

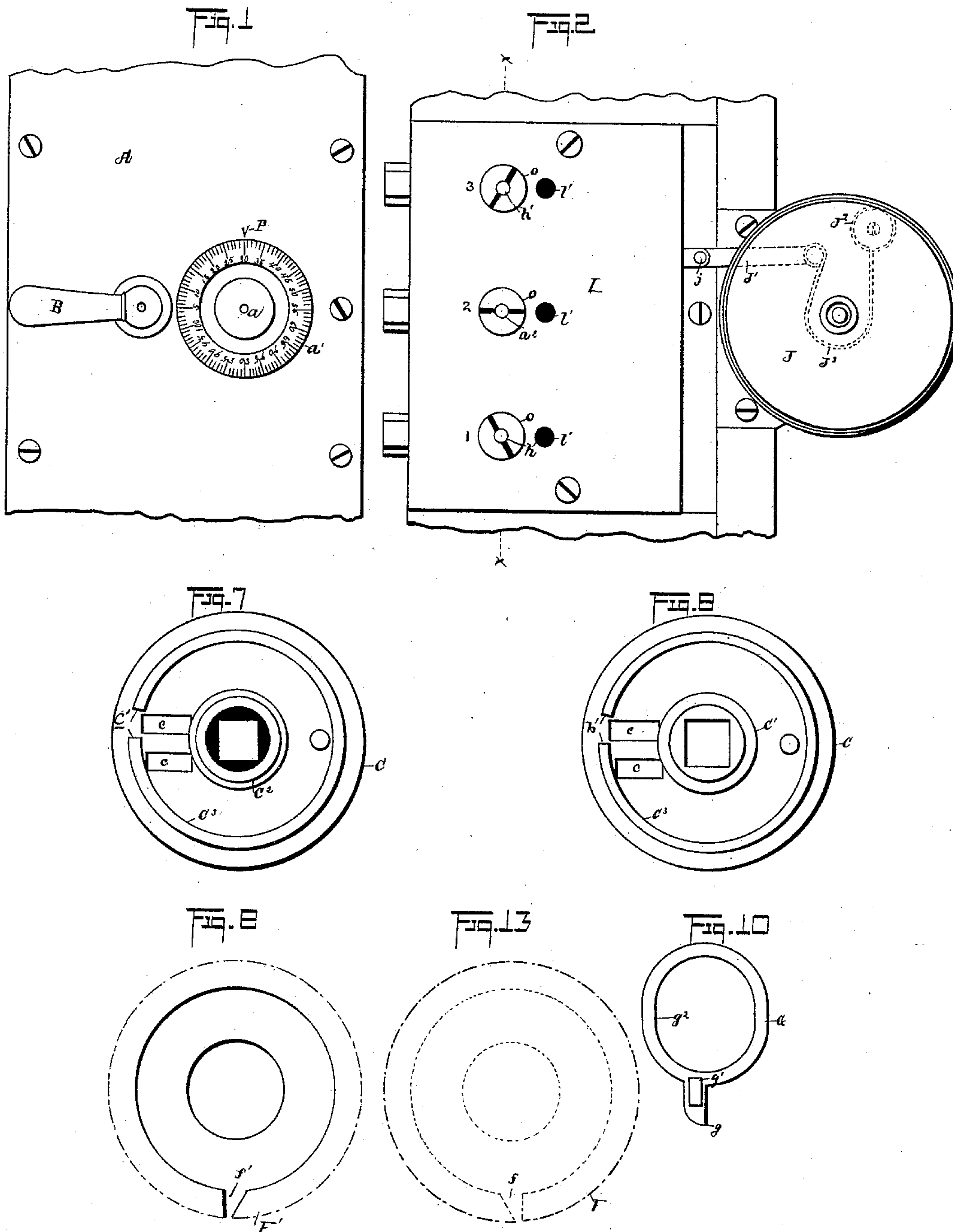
(Model.)

3 Sheets—Sheet 1.

J. M. PFLAUM.  
PERMUTATION LOCK.

No. 409,496.

Patented Aug. 20, 1889.



