

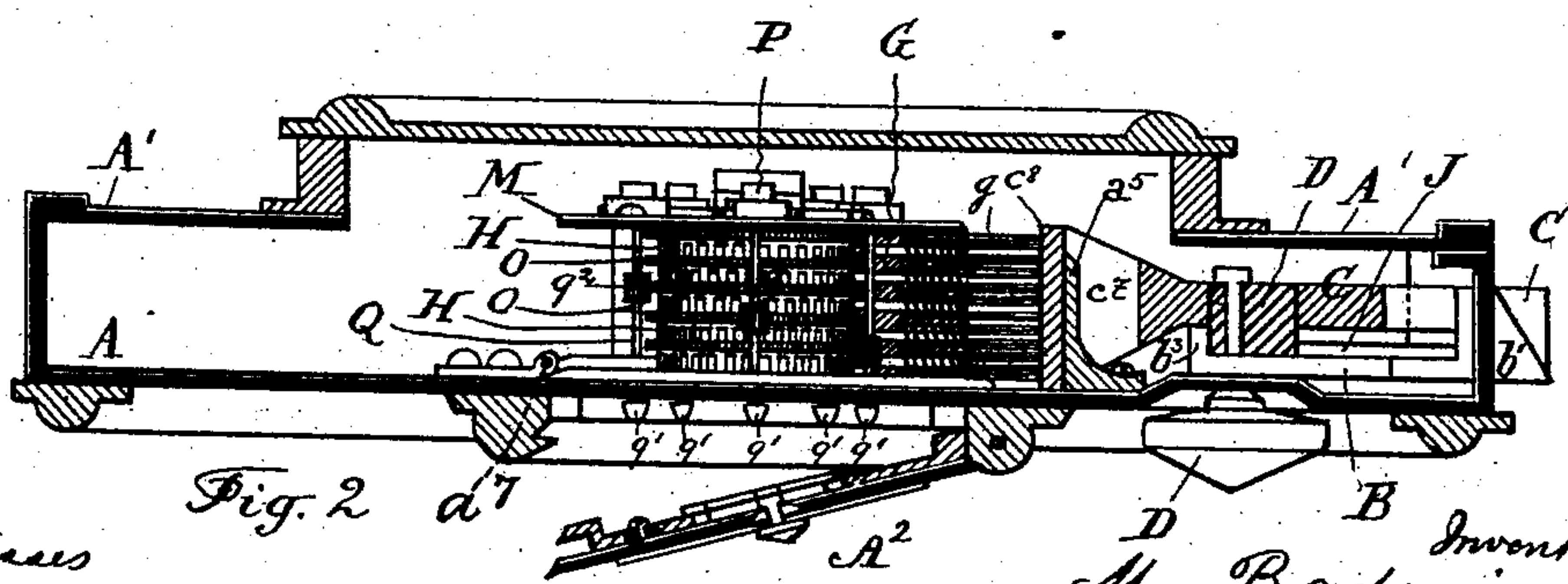
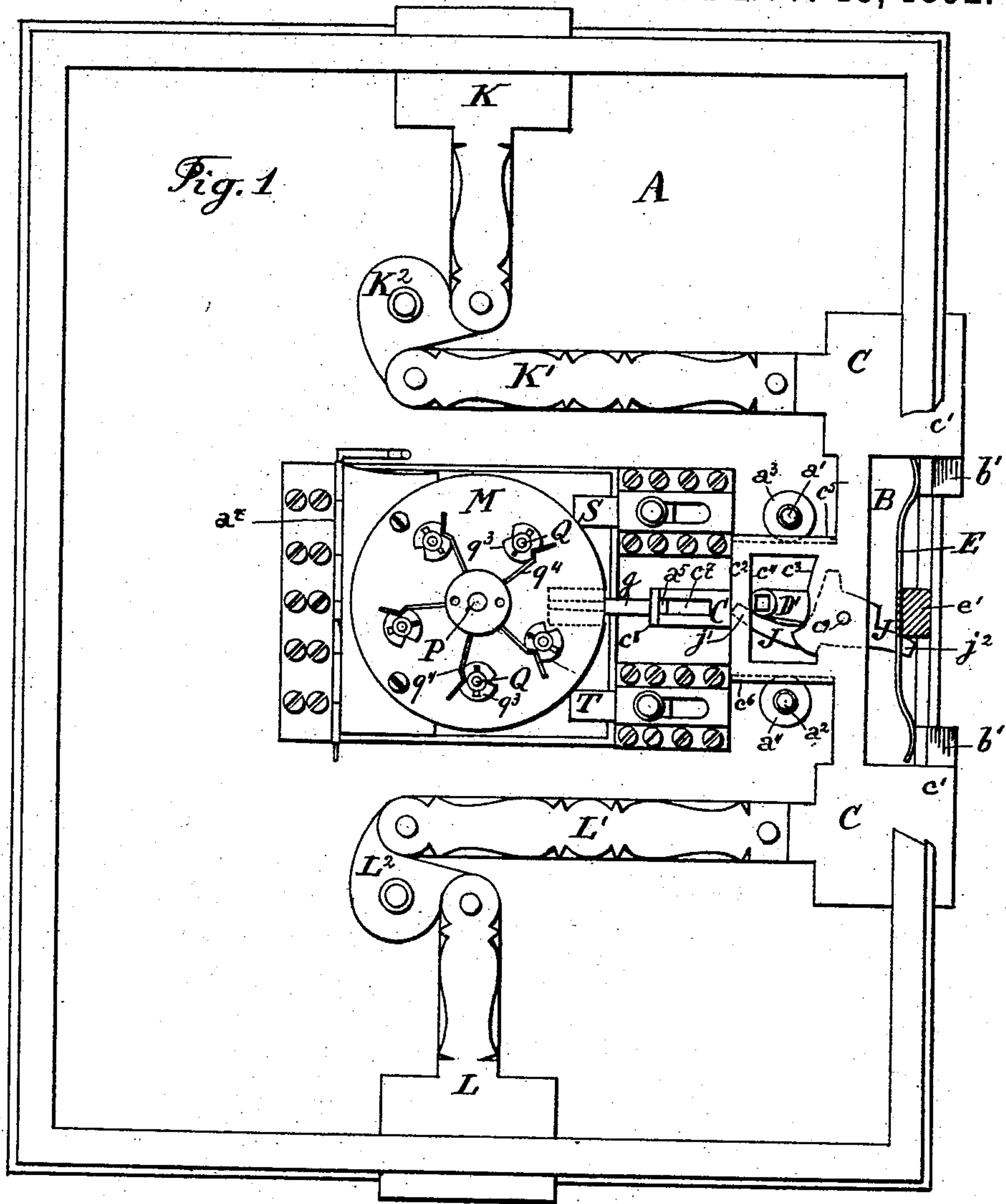
(No Model.)

