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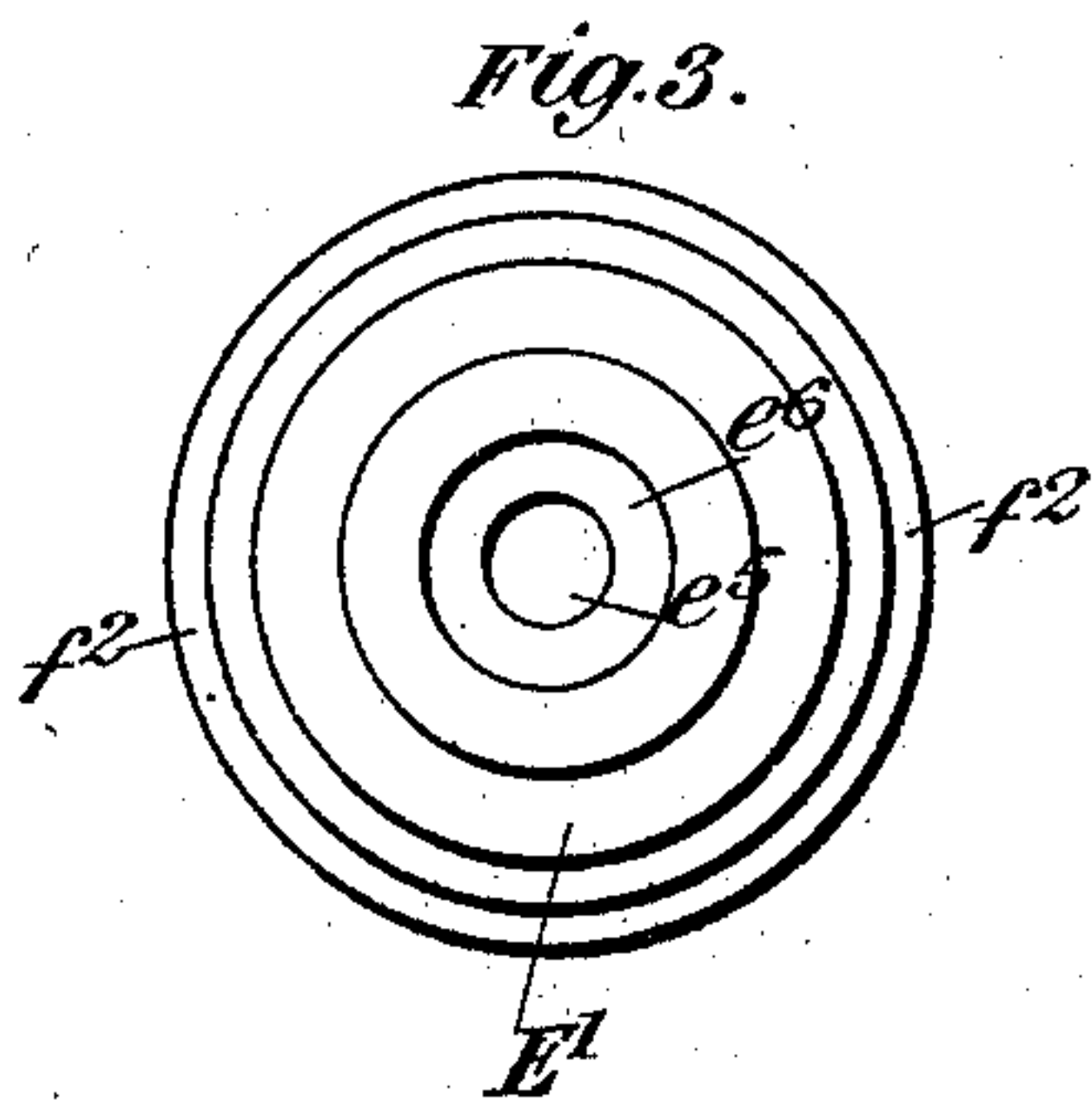
