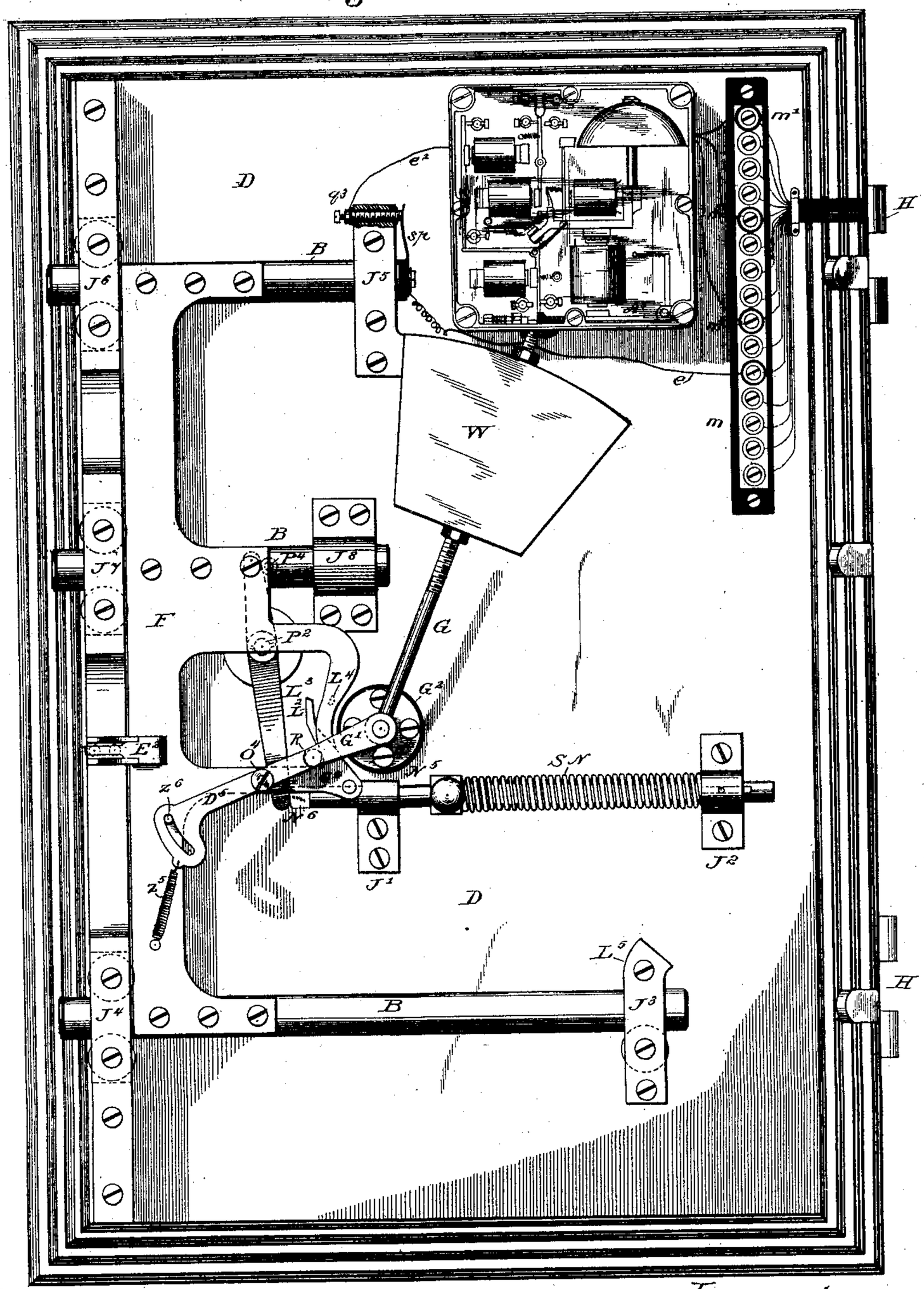
(No Model.) 3 Sheets—Sheet 1.

C. J. KINTNER.

ELECTRICAL COMBINATION LOCK.

No. 372,029. Patented Oct. 25, 1887.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

