No. 743,480. PATENTED NOV. 10, 1903.

I. G. FRENCH.

PERMUTATION LOCK.

APPLICATION FILED OCT. 22, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1

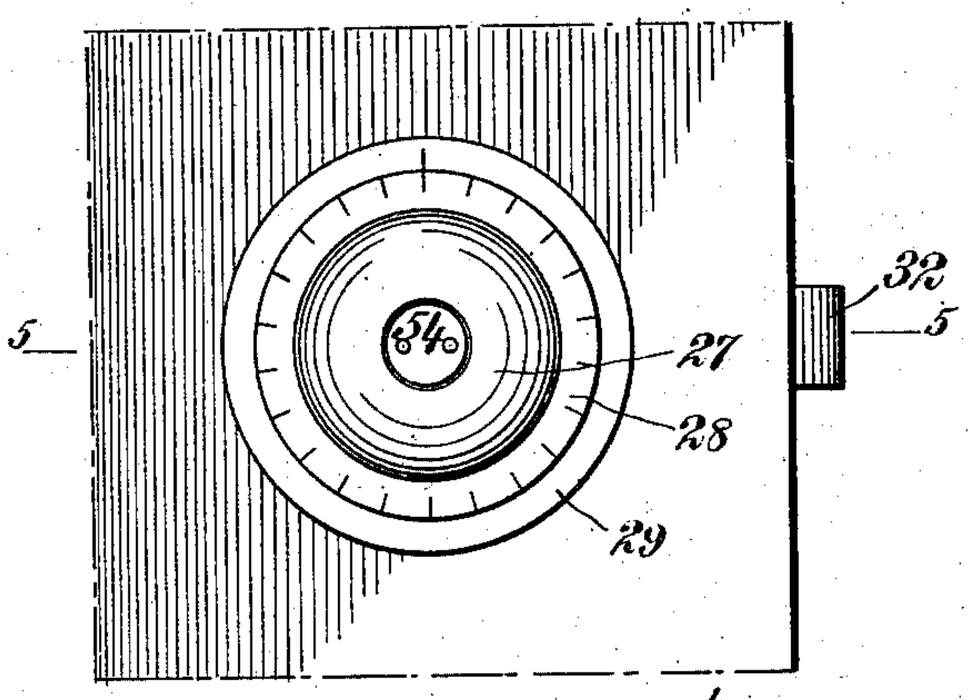


Fig. 2

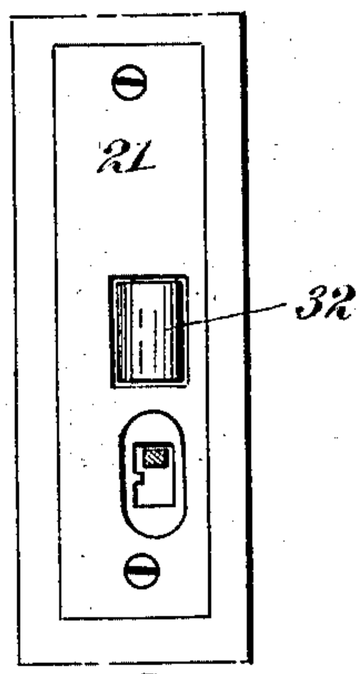