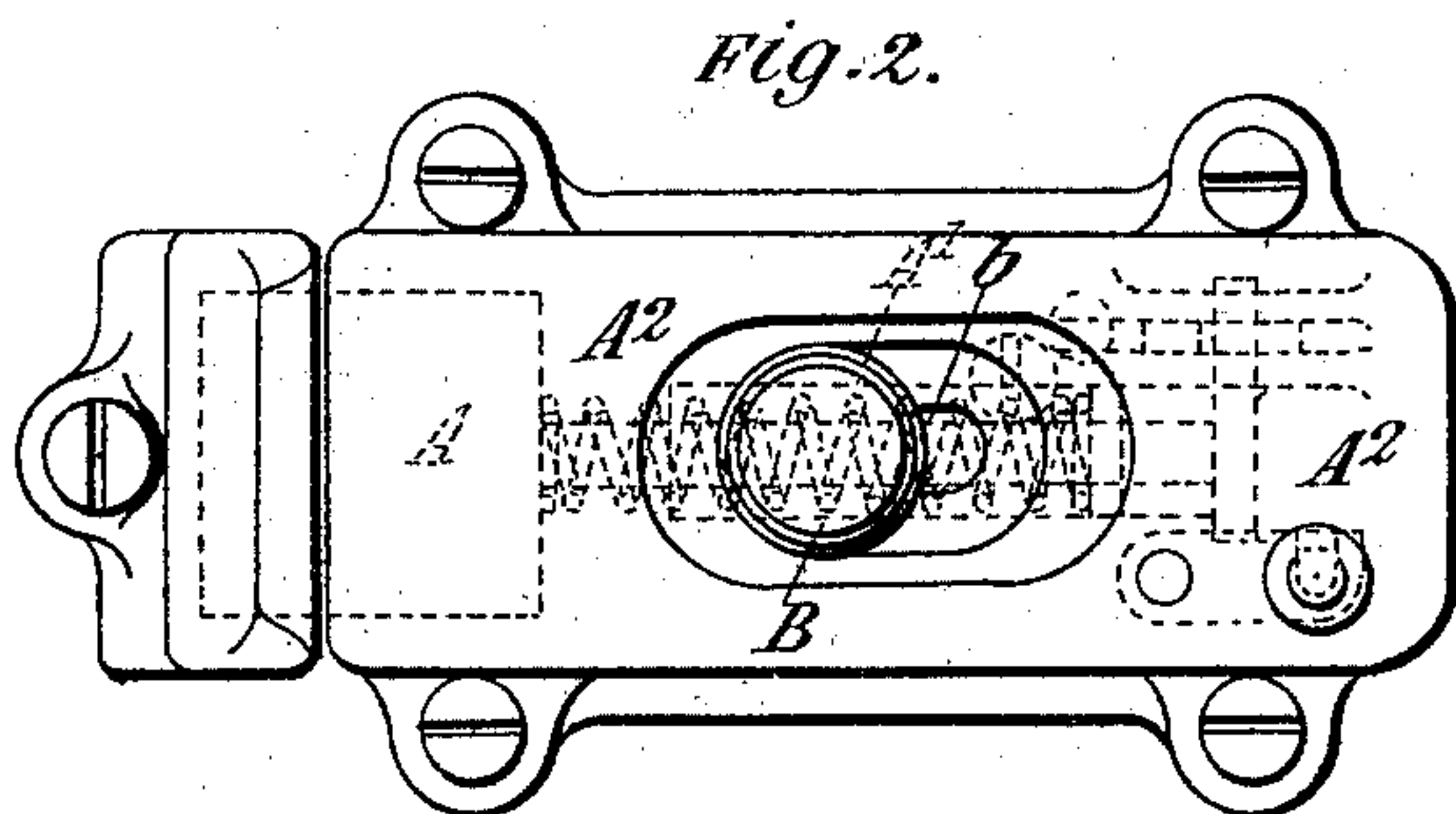
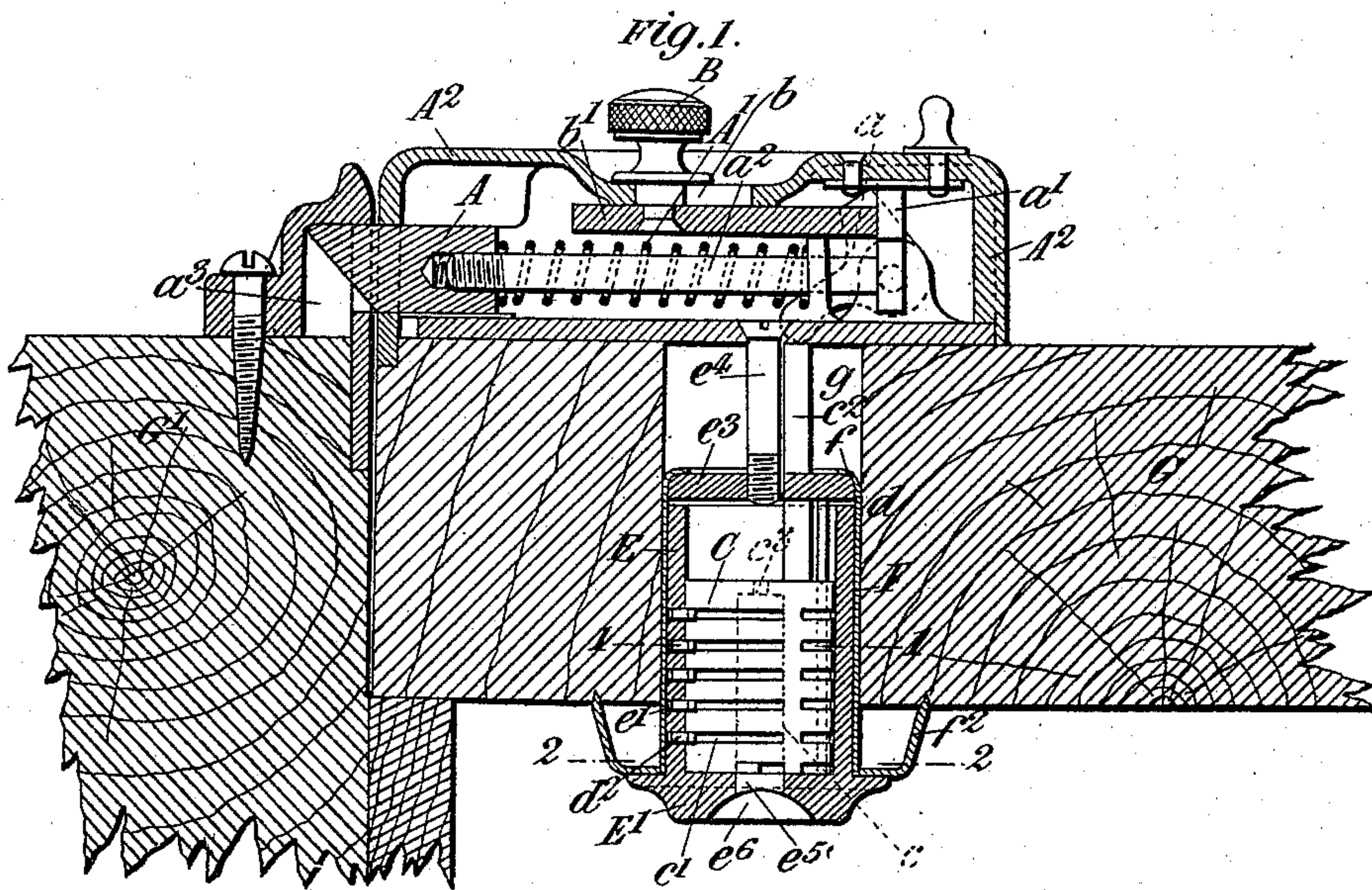
Patented May 23, 1899.

