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A. HAESNER.

ELECTRIC LOCK.

APPLICATION FILED JULY 1, 1903.

NO MODEL.

Fig. 1.

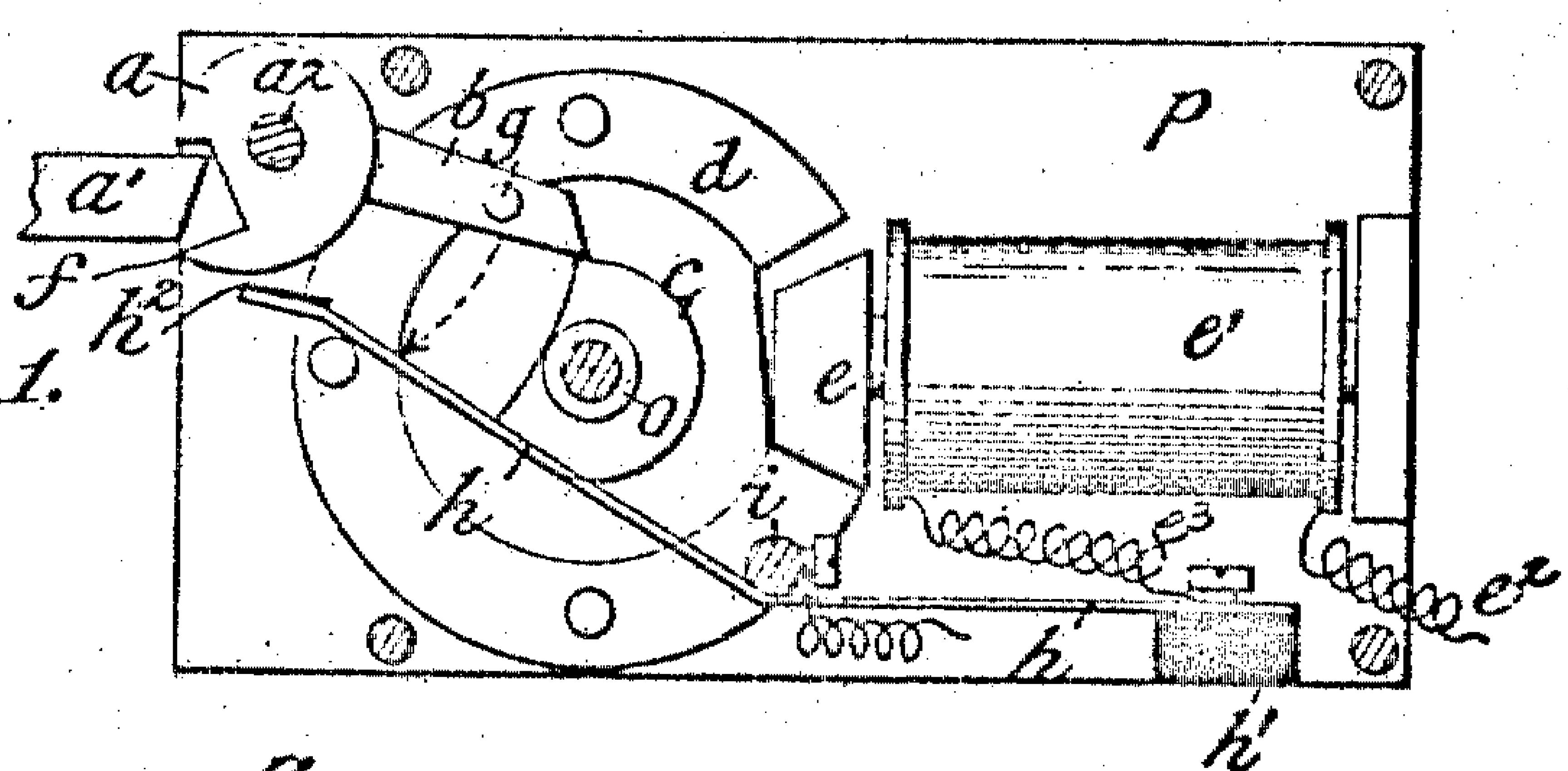


Fig. 2.