4 Sheets—Sheet 1.

M. BADONI.  
PERMUTATION LOCK.

No. 486,391.

Patented Nov. 15, 1892.



Witnesses  
Charles H. Smith  
J. Staib

Inventor  
M. Badoni  
per Lemuel W. Serrell  
Atty

(No Model.)

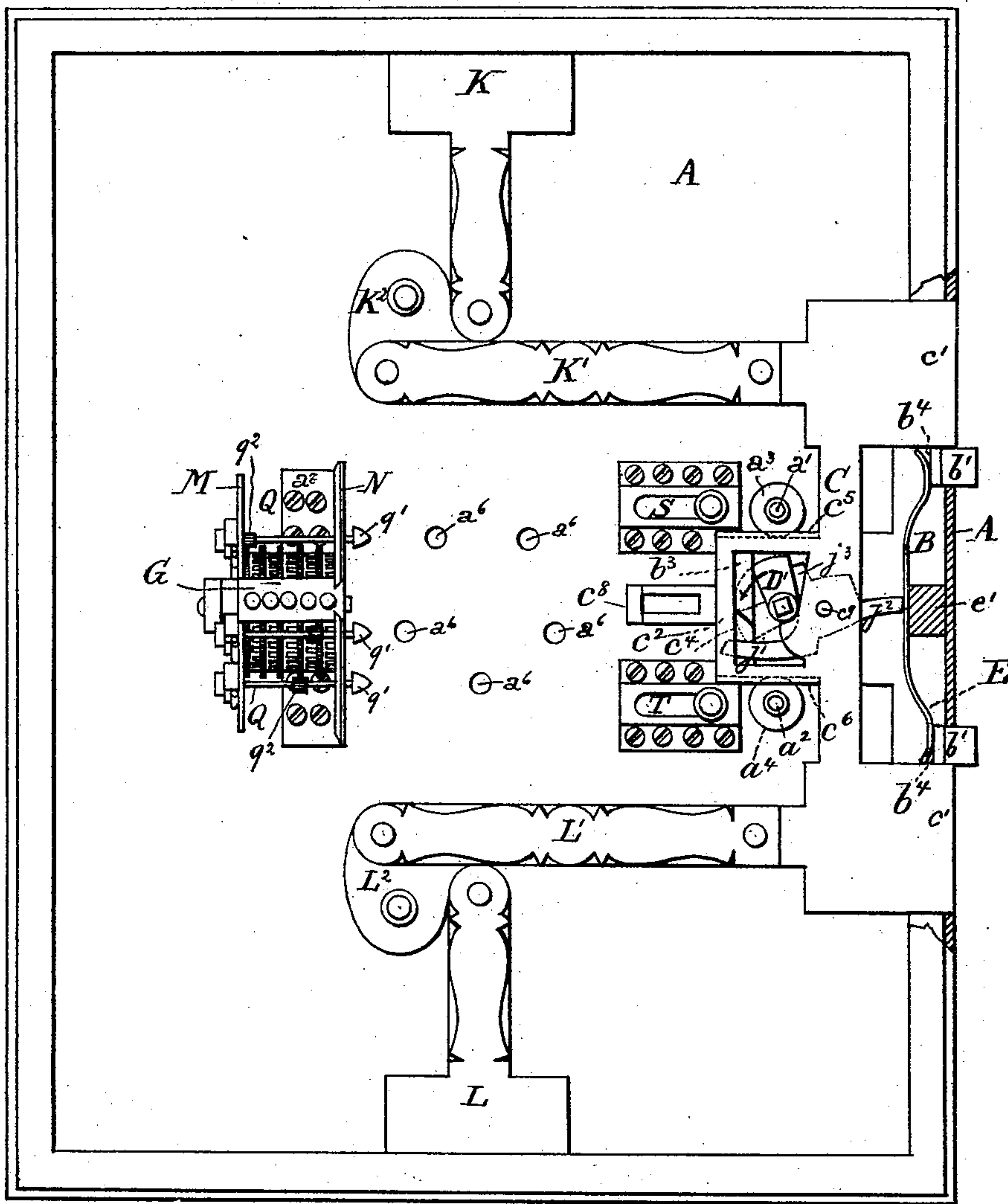
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Fig. 3