WITNESSES

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*Geo. W. King*

*Jno M. Pflaum* INVENTOR  
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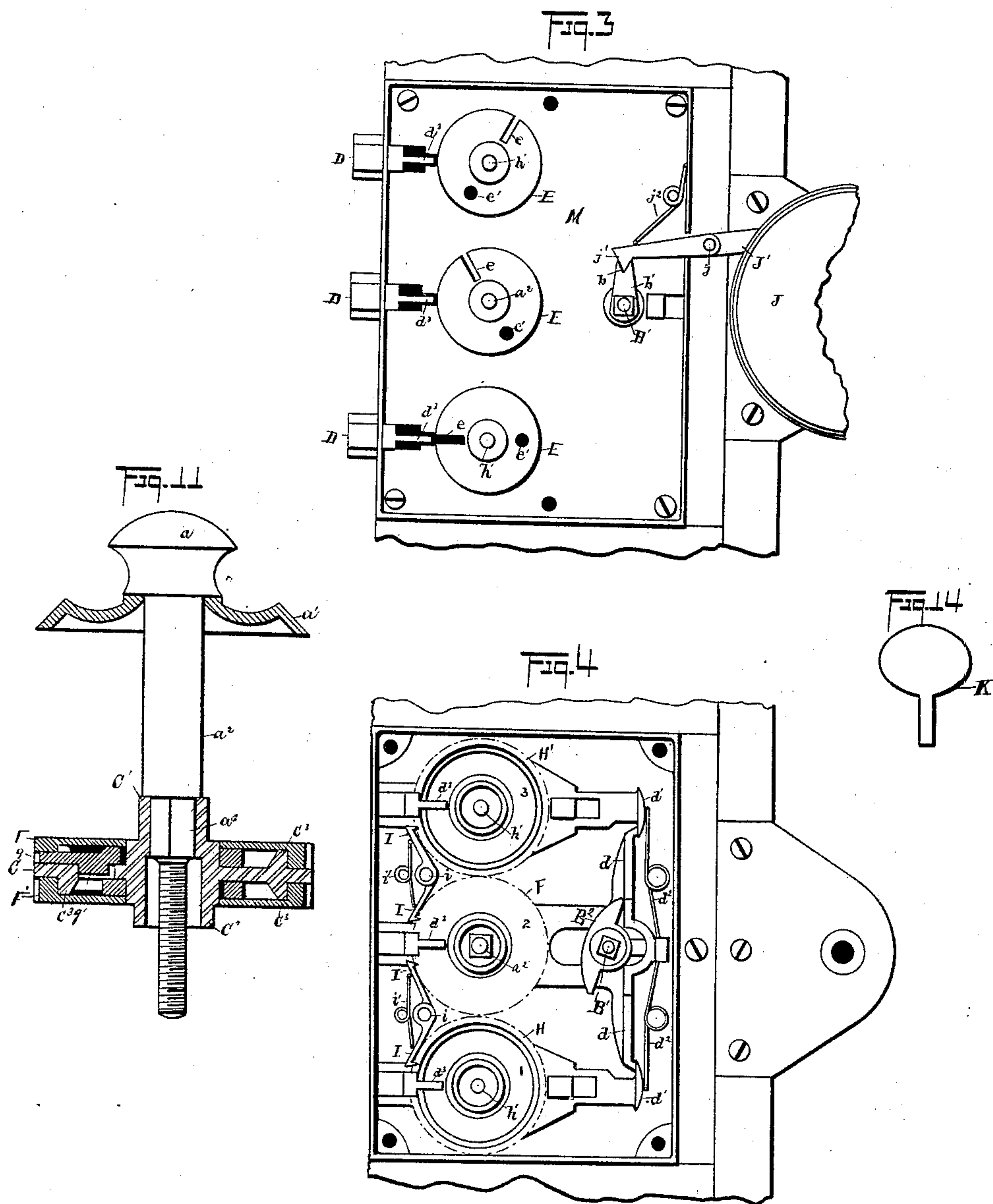
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WITNESSES