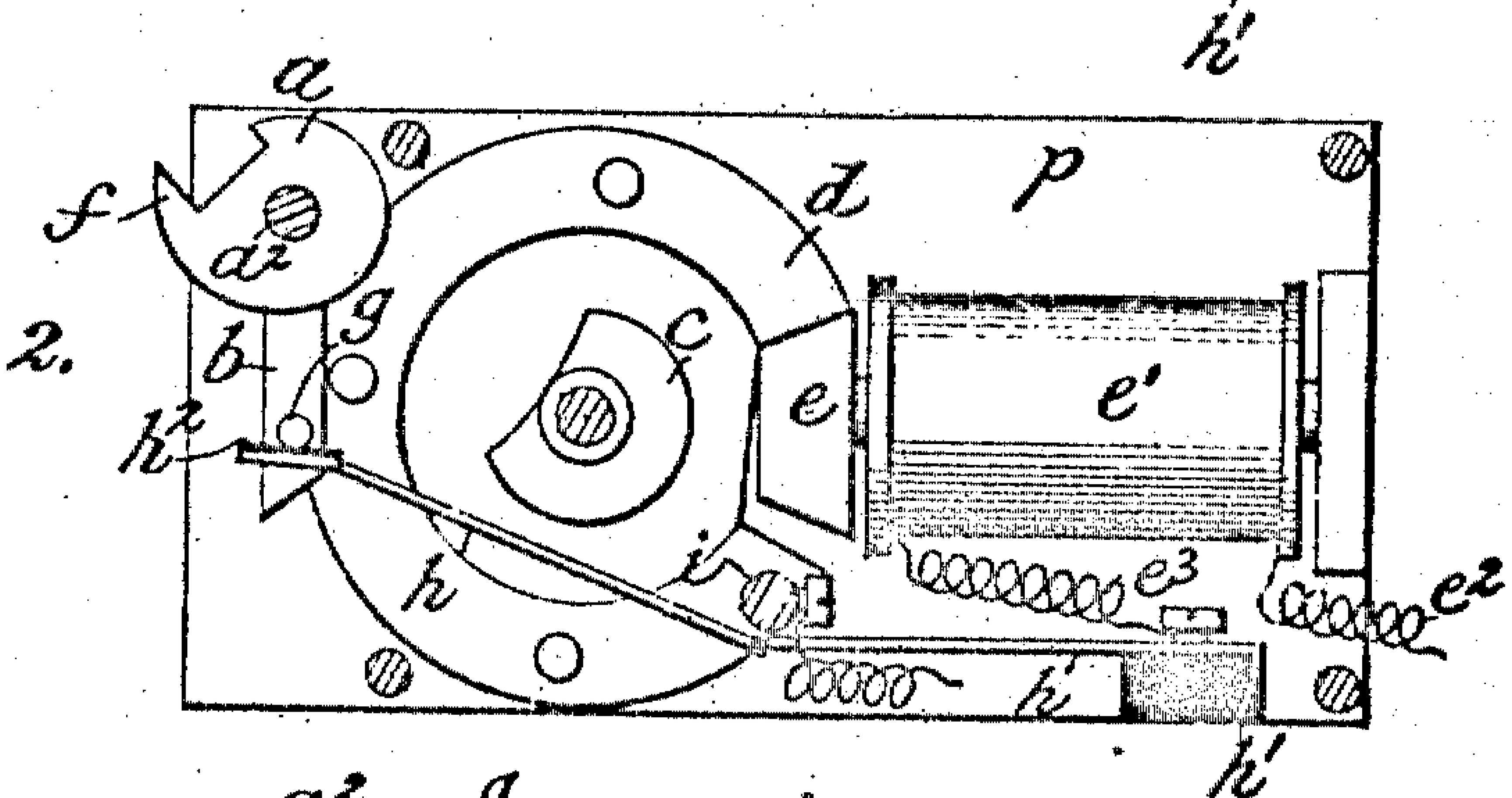


Fig. 3.