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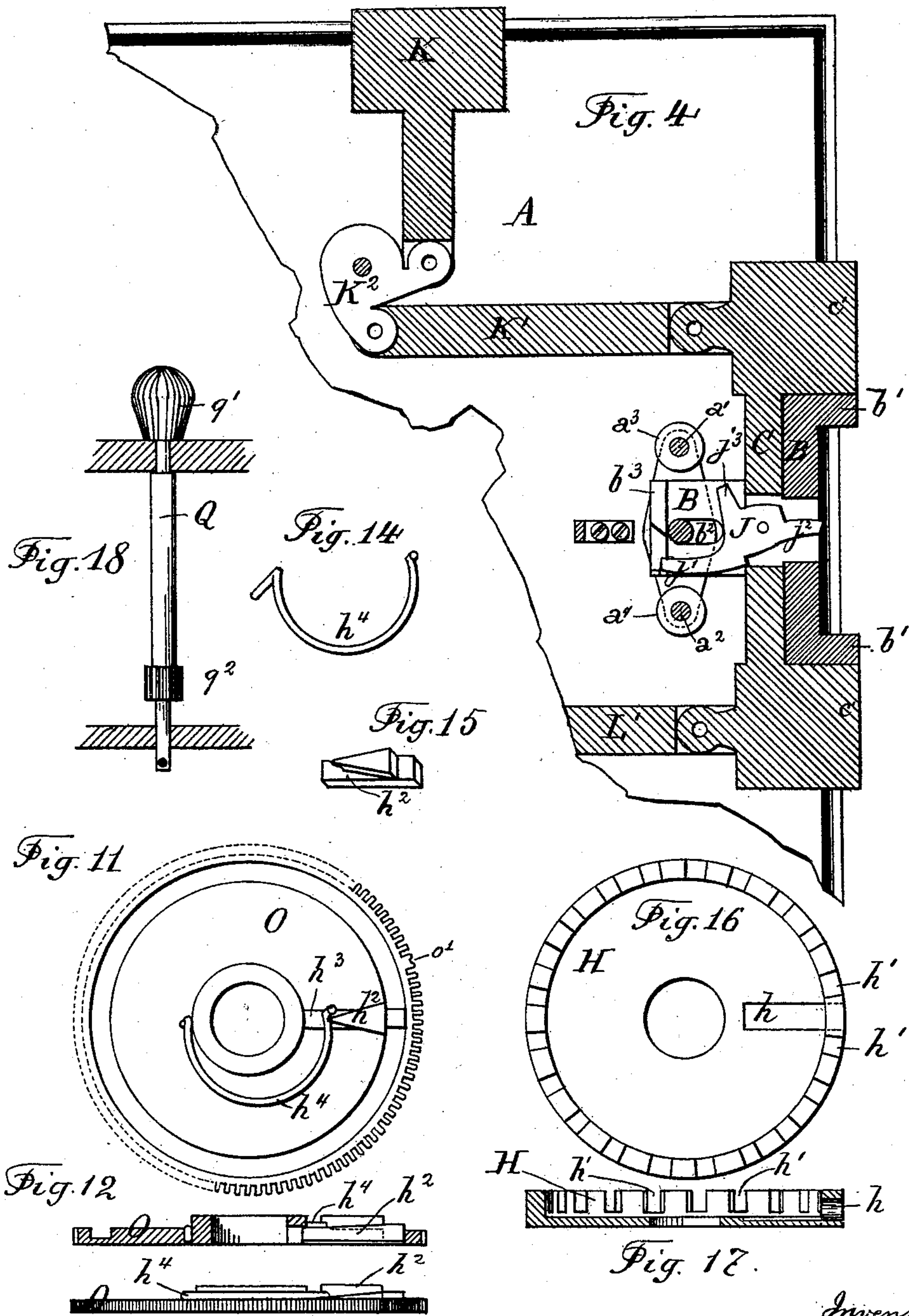
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