

(Model.)

2 Sheets—Sheet 1.

O. E. PILLARD.

PERMUTATION LOCK.

No. 301,001.

Patented June 24, 1884.

Fig:2.

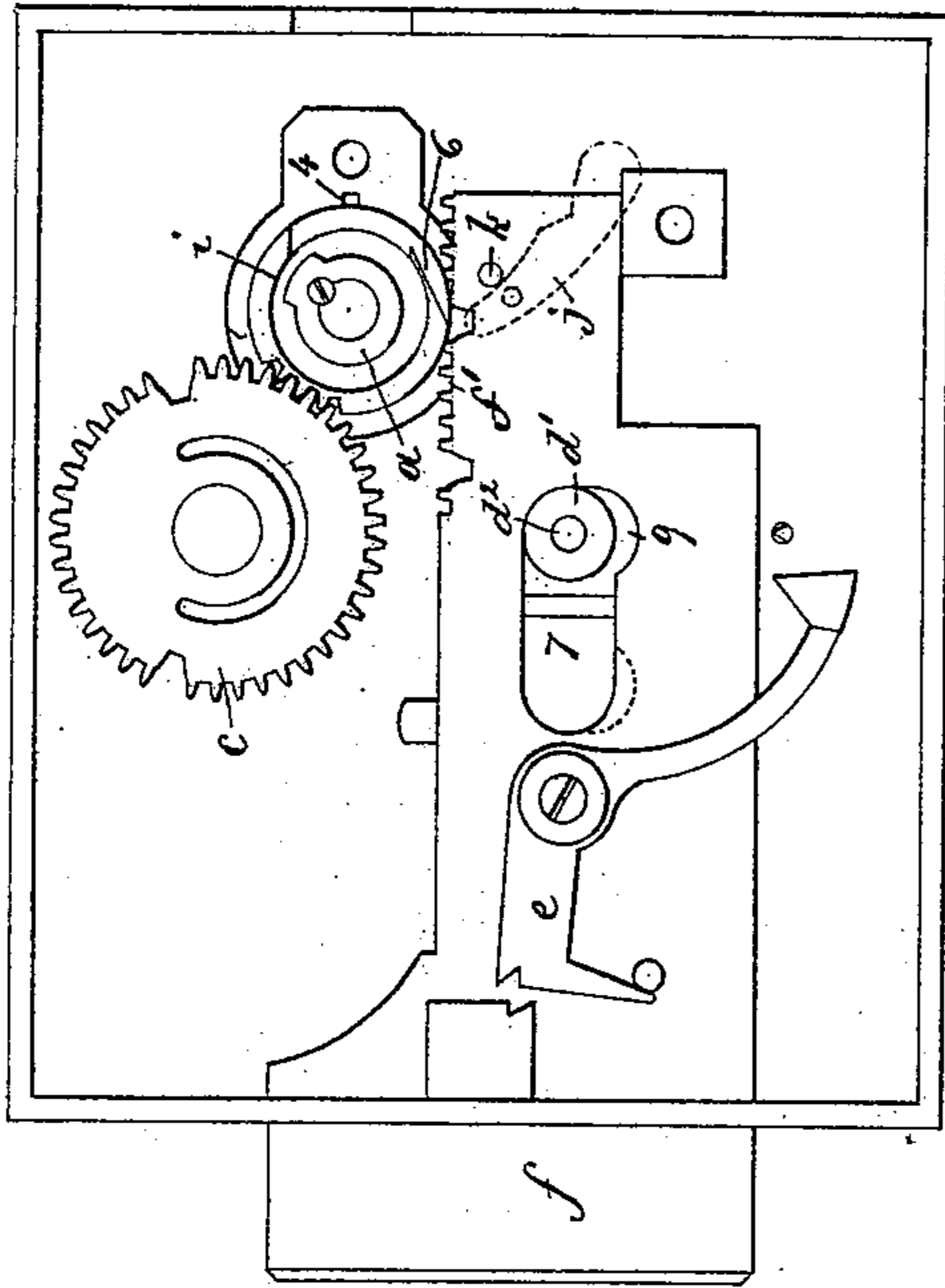


Fig:1.