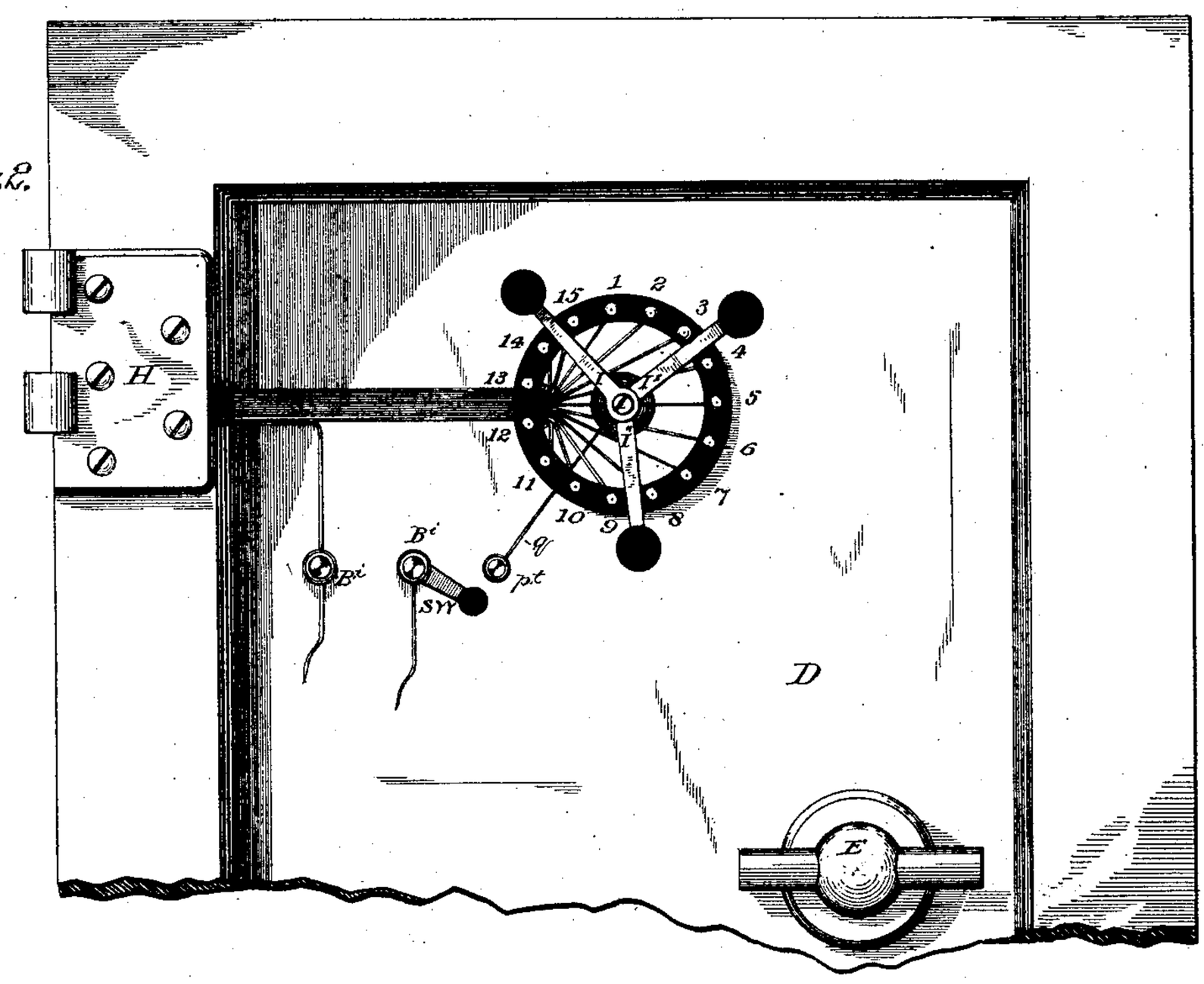

Fig. 3.

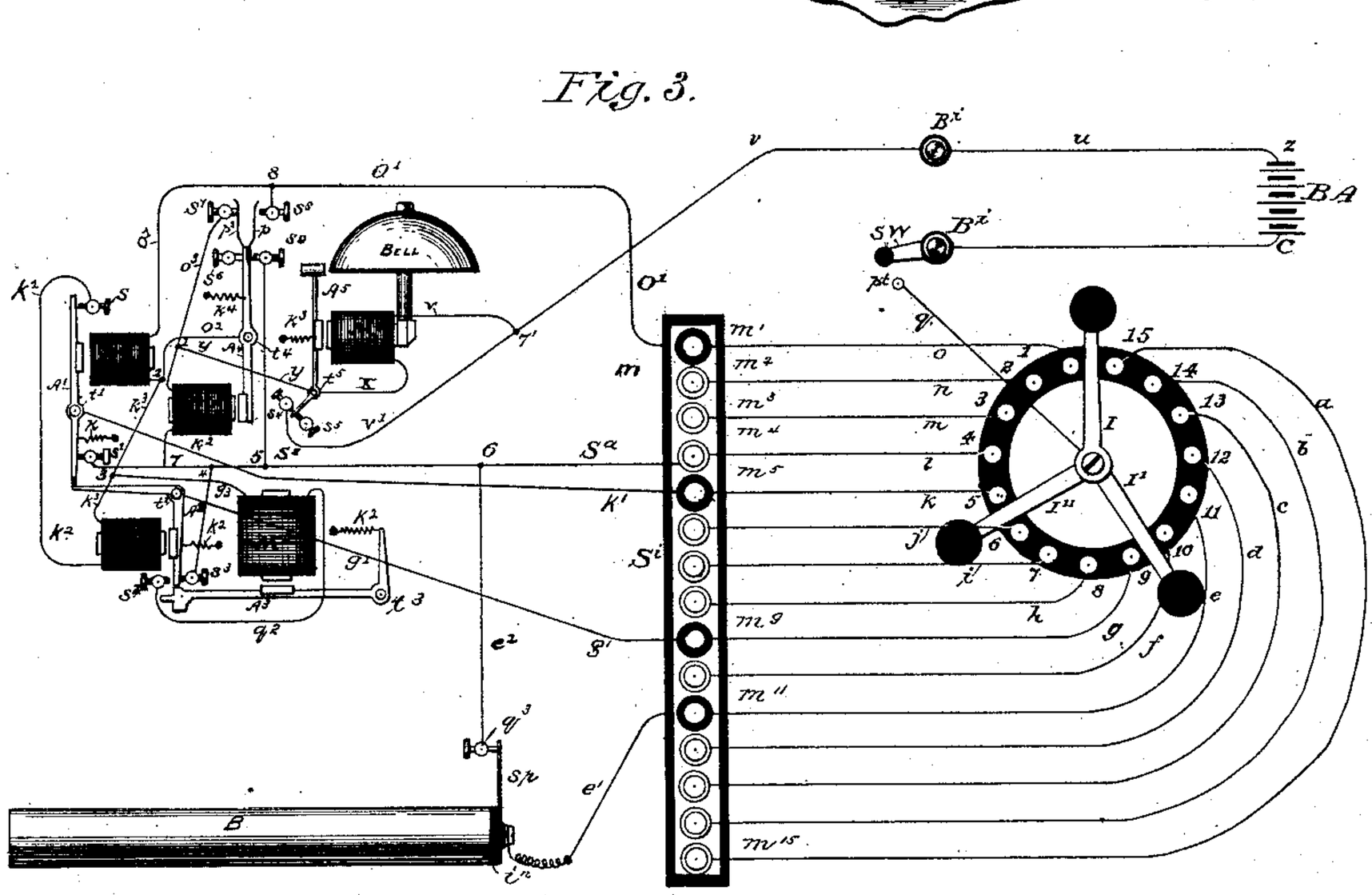

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Fig. 4.