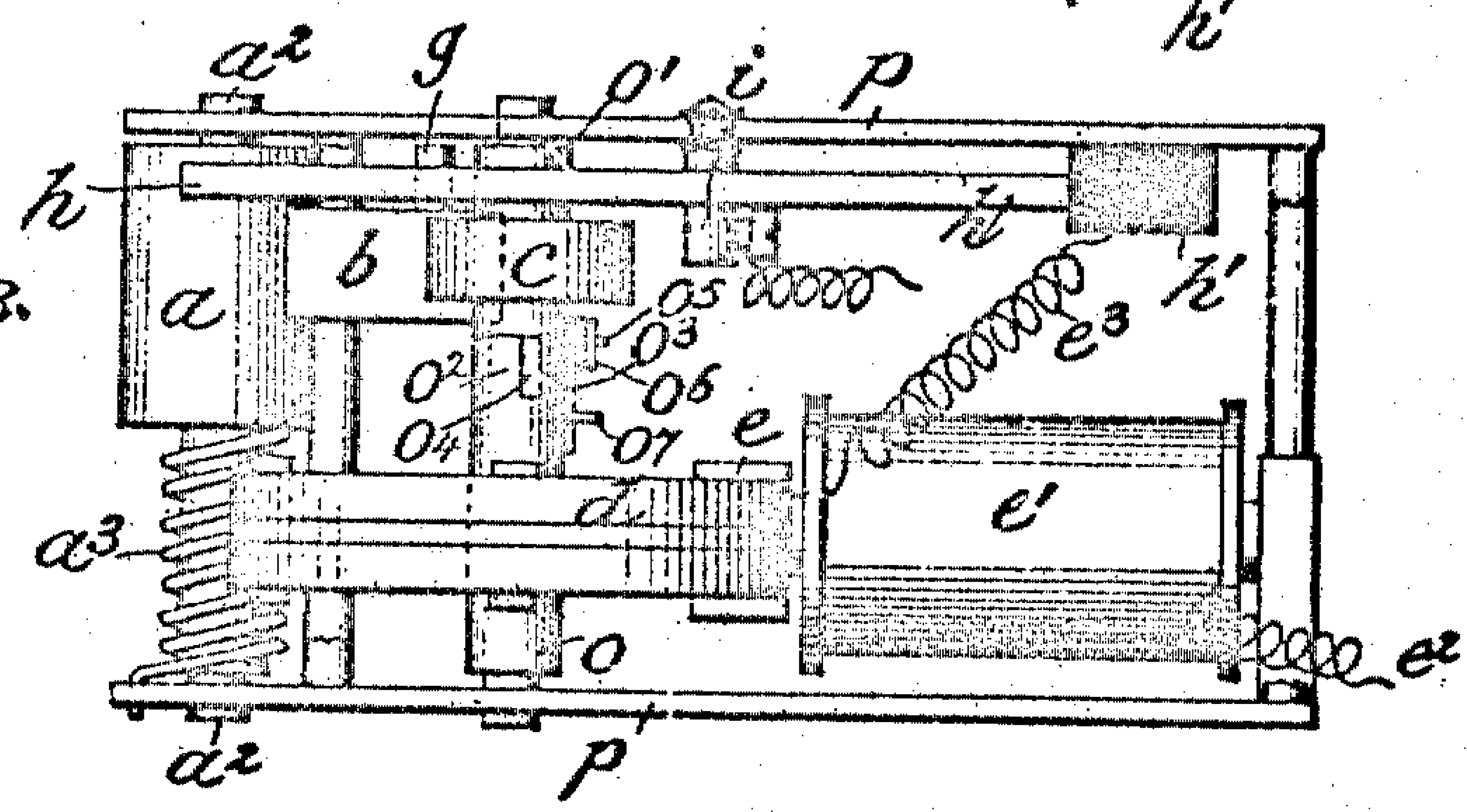


Fig. 4.