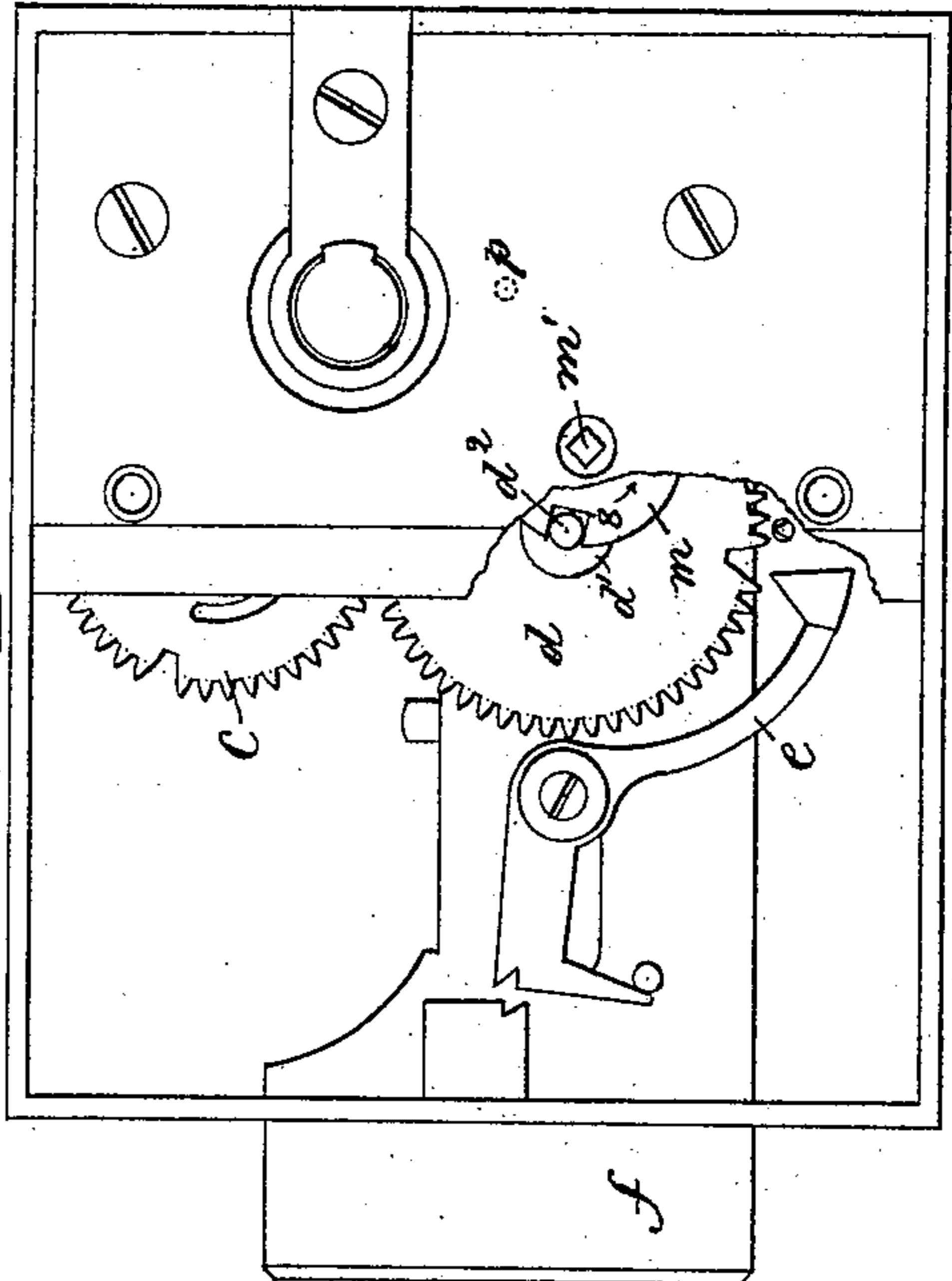


Fig:8.

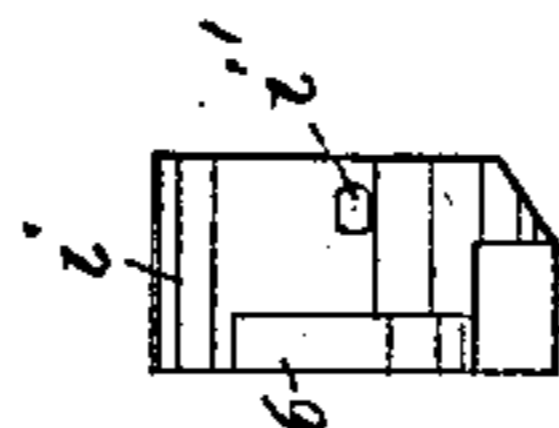


Fig:6.