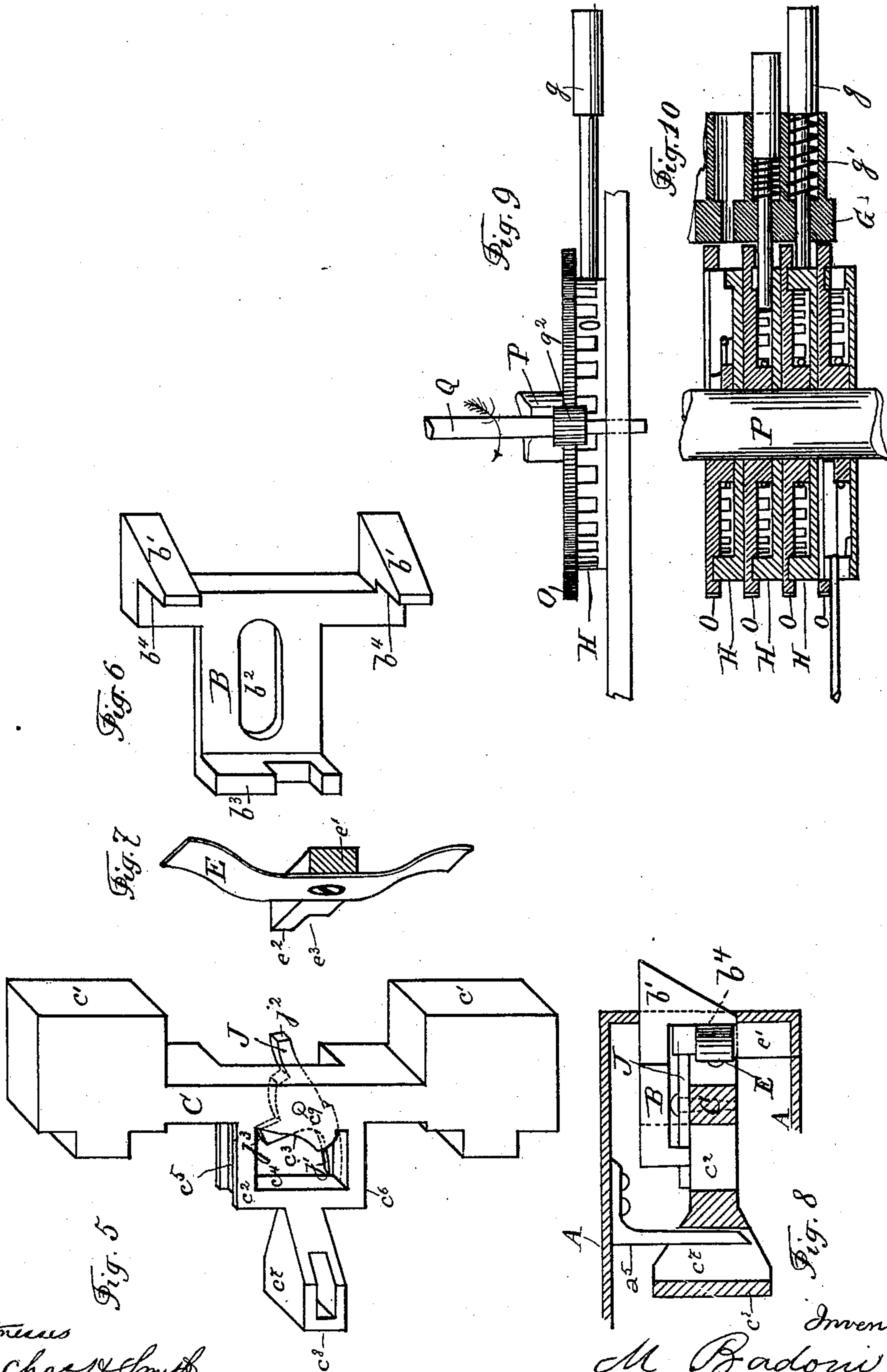
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# UNITED STATES PATENT OFFICE.

