

As before stated, it is intended to have four stations on the same line, and the bell C^2 at two of the stations will be connected to the wire X and at the other two stations to the wire XX. As shown at station *a*, the bell is connected to wire X and at station *b* to wire XX, and we will assume that at station *c* the connection is the same at at *a* and at *d* the same as at *b*. Now when central desires to call a station—say *b*—it is not desirable to ring up *d;* but as the current sent from central over wire XX will pass through the bell C^2 at each of these stations one of the bells—say that at *b*—will be polarized to respond to a − current and the one at *d* to a + current only. Now when the operator at central desires to call *b* a − current will be sent over wire XX, which will ring the bell at *b*, but not at *d*.

The armature C^9 of the magnet C is polarized to respond to the same current as the bell C^2, and consequently when a − current is sent through C its armature C^9 will be attracted and cause contact G^4 to engage brushes G^2 and G^3, and thereby close the receiver-circuit at station *b* as follows: from wire XX to wire G^6, receiver G, wire G^5, brush G^3, contact G^4, brush G^2, wire G′, to wire X. It will also close the generator-circuit at B^{10}, B^{11}, and B^{12}, and central can then talk with the subscriber at station *b* or put him into communication with some other person who may wish to talk to him either on the same line or another.

It will be observed that the armature E^9 of

the magnet E is held retracted by a spring E^{17} and that the armatures of the magnets A, C, and D have no springs. The function of the magnet E is to reset the armatures of magnets A, C, and D after they have been attracted, as fully described in my said prior application, and the spring E^{17} is of sufficient strength to prevent the armature E^0 being attracted when the current for operating the bell C^2 and magnet C is passing through magnet E, it requiring a stronger current to attract the armature E^0 than it does to ring the bell C^2 and operate magnet C.

In my said prior application when the armature E^0 operated to restore the armature A^0 to normal position the latter armature was moved sufficiently to close a circuit at A^6, A^7, and A^8 before the armature E^0 had fully completed its stroke, and this resulted in sending part of the current intended for E from one of the wires X or XX through magnet A direct to the ground, which energized A and tended to pull its armature against the action of armature E^0, and while this did not prevent the full operation of E^0 it necessitated a stronger current than is necessary in the present arrangement. As before described, the current through magnet A passes through brushes A^{11} and A^{13} and contact A^{12} to the ground, and the current to E passes through brushes E^2 and E^3 and contact E^{16} on armature A^0. When, therefore, armature E^0 begins to move, it mechanically operates armature A^0 and engages contact A^7 with brushes A^6 and A^8, and if contact was not broken at A^{11}, A^{12}, and A^{13} the magnet A would be energized and tend to attract its armature, and thus resist the action of E^0. The parts are therefore so arranged that substantially at the same time as contact A^7 is caused to engage brushes A^6 and A^8 contact A^{12} will disengage brushes A^{11} and A^{13}, and no current, or practically none, will pass through A, and the latter consequently will not resist the action of E^0. During the first part of the movement of E^0 the current through E will also pass through C, and this magnet will tend to resist the action of E^0; but as the latter moves it will close a circuit at E^7, E^8, and E^9 from magnet E to the ground, and magnet C and bell C^2 will thus be short-circuited, and the magnet will offer no further resistance to the action of E^0. Of course as armature A^0 is moved to normal position the circuit for magnet E will be broken at E^2, E^3, and E^{16}; but another will first have been established at E^{10}, E^{11}, and E^{12}.

The means for mechanically operating the armatures D^0, A^0, and C^0 by the armature E^0 are illustrated in Fig. 2, where it will be seen that the arm which carries armature E^0 is pivoted at 5 and extends for some distance on the opposite side of magnet E. The arms which carry the armatures D^0, A^0, and C^0 are respectively pivoted at 2, 4, and 3 and extend under an enlargement 7 on arm carrying armature E^0. When either of the armatures D^0, A^0, or C^0 is attracted, its arm will engage the enlargement 7, and then if armature E^0 is attracted the enlargement 7 will press on such arms as have been moved into engagement with it and restore their armatures to normal position. I do not, however, claim this feature broadly in the present application, as it is so claimed in my prior application.

Preferably the enlargement 7 will be provided with adjustable screws 9 to engage the arms carrying the other armatures.