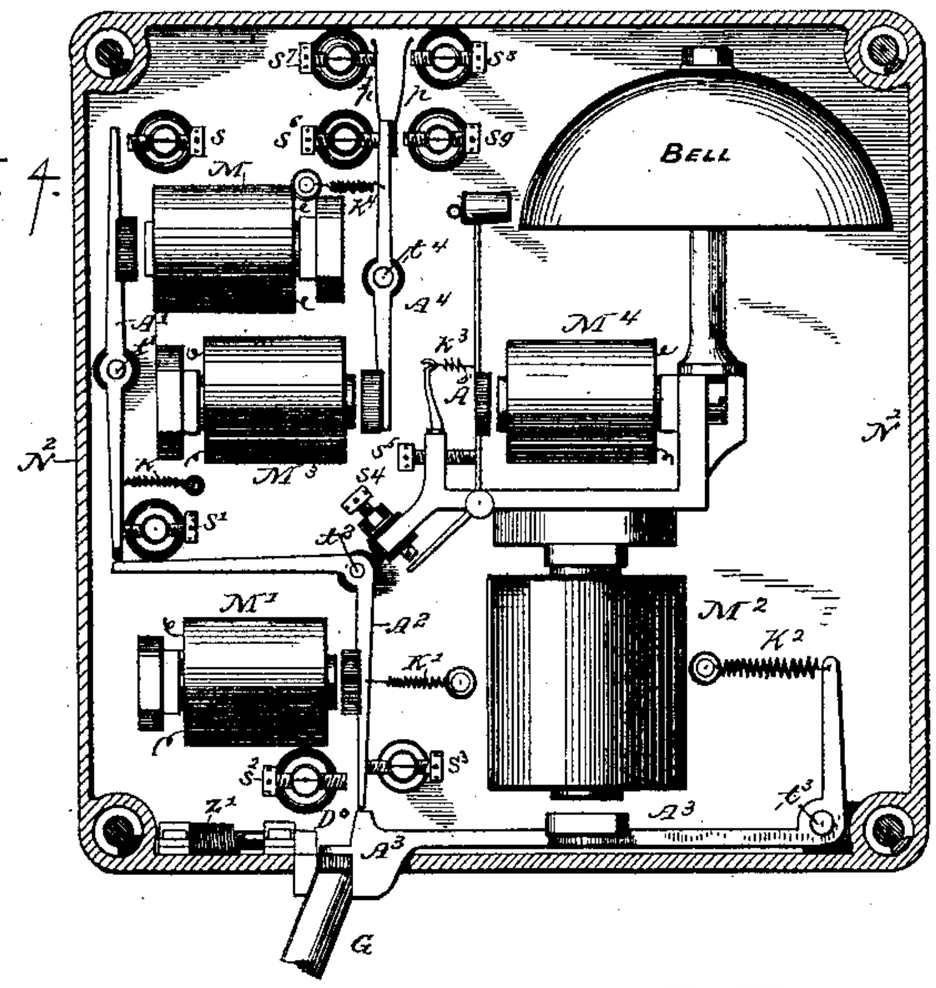

Fig. 5.

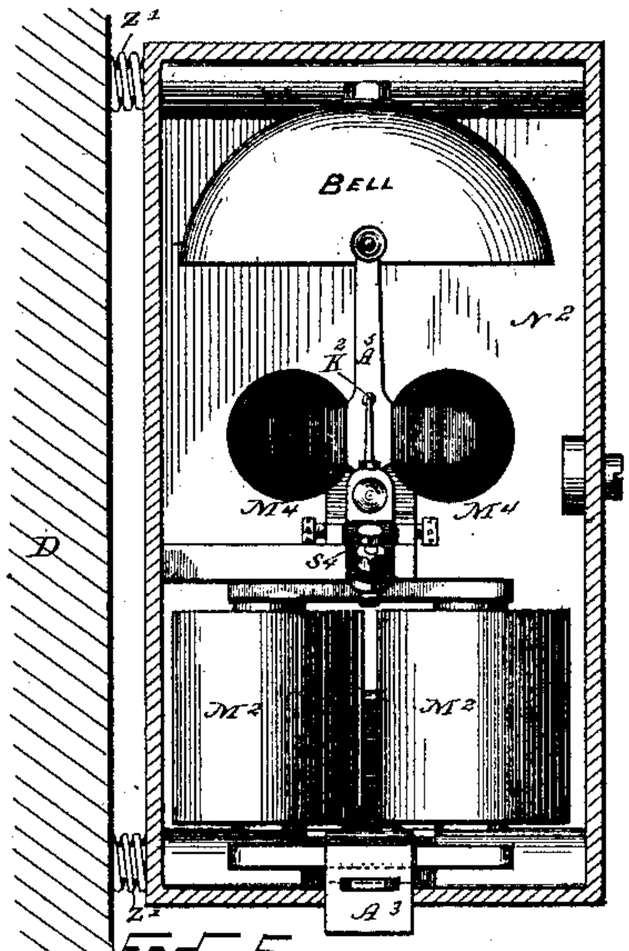

Fig. 6.