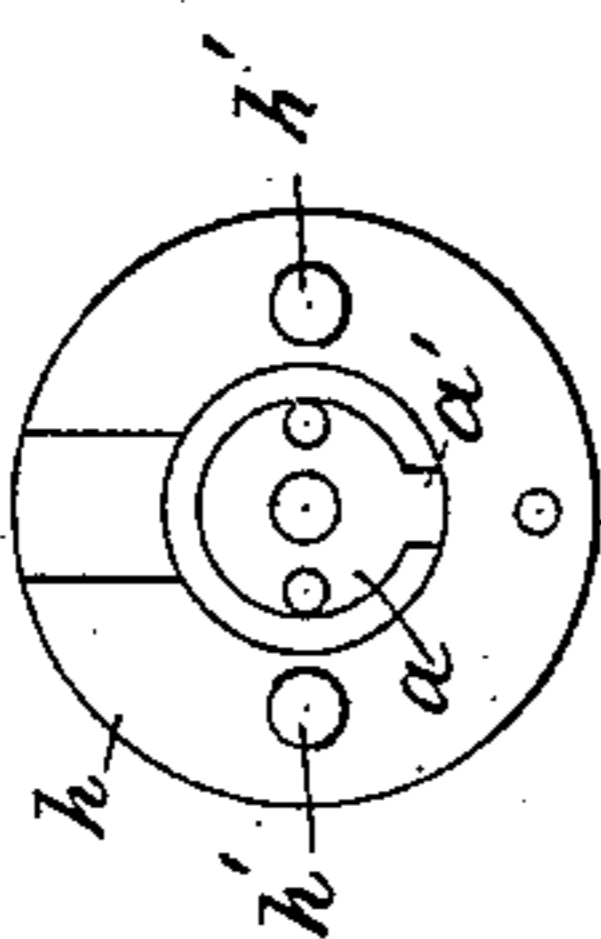


Fig:5.

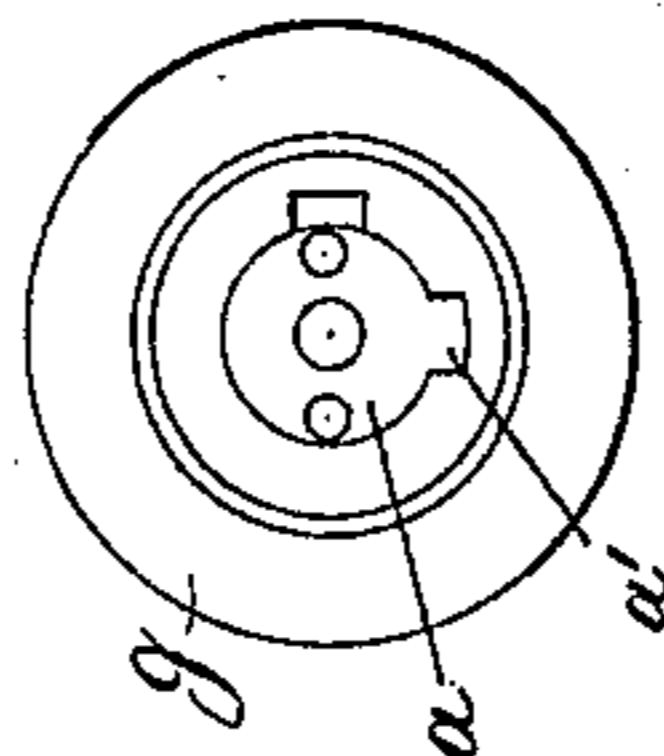


Fig:4.