MASSIMILIANO BADONI, OF GENEVA, SWITZERLAND, ASSIGNOR TO ALOYS  
REVILLIOD DE MURALT, OF SAME PLACE.

## PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 486,391, dated November 15, 1892.

Application filed July 11, 1892. Serial No. 439,661. (No model.)

*To all whom it may concern:*

Be it known that I, MASSIMILIANO BADONI, mechanician, of Geneva, Switzerland, have invented certain new and useful Improve-  
5 ments in Safe-Locks, of which the following is a specification.

The invention consists of an improved construction of the locking device for safes, the object of the said invention being to lock the  
10 said safe without the aid of a key by a mechanical combination acted upon by merely rotating suitable buttons, and which may be changed with the utmost facility. The said combination being essentially formed of a  
15 variable number of similarly-shaped pieces, which may be easily and cheaply manufactured, the whole lock may therefore be manufactured very cheaply in any suitable size and when once locked cannot be picked.

20 In the accompanying drawings, Figure 1 is an inside elevation of the safe-door after withdrawing the cover-plate, the bolts being shown thrown outward as they appear when the safe is shut. Fig. 2 is a horizontal section of Fig.  
25 1. Fig. 3 is a similar view to Fig. 1, but in which the whole combination device is turned through an angle of ninety degrees on its hinge, so that it is seen in side elevation. Fig. 4 is a partial vertical section of the bolts.  
30 Fig. 5 is a separate perspective view of the main bolt. Fig. 6 is a separate perspective view of the spring-bolt. Fig. 7 is a separate perspective view of the spring acting upon the spring-bolt and of its bearing. Fig. 8 is  
35 a horizontal section of the main bolt, showing its combination with the spring-bolt and with the rocking lever. Fig. 9 shows separately to a larger scale a plan view of one of the elements of the lock-combination. Fig. 10 shows  
40 to the same scale and in cross-section four such elements of the lock-combination. Fig. 11 is a plan view of one of the wheels. Fig. 12 is a cross-section of the same, showing, also, the slider or bolt and spring. Fig. 13 is a side  
45 elevation of the same. Fig. 14 is a plan view of the spring. Fig. 15 is a separate perspective view of the slider or bolt. Fig. 16 is a plan view of one of the disks. Fig. 17 is a cross-section of the same. Fig. 18 shows sepa-  
50 rately one of the axes.