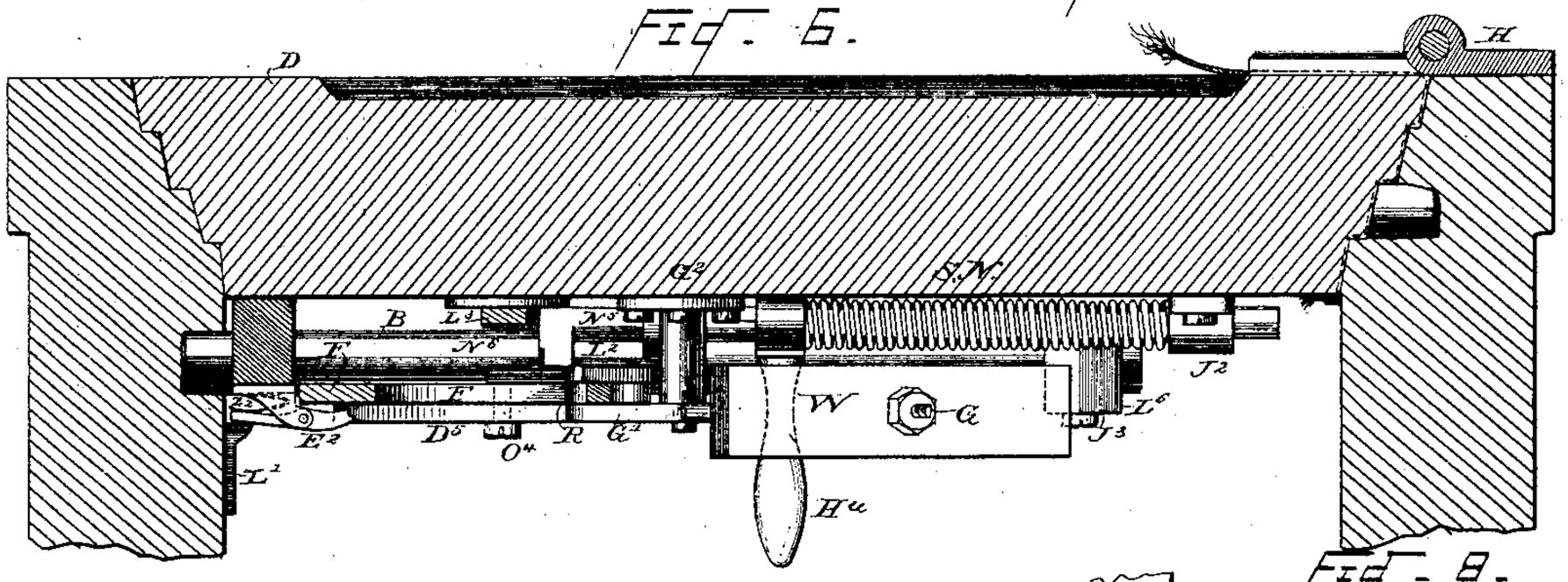

Fig. 10.

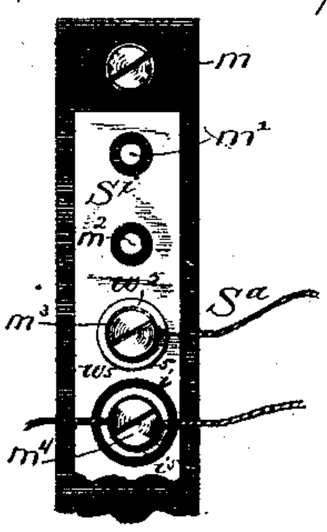

Fig. 11.

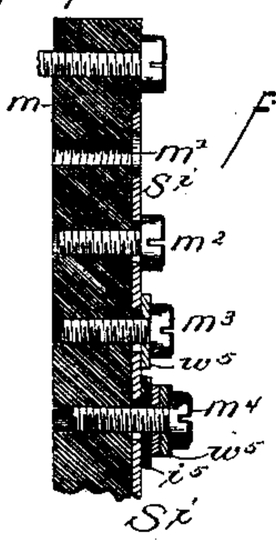

Fig. 9.

Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

CHARLES J. KINTNER, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRICAL COMBINATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 372,029, dated October 25, 1887.

Application filed July 6, 1887. Serial No. 243,598. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. KINTNER, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Electrical Combination-Locks, which improvement is fully set forth in the following specification and accompanying drawings.

Figure 1 represents a side elevation of the interior of a safe door, showing the bolts, bolt-drawing apparatus, and the combination mechanism, said bolts being shown as in locked position. Fig. 2 is an exterior elevation of a part of the door, showing the electrical contacts and contact devices with the conductors, which pass into the safe behind one of the hinges. Fig. 3 is a diagrammatic view of the apparatus for manipulating the combinations and the combination circuits. Fig. 4 is a cross-sectional view of the box containing combination-magnets and their connections, shown in elevation, and on a scale the size of actual working apparatus. Fig. 5 is a cross-section of Fig. 4. Fig. 6 is a horizontal cross-section of a safe-door and side walls of a safe, showing the bolts in position and the bolt-drawing weight and its connections for drawing the bolt when it is released, as well as the apparatus for thrusting the bolts into position when the door is closed. Fig. 7 is a detail view of connections for thrusting the bolts into place and for locking them when in place; also means for starting the bolts when it is desired to draw them. Fig. 8 is a cross-section of Fig. 7. Fig. 9 shows means for sustaining the lock mechanism inside the safe on springs, so as to resist shocks from dynamite, &c. Fig. 10 is a side elevation of a part of the switch-board shown in its entirety at the upper right-hand side of Fig. 1. Fig. 11 is a longitudinal section of Fig. 10, showing the means for changing the combinations, &c.

Similar letters of reference indicate corresponding parts in the several figures.

My invention is designed to make safes more secure and to obviate the difficulties in well-known forms of mechanical combination-locks, and to provide a lock which cannot be picked, which is simple in its mode of operation, and can be much more quickly opened than any known form of tumbler or other combination-locks.