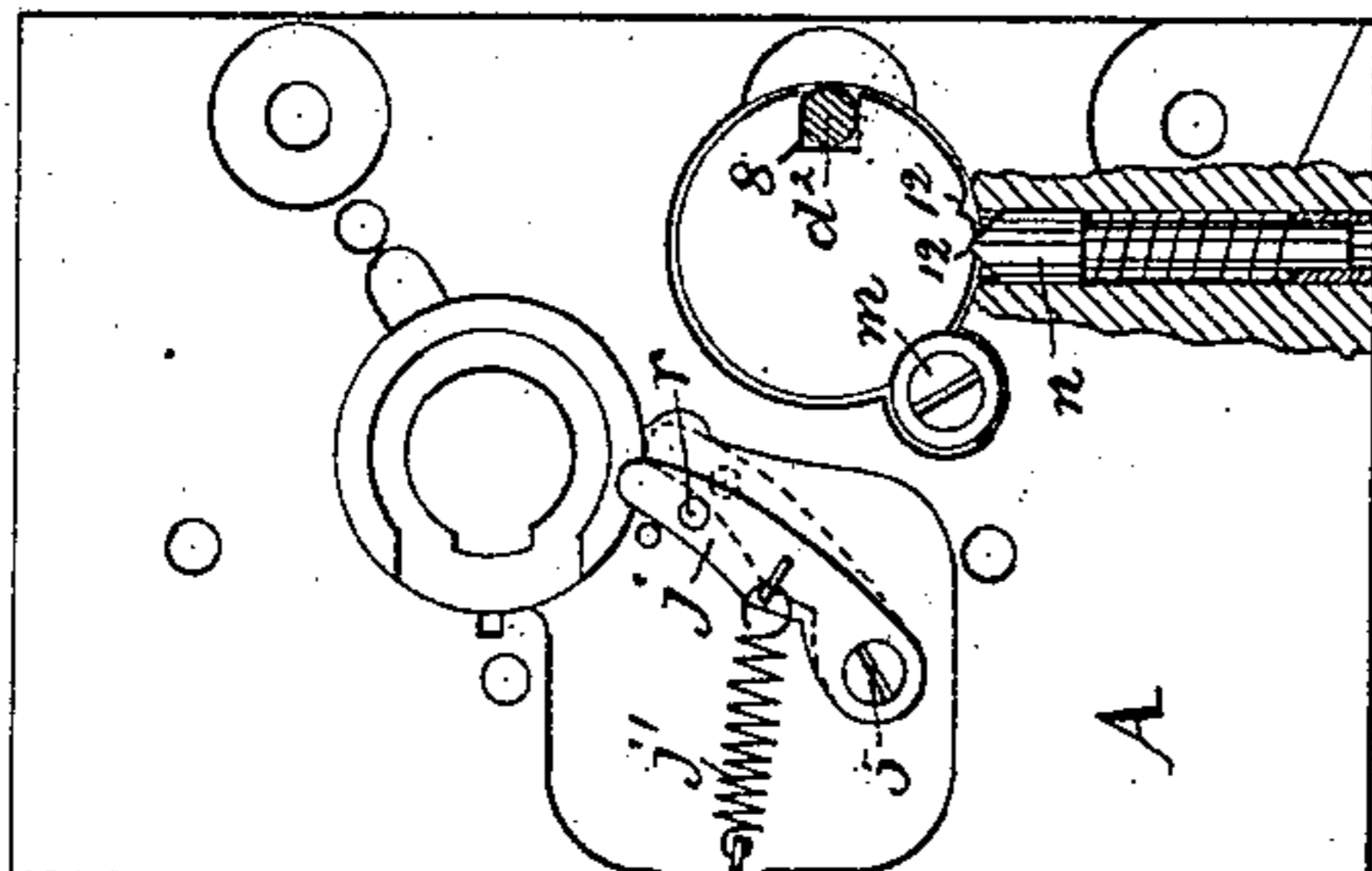
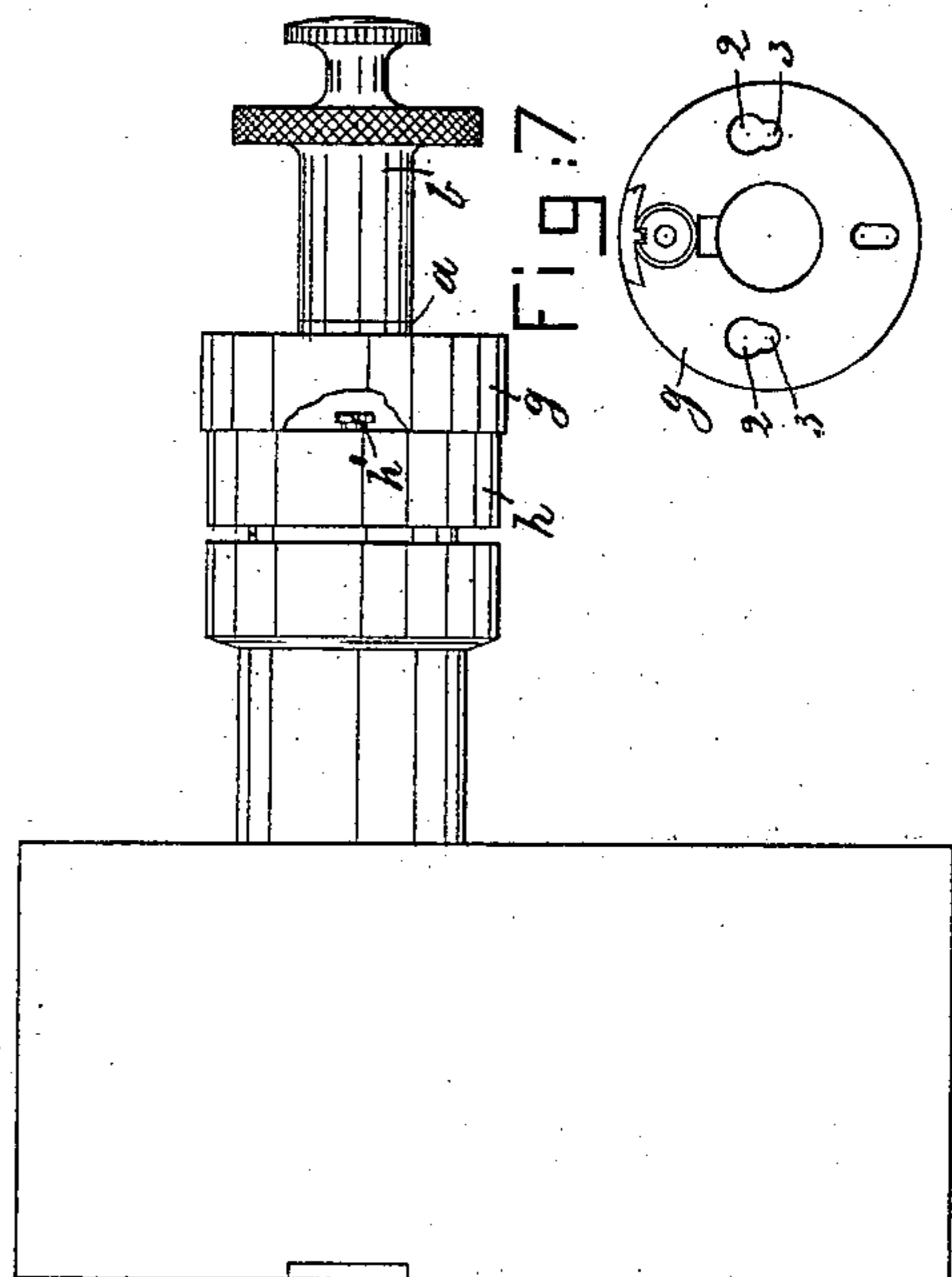


Fig:3.