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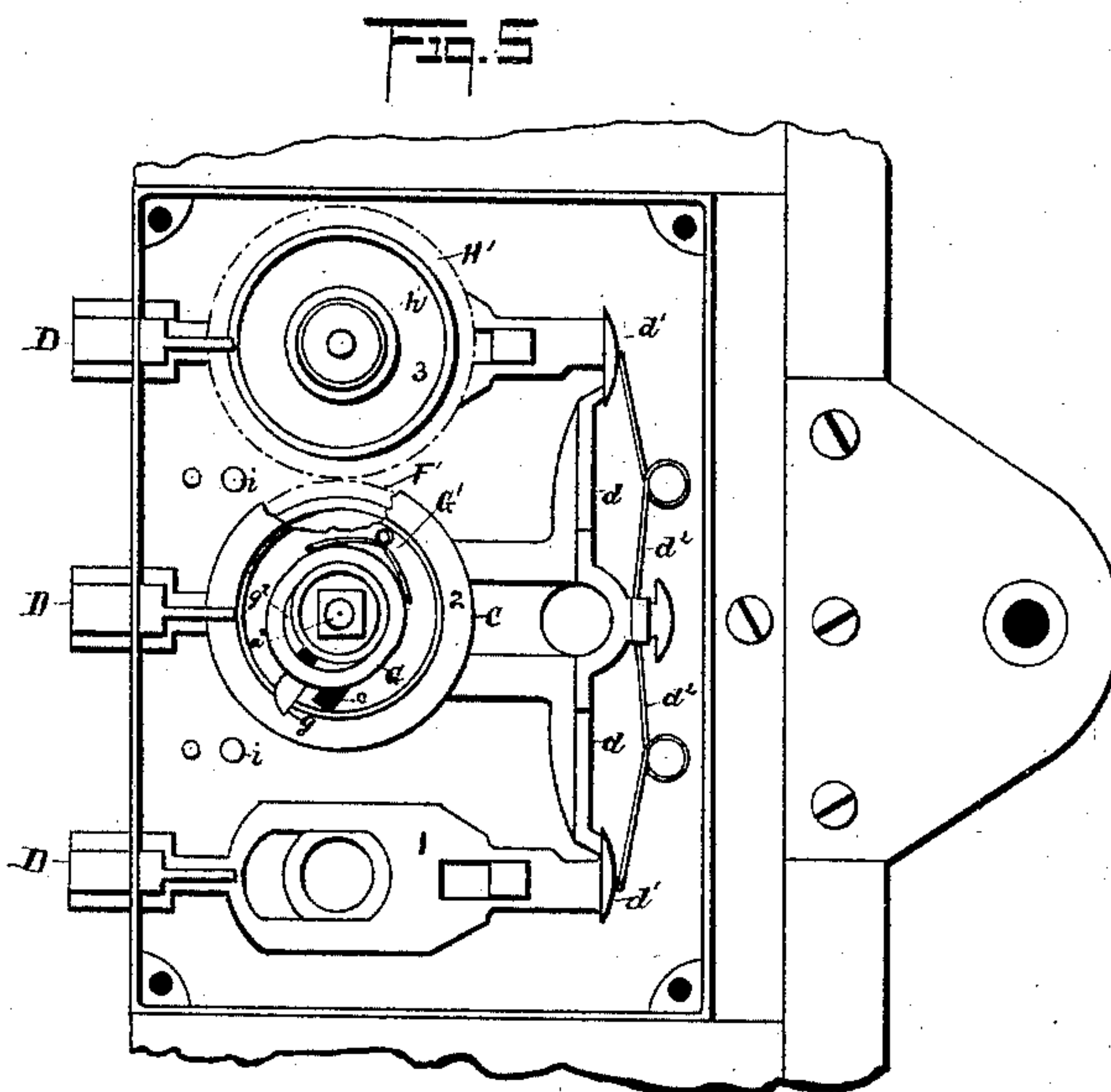
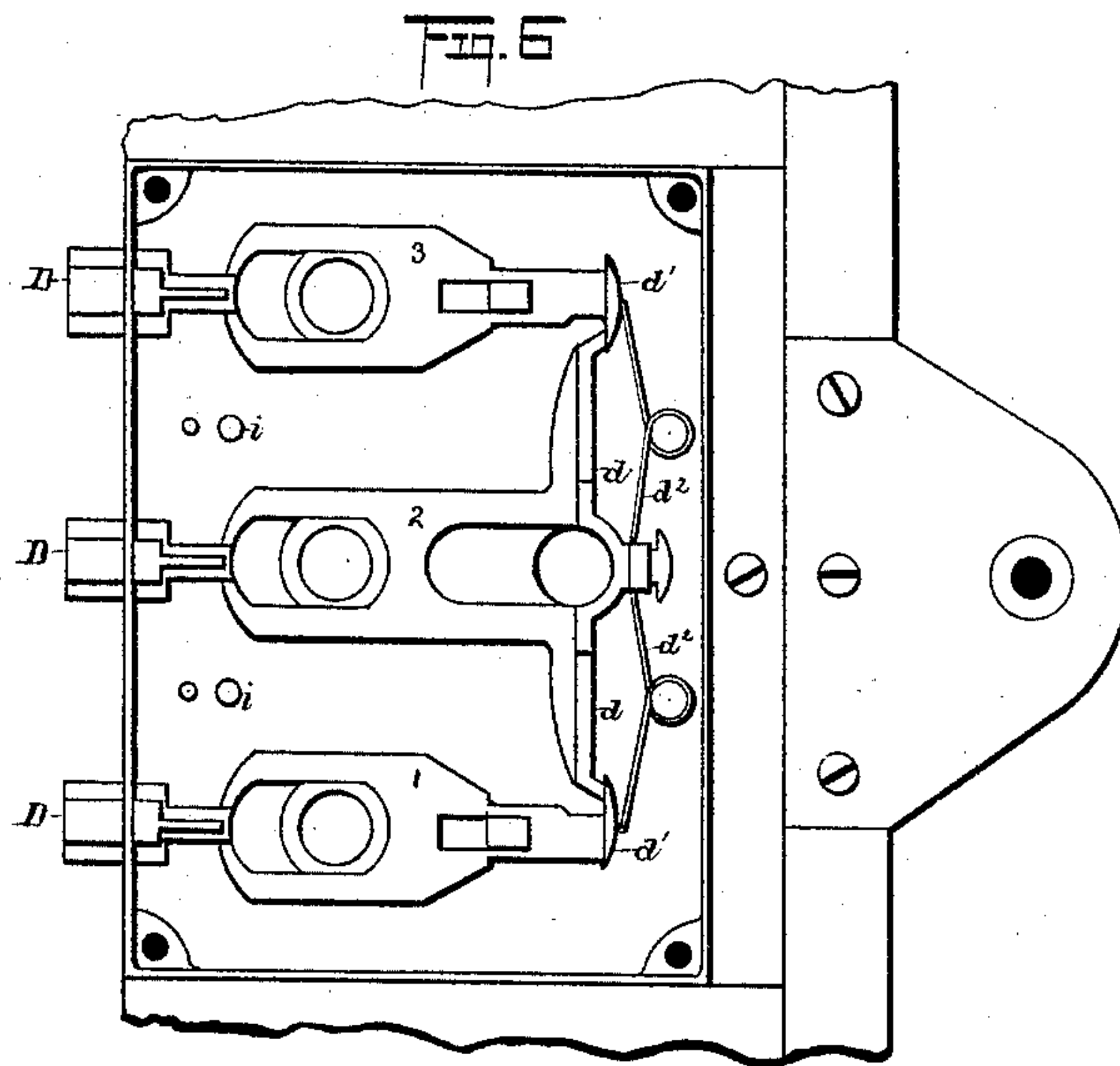