To this end it consists, first, in providing means so devised that there are no mechanical connections whatever with the inside of the safe, the combinations being formed by or through electrical conductors extending through the door in any desired manner, and controlling by said conductors electrical devices located entirely within the safe.

It consists, secondly, in means for automatically thrusting the bolts into place when the safe-door is closed, and additional means which, when released, will automatically draw the bolts.

It consists, thirdly, in the peculiar arrangements of circuits or circuit-connections, whereby one must know and follow the exact sequence of the combination in order to unlock the safe.

It consists, fourthly, in a safety-circuit and connections adapted to mislead any one not knowing the combination.

It consists, fifthly, in an alarm-bell and connections which rings continuously when the circuit is closed through any contact, and serves the double function of creating a noise, so that one cannot hear the action of the magnets, nor can one test the circuits with a galvanometer or other electrical device.

It consists, sixthly, in certain details of construction, hereinafter enumerated, and particularly pointed out in the claims which conclude this specification.

Referring now to the drawings, D represents a well-known form of safe-door, as seen looking from the inside of the safe outward.

B B are bolts of well-known construction, held together by a bolt-frame, F, and sliding in frictionless bearings J^3 J^4 J^5 J^6 J^7 J^8.

G is a lever carrying a weight, W, and adapted, when released by the armature A^3, (shown in Figs. 1 and 4,) to fall to the right until the weight W rests on the shoulder L^5, connected to bearing J^3. The lever G is pivoted at G^2, and has a short arm, G′, extending at an angle and carrying a small friction-roller, R, adapted to lock the bolts in position by virtue of the click-pawl D^5, pivoted at O^4, and held down by a spiral spring, Z^5, against the pin Z^6. It will be observed that the bolt-

frame F is cut away or has an opening, which allows the roller R to roll back as the bolts are thrust into place.

Pivoted to the inner side of the door, near the middle thereof, is a dog, E^2, (seen in Figs. 1 and 6,) which is adapted, when the bolts are drawn and the door is open, to fall behind the bolt-frame F and lock it so that the bolts cannot go into position until just before the door is finally closed. The bolts are thus released, and the lug L′ on the jamb overcomes the tension of spring Z^2 and releases the bolts, which are under stress of mechanism which I will now describe.

Pivoted to the bolt-frame F at G^4, Figs. 1 and 7, is a bell-crank lever, L^2, which has on its lower side a hook adapted to take against the end N^6 of a push-rod, N^5, sliding in bearings J′ J^2, attached rigidly to the door. This rod is surrounded at its right-hand end with a strong compressible spiral spring, adjustable and of such elasticity that when forced back by hand-hold H^a its end N^6 will be permitted to engage the hook of lever L^2.

L^3 is the bolt-starting lever, designed, when acted upon by the end N^6 of rod N^5, after it is released, to give the bolts a backward thrust, and thus tend to draw them. It is pivoted at P^2 to the body of the door, and the upper end is adapted to take against a pin, P^4, attached to the bolt B on the bolt-frame.

This constitutes the bolts and bolt setting and drawing mechanism.

I will now proceed to describe the combination mechanism, after which I will disclose the entire mode of operation.

M M′ M^2 are the combination-magnets, and M^3 is a safety-magnet, while M^4 is a bell magnet.

S^i (see Fig. 10) is the switch-board carrying all the contacts, and located inside the safe. All that portion to the right of the switch-board, in the diagrammatic view in Fig. 3, may be considered as on the outside of the safe, and all to the left as located entirely within the safe, together with the bolts and bolt-drawing apparatus.

1, 2, 3, 4, 5, &c., to 15, inclusive, are electrical contact-points embedded in an insulating-ring attached to the door, by screws or otherwise, at any convenient point of access, or to the safe itself, if desired, instead of the door. Each of these contacts has an independent conductor, *a*, *b*, *c*, *d*, &c., to *o*, inclusive, covered with asbestus or other insulating material which will withstand high heat in case of fire, and is carried thence through the door behind the hinge H, as shown in Figs. 1 and 2; or the wires may be embedded in the metal of the door when it is cast, if desired. It will be seen in Fig. 1 that they are carried in through a shallow groove or channel in such manner as to bear as little point of attack as possible for burglars. There is no other connection whatever with the inside of the safe, as will be understood on inspection of Figs. 1 and 2, the handle E being simply a button-handle with a button adapted to take into the jamb of the door and wedge it so as to take the strain off the bolts.

It will be observed in Figs. 2 and 3 that a single wire, *q*, runs from the center of the insulated ring, where it is in contact with three metal arms, I I′ I^2, to a switch-point, p^t, and by switch SW to binding-post B^i, whence it passes to the battery BA, (see Fig. 3,) and finally to binding-post B^i, whence it is carried, with its fellows, inside the safe to bell-magnet M^4. This wire is a common return-wire for all the other wires. The switch-arms I I′ I^2 rest normally on the insulating-ring, and are adapted, when carried to the right or the left, to rub over the contacts 1, 2, 3, 4, 5, &c. They are attached to a common spring and move independently of each other or together, as desired, their function being solely to conduct the battery-current from the various combination-contacts through the desired combination-circuits to the return-wire and back to battery. All of the wires from contacts 1, 2, 3, 4, &c., except those designed to constitute the combinations—in this instance those running from contacts 1, 5, and 9—are carried directly to the switch-board inside the safe and electrically connected thereto by screws m^2, m^3, &c., and washers w^5, &c., (see Figs. 10 and 11,) while those designed to constitute the combination-circuits—as those running from contacts 1, 5, and 9, (and also the bolt-detector circuit—in this instance running from contact 11, which circuit will be described later on)—are insulated from the switch-board by insulating-washers i^5, Fig. 11, and are continued on to their proper magnets by wires *o*′, *k*′, *g*′, &c., as shown in Fig. 3. This switch-board is electrically connected with a safety-magnet, M^3, by a single wire, S^a, and finally by wires *y* and *v* to B^i and wire *u* to battery; so that it will be seen that the following circuits all lead through magnet M^3 when the safe is locked: *a*, *b*, *c*, *d*, *e*, *f*, *h*, *i*, *j*, *l*, *m*, and *n*, while the circuits *o k g* lead to the combination-magnets, as will be explained in the mode of operation.