Witnesses.

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(Model.)

2 Sheets—Sheet 2.

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Fig. 9.

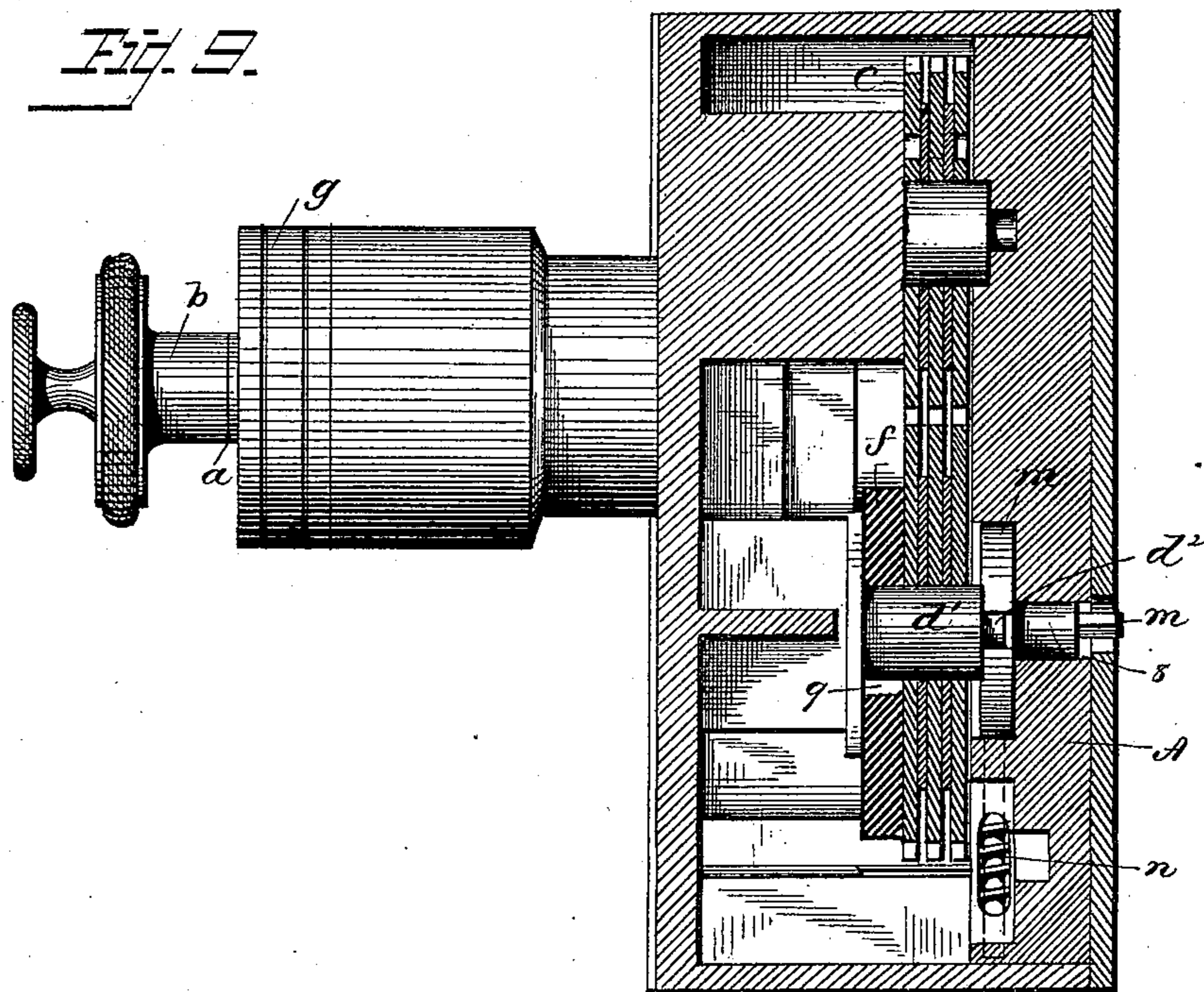
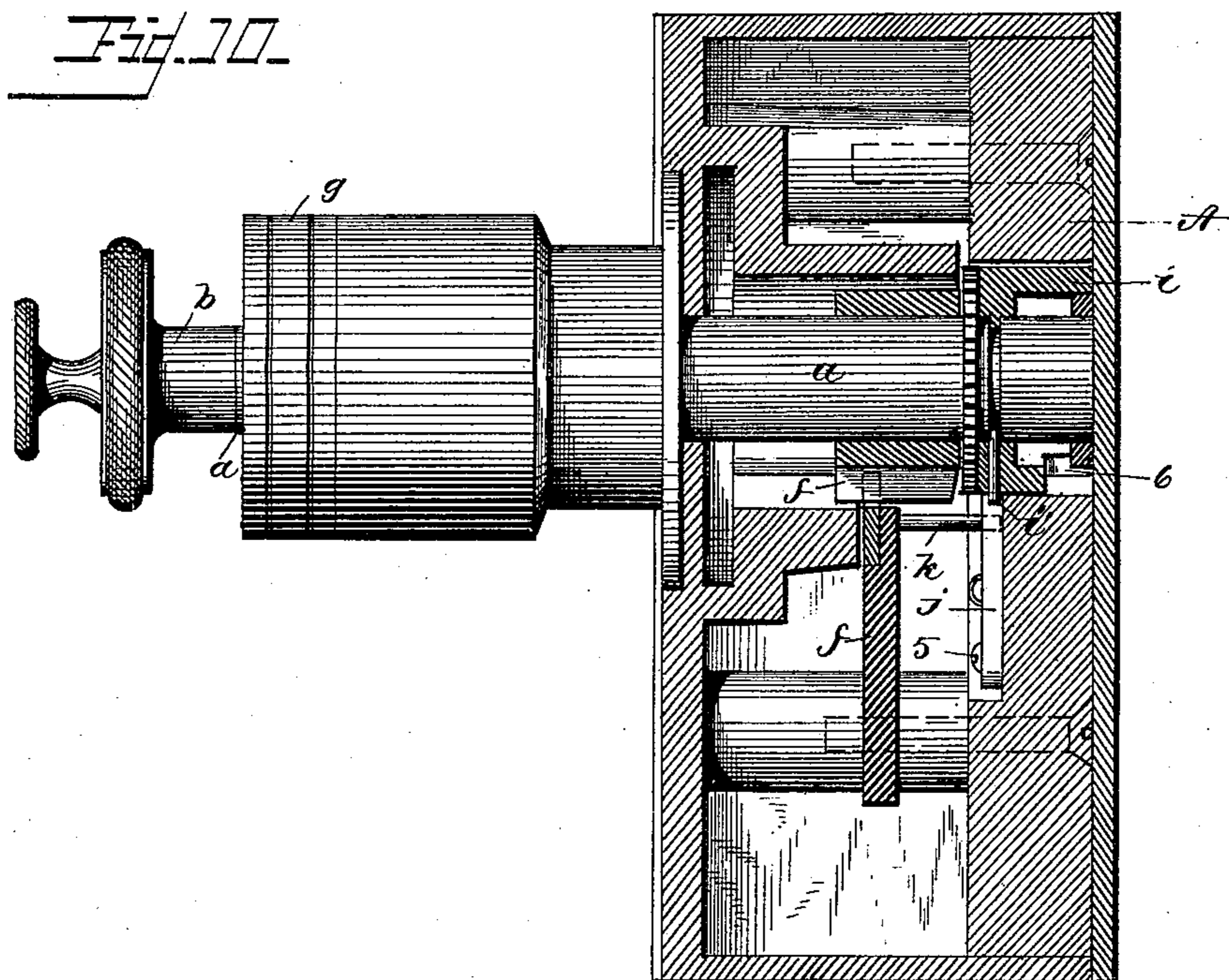