L. SILVERMAN.
LOCK.

(Application filed Oct. 7, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses
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No. 625,708.

L. SILVERMAN.

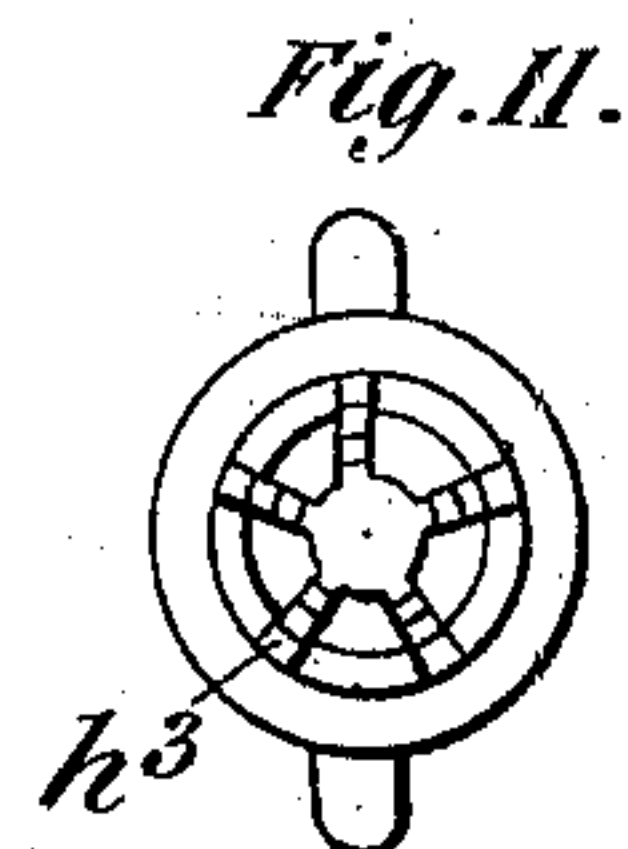
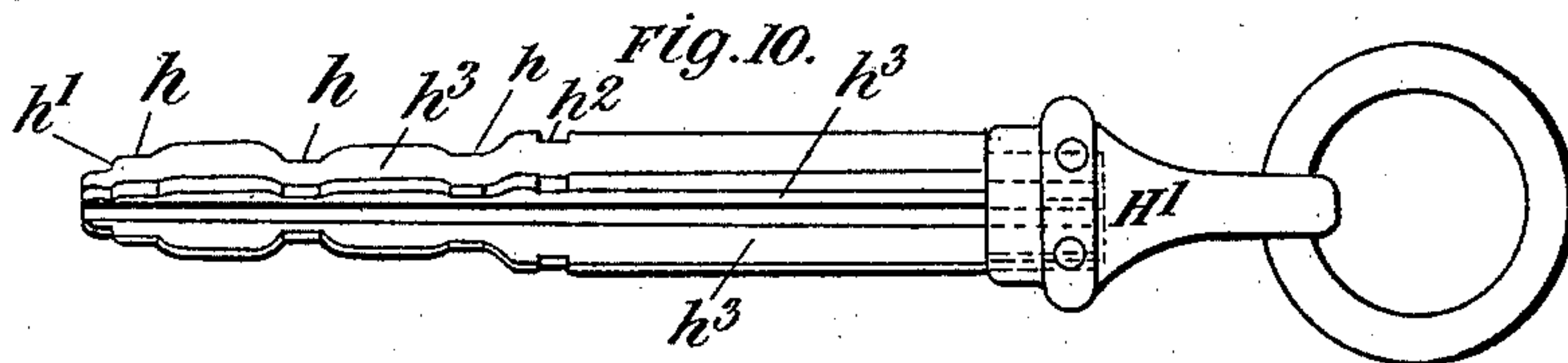
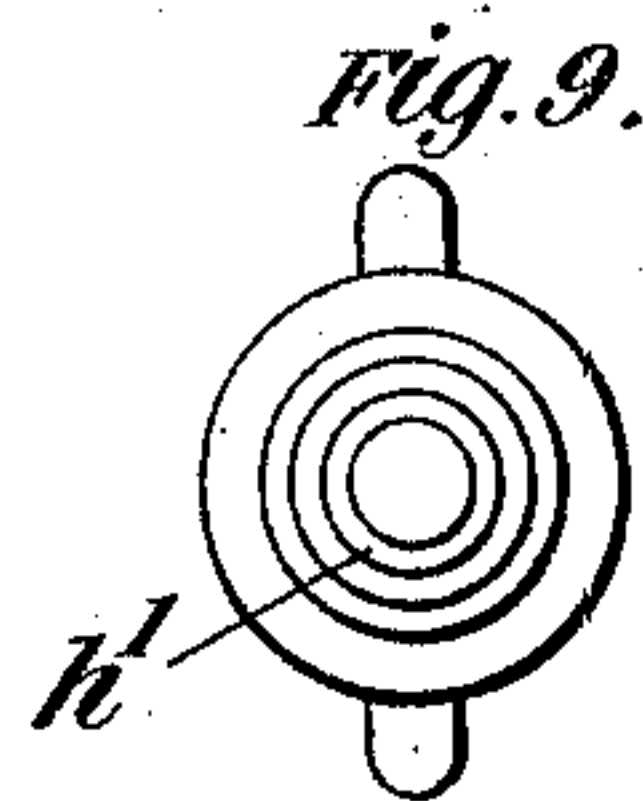
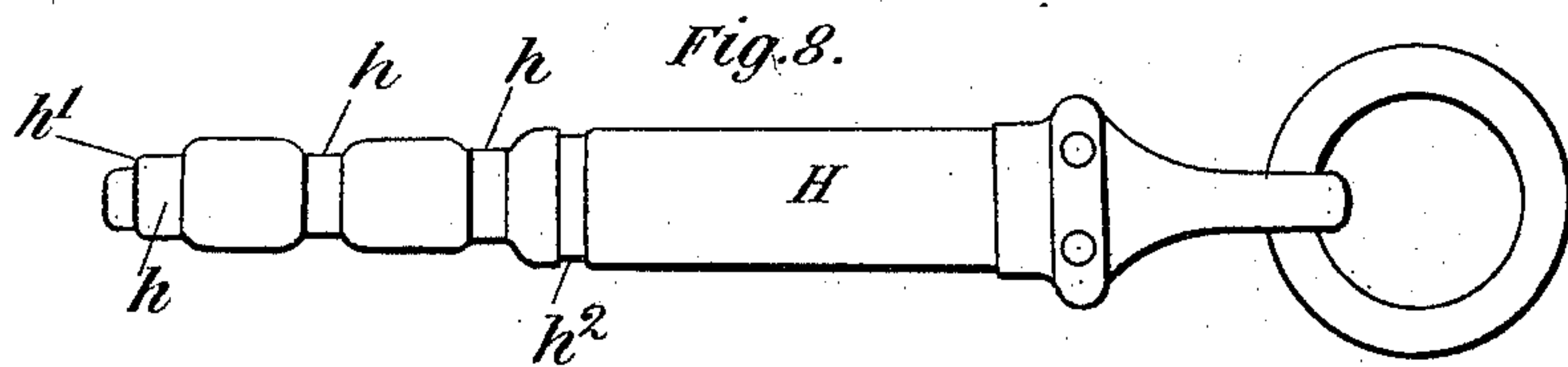
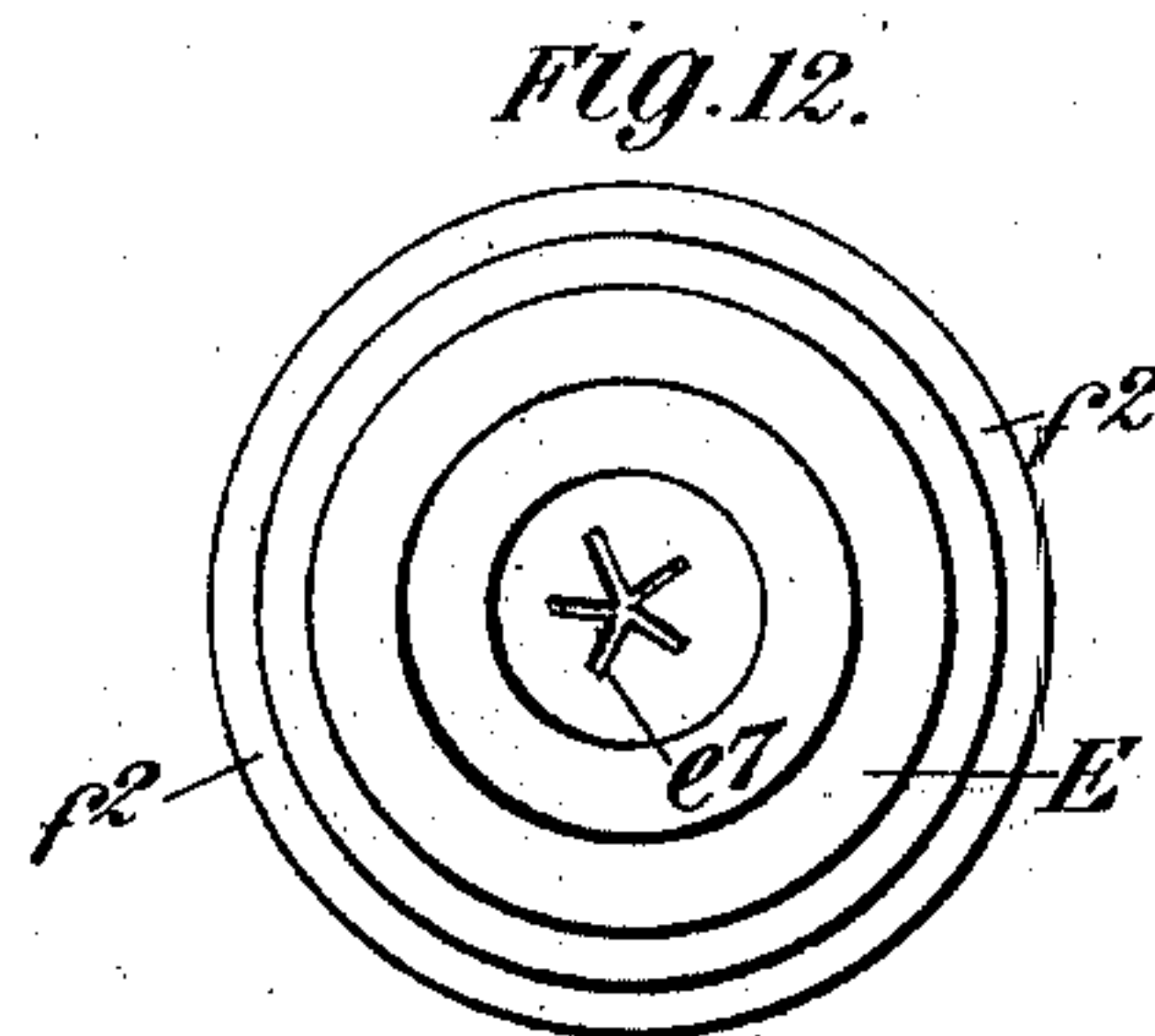