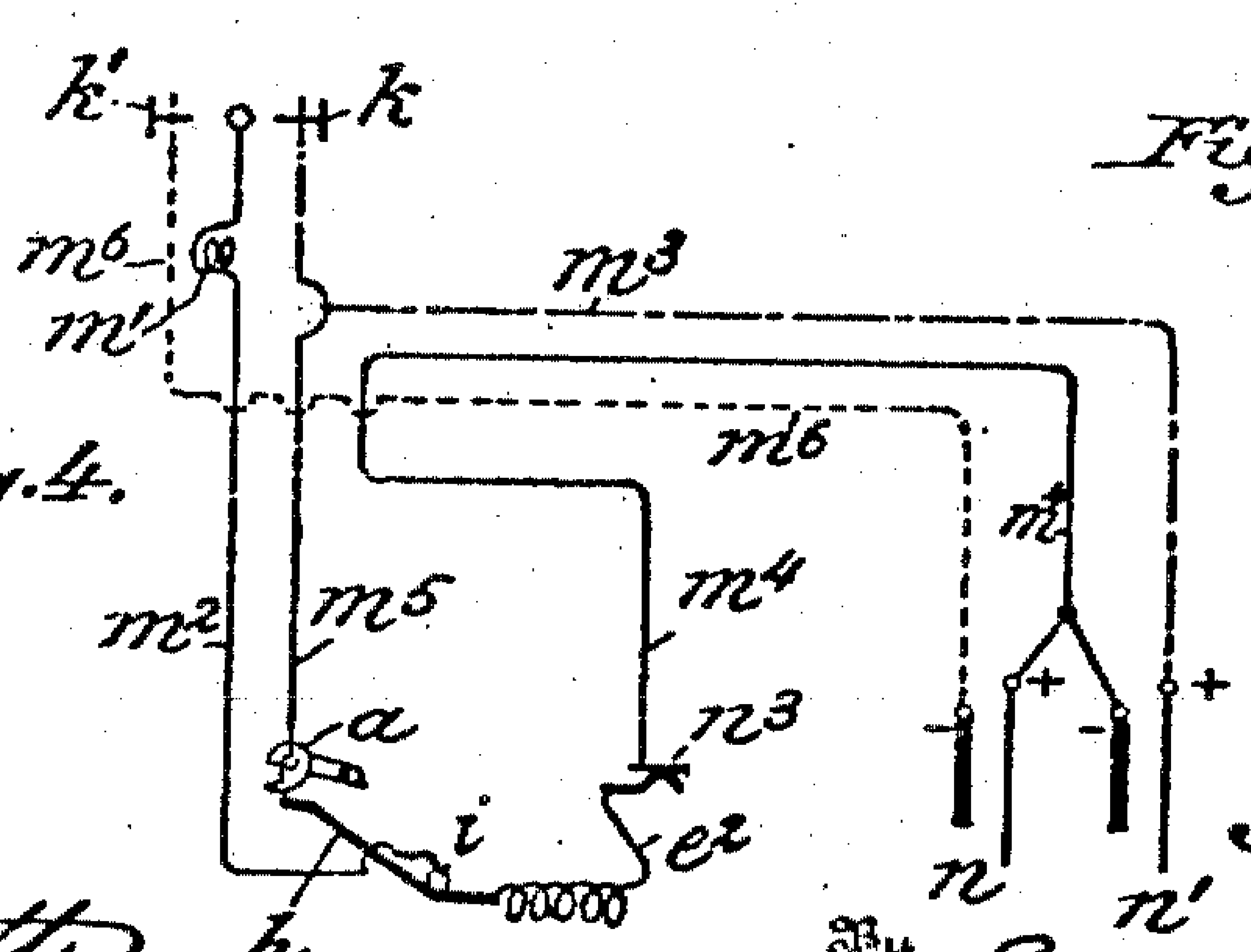