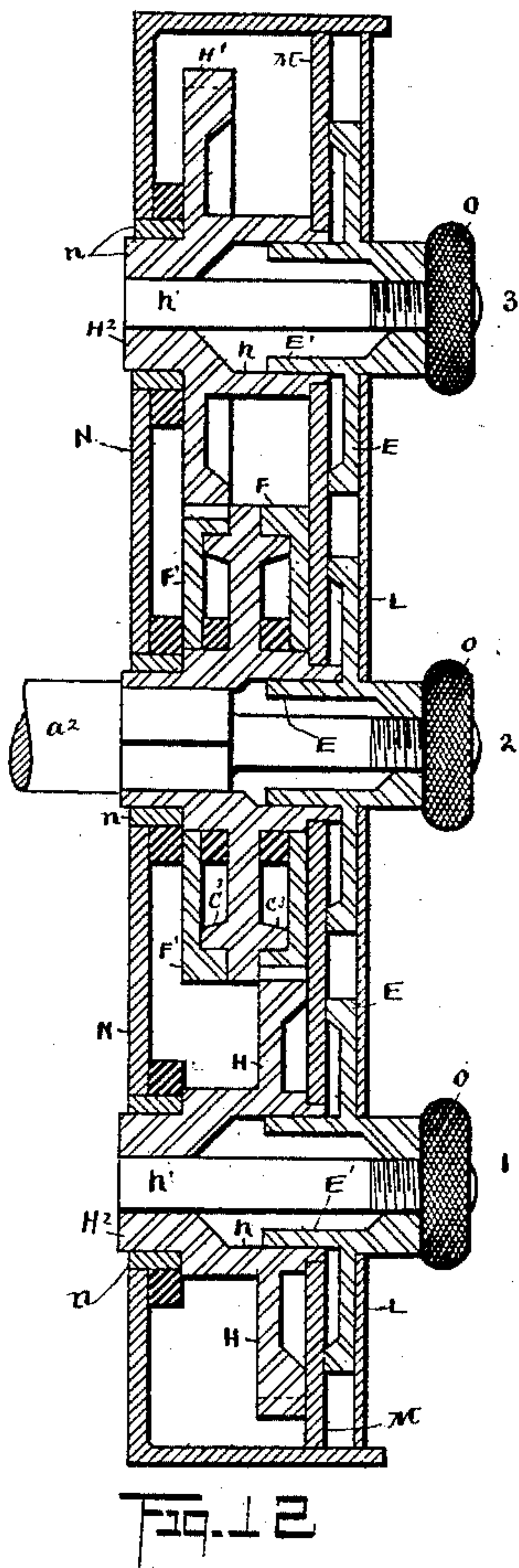
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Attorneys