Fig. 10.



Witnesses:
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UNITED STATES PATENT OFFICE.

OLIVER E. PILLARD, OF CAMBRIDGE, MASSACHUSETTS.

PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 301,001, dated June 24, 1884.

Application filed September 2, 1882. (Model.)

To all whom it may concern:

Be it known that I, OLIVER E. PILLARD, of Cambridge, county of Middlesex, State of Massachusetts, have invented an Improvement in Locks, of which the following description, in connection with the accompanying drawings, is a specification.

My invention relates to a permutation-lock of that class in which the throwing of the bolt is made dependent upon the proper position of a series of gears actuated in turn by a key-spindle, the rotary movement of which is controlled by a key in such manner as to rotate the said gears to the proper position to permit the bolt to be thrown. The said gears are actuated by a pinion fixed on the said key-spindle, which has a longitudinal movement to throw the said pinion into engagement with each of the gears successively. The said key-spindle is also provided with followers or gear-locks—one at each side of the said pinion—having no rotary movement relative to the said key-shaft, but moving longitudinally therewith as the pinion is carried from one to the other of the said gears, the said followers engaging and locking the gears after each has been moved by the pinion to the proper position. The key or device which controls the rotary and longitudinal movement of the key-spindle as it operates to place the gears in their proper position can only be removed when the said key-spindle is in its inmost position, and the bolt can only be thrown when the said key-spindle is in its outmost position.