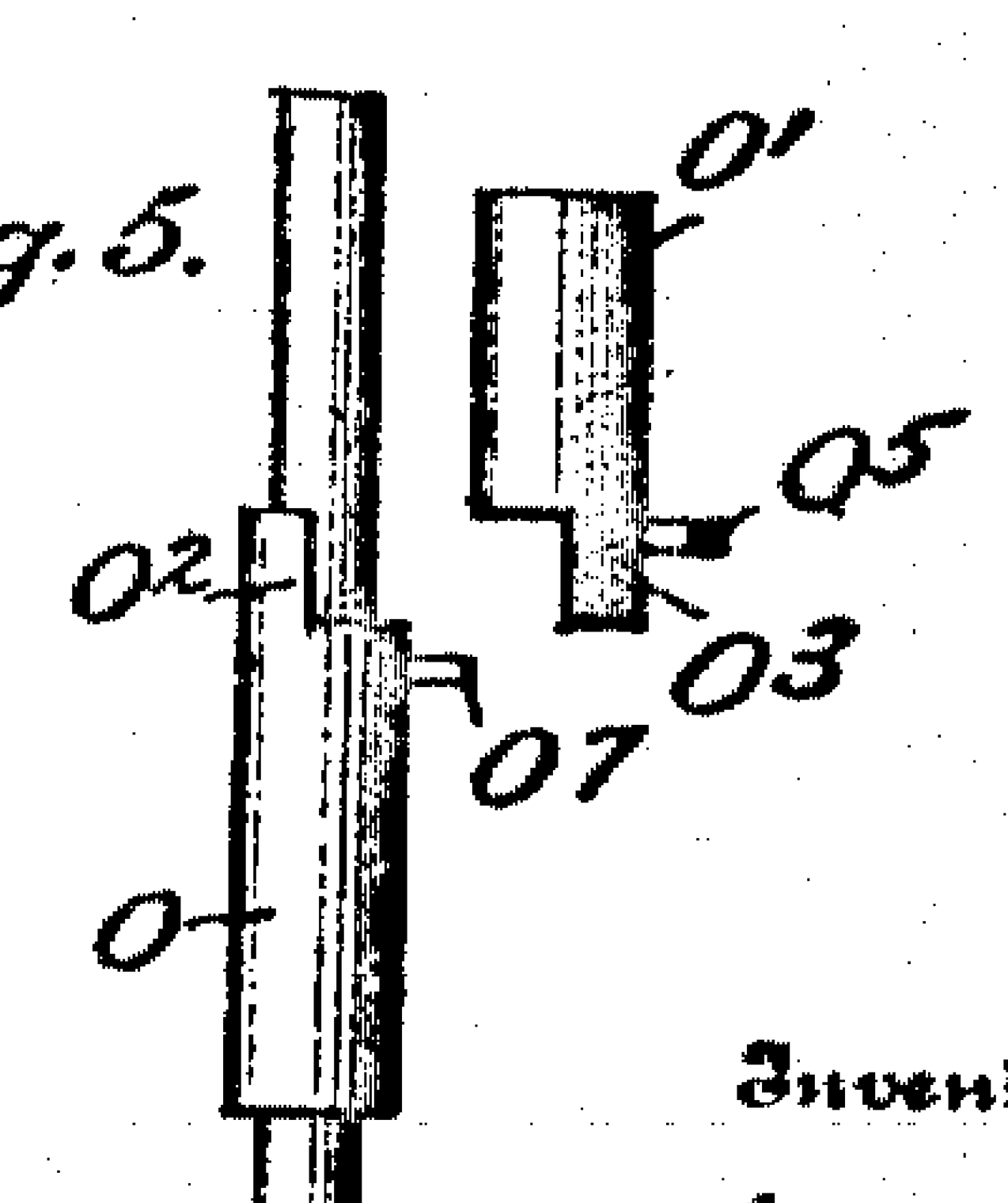