# UNITED STATES PATENT OFFICE.

JOHN M. PFLAUM, OF CLEVELAND, OHIO.

## PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 409,496, dated August 20, 1889.

Application filed August 22, 1888. Serial No. 283,488. (Model.)

*To all whom it may concern:*

Be it known that I, JOHN M. PFLAUM, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and  
5 useful Improvements in Permutation-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 pertains to make and use the  
10 same.

My invention relates to improvements in permutation-locks; and it consists in certain features of construction, and in combination of parts hereinafter described, and pointed  
15 out in the claims.

In the accompanying drawings, Figures 1 and 2 are corresponding elevations, respectively, inside and outside the safe-door, adjacent the lock. Fig. 3 is an inside elevation  
20 with plate L removed, exposing plate M. In Fig. 4 plate M is removed. In Fig. 5 the lower tumbler (No. 1) and the mechanism for actuating the same are removed. In Fig. 6 all the commutation mechanism is removed,  
25 exposing the bolts. Figs. 7 and 8 are plans showing reverse sides of disk C. Figs. 9 and 13 are plans, respectively, of gears F' and F. Fig. 10 is a plan of dog G. Fig. 11 is a plan partly in section. Fig. 12 is an end elevation  
30 in section on line *x x*, Fig. 2. Fig. 14 is a detail of plug K.

A represents the safe-door, *a* the knob for operating the permutation mechanism, and B the lever for withdrawing the bolts. Knob *a*  
35 and dial-plate *a'* are rigidly connected or integral with spindle *a<sup>2</sup>*, the latter extending through the safe-door and lock and having a square section *a<sup>3</sup>* for engaging a corresponding socket in hub C' of disk C, by reason of  
40 which this spindle and disk always turn together. The bolts are shown more clearly in Fig. 6, and in the main are of ordinary construction. The central bolt D is provided with cross-bar *d*, for engaging toes *d'* of bolts  
45 D', by reason of which bolts D' are drawn back by the rearward movement of bolt D. Lever B is attached to or integral with spindle B', the latter being provided with cam B<sup>2</sup>, for engaging cross-bar *d* in drawing back the  
50 bolts, the latter being shot by the action of

springs *d<sup>2</sup>*. Each bolt is provided with a finger *d<sup>3</sup>*, that must enter a corresponding slot *e* in the adjacent tumbler E in drawing back the bolt.