It will be understood that the first magnet, M, acts under influence of a current of electricity when the circuit is closed at contact-point 1 by arm I, wire *s*, *o*, &c., and causes magnet M to actuate armature A′ and close a new circuit at S by way of wire k^2 to the second magnet, M′, at the same time breaking a safety circuit or shunt about magnet M′ at S′, and thus on closure of circuit at contact-point 5, the second combination-number with arm I″, armature A^2 will be drawn up by magnet M′ and a new circuit made for the last or locking magnet, M^2, at S^2, by wire g^2, while its safety circuit or shunt is broken at S^3. Finally, on closure of circuit at contact-point 9 with arm I′, the last or unlocking magnet will be actuated and the bolt-drawing weight W released and allowed to do its work, the circuits being closed in multiple arc through arms I I′ I^2.

I will now proceed to describe the mode of operation in detail.

Suppose the safe to be locked and the bolts

and bolt mechanism in position, as shown in Figs 1, 3, 4, 6, and 7, and it is desired to unlock it. First swing the arms I, I′, and I² to the positions indicated in Fig. 3—that is, on the insulating-spaces on either side of the particular numbers which make up the combination—in this instance 1, 5, and 9. Then close switch SW and swing arm I onto contact 1, whereupon a circuit will be closed as follows: from battery BA, by wire *r*, to lower binding-post, B¹, switch SW, point *p*¹, wire *q*, arm I, point 1, wire *o*, through the safe-door to screw *m′*, thence by wire *o′* to magnet M and point 2, wire *o*² to armature-lever A⁴, spring *p′* on said lever, point S⁷, wire *o*³, point 1, wire *y*, pivot *t*⁵ of armature-lever A⁵, wire X, by magnet M⁴, wire *v*, point 7′, wire *v* to the outside of the safe, to upper binding-post B¹, and by wire *u* back to battery, thus completing the circuit and energizing magnet M and causing its armature A′ to be drawn up so that its lower insulated end passes out from behind armature-lever A² of magnet M′, while it makes an electrical contact at S for a new circuit by wire *k*², as will be described. The same current actuates magnet M⁴ and causes it to draw its armature forward when the magnet is shunt-circuited at S⁴ and wire *v′*, thus causing said armature to drop off in a manner well understood by electricians. On the end of armature-lever A⁵ is a bell-hammer, which, as the armature automatically vibrates, will ring the bell so long as one of the circuits remains closed. This alternate making and breaking of the circuit at S⁴ also varies the condition of the current, so a burglar cannot test with a galvanometer the resistance of the various circuits. The bell-magnet M⁴ should be very sensitive, and be actuated quicker than any of the combination-circuits, for reasons apparent to a skilled electrician. Now swing the arm I″ onto its contact-number 5, and the current from battery BA will divide into two equal parts, the first part taking the path just indicated, while a new route will be made, and the other half of the current will flow as follows: from battery by wire *r*, switch SW, wire *q*, as before, thence to arm I″, point 5, wire *k*, screw M⁵, wire *k′*, pivot *t′* of armature A′ by armature A′, which, it will be remembered, is held up by the action of the other branch of the current on magnet M, to contact S, thence by wire *k*² to the second combination-magnet, M′, wire *k*³, to point 2, when it joins the other branch of the current and passes by wire *o*², armature-lever A⁴, spring *p′*, point S⁷, wire *o*³, point 1, wires *y x*, bell magnet M⁴, wire *v*, back to battery, the bell ringing constantly. This actuates magnet M′ and draws up armature-lever A², so that its left-hand end falls behind the lower end of lever A′ and locks it mechanically. At the same time a new circuit is made at S² for the last combination-magnet, M², and a safety or shunt circuit about this magnet is broken at S³, the function of which I will disclose later on. The armature A² is also drawn away from the left-hand end of the locking-armature A³, so that the latter is now free to be raised when the circuit is closed through its actuating-magnet M². We may now throw the arm I off its contact, if we desire, for the arm A′ is mechanically locked in place by the armature-lever A². Having done this, we turn the arm I′ onto its contact 9, and the battery-circuit will now divide, as before, into two equal branches; but now between arms I² and I′, one portion going through magnet M′, as above noticed, and the other portion by arm I′, contact 9, wire *g*, through the safe-door to screw *m*⁹, wire *g′*, pivot *t*² of armature-lever A², contact S², wire *g*², unlocking-magnet M², wire *g*³, point 3, whence it joins the other branch of the current and goes, as before, by bell-magnet M⁴, back outside the safe to battery. This energizes magnet M² and draws up armature-lever A³, releasing lever G, (seen in Figs. 1 and 4,) and allowing weight W to descend. This weight falls freely through a fraction of its arc about pivot G² without meeting any obstruction. At the end of this fraction of its arc the roller R on arm G′ strikes with accelerated force the shoulder *k*⁹ (see Fig. 7) and causes the bell-crank lever L² to turn on its pivot G⁴ until it strikes lug L⁴, thus allowing the hook on the under side to release the end N⁶ of the push-rod N⁵, acting under the stored-up energy of spring SN, still left unexpended after forcing the bolts into place. This released power causes the rod N⁵ to thrust its end N⁶ against the lower end of the lever L³, pivoted to the door by a pivot-pin, P², (see Figs. 7 and 8,) and having its upper end in close contact with a pin or bearing, P⁴, attached to the bolt B. This action starts the bolts, and the weighted lever G descending, the roller R strikes the inclined surface of the bolt-frame above the lug L⁴, as seen in Figs. 1 and 7, and when the weight reaches its rest at L⁵, Fig. 1, its force is expended and the bolts drawn. Now take hold of knob E and turn it so that its button (which is not seen, but locks in the jamb 6) will be released, and the door will come open. As soon as the door opens, the click or dog E², (seen in Figs. 1 and 6,) actuated by spring Z², falls behind the bolt frame F and locks it, so that the bolts cannot be forced outward until the door is closed again. The function of this dog is to act against the bolt-thrusting rod N⁵ until the door is in such position that the bolts can be thrust into place on releasing the bolt-frame by action of lug L′ on door E² when the door is closed. It will be seen on examining Fig. 4 that when the lever G is released a spring-pressed dog, D⁶, actuated by a spring, *z′*, follows it up and slides under an extension of lever A³, locking it up until the lever G is again returned to locking position, when all of the armature-levers A′, A², and A³ will be released and fall into locking position, as shown. Now, suppose the safe open and it is desired to lock it, take hold of lever G with one hand and handle H⁸ with the other, lift the weight and at the same time compress the spring SN to such an extent that the bell-