Fig. 5.



Witnesses

F. H. Schott

Inventor

Adalbert Haesner

By Georgii [illegible]

his Attorneys

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UNITED STATES PATENT OFFICE.

ADALBERT HAESNER, OF MUNICH, GERMANY.

ELECTRIC LOCK.

SPECIFICATION forming part of Letters Patent No. 767,050, dated August 9, 1904.

Application filed July 1, 1903. Serial No. 163,969. (No model.)

To all whom it may concern:

Be it known that I, ADALBERT HAESNER, a citizen of Germany, residing at Munich, Bavaria, Germany, have invented certain new and useful Improvements in Electric Locks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in electric locks.

The objects of my invention are to provide a lock which will permit the door to be locked and unlocked from a distance, which will indicate the condition of the lock, as to whether locked or unlocked, and which will allow the lock after once being unlocked to be again locked without necessitating the intermediate opening and closing of the door.

With this general object in view and some others which will be obvious to those skilled in the art from the description hereinafter, my invention consists in the general combination of elements, as well as the details of construction, which will first be described in connection with my preferred embodiment of the invention and then particularly pointed out in the claims, it being understood that many changes may be made in the structure specifically described hereinafter without departing from the spirit of my invention.

In the drawings, Figure 1 is a plan view of the preferred form of lock mechanism, showing it in the locking position. Fig. 2 is a similar view of the same in the unlocked position; Fig. 3, a side elevation of said lock mechanism looking from the inside of the door, and Fig. 4 a diagrammatic view of the electric circuits. Fig. 5 is a detail view of the armature-spindle and the tumbler-shaft taken apart.

Referring to the drawings, a is an armature-spindle pivotally mounted in the lock-casing p, one end of said spindle being reduced in diameter. Upon this reduced end is mounted a tubular tumbler-shaft a', the said tumbler-shaft and the armature-spindle a being interlocked with each other by overlapping jaws a^2 a^3, which, however, do not fit together tightly, a small space a^4 being left between them to permit a limited amount of rotation of the tumbler-shaft a' upon the armature-spindle a. The tumbler-shaft is provided with a radial pin a^5, to which is secured one end of a coiled spring a^6, having one end extended to engage and press against a radial pin a^7, secured in the armature-spindle a. Upon this armature-spindle a is fixed a compound polarized armature d circular in general outline, its cut-away portion serving to receive a pole-piece e of an electromagnet e', the terminals of whose coils are indicated at e^2 and e^3. The latter terminal, e^3, is connected to one end of a spring-arm h, secured to the lock-casing, but insulated therefrom by an insulating-block h'. The said spring-arm normally presses against a contact-post i, and the free end of said spring-arm beyond the contact-post is bent in the direction toward which the door opens. At the extreme end of the spring-arm is secured an insulating-plate h^2.

Upon the tumbler-shaft a' is fixed a tumbler c, which has the form of a disk with one side cut away, as shown in Figs. 1 and 2. This tumbler is arranged to engage one end of a detent-arm b, which is fixed to a rotary detent a, having a recess to receive the usual spring-actuated bolt a', Fig. 1, that part of the detent which engages the inside of the spring-bolt a' when the door is being closed being somewhat extended, as shown at f, Figs. 1 and 2. The rotary detent a is fixed on an axis a^2, pivoted in the lock-casing, which axis is surrounded by a coiled spring a^3, connected at one end to the lock-casing and at the other end to the rotary detent, as shown in Fig. 3, the tendency of this spring being to rotate the detent a to the position shown in Fig. 2.

The circuit connections are as follows, reference being had to Fig. 4: The terminal e^2 of the electromagnet is connected to the positive pole of a battery n and also to the negative pole of a battery n' by a conductor m^4, suitable circuit-breaking mechanism being included in this conductor, so that the line will be open when the door is open. The specific construction of such a circuit-breaker constitutes no part of the present invention and is not described, but is indicated at n^2, Fig. 4.