The permutation mechanism is as follows: 55  
The disk C, in addition to hub C' for engaging spindle *a<sup>2</sup>*, has on the opposite side of the disk a hub C<sup>2</sup>, the bore of this latter hub being considerably larger than the dimensions of the spindle at this part, leaving room be- 60  
tween the spindle and inner periphery of hub C<sup>2</sup> for inserting the hub E' of one of the tumblers E. (See Fig. 12.) Disk C has on either side thereof an annular flange C<sup>3</sup>. Two slots *c c* are made through the web or body of the 65  
disk, and located about as shown in Figs. 7 and 8; also, a channel *c'* is made through each flange C<sup>3</sup>, near the respective slots *c*. Mounted on opposite sides of disk C are two  
70 toothed wheels or gears F and F', these gears being journaled loosely on the respective hubs of the disk. The rims of these gears overlap the periphery of the respective flanges C<sup>3</sup>, (see Figs. 11 and 12,) and these  
75 rims, on the inner periphery thereof, have ratchet-notches, respectively, *f* and *f'*, for engaging corresponding points *g* of dogs G. These dogs fit easily, respectively, between  
80 disk C and gears F and F', the points *g* of the dogs extending out through the respective channels *c'*. Each dog has a lug *g'*, that operates in a slot *c* of the disk and serves as a steady-pin for the dog.

A spring G' is arranged, as shown in Fig. 5, at the back of each dog to press the point of 85  
the dog forward. The large central opening *g<sup>2</sup>* of the dog admits the latter being placed astride the hub of the disk. The two dogs are alike, but are in reverse position. When, therefore, the disk is turned in the one direc- 90  
tion, one of the dogs will engage notch *f* and turn gear F with the disk. When the disk is turned in the other direction, the other dog will engage notch *f'* and turn gear F' with the disk, and in either case the idle dog 95  
will snub back in passing its notch of the gear. In other words, gears F and F' are turned only one at a time and in reverse direction by reverse movement of disk C. Gear F en-  
gages gear H and gear F' engages gear H'. 100



Gears H and H' are respectively provided with trunnions H<sup>2</sup> and hollow hubs *h* and studs *h'*. Trunnions H<sup>2</sup> are journaled in corresponding seats formed by the projecting flanges *n* of the back or bed plate N of the lock. Hubs *h* receive each a hub E' of a tumbler, and studs *h'* extend loosely through central holes of the tumblers and are provided each with a thumb-nut O for tightening the respective tumblers on the respective hubs, whereby each tumbler and its supporting-hub turns together, except when such thumb-nut is loosened. The three tumblers are supposed to be alike, and as it is desirable to have some means of designating the different tumblers in setting the combination, and as the tumblers are concealed by plate L, the three thumb-nuts O are numbered, respectively, 1, 2, and 3, to represent the different tumblers to which they are connected. Each tumbler has a hole *e'*, that registers with a hole *l'*, made in plate L, when slot *e* of such tumbler is in position to receive the opposing finger *d*<sup>3</sup> of the bolts. Retaining-pawls I are respectively mounted on pins *i* and respectively engage gears F, F', H, and H', these pawls being held to such engagement by springs *i'*. These pawls are snubbed back when the different gears are actuated by dogs G, the function of these pawls being to retain the different gears as against reverse movement that would likely accrue from friction of parts. With the arrangement of parts thus shown it is evident that when knob *a* is turned in the one direction gears F and H and tumbler E, No. 1, will be turned, and that when knob *a* is reversed gears F' H' and tumbler No. 1 will remain stationary and gears F' H' and tumbler E, No. 3, will be actuated, and that tumbler E, No. 2, being connected with disk C, and the latter being mounted on the knob-spindle *a*<sup>2</sup>, tumbler No. 2 will turn in unison with knob *a* when this knob is moved in either direction. When the safe-door is opened, thumb-nuts O and holes *l'* are accessible.