Fig. 3

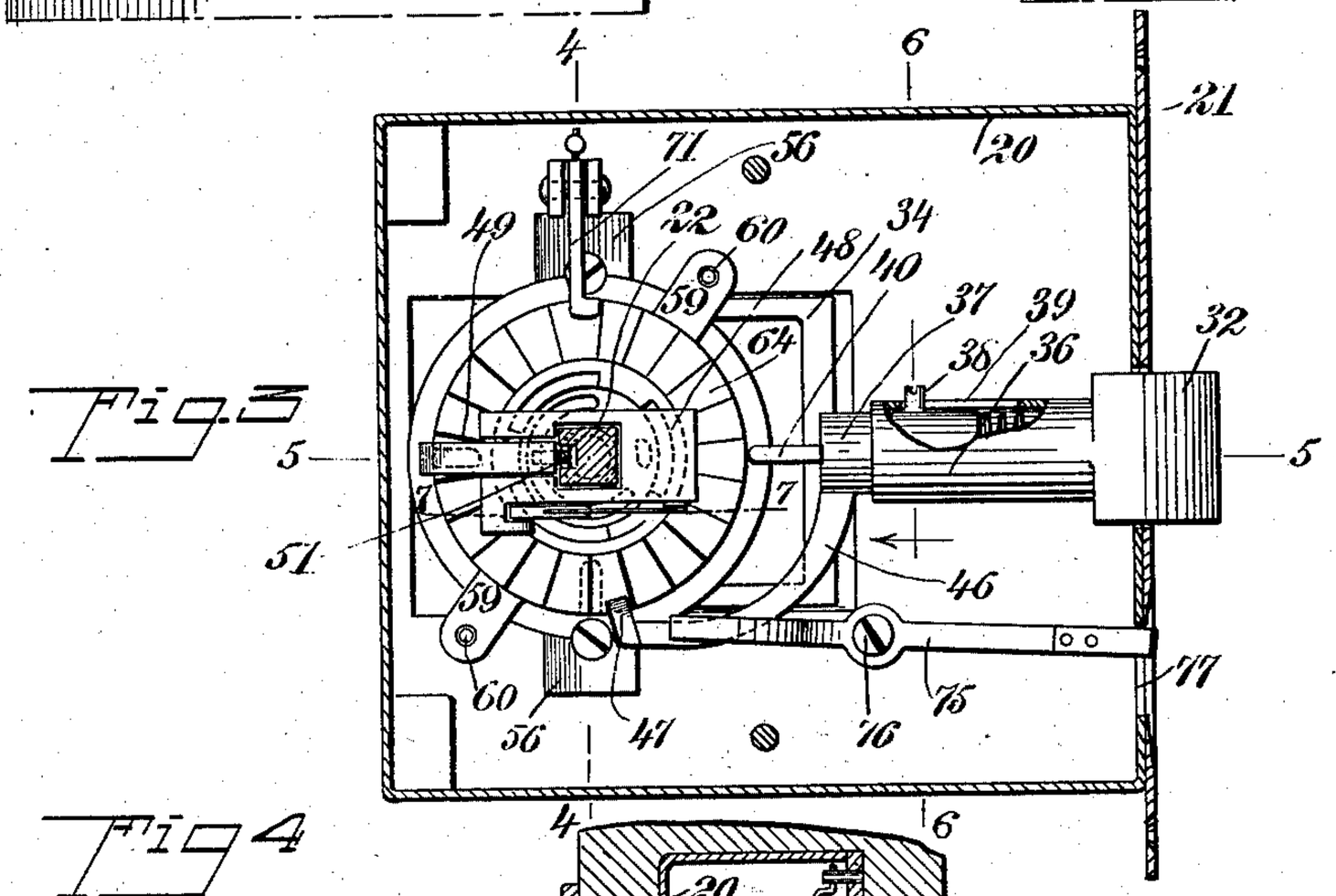
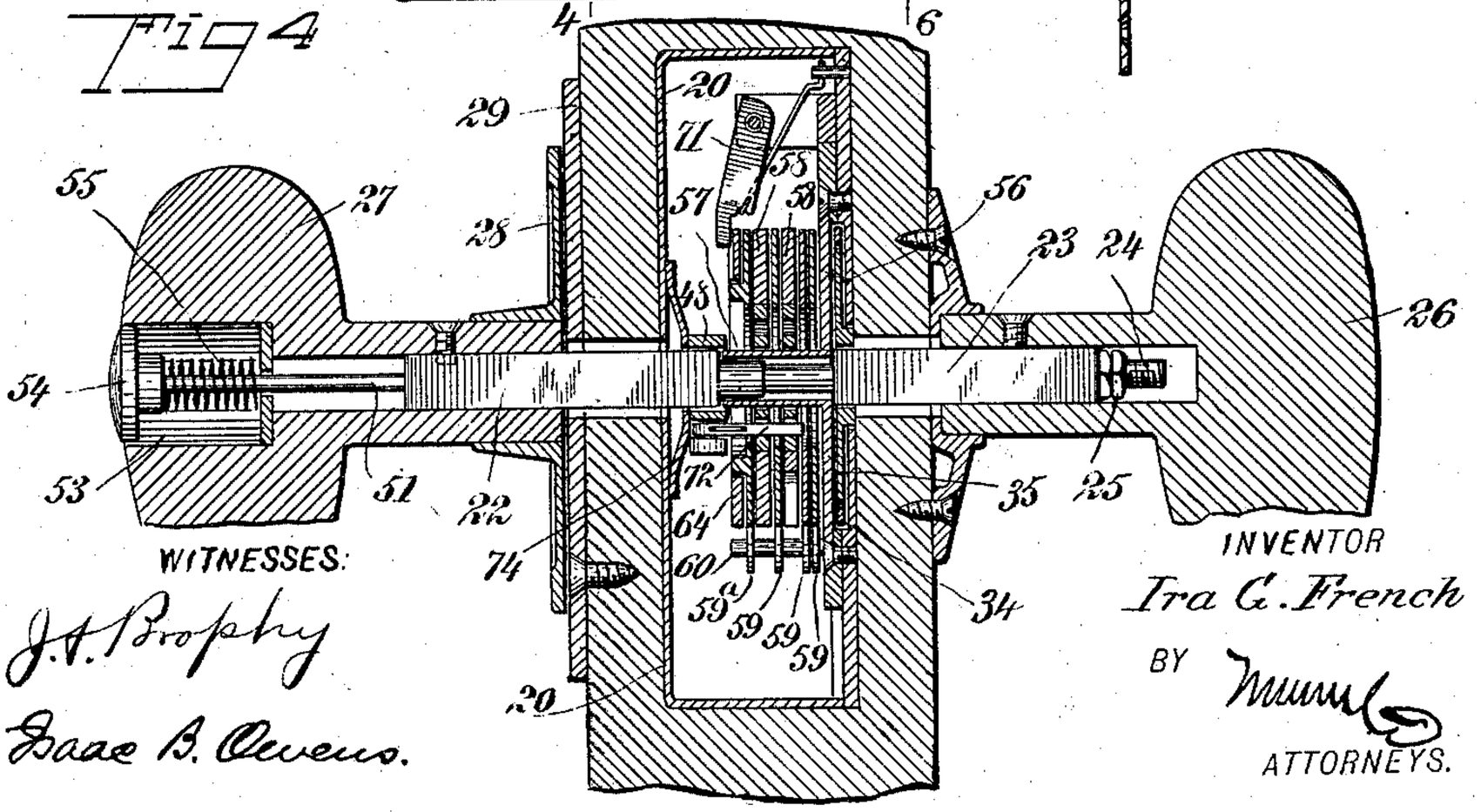