In all the figures the same letters refer to the same parts.

A is the door or cover of a safe of whatever form or dimension.

B is a spring-bolt having two or more lock- 55  
ing projections  $b'$  and intended to hold the safe shut without fastening the same—for instance, while the owner of the same is at his office and wants to frequently open the safe.

C is a fastening-bolt, the retracting of which 60  
may be prevented by means of the lock-combination hereinafter described. Both the spring-bolt B and the fastening-bolt C are acted upon by means of an external button or handle D, Fig. 2, the square axis of which bears a piece 65  
D', working like a key-bit upon both bolts B and C, and which will, therefore, be called the "bit" in the following specification. The spring-bolt B is formed substantially as shown in Fig. 6, having a slot  $b^2$ , in which plays the 70  
axis of the button or handle D, a projection  $b^3$ , intended to be acted upon by the bit D' to retract the spring-bolt, and projections  $b^4$ , intended to be acted upon by the ends of the spring-blade E, Fig. 7, the middle part of 75  
which is affixed to a bearing  $e'$ , firmly fixed to the door or cover A. The spring E tends to force the projections  $b'$  of the spring-bolt B out of the door or cover A, placing thereby the projection  $b^3$ , as shown in Fig. 3. If the 80  
bit D' acts upon said projections  $b^3$  in the direction of the arrow shown in Fig. 3, the spring-bolt B will be retracted, so as to allow the door or cover to be opened by merely rotating the button or handle D, and when the latter is re- 85  
leased the spring-bolt B will again be forced forward by the spring E. The fastening-bolt C is formed substantially as shown in Fig. 5. Its two or more projections  $c'$  are intended to lock the door or cover A, and its box-like pro- 90  
jection  $c^2$  is intended, on the one hand, to surround the bit D' of the handle D, which acts alternately upon its inner faces  $c^3$  and  $c^4$ , its outer edges  $c^5$  and  $c^6$  guiding the to-and-fro motion of the bolt C by means of rollers  $a^3$  95  
and  $a^4$  provided for that purpose and pivoted to suitable pivots  $a'$  and  $a^2$ , fixed to the cover or door A. The said bolt C is further provided with another box-like projection  $c^7$ , embracing a fixed projection  $a^5$ , fixed to the 100



cover or door A. The box-like projection  $c^7$  is adapted to slide on the said projection  $a^5$  and its face  $c^8$  is intended to act upon the pins or sliders  $g$  of the hereinafter-described lock-combination, so that the bolt C is only adapted to be returned into the position shown in Fig. 3 when all those pins or sliders  $g$  are allowed to enter their respective disks H—that is to say, when all those disks H have been set to a predetermined position. There is further provided on the fastening-bolt C a suitable rocking lever J, the purpose of which is to prevent the said fastening-bolt C being thrown forward by the forward motion of the spring-bolt B, as might occur by the friction of the latter against its neighbor. The said rocking lever J is pivoted at  $c^9$  to the bolt C and has three arms  $j^1$ ,  $j^2$ , and  $j^3$ . When the bit  $D'$  is turned in the direction of the arrow in Fig. 3—that is to say, when it retracts the two bolts B and C—it meets at the end of its stroke the arm  $j^1$  of said lever J, and in depressing the same it places the arm  $j^2$  of the same lever in front of the full part  $e^2$  of the bearing  $e'$ , as shown in Fig. 3, thus preventing any forward motion of the fastening-bolt C until the rocking lever J is rocked. The latter occurs when the bit  $D'$  is turned from the position shown in Fig. 3 into that shown in Fig. 1—that is to say, in the opposite direction to that indicated by the arrow in Fig. 3. It then meets the arm  $j^3$  of the rocking lever J, and the arm  $j^2$  of the latter is thrown into the position shown in Fig. 1, in which it is in front of the outcut  $e^3$  of the fixed part  $e'$ , leaving again the bolt C free to be slid forward for locking the door or cover A. The main bolt C may or may not be connected with supplementary bolts K and L by means of any suitable connecting rods and levers—for instance, as  $K^1 K^2 K^3$  and  $L^1 L^2$ .