In setting the tumblers to the desired combination no particular order need be followed; but for convenience in describing the operation I will follow the order in which the tumblers are numbered, and the different tumblers will be designated simply by such respective numbers 1, 2, and 3. First, knob *a* is turned in the direction to actuate No. 1, and when the hole thereof *e'* and hole *l'* register plug K is inserted in these holes to hold this tumbler stationary, after which the thumb-nut is loosened and knob *a* is turned until the desired number—which we will suppose to be 61—of the dial comes opposite point P on the door, and while the parts are in this position the thumb-nut is again tightened and plug K removed. It will be remembered that when hole *e'* of a tumbler registers with the corresponding hole *l'* notch *e* of this tumbler will be in position for withdrawing the opposing bolt. In the present instance, therefore, No.

1 having been tightened or locked by the thumb-nut with the dial at No. 61, in unlocking the safe the dial must be returned to No. 61 to bring tumbler No. 1 in position to admit the withdrawal of the opposing bolt. Next, and as tumbler No. 2 is mounted on the spindle of the knob *a*, the latter may be turned in either direction to bring tumbler No. 2 in position with its hole *e'* registering with corresponding hole *l'*, after which plug K is inserted. The thumb-nut is then loosened and the dial is set, we will suppose, at No. 13, after which the thumb-nut is tightened and the plug removed. No. 3 is set in the same manner as No. 1, except that knob *a* is turned in the opposite direction, and we will suppose that No. 3 is set at No. 88 of the dial. After the different tumblers have been set and the safe locked the knob is supposed to have been turned, first in one direction and then in the other direction to disarrange the combination.

In unlocking the safe the manipulation of knob *a* may be as follows: First, the knob is turned in the direction to move tumbler No. 1, and the knob should be turned once round to be sure that the dog thereof has engaged notch *f*, after which the movement of the knob is continued to bring the tumbler in position for receiving the bolt, which in the present case is supposed to be at No. 61 of the dial. Next, the knob is reversed and given a revolution, and then continued until the dial is set at 88. The knob is then again reversed and the dial set at No. 13, after which the bolts may be drawn back. In closing the safe, the bolts being spring-actuated, the safe is of course self-locking, and after the safe is closed it only remains to turn the knob, as aforesaid, to disarrange the combination, in which disarranged condition the safe is left.

Tumblers Nos. 1 and 3 may be set at any desired number of the dial, but tumbler No. 2 is subject to some limitations, as follows: The dials are usually numbered to 100, the latter number being coincident with 0, and the points of the dogs are usually set opposite the zero-point of the dial, and of course never change their position relative to the zero-point, but move with the dial. We will suppose, also, that in turning tumbler No. 1 the dial is turned past point P in the direction that the figures on the dial read, 1, 2, 3, &c., in which case in turning tumbler No. 3 the figures on the dial would pass point P in the reverse order, 99, 98, 97, &c. Tumbler No. 1 having been turned to dial number, for instance, 61, is left in this position, and tumbler No. 3 is turned in the opposite direction twelve numbers from zero to reach No. 88. Now it is evident that in such case the dial cannot be turned from 0 in the one direction past 61, or in the other direction from 0 past 88, without moving one or the other of the two outside tumblers. In this case, therefore, the middle tumbler No. 2 is limited in its range



accordingly, and instead of having been set at No. 13 it could, if so preferred, have been set at any number of the dial from 0 to 61 in the one direction, or from 0 to 88 in the other direction, but its range could not have exceeded these limits. Tumbler No. 2 may therefore be set at any desired number between the dial-numbers of tumblers Nos. 1 and 3, provided the sum of these numbers, the one counted forward from 0 and the other counted backward from 0, does not exceed the numbers (100) on the dial. If in setting tumblers Nos. 1 and 3 the sum of the extreme movements of the dial exceed a revolution thereof, in such case the notches  $f$  and  $f'$  pass each other, and as the dogs can only pass from one notch to the other without moving one of the outside tumblers the range of dial-numbers to which tumbler No. 2 can be set in such case is limited between notches  $f$  and  $f'$  on the side of the dial opposite point P. This will perhaps be better understood by citing some example. For instance, tumbler No. 1 having been set, as aforesaid, at No. 61 of the dial, suppose tumbler No. 3 had been set at 50 of the dial, in which case, in turning the dial backward from 0 to reach No. 50, notch  $f'$  will have been moved past notch  $f$ , and the dogs will be left with a range of only eleven numbers, from 50 to 61, without moving one of the outside tumblers, and consequently this range of eleven numbers, between 50 and 61, is all that can be chosen from in setting the middle tumbler No. 2. Again, if tumbler No. 1 were set at number 15 of the dial and tumbler No. 3 were set at number 7, a range of only eight numbers, from 7 to 15, would be left from which to choose in setting tumbler No. 2; or if tumbler No. 1 were set at 91 and tumbler No. 3 were set at 6, a range of eighty-five numbers would be left from which to choose in setting tumbler No. 2. From these examples given it is believed that there will be no difficulty in determining what numbers may be chosen for setting tumbler No. 2 under any circumstances. The limits thus had in setting tumbler No. 2 do not detract from the merits of the lock, as there remains almost an endless number of combinations that can be used. These combinations are not often changed. Some people never change them. Others only change the combination at long intervals—say once in a year or two—but whenever such change in the combination is made it requires but little trouble and but a few minutes time.