Fig. 4



WITNESSES:

J. A. Brophy

Isaac B. Owens.

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ATTORNEYS.

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 5

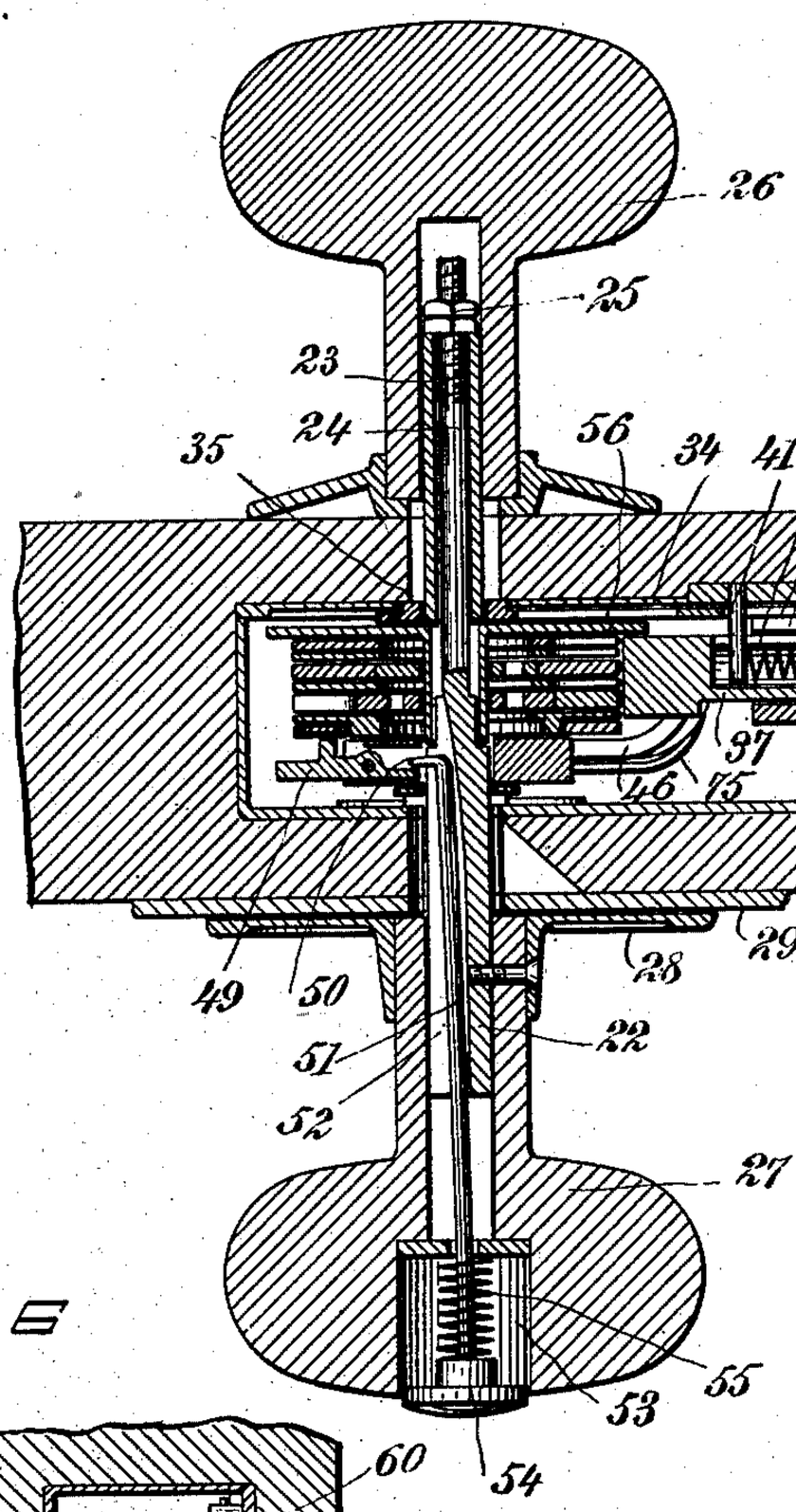


Fig. 6

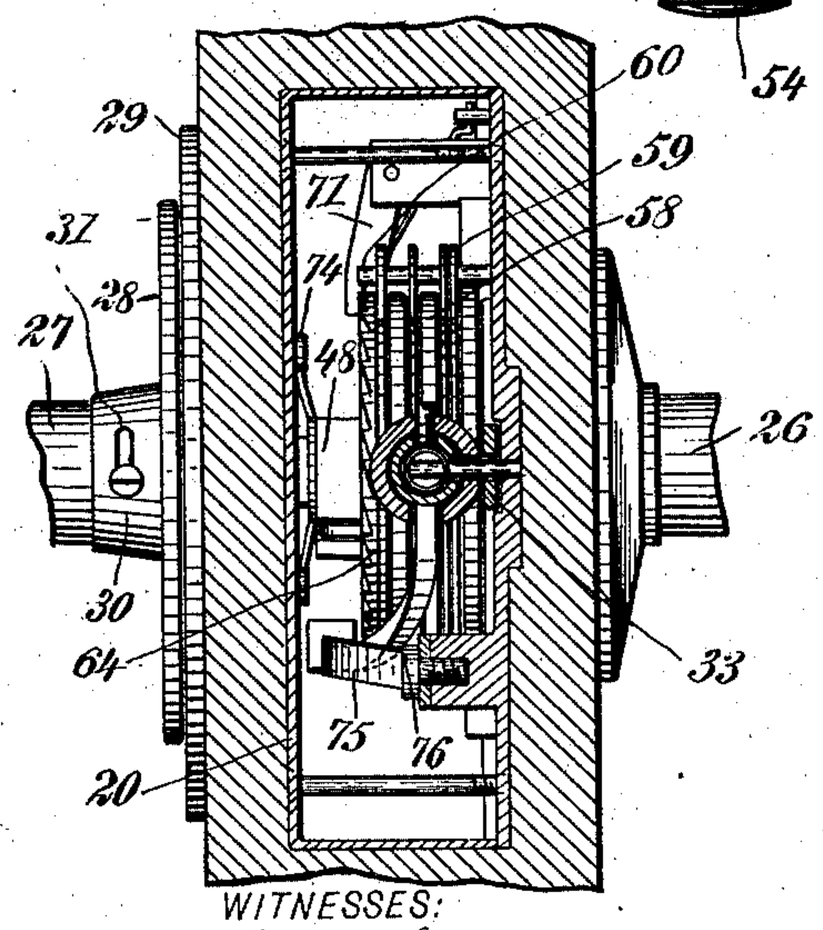
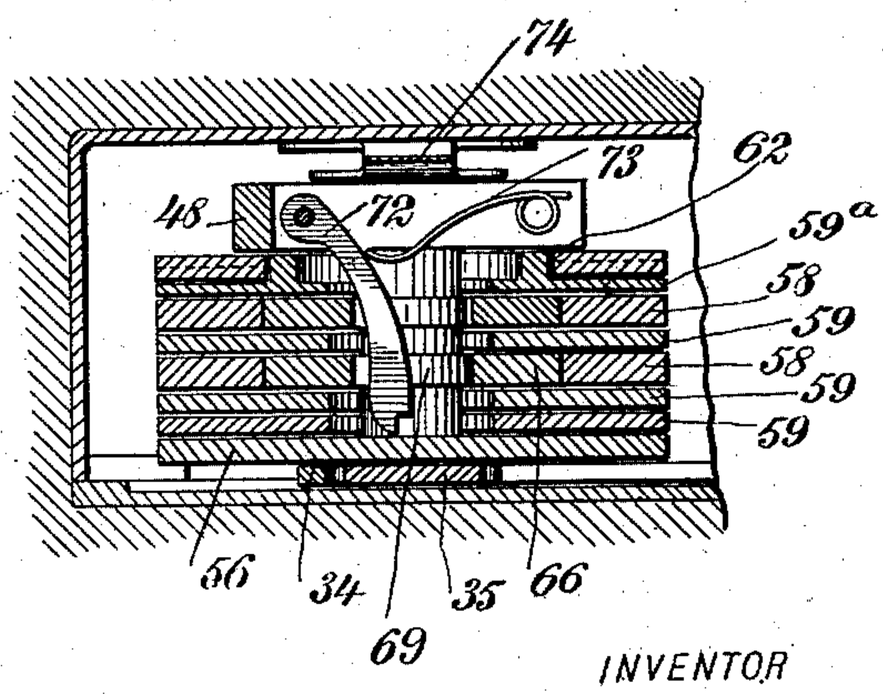