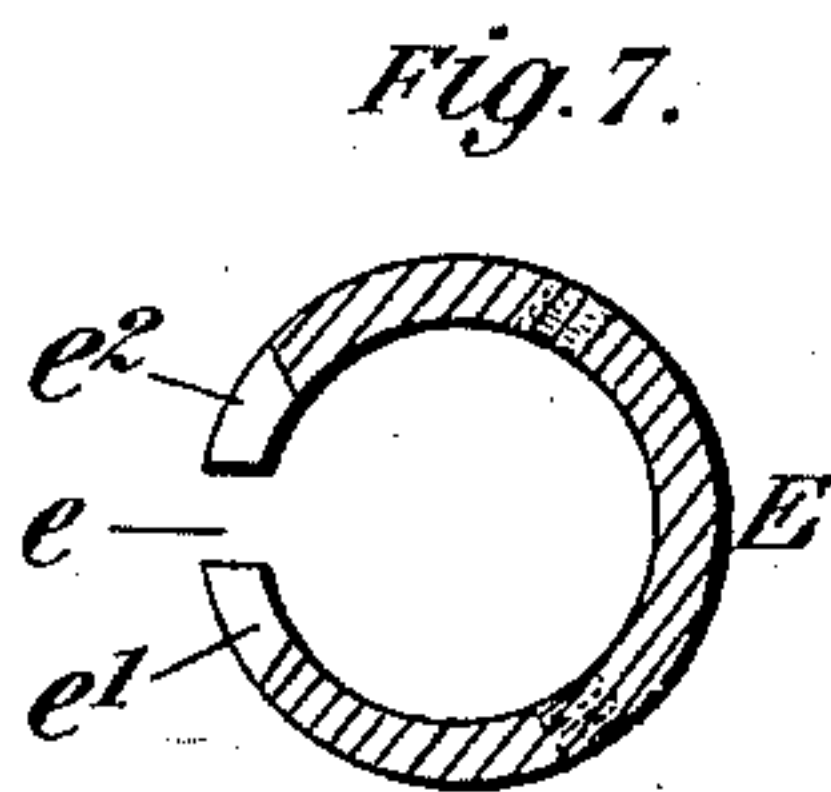
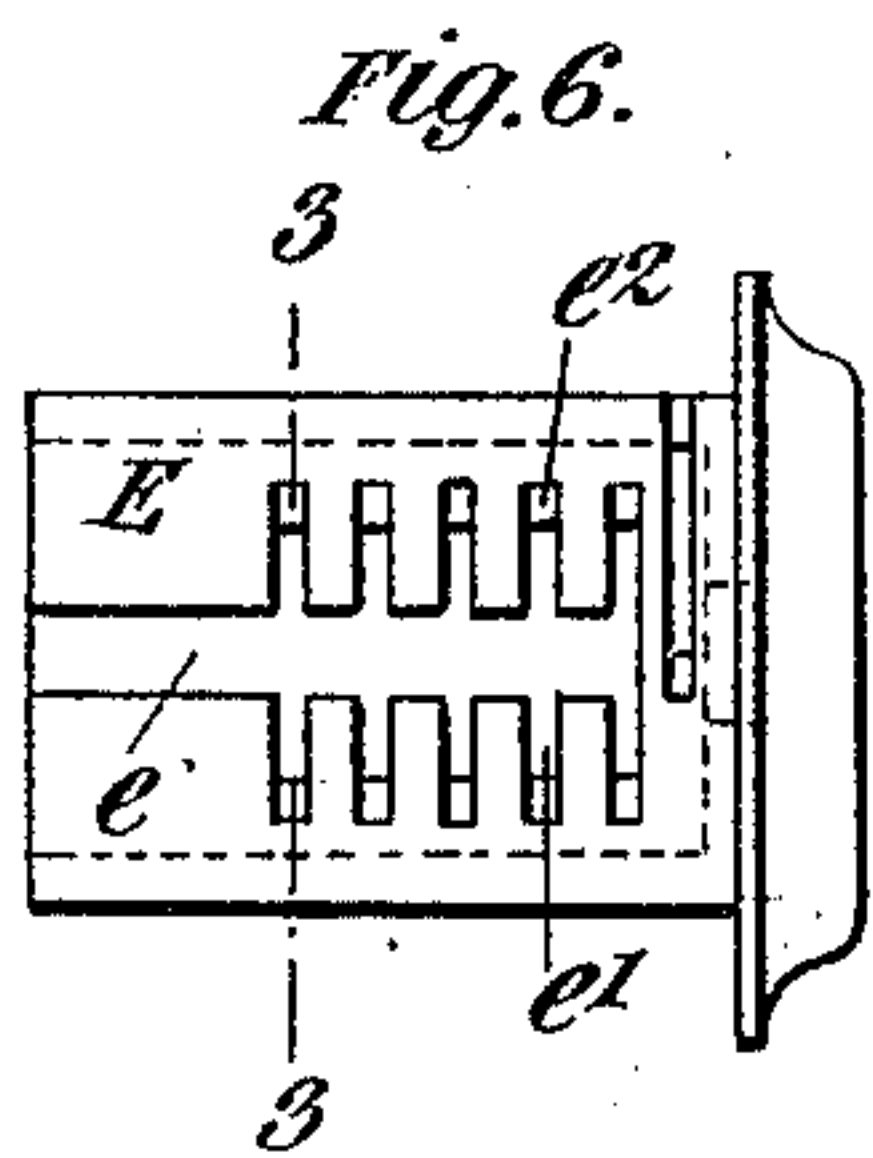
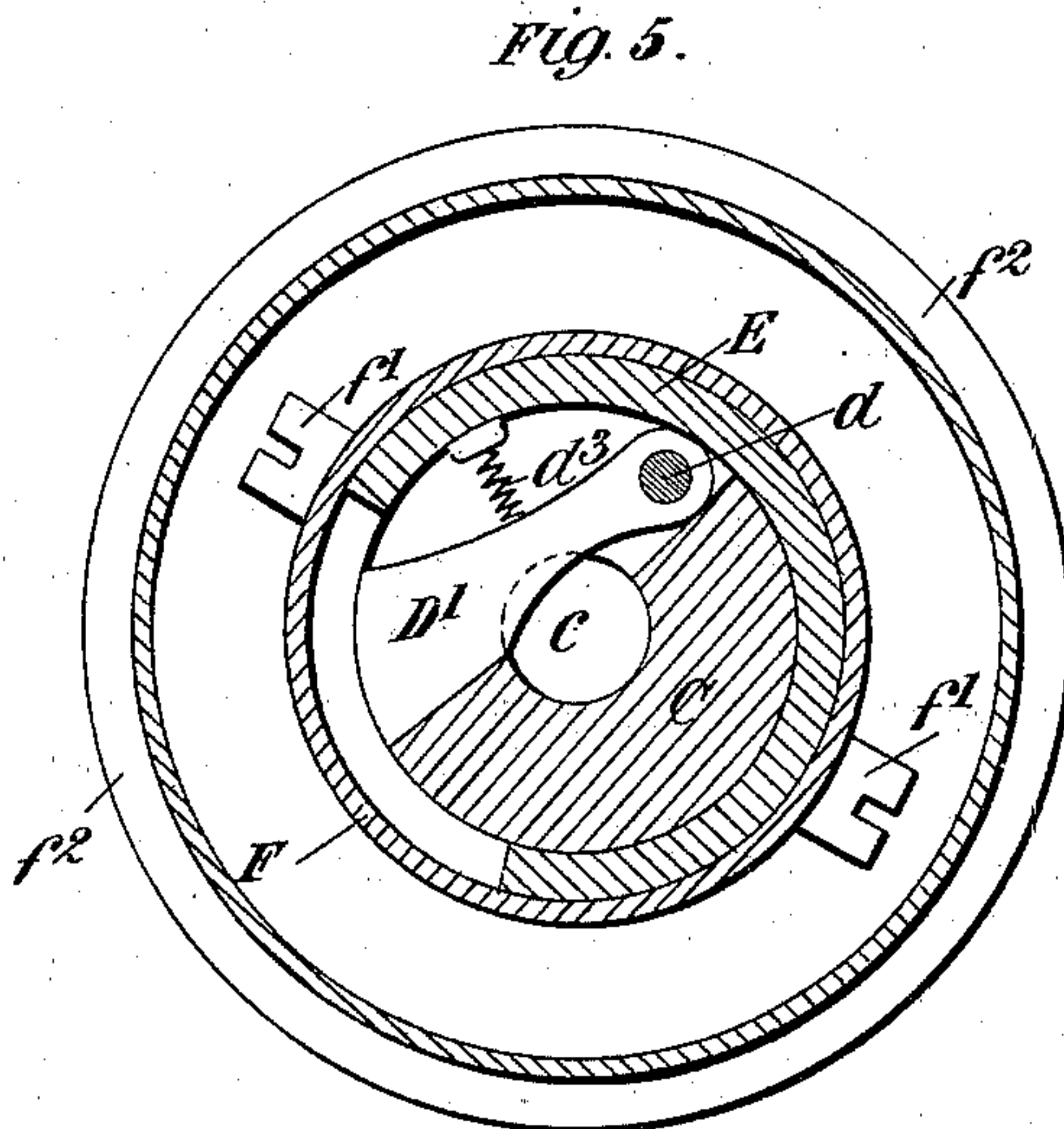
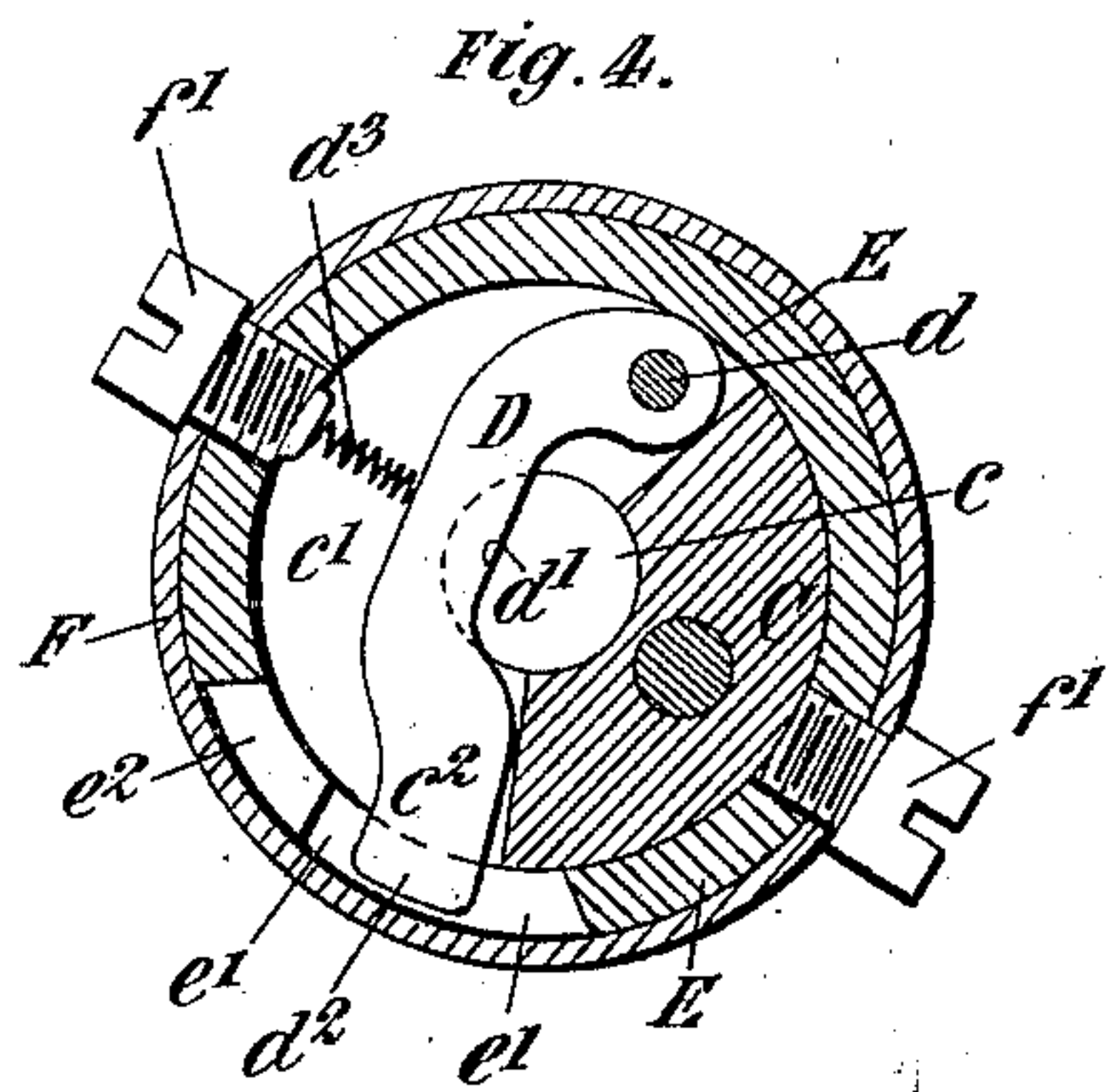
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LOCK.