The above-mentioned pins or sliders  $g$  of the lock-combination are lodged in a suitable casing G, fixed to the plates M and N, between which are disposed the wheels O and disks H, pivoted to a central axis P, which connects the plates M and N with one another. Each of the pins  $g$  is provided with a spiral spring  $g'$ , which tends to press the pin into the position in which its inner end (of smaller diameter) is retracted into the casing or box G—as, for instance, in Fig. 2. In line with each pin  $g$  there is provided a disk H, Figs. 16 and 17, having a suitable number of outcuts  $h'$ , but only one hole  $h$  large enough to allow the pin  $g$  to enter the same. Thus it appears that it is necessary to have all the disks H placed in the position in which they present the holes  $h$  in line with the pins  $g$ , if those pins are to be pressed into their box G in projecting their inner ends of smaller diameter into the disks H—that is to say, if the bolt C is to be left free to be retracted without having the face  $c^8$  of the projection  $c^7$  locked by one or more of the pins  $g$ .

Each of the disks H is provided with a gear-wheel O, Figs. 11 and 12, which extends be-

yond said disk H, as shown in Figs. 9 and 10, and which is provided with a bolt  $h^2$ , Fig. 15, adapted to slide in a radial slot  $h^3$  of said wheel O and pressed from the center to the periphery of said wheel by means of a suitable spring  $h^4$ . The said bolt  $h^2$  engages any of the outcuts  $h'$  of the corresponding disk H, so as to have each disk H locked in a predetermined position with regard to the corresponding wheel O. The outcuts  $h'$  are provided with suitable figures, and the more outcuts that are provided for each disk H the more numerous combinations it is possible to make. The bolts  $h^2$  connect the corresponding disk H and wheel O with one another, so that in rotating one of the wheels O one rotates at a time the corresponding disk H. Now there are provided as many axes Q, having each a button  $q^1$  and a pinion  $q^2$ , as there are wheels O in the combination and each pinion  $q^2$  engages one of the wheels O. The buttons  $q^1$  project through suitable holes  $a^6$  out of the door or cover A, Figs. 2 and 3, so that they may easily be rotated by hand. In some cases there may be provided an external box A' with cover A<sup>3</sup>, by which the said buttons  $q^1$  are covered; but this is not a feature of the present invention.

The whole described combination of box G, with pins  $g$  and springs  $g'$ , plates M and N, wheels O, and disks H, is suitably hinged at  $a^7$  to the cover or door A, so as to be adapted to be turned through an angle of ninety degrees to the said cover, as shown in Fig. 3, with the object of altering the combination. This takes place by changing in the outcuts  $h'$  or one or more of the bolts or sliders  $h^2$  of the corresponding wheel O, and this operation is very easily performed by means of any suitable tool passed into that outcut  $h'$  in which the said bolt or slider is engaged, pressing the same into the disk H, and at same time rotating the latter by means of said tool. The bolt or slider  $h^2$  will then project into the next outcut  $h'$ . This operation may be repeated until said bolt or slider  $h^2$  is engaged in the desired outcut  $h'$ , the figure of which must be noted, as being necessary to be known for the opening of the safe. This being done, the whole combination is thrown from the position shown in Fig. 3 into that shown in Figs. 1 and 2 and locks the same into this latter position by means of the bolts S and T. Each axis Q also carries a cam  $q^3$ , provided with suitable notches into which engages the beveled end of a corresponding spring  $q^4$ , fixed to the axis P. Each wheel O is further provided with a full tooth  $o'$ , Fig. 11, and the teeth of said wheel O and of the pinions are so calculated as to rotate each disk H a suitable number of degrees, so as to place the same exactly with one of its divisions in front of the corresponding pin  $g$  each time the spring  $q^4$  jumps from one of the notches of the cam  $q^3$  into the next one. This jumping is easily perceptible to the person who rotates by hand the knobs  $q^1$ .