At the point from which the lock is to be controlled are placed two circuit-closing devices, as keys or push-buttons, (indicated at k and k', Fig. 4.) One side of the key k is connected by a conductor m^2 to the positive pole of the battery n', which pole is also connected to the rotary detent a of the lock, preferably by a branch conductor m^5, leading from the conductor m^2 to the lock-casing, with which the rotary detent is in good electrical connection through its axis a^2 and the spring a^3. The key k' has one side connected by a conductor m^6 to the negative pole of the battery n. The remaining sides of the keys k and k' are connected jointly by a conductor m^3 to the contact-post i of the lock, this conductor including the coil of an annunciator m', which is provided with a polarized armature, so that a current in one direction through the coil will move the armature in one way, while a current in the opposite direction will move the armature in the opposite way. Such annunciators or indicators are old and well known and need no further description herein.

The operation of the mechanism is as follows: Assuming that the door is locked, the parts have the positions shown in Fig. 1, wherein the detent-arm b is shown as resting upon the tumbler c, whereby it is impossible to rotate the rotary detent to free the spring-bolt a', thereby preventing the door from being opened merely by pulling the door. If now the key k' be pressed, an electric circuit will be closed as follows: from the positive pole of battery n, over conductor m^4, through the closed circuit-breaker n^3 and the coil of the electromagnet e', to the spring-arm h, thence along said spring-arm to the contact-post i, and from there along the conductor m^2, through the coil of the annunciator m', to the closed key k', and from there back to the negative pole of battery n over conductor m^6. The action of the current over this circuit is to energize the electromagnet e', so as to attract and thereby rotate the armature d to the position shown in Fig. 2, thus turning the tumbler c so that it clears the end of the arm b, whereby said arm is free to swing through the cut-away portion of the tumbler, which it tends to do under the influence of the spring a^3, being restrained merely because of the inertia of the door and the friction to be overcome in opening the door. At the same time with the operation of the lock mechanism to unlock the door the annunciator or indicator m' is operated to indicate that the door is unlocked. If now the door is opened by hand in the usual way, the rotary detent is moved toward the position shown in Fig. 2, and in so moving its pin g is brought into contact with the spring-arm h, thus pushing the spring-arm away from the contact-post i and opening the circuit which has been described above. At the same time the engagement of the pin g with the spring-arm h closes another electric circuit as follows: from the positive pole of the battery n', over a part of conductor m^2 and over branch conductor m^5, to the lock-casing, and thence to the rotary detent a, its arm b, and the pin g. From the pin the current passes during the contact of the pin with the spring-arm h to the said spring-arm and through the coil of the electromagnet e', from whence it returns to the negative pole of battery n' over conductor m^1, passing through the spring circuit-breaker n^3, which is still closed, because of the fact that the pin g reaches the spring-arm h before the door has been moved sufficiently to open the spring circuit-breaker n^3. As the current over the circuit just described traverses the coil of the electromagnet in a direction reverse to the first current the armature d is moved back to its first position, (shown in Fig. 1,) carrying with it the tumbler c. The continued movement of the door in opening finally permits and causes the rotary detent a to move to its extreme position, (shown in Fig. 2,) wherein its pin g comes into contact with and rests upon the insulating-plate h^2, thus breaking the circuit just described between the pin g and the spring-arm h. Also owing to the opening of the door all circuits through the lock are broken by the opening of the circuit-breaker n^3. When now the door is again closed, the spring-bolt a' will first strike the nose f, which, as before described, projects to a considerable extent from the rotary detent. In this way the latter is moved against the tension of the spring a^3 to the position shown in Fig. 1, the arm b forcing itself past the tumbler c, which yields sufficiently to permit this, and immediately springs back under the said arm b, this yielding of the tumbler and its return to the normal locking position being permitted owing to the yielding connection of the tumbler-shaft a' to the armature-shaft a, the spring a^6 allowing the tumbler-shaft to be rotated backward to a slight extent and then returning said shaft to its normal position. If after the key k' has been pressed to unlock the door, as hereinbefore explained, it is then desired to lock the door again the key k may be pressed, which, if the door be shut, closes a circuit as follows: from the positive pole of battery n', over conductor m^5, through key k, annunciator m', over conductor m^3, the coil of the electromagnet e', through the closed spring circuit-breaker n^3, and back to the negative pole of battery n', over conductor m^4. Since the current over this circuit passes through the annunciator-coil in a direction reverse to that of the current which unlocks the door, it will operate said annunciator to indicate that the door is locked. If, however, the door is not shut, the circuit just described cannot be closed by the key k, since the spring circuit-breaker n^3 will be open and the spring-arm h will not be in contact with the contact-