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(No Model.)

2 Sheets—Sheet 2.



Witnesses

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UNITED STATES PATENT OFFICE.

LOUIS SILVERMAN, OF CRAYFORD, ENGLAND.

LOCK.

SPECIFICATION forming part of Letters Patent No. 625,708, dated May 23, 1899.

Application filed October 7, 1898. Serial No. 692,937. (No model.)

To all whom it may concern:

Be it known that I, LOUIS SILVERMAN, engineer, a subject of the Queen of Great Britain, residing at Crayford Works, Crayford, county of Kent, England, have invented certain new and useful Improvements in Locks and Keys, of which the following is a specification.

This invention has for its chief object to so construct a lock that its key does not require any choice of position for inserting it into the keyhole. For this purpose the bolt of the lock is adapted to be retracted by the endwise movement of a cylindrical or other block carrying a series of tumblers so contrived as to be operated by a key in the shape of a tapered spindle having a smooth or a longitudinally-serrated surface formed with a series of annular or circularly-disposed projections or depressions. The shape and position of these projections or depressions are such that when the key is thrust into the keyhole the series of tumblers will be shifted into a position to release the tumbler-carrier and permit the latter to be pushed inward by the key, and thereby disengage the bolt of the lock. The lock is also so constructed that even if all the tumblers should be surreptitiously moved by an instrument other than the proper key into a position to disengage them from their locking position they would not of necessity thereby release the said tumbler-carrier, means being provided whereby the movement of any one of them beyond a predetermined position depending upon the formation of the proper key would relock the tumbler-carrier and prevent it from being shifted inward, as aforesaid. I also provide the tumbler-carrier with means whereby it will be assisted to resume its normal position by the act of withdrawing the key. I thus avoid the use of a strong spring for returning the bolt of the lock to its locked position.

In order that my invention may be clearly understood and readily carried into effect, I will proceed to describe the same fully with reference to the accompanying drawings, in which—

Figure 1 is a horizontal section of a latch-lock constructed in accordance with my invention and applied to a door. Fig. 2 is an elevation of the lock as seen from the inside

of the door, and Fig. 3 is an elevation of the lock as seen from the outside of the door. Figs. 4 and 5 are transverse sections taken, respectively, on the lines 1 1 and 2 2 of Fig. 1 and drawn to a larger scale. Fig. 6 is an elevation, and Fig. 7 a cross-section on the line 3 3 of Fig. 6, showing a slotted fixed sleeve with which the tumbler-carrier is surrounded, the purpose of which will be hereinafter described. Fig. 8 is an elevation, and Fig. 9 a front end view, of the key, on an enlarged scale, for use with this lock. Figs. 10 and 11 are similar views showing a modified construction of the key. Fig. 12 is an elevation similar to Fig. 3 and shows the shape of the keyhole when a key of the kind illustrated in Figs. 10 and 11 is employed.