Fig. 7



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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 8

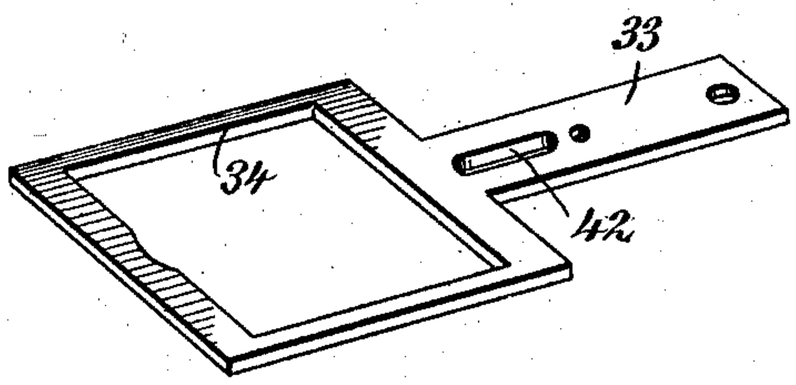


Fig. 12

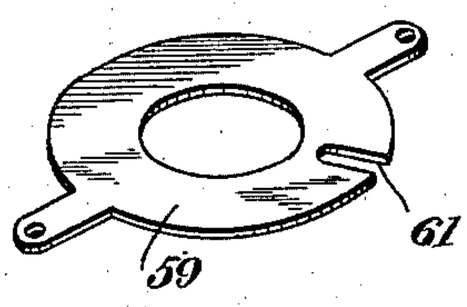


Fig. 9

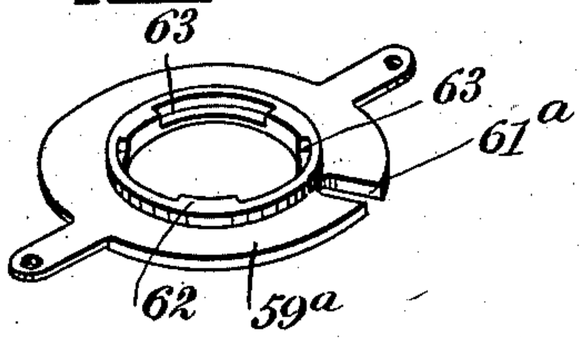


Fig. 13

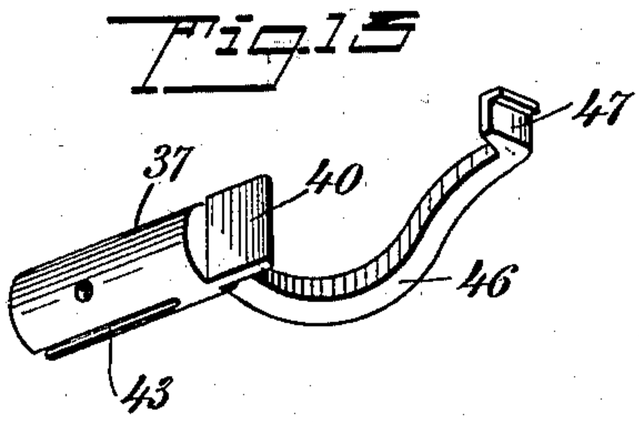


Fig. 10

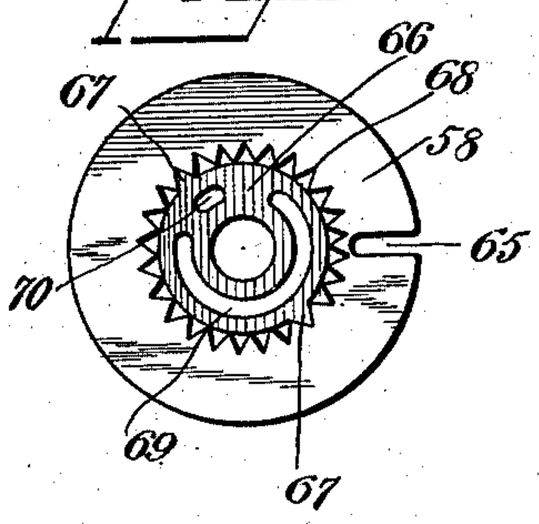


Fig. 14

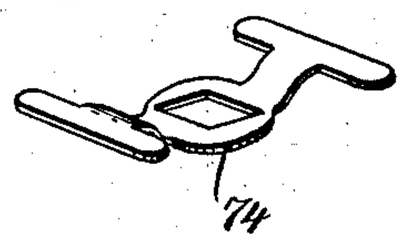


Fig. 11

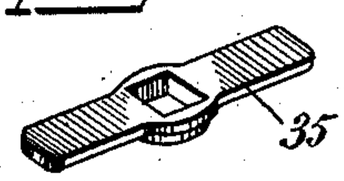


Fig. 15

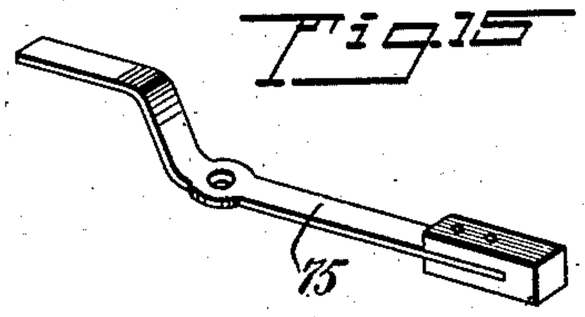
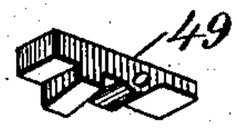


Fig. 16



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ATTORNEYS.

No. 743,480. Patented November 10, 1903.

UNITED STATES PATENT OFFICE.

IRA G. FRENCH, OF ORANGE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO BURTON H. LEE, CHRISTOPHER W. COLLIER, AND CHARLES A. PIKE, OF ORANGE, MASSACHUSETTS.

PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 743,480, dated November 10, 1903.

Application filed October 22, 1902. Serial No. 128,263. (No model.)

To all whom it may concern:

Be it known that I, IRA G. FRENCH, a citizen of the United States, and a resident of Orange, in the county of Franklin and State of Massachusetts, have invented a new and Improved Permutation-Lock, of which the following is a full, clear, and exact description.