An alarm-bell J is connected with the lock and operated as follows to sound an alarm every time the bolts are drawn: Lever J', to which the bell-hammer J<sup>2</sup> is connected by means of spring J<sup>3</sup>, is pivoted at  $j$ . The free end of the lever is provided with a V-shaped laterally-projecting point  $j'$ , that engages a corresponding notch  $b$  on the end of arm  $b'$ , this arm being rigidly secured to spindle B'.

A spring  $j^2$  holds point  $j'$  to its engagement with the notch, and in whichever direction spindle B' is turned in withdrawing the bolts of the lock lever J' is actuated and the alarm-bell is sounded.

What I claim is—

1. The combination, with outside hand-knobs, dial, and internal disk mounted on a spindle in common, of spring-actuated dogs connected with such disk, toothed wheels mounted loosely on either side of the disk, the dogs having beveled ends arranged in reverse order, and the toothed wheels having corresponding notches for engaging the respective dogs with reverse movements of the disk, substantially as set forth.

2. The combination, with internal disk, mechanism, substantially as indicated, for actuating the same, said disk having annular flanges on either side thereof, such flanges having respectively radial openings, of toothed wheels journaled on the respective hubs of such disk, the rim of the respective toothed wheels overlapping the respective flanges of the disk, spring-actuated dogs located between the disk and the respective toothed wheels, beveled points of the dog, and corresponding notches of the toothed wheels for mutual engagement, whereby the respective toothed wheels are rotated with the respective reverse movements of the disk, substantially as set forth.

3. The combination, with hand-knob, dial, spindle, and disk, the latter having a hollow hub, substantially as indicated, of a tumbler mounted on the said spindle, the hub of the tumbler entering the hollow hub of the disk, a nut mounted on such spindle for tightening the engaging-hub to cause the tumbler to revolve with the disk, substantially as set forth.

4. The combination, with gears F F' and mechanism, substantially as indicated, for operating these gears in opposite directions, of gears H H', the latter being connected with tumblers arranged substantially as described, and for the purposes set forth.

5. The combination, with hand-knob, dial, and spindle, a central tumbler mounted on the said spindle and adjustably secured thereto, of tumblers arranged on either side of the central tumbler, mechanism, substantially as indicated, for connecting the side tumblers with the central spindle, whereby the side tumblers are actuated in opposite directions by reverse movement of the central spindle, substantially as set forth.

6. The combination, with three tumblers and mechanism for actuating the different tumblers, substantially as indicated, of slot and hole in each tumbler, corresponding holes in the face-plate of the lock, arranged substantially as indicated, whereby the opposing holes of plate and tumbler register when the slot of such tumbler is in position to receive the opposing bolt, substantially as set forth.

7. The combination, with lever and spindle for withdrawing the bolts, a lateral arm connected with such spindle, said arm having a V-shaped notch at the free end thereof,  
5 of signal-bell and spring-actuated bell-lever for the same, said bell-lever having a V-shaped projection for engaging such notch of the spindle-lever, substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 10  
4th day of January, 1888.

JOHN M. PFLAUM.

Witnesses:

CHAS. H. DORER,  
ALBERT E. LYNCH.