crank lever L^2 will fall into locking position. On raising the weight W to its extreme limit the dog D^o will be forced back and armature-lever A^3 will fall into locking position, as will also the armature-lever A^2 A′, and roller R will rest upon the left side of the hooked lever and at a point about o^4. The bolts will now be under stress of spring SN, and would slide out but for the action of the click or dog E^2, above described. Now, on closing the door this dog is tilted upon a pivot by the lug L′, (seen in Fig. 6,) and caused to release the bolt-frame, and the bolts are forced into place by spring SN, and as the roller R rides over the pawl D^5 it falls into locking position, under stress of spring z^5, and the safe is now locked. One of the arms I, I′, or I^2 should now be placed upon contact 11, and a circuit will be closed, if the bolts have gone into place, as follows: from battery Z, arm I′, point 11, wire *e*, screw m^{11}, which is insulated from the switch-board in this instance in the same manner as are the combination-circuits 1, 5, and 9; thence by wire *e*′, spring SP, attached to the bolt B, contact q^3, wire e^2, safety-wire S^a, through the safety-magnet M^3, bell-magnet M^4, to the outside of the safe, to battery, thus ringing the bell and indicating that the bolts are in position. If they were not in position, the circuit would not be closed at q^3, since the spring SP travels with the bolts and only closes the circuit when they are in place.

I have described above the manner of unlocking the safe, supposing one acquainted with the combination; but to avoid picking the lock an essential feature exists in my safety-circuit system, the operation of which I will now disclose.

It will be seen in examining the circuits of the combination-magnets that they all three pass by armature-lever A^4 through spring p' and contact S^7. At this point I utilize a safety-magnet, M^3, designed to actuate a switching armature-lever, A^4, and divert all of the circuits, both combination and otherwise, through said safety-magnet, so that when once one closes a circuit through any contact by either of the arms I, I′, or I^2 in any order than that indicated by the proper combination the safety-magnet will be actuated and the circuits changed, and when once actuated the safety-magnet will continuously divert one seeking the combination. It will be observed that all of the circuits in their normal condition, save No. 1, lead to the safety-magnet. Take *a b c d f h i j l m n*, and we find they all go direct to switch-board S^1 and by wire S^a to the safety-magnet and back through bell-magnet M^4 outside the safe to battery, while circuit *e* goes by the route already explained when the bolts are in position. Take, now, the second combination-circuit, 5, we find it goes from battery by arm I^2, when on contact 5, by wire *k*, screw m^5, wire *k*′, pivot *t*′, armature-lever A′, back-stop S′, to point 7, through the safety-magnet, as before, by bell-magnet outside the safe to battery. In the same way, taking the third combination-circuit, we find on placing I′ on point 9 a circuit is formed by wire *g*, screw m^9, wire *g*′, pivot t^2, armature-lever A^2, back-stop S^5, wire *g* to point 4, point 7, safety-magnet M^3, bell-magnet M^4, and outside the safe, as before, so that it will be seen that on closing any circuit except 1 the safety-magnet will be actuated and armature A^4 caused to switch the circuit from point S^7 to points S^8 and S^9 by way of spring *p*. This holds up the armature-lever; and now, if we close the circuit of the first combination at 1 by arm I, it will be completed as follows: from battery by arm I, contact 1, wire *o*, screw *m*′, wire *o*′, point S, contact S^8, spring *p*, contact S^9, point 5, through safety-magnet M^3, and out by bell-magnet. It will thus be seen that there is always a closed circuit through the safety-magnet for every contact on the outside of the safe except the first combination number, which, it will be understood, needs no such security, and is in turn converted into a safety-circuit, if the safety-magnet is once actuated.

If desired, I may insert variable resistance between the switch-board and the exterior circuits, one for each circuit, and each having a different amount of resistance, so that no indication can be had of the condition of the circuits on testing should the bell-magnet fail to work.

To change the combination, I simply draw the screws from the circuits and remove the insulating-washer, placing it under any desired numbers, and connecting the wires *o*′, *k*′, and *g*′ to the circuits thus changed, converting the old combination-circuits into safety-circuits by making metallic connection with the external wires and the switch-board. Any new combination may thus be arranged at a moment's notice. In the same way I may change the test-circuit *e*′ e^2 to any other conductor besides *e*.

The magnets M M′ M^2 M^3 M^4 are attached firmly to the case N^2 by yokes or screws, and their armatures are provided with the usual adjustable back-stops, *s*, *s*′, s^2, &c., (seen in Fig. 4,) and the usual retractile springs *k*, *k*′, k^2, k^3, k^4, &c.