It is desirable to provide some means for informing a person desiring to call when the line is busy that such is the fact, and I preferably employ an audible signal for this purpose, which is operated by a current from the generator F. As before stated, when a call is sent to central or from central all the magnets A on the line are energized and attract their armatures, thereby breaking all the generator-circuits to central at A′, A^2, and A^3 and closing a circuit at K^6, K^7, and K^8. If now a person at a station other than the one using the line should operate his generator F, a current will flow from the generator to wire F′, wire K^{10}, brush K^{12}, contact K^{13}, brush K^{11}, bell K, wire K^9, brush K^8, contact K^7, brush K^6, wire K^5, brush K^4, contact K^3, brush K^3, wire K′, wire A^4 to generator, and the bell K will ring, and thus notify the person that the line is busy. In my prior application the armature of the magnet B carried a contact equivalent to contact K^{13} on armature D^0 to engage brushes equivalent to brushes K^{11} and K^{12}, and the armature D^0 thus performs another function performed by the armature of magnet B in my said prior application.

Various means may be devised for sending the necessary currents over the wires X and XX by the operator at central, and in Fig. 4 I have shown apparatus which may be used for this purpose. Thus for sending the strongest current over the wires X and XX for energizing the magnets E, I provide a battery or other source of electrical supply S of the necessary capacity and provide a switch-lever S′, having contacts S^2 and T, insulated from each other. Brushes S^3 and S^4, adapted to be engaged by the contact S^2, are respectively connected to wires XX and X. One pole of the battery S is electrically connected by a wire S^5 to the contact S^2 and the other pole to the ground. When the switch-lever S′ is moved to engage contact S^2 with brushes S^3 and S^4, current from the battery will be sent over both line-wires XX and X through magnets E to the ground, as already described, and back to battery S. A portion of the same battery S may be utilized for energizing magnets A, which do not require so strong a current as magnets E. Thus the

contact T is electrically connected by a wire T′ with a portion only of the battery, as shown in Fig. 4. Two brushes T^2 and T^3, adapted to be engaged by contact T, are respectively connected to wires XX and X, and when switch-lever S′ is moved to engage contact T with brushes T^2 and T^3 current from a portion of battery S will flow over wires XX and X through magnets A to the ground and back to the battery S. The current for energizing magnets C and bells C^2 is preferably a continuous vibratory current, and in Fig. 4 I have shown one means for sending a current of this character over the lines X and XX. Thus the line X is connected to a pivoted switch O by a wire O′, and the line XX is connected to a similar switch O^2 by a wire O^3. A battery or other suitable generator O^4 is provided, and the positive pole thereof is connected to a contact O^5, adapted to be engaged by either of the switches O or O^2, and its negative pole is connected to a contact O^6, adapted to be engaged by either of the switches O or O^2. A commutator is provided in each connection between said contacts and the battery, and the latter is connected to the earth.

If the switch O be rocked to engage O^6, a negative current will be sent over line X through magnets C and return by the ground to battery O^4. If switch O engages O^5, a positive current will be sent over line X and return through the ground to battery O^4. By operating switch O^2 the same effects take place over wire XX.

It may sometimes happen that after the operator at central has operated a switch O or O^2 to send either a positive or a negative current over the wire XX or X, as the case may be, to energize a magnet C she may inadvertently in returning the switch to normal position move it too far and engage the other contact, in which case a current of opposite polarity would be sent over the line-wire, and this would repel the armature that had been attracted and again break the receiver-circuit at G^2, G^3, and G^4, in which case the subscriber intended to be called would be unable to talk over the line. To compensate for such accident and insure that the receiver-circuit shall be closed in any event, the arm which carries the armature C^0 is provided with an extension 20, adapted to engage a similar projection 21 on the arm carrying the armature D^0 when both armatures are in their retracted positions. (See Fig. 3.) If now the armature C^0 be attracted, it will cause the armature D^0 to move toward its magnet D mechanically, and thereby close the receiver-circuit at G^7, G^8, and G^9. It will thereafter make no difference if the armature C^0 is repelled, as stated above. The receiver-circuit will still be closed at G^7, G^8, and G^9 and the person called can talk over the line. It will be observed that the armature D^0 can be operated by its magnet D without affecting the armature C^0.