The figures of the outcuts  $h'$  are arranged



so as to have the hole  $h$  of each disk  $H$  placed in front of pins  $g$  when the corresponding pinion  $q^2$  is rotated to the left until it meets the full tooth  $o'$  of the wheel  $O$  the slider or bolt  $h^2$  being engaged into that one of the outcuts  $h'$  which is marked "0." If, therefore, the bolt  $h^2$  of the first wheel  $O$  is engaged into the outcut marked 8 of the corresponding disk  $H$ , the latter may be easily placed into that position in which its hole  $h$  is in front of the corresponding pin  $g$ —that is to say, into that position in which it allows the bolt  $C$  to be retracted by merely rotating the said first wheel in the left-hand direction until it is stopped by the meeting of the pinion  $q^2$  with the full tooth and then rotating the safe knob or button in the right-hand direction and counting eight jumps of the corresponding spring  $q^4$  and then stopping. The corresponding disk will then of course be placed with its hole  $h$  in front of the corresponding pin  $g$ , and so on for each of the wheels  $O$  and disks  $H$ .

Having thus described my invention, I claim—

1. In locks for safes, the combination of a spring-bolt  $B$ , formed substantially as shown, with a fastening-bolt  $C$ , formed substantially as shown, a spring  $E$ , with bearing  $e'$ , a rocking lever  $J$ , pivoted to said bolt  $C$ , a bit  $D'$ , acted upon by means of a knob or handle  $D$  and acting upon the aforesaid bolts  $B$  and  $C$  and lever  $J$ , and with a series of pins or other sliding pieces  $g$ , located in a box  $G$  and pressed by the retracting motion of the bolt  $C$  against a corresponding series of disks  $H$ , which are provided each with one hole  $h$  for the passage of the corresponding pin or other sliding piece  $g$ , and with series of outcuts  $h'$ , and said disks  $H$  being each connected to a corresponding wheel  $O$  by means of a bolt or slider  $h^2$ , which may be locked into any one of the outcuts  $h'$  of the disk  $H$ , each wheel  $O$  being acted upon by means of a pinion  $q^2$ , able to be rotated from the outside of the safe, and each wheel  $O$ , being provided with a full tooth  $q^2$  or other suitable stop, substantially as and for the purpose specified.

2. The combination, with the bolt having a face  $c^8$ , of the sliders  $g$ , the box  $G$ , supporting the same, the springs to press the sliders toward the bolt, the disks, each with outcuts and a hole for receiving the end of the slider as the bolt is retracted, the wheels  $O$ , and the spring-bolts  $h^2$  for connecting the wheels and disks, and pinions and knobs for rotating the respective wheels and setting the disks, substantially as specified.

3. The combination, with the bolt having a face  $c^8$ , of the sliders  $g$ , the box  $G$ , supporting the same, the springs to press the sliders toward the bolt, the disks, each with outcuts and a hole for receiving the end of the slider as the bolt is retracted, the wheels  $O$ , and the spring-bolts  $h^2$  for connecting the wheels and disks, and pinions and knobs for rotating the respective wheels and setting the disks, the axis  $P$  and plates  $M N$ , and the hinge  $a^7$ , by which access is given in setting the disks, substantially as specified.

4. The fastening-bolt  $C$ , in combination with the bolt  $B$  and spring for projecting the same and the rocking lever  $J$  and bit  $D$  for acting upon both bolts to withdraw or project the same, the rocking lever  $J$  holding the bolt  $C$  out of action when only the spring-bolt  $B$  is made use of, substantially as specified.

5. The combination, with the bolt and sliders  $g$ , of the disks  $H$ , each having outcuts and a hole for its slider, and the wheels  $O$ , having stops  $O'$  and spring-bolts for connecting the wheels and disks, turn-buttons, axes, and pinions gearing into the wheels, and cams and springs for indicating the places at which the pinions are to be stopped, substantially as specified.

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

MASSIMILIANO BADONI.

Witnesses:

GILMER SCHMID,  
REVILLIOD DE MURALT.