A is the bolt, which in the example illustrated is adapted to slide horizontally against the resistance of a spring A', contained in a lock-casing A². B is a knob by which such bolt can be operated by a person from the inside of the door.

C is the tumbler-carrier, which is connected with the bolt A, so as to withdraw the latter when said carrier is moved inward, as hereinafter explained, and D D are the tumblers. The said tumbler-carrier is preferably made cylindrical and has a central hole c therein for the key to enter. It likewise has therein a number of transverse slotted openings c' for the reception of the tumblers D, which are all retained in place by a single pivot-pin d. These tumblers are adapted to normally lie with a portion d' of their inner edge projecting slightly into the said hole and with their free ends or noses d² prolonged beyond the surface of the said cylindrical carrier C. The said noses are kept pressed toward the bottom of the slotted openings c' by springs d³, as shown in Fig. 4. Around the said carrier C is a fixed sleeve E, which is formed with two series of transverse or radial slots e' e², each series opening into a longitudinal slot e, situated between the two series. (See Figs. 6 and 7.) The inner end of the said sleeve is closed by a fixed disk e³, Fig. 1, around which the inner edge f of a thin outer casing F is bent to avoid any liability of the said disk from being pushed out of place by the cylindrical carrier. The said casing F incloses the said sleeve and is connected there-

with by radial screws $f' f'$, Figs. 4 and 5. It is provided with a hollow collar f^2 , that bears against the surface of the door G and supports the outer end or boss E' of the said fixed sleeve E. The door G, to which the lock is applied, is formed with a hole or cavity g , into which the casing F, containing the sleeve E and the tumbler-carrier C, is fitted and held in place by a screw e^4 , extending from the sole-plate of the lock-casing A^2 to the disk e^3 , as clearly shown in Fig. 1. The said tumbler-carrier C has a fixed longitudinal pin c^2 , which is of such a length that its inner end will lie adjacent to one limb of a bell-crank a , contained in the lock-casing A^2 , the other limb of such bell-crank engaging with a shoulder a' on a sliding rod a^2 , connected with the bolt A. The spiral spring A' surrounds the said rod a^2 and acts to press the bolt A into a position to engage with the socket a^3 on the door-jamb G' . By these means when the tumbler-carrier is released, as hereinafter explained, and pushed inward its pin c^2 operates the bell-crank a , which in turn acts upon the shoulder a' and retracts the bolt A to permit the opening of the door. The aforesaid knob B projects through a slot b in the lock-casing and is connected with a sliding piece b' , whose end lies in front of the aforesaid shoulder a' . The rod a^2 can thus be actuated from the inside of the door to retract the bolt A by operating the knob B.

The key for operating the tumblers D and releasing the carrier C to permit its being shifted inward, as aforesaid, is in Figs. 8 and 9 in the form of a slightly-tapered spindle H, having a series of annular acting surfaces or depressions h therein, the number and position of these acting surfaces being such that when the key is thrust fully home into the lock they will come against the portion d' of the various tumblers and move them into a position to bring all their noses d^2 out of the series of transverse or radial slots e' in the casing E and cause all of them to lie in alignment with each other in the longitudinal slot e . The tumblers having assumed this position, they no longer resist the inward movement of the carrier C when the latter is pushed inward by pushing the key. The extent to which the key can be thrust into the carrier to release the tumblers is limited by forming its inner end with a shoulder h' to bear against a corresponding cavity c^3 in the inner end of the carrier. Thus when the key is pushed fully home into the carrier it first brings the noses of the tumblers into the longitudinal slot e to release the carrier, as above explained, and then by the action of the shoulder h' on the key and the continued pushing in of the key causes the carrier to slide inward toward the end disk e^3 . During this inward movement the carrier causes the pin c^2 to act upon the bell-crank, as aforesaid, and through the intervention of the shoulder a' on the rod a^2 withdraws the bolt A and unlocks the door. As the key is withdrawn the spring A' reacts

and by causing the bell-crank to resume its normal position returns the carrier to its original position, whereby the tumblers again arrive opposite the slots e' in the sleeve E, with which they engage under the influence of their springs d^3 and relock the carrier in its fixed position. I prefer to arrange at the front end of the carrier an auxiliary tumbler D' , Fig. 5, the nose of which does not project into the slots in the sleeve E, and I form the key with an annular depression h^2 to engage with said tumbler D' when the key is fully home in the carrier. Such tumbler then temporarily connects the key with the carrier, so that the latter can be moved inward and outward by the key as it is thrust into or withdrawn from the keyhole. By these means the outward movement of the carrier does not depend wholly upon the spring A' for returning it to its normal position, and I am therefore enabled to employ a comparatively weak spring A' , whose resistance to the movement of the bolt A when the latter is being retracted by pushing in the carrier is very small. The said depression h^2 should not be made too deep; otherwise difficulty will be experienced in disengaging it from the auxiliary tumbler when the key is to be withdrawn from the keyhole or thrust therein. With a key of the kind illustrated in Figs. 8 and 9 the keyhole e^5 in the boss E' is of circular formation, as shown at Fig. 3, the said hole being arranged in a conical or similar cavity e^6 in the boss E' . Such conical cavity serves as a guide to direct the point of the key properly into the hole. Without this conical cavity difficulty might be experienced in putting the key into its keyhole owing to the small diameter of the latter.

In order to avoid as much as possible the entrance of dust or the insertion of foreign particles into the keyhole e^5 , I prefer to make it with radial slits e^7 , as illustrated in Fig. 12, and the key is then constructed in the form represented in Figs. 10 and 11—that is to say, instead of being circular in cross-section, as in Figs. 8 and 9, it is formed with longitudinal radial ribs h^3 , which fit the slits e^7 in the keyhole. The surfaces h for acting upon the tumblers are formed in the edges of all of the said ribs and serve identically the same purpose as the annular recesses h in the key shown in Figs. 8 and 9. The head H' of the key, especially when said key is made in accordance with Figs. 10 and 11, is preferably connected to the spindle portion by a swivel-joint, so that the said spindle portion can turn and adapt itself to the position of the radial slits e^7 as the point of the key comes against the conical cavity e^6 and enters the keyhole.