As my invention contemplates the omission of springs for returning some of the armatures to normal position, it is desirable to provide some means for preventing such armatures being accidentally moved, when not desired, by jarring or other like cause. Referring now to Fig. 5, any suitable stop (indicated by 25) may be provided for limiting the movement of the armature away from the magnet, and in order to yieldingly prevent its movement toward the magnet I provide a V-shaped projection 26 on the end of the armature-arm and also a spring 28, having a V-shaped projection 27 to engage said projection 26.

In Fig. 5 the parts are shown in normal position in full lines, and it will be seen that the armature is yieldingly held away from the magnet. When, however, the magnet is energized, the spring 28 will yield and permit the projection 26 to pass by 27 to the position indicated in dotted lines in said figure, and the reaction of the spring will through the cooperation of the inclined surfaces of the two projections tend to move the armature toward the magnet and hold it there even if the magnet has been deënergized. The springs will also aid the armature E^0 in resetting the armatures.

Referring now to Fig. 6, which is a diagrammatic view showing the apparatus at central and that at one station on a party-line in a central-energy system, it will be observed that the magnets A, C, D, and E are employed in substantially the same relations as in the system heretofore described. The generator F and its circuits are, however, omitted. In this case the removal of the receiver G from its supporting-hook D^{11} will serve to send a signal to central and automatically send a current from central through the magnet D to close the receiver-circuit. Assuming now the receiver G is removed from the hook D^{11}, the latter will be moved by its spring into engagement with a contact D^{10} and close a circuit as follows: from hook D^{11} to contact D^{10}, wire D^{12}, brush A^3, contact A^2 on armature A^0, brush A′, wire D^{13}, magnet D, wire D^{14}, main-line wire XX, through battery M^2, spring-contact M^3, contact M^4, wire M^5, magnet M, wire M^6, line-wire X, wire D^{15} to hook D^{11}. The closing of this circuit will energize magnets D and M. The magnet D will attract its armature D^0 and close its receiver-circuit at G^7, G^8, and G^9 and break the local circuit for bell K at K^{11}, K^{12}, and K^{13}.

The magnet M will attract its armature M^0 and cause the contact M^7 to engage the brushes M^8 and M^9 and the contact M^{10} to engage brushes M^{11} and M^{12}. A circuit will thus be established from battery M^2 to wire M^5, magnet M, brush M^8, contact M^7, brush M^9, wire M^{13}, to battery M^2, and the current from

the battery will keep the magnet M energized to hold its armature attracted and keep circuits closed at M^7, M^8, and M^9 and at M^{10}, M^{11}, and M^{12}, so as to absolutely insure the operation of all the magnets A on the party-line when current is sent over the lines X and XX from central to energize them, as before described in connection with Fig. 1. As soon as the magnets A attract their armatures the circuits for magnets D will be broken at A′, A^2, and A^3, and no further current can pass through these magnets from the line until the parts are restored to normal position.

As no generator is employed at the stations in the central-energy system, it is necessary to provide some means for ringing the bell K to indicate to a subscriber when the line is busy. As shown, I provide a battery L in the local circuit for the bell. When the armature A^0 is attracted, the contact K^7 will engage brushes K^6 and K^8. An open circuit with a break at D^{10} and D^{11} is then established, including the bell K and battery L, as follows: from hook D^{11} to wire L′, battery L, wire K^{10}, bell K, wire K^9, brush K^{12}, contact K^{13}, brush K^{11}, wire K^{15}, brush K^8, contact K^7, brush K^6, wire K^5, brush K^4, contact K^3, brush K^2, wire K′, wire D^{12}, and contact D^{10}. If then the receiver be removed from its hook D^{11}, the circuit will be closed between D^{10} and D^{11} and bell K will ring.

So far as sending current from central over the wires X and XX for the magnets C and E and bell C^2 the operation is the same as already described in connection with Fig. 1.

It will of course be understood that when the armature D^0 has been operated the circuit for bell K is broken at K^{11}, K^{12}, and K^{13}. The same is equally true with reference to Fig. 1, where the generator F will not ring the bell K at any station where the armature D^0 has been operated.

The brushes A′ and A^3 and contact A^2 are so arranged that the armature A^0 will nearly complete its full stroke before the circuit for magnet D is broken at this point, and the brushes G^7 and G^9 and contact G^8 are so arranged that armature D^0 will make only a small portion of its stroke before the receiver-circuit is closed at G^7, G^8, and G^9. This is essential for the perfect operation of the apparatus, since magnet D gets its current through A′, A^2, and A^3, and if the circuit was broken prematurely at this point the receiver-circuit would not be closed at G^7, G^8, and G^9.