This invention relates to a permutation-lock designed especially for application to the doors of residences, the arrangement being such that the lock may be readily opened from the inside of the house, but can only be opened from the outside by a person familiar with the combination.

The invention involves an arrangement whereby the lock may be operated in the dark to set the combination, the movement of the dial being indicated either by the noise of a spring-acting pawl or by the throb against the operator's hand of a member operated from said pawl.

The invention involves certain novel features of construction and combinations of parts, as will be hereinafter fully described and claimed.

This specification is an exact description of one example of my invention, while the claims define the actual scope thereof.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is an outside view showing the knob and the dial. Fig. 2 is an end view showing the bolt and the stop-arm. Fig. 3 is an elevational view of the interior mechanism, the view showing the lock-casing and the shank in section. Fig. 4 is a section on the line 4 4 of Fig. 3. Fig. 5 is a section on the lines 5 5 of Figs. 1 and 3. Fig. 6 is a section on the line 6 6 of Fig. 3. Fig. 7 is a section on the line 7 7 of Fig. 3; and Figs. 8 to 16, inclusive, are details of various elements of the lock, as will be hereinafter particularly described.

The lock has a casing 20 similar to the casing of the ordinary door-lock, and when the lock is applied to a door this casing is mortised thereinto in the usual manner. 21 indicates the face-plate of the lock, which lies against the outer edge of the door, as shown in Fig. 2. As shown in Fig. 5, the shank of the lock is made up of two parts 22 and 23, the part 22 having an extension 24, which projects through the part 23, the latter being tubular, and the extension 24 being engaged with the shank-section 23 by the nuts 25 or like fastenings. Secured to the section 23 is a knob 26, which is located at the inside of the door, and secured to the section 22 is a knob 27, which is located at the outside and carries on its stem an indicator-disk 28, which works over a dial-plate 29, fastened to the door and lying inward of the indicator-disk, as shown best in Fig. 6. The hub of this disk 28 is fastened to the stem of the knob 27 by means of a screw 30, which works in a slot 31, formed in the hub of the disk, and which thereby facilitates the adjustment of the disk with respect to the dial-plate.

32 indicates the bolt, which is fastened rigidly to the arm 33 of the rectangular strap 34. (See Figs. 5 and 6.) This strap 34 surrounds the inner end of the shank-section 23 and is adapted to be engaged by a cross-arm 35 on said end of the shank-section 23. (See Figs. 5 and 11.) By turning the knob 26 movement is imparted to the parts 33 and 35, and this by coaction with the strap 34 and arm 33 draws inward the bolt 32. The bolt 32 has a tubular rear portion 36, in which is fitted loosely a tubular bar 37, these parts having limited sliding movement by means of a pin 38, which is fastened to the part 37 of the bolt 32 and projects into a slot 39, formed in the bolt-section 36. (See Figs. 5, 6, and 13.) The rear end of the bar 37 carries a tongue 40, which projects inward and is adapted to coact with the tumblers in a manner which will be hereinafter described.

41 indicates a pin attached to the casing 20 and projecting inward through a slot 42 in the arm 33 and through slots 43 and 44, respectively, in the parts 37 and 36. This pin 41 holds the parts 32 and 37 against rocking movement, but allows them free longitudinal movement.

45 indicates a spring which is placed in the tubular parts 36 and 37 and which presses

between the pin 41 and the bolt 32, thus tending to hold the bolt in active position.

To the bar 37 of the bolt 32 is attached an arm 46, which projects laterally of and inward from the bar 37 and has an inturned or transversely-disposed end 47. By means of this arm 46, with its end 47, the bolt is drawn from the knob 27. It will be observed that by means of the parts 35 and 34, previously described, the bolt is drawn from the knob 26. On the shank-section 22 within the casing 20 is located a rectangular cross-piece 48, which turns with the square end of said shank-section and has a pawl 49 pivotally mounted thereon, this pawl being disposed radially of the shank-section 22 and having its inner end engaged with the laterally-turned end 50 of a rod 51, which is fitted in a groove 52, formed in the shank-section 22, and which rod extends outward from the shank into the knob 27. The knob 27 has a cavity 53 in its end, and in this cavity is located the head 54 of the rod 51. Bearing between the bottom of the cavity 53 and said head 54 is a spring 55, which tends to push outward the rod 51 and its head 54, keeping the end 50 normally engaged with the pawl 49. As the shank-section 22 is turned and the end of the pawl 49 engaged with the end 47 of the arm 46 the bolt 32 may be drawn into the casing—that is to say, when the turning movement of the shank is in the direction from left to right, referring to Fig. 3.