post *i* because of the fact that said spring-arm is held away from the post *i* by the pin *g* and arm *b* of the rotary detent. The circuit-breaker operated by the door serves to open the circuit when the door is open and to close it only when the door is opened, whereby it is rendered impossible to improperly cause the apparatus to indicate the locked condition of the door when the same is open by moving the rotary detent by hand to its locking position.

Owing to the fact that a polarized armature is employed—that is to say, an armature which is a permanent magnet—the use of springs, detent devices, or the like for holding said armature in either extreme position is avoided, because said armature, being a magnet, will stick to the pole-piece *e* of the electromagnet in either position to which it is thrown. Moreover, the use of the polarized armature results in a positive action in locking and unlocking the detent.

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

1. In an electric lock, the combination, with an electromagnet, and means for supplying currents of opposite polarity to said electromagnet, of a polarized armature operated by said electromagnet, a detent arranged to hold the door, and mechanism operated by the polarized armature and arranged to lock and unlock the detent.

2. In an electric lock, the combination, with an electromagnet, a detent arranged to hold the door, a polarized armature operated by the electromagnet, detent-locking means, operated by the armature and arranged to lock the detent, means for supplying current to the electromagnet to move the detent-locking means and thereby unlock said detent, and mechanism actuated by the detent and arranged to reset the detent-locking means.

3. In an electric lock, the combination, with a detent arranged to hold the door, a polarized armature operated by the electromagnet, detent-locking means operated by the armature and arranged to lock the detent, means for supplying current to the electromagnet to move the detent-locking means and thereby unlock the detent, and mechanism actuated by the detent and arranged to supply to the electromagnet a current of polarity opposite to the first-mentioned current.

4. In an electric lock, the combination, with a detent arranged to hold the door, a tumbler arranged to lock said detent and an armature arranged to move said tumbler, of an electromagnet arranged to operate the armature, and a yielding connection attached to the armature and to the tumbler.

5. In an electric lock, the combination, with a detent arranged to hold the door, an armature-spindle, and armature mounted thereon, and an electromagnet arranged to actuate the armature, of a tumbler-shaft mounted on the armature-spindle, a tumbler carried by said tumbler-shaft and arranged to lock the detent, and a resilient connection between said tumbler-shaft and the armature-spindle.

6. In an electric lock, the combination, with a detent arranged to hold the door and provided with a detent-arm, detent-locking means for locking said detent-arm, an electromagnet arranged to operate said detent-locking means, a spring-arm connected to one terminal of the electromagnet and arranged to be moved by the detent, a contact device arranged to engage the spring-arm, a circuit including the electromagnet and the contact device, a second circuit including the detent-arm and the electromagnet, means for supplying current of one polarity to the first circuit, and means for supplying current of opposite polarity to the second circuit.

7. In an electric lock, the combination, with a detent arranged to hold the door, means for locking said detent, a polarized armature arranged to actuate said means, and a pair of circuits including the electromagnet, of means for supplying to said circuits current of opposite polarity, an indicating device common to both circuits, and circuit-closing devices in each circuit.

In testimony whereof I affix my signature to this specification in the presence of two witnesses.

ADALBERT HAESNER.

Witnesses:
ROBERT HERZING,
SITTENAUER METH.