In the event of any of the tumblers being moved out of the slots e' beyond the position necessary to bring their noses into the longitudinal slot e in the sleeve E, as already described, they will enter the series of slots e^2 . Therefore notwithstanding the fact that the

tumblers may all be disengaged from the slots e' even if only one of them be shifted beyond the proper position it will enter one of the slots e^2 and still prevent the carrier C from being shifted longitudinally. It will consequently be obvious that it would be a task of extreme difficulty (without the proper key) to so move all the tumblers that their noses would be shifted only just far enough to be disengaged from the series of slots e' and not too far to come into engagement with the other series of slots e^2 . Moreover, it will be readily understood that in the construction of locks and keys according to my invention a very slight alteration in the position occupied by the tumblers with respect to one another and of the position and depth of the acting surfaces of the key will render one lock incapable of being opened by any other than the identical key made for it. Therefore although a number of keys all very similar in appearance may be obtained only that one which has the requisite depth and position of depressions in it will act properly upon all the tumblers of a particular lock to bring them into a position to lie exactly between the two series of slots e' e^2 in the sleeve E.

What I claim is—

1. In a lock the combination with the carrier longitudinally movable in a fixed sleeve, of a series of tumblers pivoted in said carrier and normally resting with their side edges projecting a suitable distance into a longitudinal cylindrical aperture in said carrier lying transversely to said tumblers, the ends of the latter being engaged in slots formed in a fixed part transversely to a longitudinal channel into which said slots open, and a key of symmetrical form throughout having a series of annular acting surfaces for liberating the said tumblers from said slots and bringing their ends in said longitudinal channel to permit the carrier to move longitudinally in its sleeve, substantially as described and for the purpose specified.

2. In a lock, the combination with a tumbler-carrier movable longitudinally in a fixed sleeve, of a lever operated by said movement to draw the bolt, a series of tumblers pivoted in said carrier and partly projecting transversely into a longitudinal opening in the carrier, the ends of said tumblers normally resting in transverse slots which open into a longitudinal channel in the sleeve, said slots having suitable continuations upon the opposite side of said channel, and a key having a symmetrical shape and provided with annular acting surfaces to engage the tumblers projecting into the longitudinal opening and carry their ends out of the transverse slots into the longitudinal channel in the sleeve whereby the tumbler-carrier can be moved to draw the bolt, substantially as described.

3. In a lock, the combination of a cylindrical tumbler-carrier provided with means for actuating a door-fastening device by sliding endwise, and having a longitudinal hole

therein, of a series of transverse tumblers pivotally mounted in said carrier with a portion of their inner edges projecting into said hole, of a fixed cylindrical sleeve surrounding the carrier and formed with two series of transverse slots separated by a single longitudinal slot, one series of the transverse slots receiving the noses of the tumblers when the carrier is locked in its normal position and the other series of transverse slots receiving the said noses and relocking the carrier in the event of their being moved beyond the position necessary to bring them into the longitudinal slot, and of a symmetrically-shaped key having series of annular acting surfaces for moving the tumblers and bringing their noses into the longitudinal slot when said key is thrust into the said hole to release the carrier substantially as described.

4. In a lock, the combination of a cylindrical tumbler-carrier provided with spring-controlled means for actuating a door-fastening device by sliding endwise and having a longitudinal hole therein, of a series of transverse tumblers pivotally mounted in said carrier with a portion of their inner edges projecting into said hole, of a fixed cylindrical sleeve surrounding the carrier and formed with two series of transverse slots and a single longitudinal slot for the noses of the tumblers to engage with, of a symmetrically-shaped key formed with a shoulder at its front end to engage with a correspondingly-shaped cavity at the inner end of the carrier the said key having series of annular acting surfaces for operating the tumblers when the key is thrust into the said hole substantially as described.

5. In a lock, the combination of a cylindrical tumbler-carrier provided with spring-controlled means for actuating a door-fastening device by sliding endwise and having a longitudinal central hole therein, of a series of transverse tumblers pivotally mounted in said carrier with a portion of their inner edges projecting into said hole, of a fixed cylindrical sleeve surrounding the carrier and formed with two series of transverse slots and a single longitudinal slot for the noses of the tumblers to engage with, of an auxiliary tumbler unprovided with a nose, and of a symmetrically-shaped key having series of annular acting surfaces for operating the tumblers when it is thrust into the said hole, and formed with a shoulder at its point to engage with a correspondingly-shaped cavity at the inner end of the carrier, the said key being also formed with an annular depression to engage with the said auxiliary tumbler when the key is fully thrust into the lock so that in the act of attempting to withdraw the key the sliding carrier will be assisted to return to its normal position substantially as described and for the purpose specified.

6. In a lock, the combination with a tumbler-carrier capable of movement longitudinally in a fixed sleeve, of a series of transverse tumblers pivoted at one end within the

carrier and lying in planes transverse to a central, longitudinal opening into one side of which the edges of said tumblers project, two series of transverse slots formed in the inner face of the sleeve and separated one series from the other by a longitudinal channel in said sleeve, a pin attached to the carrier and extending into the lock-case, a bell-crank lever having one arm engaging a shoulder rigid with the lock-bolt and the other arm engaged by the pin on the carrier, and a key of symmetrical shape provided with annular acting surfaces to engage the tumblers and move them out of one of said series of transverse slots into the longitudinal channel in the sleeve, substantially as described.

7. In a lock, the combination with a spring-thrown bolt of a tumbler-carrier movable longitudinally transversely to said bolt in a fixed sleeve, said sleeve having in its inner face two series of slots separated by and at right angles to a longitudinal channel in said sleeve, a series of tumblers pivoted at one end in the carrier and having their other ends normally lying in one series of said slots, a bell-crank lever in the lock-case having one arm engaging a shoulder that moves with the bolt, a pin on the end of the carrier engaging the other arm of said lever, and a key of symmetrical shape and consisting of a spindle having radially-projecting ribs provided with a plurality of annular working faces, the faces

in the same annulus being alike on all the ribs, said key being adapted to enter a longitudinal opening of like shape and engage the tumblers which project therein and move their free ends out of the series of slots in which they lie and into the longitudinal channel in the fixed sleeve, substantially as described.

8. In a lock, the combination with a fixed sleeve of a tumbler-carrier movable longitudinally, a series of tumblers pivoted therein, a pin on the carrier extending into the lock-case, means operated by said pin to draw the bolt by the movement of said carrier, a key having a symmetrical shape and provided with a series of annular working faces to engage the tumblers and move them out of a series of transverse slots in which their free ends lie, into a longitudinal channel in the sleeve and an auxiliary tumbler pivoted near the front of the carrier and having its end out of the transverse slots, said tumbler being adapted to engage an annular depression in the key when the latter is properly inserted, substantially as described.

In testimony whereof I have hereunto set my hand, in presence of two subscribing witnesses, this 23d day of September, 1898.

LOUIS SILVERMAN.

Witnesses:

F. McLELLAN,

FRED C. HARRIS.