Without limiting myself to the precise construction and arrangement shown, I claim as my invention—

1. In a telephone system for party-lines, the combination with the main-line wires leading from a central office, of a series of telephone-receivers each independently connected to the line-wires by an open electric circuit, a magnet and an armature at each station for closing the circuit of its receiver only, and means at each station under the control of a person thereat for energizing the magnet at such station to first close its own receiver-circuit, and then close a circuit at the central office for sending a current over the main-line wires to operate devices for preventing the closure of any other receiver-circuit on the line, substantially as set forth.

2. In a telephone system for party-lines, the combination with the main-line wires leading from a central office, of a series of telephone-receivers each independently connected to the line-wires by an open electric circuit, a receiver-circuit closer at each station including a magnet and an armature, a signal at the central office, and a generator at each station under the control of a person thereat for energizing the magnet at its own station only to close the receiver-circuit and also for operating the signal at the central office, and for closing a circuit at the central office for sending a current over the main-line wires to operate devices for preventing the closure of any other receiver-circuit on the line by persons at such receiver-stations, substantially as set forth.

3. In a telephone system for party-lines, the combination with the main-line wires leading from a central office, of a series of telephone-receivers each independently connected to the line-wires by an open electric circuit, a circuit-closer including a magnet and an armature at each receiver-station under the control of a person thereat for closing the receiver-circuit at such station, a circuit-closer including a magnet and an armature at each receiver-station under the control of an operator at the central office for closing the receiver-circuits at the respective stations, and means for mechanically operating the first-named armature at a station when the second-named armature at the same station is electrically operated for closing the receiver-circuit, substantially as set forth.

4. In a telephone system for party-lines, the combination with the main-line wires leading from a central office, of a series of telephone-receivers each independently connected to the line-wires by an open electric circuit, a circuit-closer including a magnet and an armature at each receiver-station under the control of a person thereat for closing the receiver-circuit at such station, a circuit-closer including a polarized magnet and an armature at each receiver-station under the control of an operator at the central office for closing the receiver-circuits at the respective stations, and means whereby the first-named magnet and armature may be operated to close the receiver-circuit without affecting the polarized armature, and when the said polarized magnet and armature are operated to close the receiver-circuit the first-named armature will be mechanic-

ally operated thereby to also close the receiver-circuit, substantially as set forth.

5. In a telephone system for party-lines, the combination with the main-line wires leading from a central office, of a series of telephone-receivers each independently connected to the line-wires by an open electric circuit, a circuit-closer including an electrically-operated armature at each station under the control of a person thereat for closing the receiver-circuit at such station, a circuit-closer including a polarized magnet and armature at each receiver-station under the control of an operator at central for closing the receiver-circuits at the respective stations, said armatures being carried by pivoted arms and the arms overlapping at adjacent ends, whereby when the polarized armature is electrically operated to close the receiver-circuit its arm will rock the arm of the other armature and cause the latter to also close the receiver-circuit, substantially as set forth.

6. In a telephone system for party-lines, the combination with the main-line wires leading from a central office, of a series of telephone-receivers each independently connected to said wires by an open electric circuit, means at each receiver-station adapted to be electrically operated by a current from the central office for preventing the closure of the respective receiver-circuits, means at each receiver-station adapted to be electrically operated for closing the receiver-circuit at its own station only, and a single magnet and armature at each receiver-station for closing its own receiver-circuit and also closing a circuit at the central office over which said current may be sent to prevent the closure of the other receiver-circuits on the line by persons at such receiver-stations, substantially as set forth.

7. In a telephone system for party-lines, the combination with the main-line wires leading from a central office, of a series of telephone-receivers each independently connected to said wires by an open electric circuit, a generator at each receiver-station, a magnet at each station in the normal circuit of the generator and operating when energized by the generator to close the receiver-circuit at its station and also to close a second circuit for the generator, and another magnet at each station operating when energized by a current from the central office to break the normal circuit of the generator, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

KOBY KOHN.

Witnesses:

F. L. FREEMAN,

GEORGIA P. KRAMER.