One of the objects of my present invention is to prevent the said key-spindle from being carried to its inmost position to permit the key to be removed when the said bolt is thrown back or the lock unlocked; and it consists in the employment of a locking-dog for the key-spindle, operated by the bolt in such a manner that when the bolt is thrown forward or locked the said locking-dog leaves the key-spindle free to move, as usual, thus permitting it to be thrown to its extreme inward position and the key removed in the usual manner. When, however, the said bolt is thrown back or unlocked, the said locking-dog for the key-spindle prevents a sufficient longitudinal movement of the said key-spindle to permit

the key to be disengaged and removed from the lock. In order to change the combination of the lock, the key has to be removed and at the same time the gears of the lock have to be disengaged.

In locks of this class, as heretofore ordinarily constructed, the said gears have been disengaged by the backward movement of the bolt, thus affording an opportunity for a change of combination, as far as the gears are concerned, when the bolt was thrown back. In a former patent, No. 189,902, dated April 28, 1877, a disengaging device independent of the lock-bolt is employed to disengage the said gears; but it is possible to thus disengage them only when the bolt is thrown back or unlocked. When, however, the herein-described key-locking dog is employed, the said key, as before mentioned, cannot be removed when the bolt is thrown back, and I consequently employ an independent device for disengaging the gears when the bolt is forward and the key consequently free to be removed. Instead of thus disengaging the gears when the bolt is forward, I can use the ordinary method of disengaging the gears when the bolt is thrown back; but in this case I have to employ a separate device to retain the key-locking dog inoperative when the said bolt is thus thrown back, to enable the key to be then removed, as usual, for the purpose of changing the combination.

Figure 1 is a rear elevation of a lock embodying this invention, the lock-plate and a portion of the cap-plate being removed; Fig. 2, a similar rear elevation, the entire cap-plate being removed, showing the key-spindle and one of its followers, and showing in dotted lines the locking-dog for the said key-spindle, it being, however, disengaged therefrom as the bolt is thrown forward or locked; Fig. 3, an end elevation showing means employed for connecting the key with the hub of the lock; Fig. 4, an inside view of the cap-plate of the lock, showing the key-locking dog and gear-disengaging device; Fig. 5, an end view of the key and key-spindle; Fig. 6, an end view of the hub upon which the key is mounted; Fig. 7, a view of the inner face of the key detached; Fig. 8, a side elevation of the follower

that is engaged by the key-locking dog. Fig. 9 is a sectional view of the lock, taken on the line which passes through both sets of the gears, the gear-disengaging disk, however, being shown in full lines in order to more clearly illustrate that part. Fig. 10 is a similar view taken on the line which passes through the lock-spindle.

The key-spindle *a*, provided with the projection *a'*, to engage the key, the knob *b*, for operating the said spindle, the gears *c* *d*, operated by the said spindle, the dog *e*, controlled by the said gears *d*, and itself controlling the movement of the bolt *f*, are all substantially the same as in locks of this class heretofore in use.

The key *g* is provided on its face, which engages the hub *h*, with circular openings 2, which pass over the heads of studs *h'* (see Figs. 3 and 6) on the said hub *h*, when the key has its central opening for the key-spindle slightly out of line with the central opening of the said hub *h*. The said openings 2 are provided with notches 3, which, by a slight downward movement of the said key, pass over the necks of the studs *h'*, thus securing the key on the hub, and at the same time bringing the central openings of the key and hub into line with one another, so that the key-spindle may be moved out through the key, its movement being controlled thereby in the usual manner, so that it places the bolt-controlling gears *d* in the proper position to permit the bolt to be thrown, and ultimately brings the pinion on the key-shaft into gear with the rack-teeth *f'* upon the bolt *f*, (see Fig. 2,) to enable the said bolt to be thrown backward and forward by the rotation of the said key-spindle in the usual manner. The circular-headed studs *h'* form a much stronger means for holding the key on the lock than those heretofore employed. The follower *i*, loose on the said key-spindle *a*, (see Fig. 2,) and prevented from rotating therewith by a stud, *i'*, engaging a slot, 4, in the frame-work of the lock, engages the teeth of the gears *c* after they have been moved to their proper position by the pinion on the key-shaft preventing their further movement until again engaged by the said pinion, as usual.