I design to use a magneto-machine in place of a battery, which shall be inclosed in a neat case and attached to the door near the binding-posts B^1. It should have spring mechanism, which can be wound up and released when desired, giving current enough to actuate the magnets in multiple arc, as explained.

The weight W is rendered adjustable on lever G by nuts, as shown, so as to enable one to place it at the most efficient point of the lever.

All of the magnets and contact-points are located in a dust-tight box, N^2, having a strong glass front, so that their working can be seen, and the locking-armature A^3 has locking connection with lever G through a close-fitting hole, as shown in Figs. 4 and 5. Spring-contacts of platinum should be used wherever good contact is desired; but this is a matter

well appreciated by all skilled in the art of electricity.

The switch-board S^1 may be located inside the case N^2, if desired; or it may consist of several parallel strips located side by side, as desired, and the number of wires going inside the safe may be unlimited, fifty usually being enough. Of course I may make a greater number of combinations by simply increasing the number of combination magnets—that is, by having four locking-magnets instead of three I would have a four-combination lock, &c.

Of course I do not limit my locking mechanism to the bolt apparatus shown, as it is obvious it may be applied to any well-known form of bolt apparatus in existence by simply utilizing the locking-armatures A^3 for controlling the dog or bolt-locking mechanism.

It will be understood that all the electrical contacts should be insulated from the door of the safe, which is of metal, and the switch-board is insulated by a strip of insulating material. I prefer to use an insulating material which is substantially fire-proof, such as vulcanized fiber.

I do not claim in this application the broad idea of controlling an electric lock by a series of circuits running inside a safe and preventing such control unless a proper sequence of circuits be closed, nor the apparatus for practicing such method, as such subject-matter is claimed in another application filed by me in the United States Patent Office May 11, 1887, and bearing Serial No. 237,803.

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

1. The combination, in an electric safe-lock, of a series of circuits leading into the safe to a common point of attachment, with an additional selected series of circuits also leading into the safe, the first of said latter series of circuits being normally open only on the outside of the safe, while the remainder of them are operatively open each at two points located, respectively, outside and inside the safe, and a common return-circuit for all of said circuits, and mechanism, substantially as described, for controlling the bolts of a safe.

2. In a combination-lock, a series of circuits leading from the outside to the inside of the safe to a common point of attachment and having a common return-circuit through a safety electro-magnet to the outside of the safe, in combination with an additional set of selected circuits leading also to the interior of the safe, the first of said circuits passing through an electro-magnet and to the common return-wire, the second and third normally to the safety-magnet and common return-circuit, with electro-magnets and connections, as described, whereby a wrong closing of any circuit will prevent the lock from being opened, substantially as described.

3. The within-described method of operating or controlling combination-locks electrically, consisting in causing the proper sequence of electrical circuits to close successive circuits at normally-open points within the safe, and in preventing such operation unless the proper sequence is observed, substantially as described.

4. In a safe-lock, the combination of electro-magnetic means for controlling the operation of the bolts with a weighted locked lever which, when released, automatically withdraws the bolts, substantially as described.

5. In a safe-lock, the combination of spring-actuated mechanism for forcing the bolts into place when the door of the safe is closed, with a weighted locked lever for withdrawing said bolts when it is desired to open the safe, substantially as described.

6. The combination, in a safe, vault, or other lock, of a weighted lever for automatically withdrawing the bolts, with electro-magnetic means for releasing or controlling said automatic bolt-withdrawing mechanism, substantially as described.

7. The combination, in a safe or other lock, of spring-pressed mechanism for automatically forcing the bolts into place on closing the door of the safe, with a weighted lever for automatically withdrawing the bolts, and electro-magnetic means for releasing or controlling said bolt-withdrawing mechanism, substantially as described.

8. The combination, in an electrical combination-lock, of a series of circuits leading to the interior of the safe or vault to be protected, with electro-magnetic apparatus located in said circuits and within the safe or vault for controlling the operation of the bolts, and an electrical generator and means for closing the circuit of said generator in proper sequence to the electro-magnetic mechanism, substantially as described.

9. In an electrical safe-lock, the combination of an electrical circuit with means attached to the bolt or bolt-frame for closing said circuit when the bolts are in place, and an electrical generator and alarm apparatus in said circuit to announce the fact that the bolts are in place and the safe locked, substantially as described.

10. The combination, in an electrical lock, of an electro-magnetic alarm-bell located within the safe, and connections, as described, whereby the bell will ring continuously when any one of the circuits is closed, substantially as described.

11. In a combination-lock, the combination of a bolt or bolt withdrawing or controlling mechanism with a series of locking-levers, the first of which locks the bolt or bolt-controlling mechanism, and the second locks the first, the third the second, and so on, dependent upon the number of such levers, substantially as described.

12. In a safe-lock, the combination of a bolt with bolt-controlling mechanism, consisting of a series of locking-levers which lock the bolt and each other in succession, substantially as described.

13. The combination, in an electro-magnetic safe-lock, of two or more electro-magnets having locking armature-levers for controlling the bolts, each one of which serves to lock the one in advance of it, so that the electro-magnets must be actuated or energized in sequence to release the bolts, substantially as described.

14. In an electro-magnetic lock, the combination of a series of electro-magnets having locking armature-levers which lock each other and the bolts, with a safety electro-magnet which prevents the action of any or all of the locking-magnets if the circuit is closed wrongly, either before or after the combination is partially found, substantially as described.

15. In a safe or analogous device, the combination of a series of electrical circuits leading from the exterior of the safe to the interior thereof, and automatic bolt-withdrawing mechanism, with electro-magnetic appliances for controlling the action of the automatic bolt-withdrawing mechanism, and additional electro-magnetic devices for preventing such withdrawal unless a proper sequence of said circuits be closed, substantially as described.

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Witnesses:
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