The locking-dog *j*, pivoted at 5 upon the cap-plate A, or otherwise suitably mounted in the stationary frame-work of the lock, (see Fig. 4,) is engaged by the stud *k* upon the bolt *f* when thrown forward or locked and moved thereby away from the path of the follower *i*, as shown in dotted lines, Fig. 4, so that the said follower and key-spindle can move longitudinally, the said spindle thus being permitted to enter the lock to permit the key to be removed. When, however, the said spindle is moved out to permit the bolt to be thrown, and the said bolt is thrown back, the stud *k*, moving therewith, permits the locking-dog *j* to be moved by its actuating-spring *j'* into proper position, as shown in full lines, Fig. 4, to engage the end of the follower *i*,

which may be cut away for that purpose, as shown at 6, Fig. 8, thus preventing the key-spindle from entering the lock a sufficient distance to permit the key to be removed. When it is desired to change the combination, the bolt-controlling gears *d* have to be disengaged from the gears *c*, that are directly actuated by the key-spindle, and the key at the same time removed. The said gears *d* are mounted on a hub, *d'*, which passes through a slot, 7, in the lock-bolt, and in locks of this class, as heretofore commonly constructed, the said slot has been inclined, so that when the bolt is thrown back or unlocked the said gears *d'* are moved far enough from the gears *c* to disengage their teeth, and the key has then been removed to change the combination while the bolt was thrown back or unlocked. In the present construction, however, the locking-dog *j* prevents the withdrawal of the key when the bolt is thrown back, and it is consequently necessary, in order to change the combination, either to provide means for disengaging the gears *d* from the gears *c* when the bolt is thrown forward, or that the locking-dog *j* should be rendered inoperative for the time being, when the bolt is thrown back and the said gears disengaged. Such a device for disengaging the gears *d* from the gears *c* is shown as consisting of a disk, *m*, having a notch, 8, engaging the spindle *d''* of the hub *d'* of the gears *d*. The said disk *m* is provided with a squared spindle, *m'*, (see Fig. 1,) or otherwise, adapted to be engaged by an ordinary socket-wrench or key, by which it may be rotated in the direction of the arrow, Fig. 1, to throw the gears *d* out of engagement with the gears *c*, the slot 7 in the bolt being provided with an offset, 9, as shown in Fig. 2, to permit the said movement of the hub *d'* and gears *d* when the bolt is thrown forward.

A friction or holding device shown as a spring-bolt, *n*, (see Fig. 4,) engaging notches 12 in the periphery of the disk *m*, retains the said disk in either position in which it may be placed by means of the wrench, thus keeping the gears *d* either in or out of engagement with the gears *c*, as the case may be. In order to change the combination, the bolt is thrown forward or locked, or the gears *d* disengaged by means of the disengaging-disk *m*, and the key-spindle *a* of the lock then carried in, as usual, after which the key may be removed and the combination changed in the usual manner, the gears *c* set in accordance therewith, and the gears *d* thrown into engagement with the gears *c* by the device *m*, as before.

When desired to employ the locking-dog *j* in connection with a lock, in which the gears *d* are disengaged when the bolt is thrown back, as heretofore practiced, this can be accomplished by providing the frame-work of the lock with an opening, *p*, as shown in dotted lines, Fig. 1, through which a suitable instrument can be inserted to retain the locking-dog *j* disengaged from the key spindle or fol-

lower *i* when the bolt is thrown back. The locking-dog *j*, as shown in Fig. 4, is provided with a corresponding hole, *r*, which registers with the hole *p* when the bolt is thrown forward, so that if a pin or rod is inserted through the said hole *p* it will enter the hole *r* and retain the locking-dog in the position shown in Fig. 2, when the bolt is thrown back, thus permitting the key to be removed.

10 Either an inclined slot in the bolt or an independent device might be employed to disengage the gears *d* from the gear *c* when the bolt is thrown back, in which latter case the slot 7 in the bolt would have the offset at its other end, as shown in dotted lines, Fig. 2, and in this case it would be necessary to employ the device for holding the locking-dog inoperative when the bolt was thrown back, and the gears disengaged whenever it is desired to remove the key and change the combination.

I claim—

1. In a permutation-lock of the class described, the combination, with the key, key-spindle, and bolt, of a pivoted locking-dog to engage the said key-spindle, and means, substantially as described, on the bolt, whereby, when the bolt is moved, the said locking-dog is operated to be engaged with or disengaged from the key-spindle, as set forth.

2. In a permutation-lock, the gears operated by the key-spindle, and bolt-controlling gears meshing therewith, combined with the disen-

gaging device for the said gears, consisting of the notched disk engaging the spindle of the said gears, and adapted to be rotated by a wrench or key, substantially as described.

3. The key-spindle and locking-dog *j* therefor, combined with the lock-bolt provided with a stud, whereby the said locking-dog is disengaged from the key-spindle in the forward movement of the said bolt, substantially as described.

4. The key-spindle, gears actuated thereby, and bolt, combined with the locking-dog *j*, for the said spindle, operated by the movement of the bolt, and a disengaging-disk for the said gears independent of the bolt, substantially as described.

5. The combination, in a lock of the class described, of the gears operated by the spindle and the bolt-controlling gears, with the disengaging-disk *m*, notched to receive the spindle of the said bolt-controlling gears, and the holding device for the said disk, whereby the said gears are retained in either the connected or disconnected position until positively moved therefrom, substantially as described.

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

OLIVER E. PILLARD.

Witnesses:

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BERNICE J. NOYES.