Fastened to the inner side wall of the casing 20, as best shown in Fig. 4, is the base-plate 56 of the tumbler mechanism. This plate is also clearly illustrated in Fig. 5. Said base-plate is centrally orificed and has a boss or tube 57 surrounding said orifice. Mounted loosely on said boss 57 are the tumblers 58, which are according to the example given in the drawings two in number. Between these tumblers are located the spacer-plates 59, said spacer-plates having ears thereon engaged with pins 60, fastened to the casing 20. (See Figs. 3 and 4.) Fig. 12 illustrates the spacer-plates 59 in detail, and referring to this view it will be seen that the said plates are provided with radial slots 61, which slots are placed directly opposite the tongue 40 of the bar 37, so as to allow said bar to move inward without being interfered with by the spacer-plates. The top spacer-plate 59^a is shown in detail in Fig. 9, and this plate has in addition to the slot 61^a a circular bead 62 surrounding the central orifice in the plate. This bead has notches 63 in its inner side to reduce its weight, and said bead serves to carry in position the ratchet-ring 64. (See Figs. 3, 4, 5, and 6.) This ratchet-ring is toothed on its side face, and the pawl 49 coacts therewith in a manner which will be hereinafter fully described. The spacer-plates 59 and 59^a are held from rotation; but the tumblers 58 are free to turn around the boss 57. These tumblers are illustrated in detail in Fig. 10, and each tumbler comprises an outer or main portion having a radial slot 65 therein corresponding with the slot 61 and adapted to allow the tongue 40 to move inward. Each tumbler also comprises a central portion 66, having tongues 67, which are adapted to engage with notches 68, formed in the inner periphery of the main section 58 of the tumblers. The parts 66 and 68 being securely, yet removably, connected with each other, it is clear that by adjusting the tongue 67 in the notches 68 the relative position of the two parts may be regulated, and thus the permutation of the lock may be changed at will as desired. The part 66 of the tumbler has an arc-shaped slot 69 extending nearly around the same, and between the ends of this slot 69 a small orifice 70 is formed.

A spring-pressed pawl 71 is suitably mounted in the casing 20 and bears against the ratchet-ring 64, this pawl 71 being of such arrangement relatively to the pawl 49 that the latter pawl may pass free of the pawl 71 when the pawl 49 is turning with the cross-piece 48. The cross-piece 48 in addition to the pawl 49 carries a pawl 72, which is pivoted to the cross-piece and pressed by a spring 73. This pawl 72 projects downward alongside the boss 57 and passes through the slots 69 in the tumblers, said pawl lying in the position shown in Fig. 7. The end of the pawl 72 is capable of being entered into the orifices 70 of the tumblers, and when this is done by turning the cross-piece 48 through the medium of the shank-section 22 the tumbler may be adjusted as desired. In order to adjust the lower tumbler or tumblers, the pawl is projected through the slot 69 of the upper tumbler or tumblers. The slots 69 of the tumblers are therefore useful only to permit the pawl 72 to pass through one tumbler to reach the other.

74 indicates a spring-plate (see Figs. 4 and 14) which surrounds the shank-section 22 and presses against the casing 20 and against the cross-piece 48, thus holding the cross-piece raised on the bead 62 of the spacer-plate 59^a.

75 indicates the stop-arm, which is in the form of a lever fulcrumed at the point 76 and having its front end projected through a slot 77 in the front wall of the casing 20 and in the face-plate 21. The inner arm of the lever lies over the arm 46 and is in position to be swung upward from the position shown in Fig. 3, so as to lie over the ratchet-ring 64 and confine the pawl 49 between the arm 75 and the end 47 of the arm 46, thus preventing such movement of the cross-piece 48 as will displace the tumblers. By means of this device when the tumblers are once thrown to released position persons may be prevented from throwing the tumblers back to locked position. They will not, however, be prevented from operating the latch, since there is nothing to restrain the action of the pawl 49 on the end of the arm 46 in the manner which has heretofore been explained.

The operation and manner of using the in-

vention may be traced as follows: In its ordinary adjustment—that is to say, when the parts are in the position shown in Fig. 3—the lock is free to be operated from the inside by the manipulation of the knob 26 in the usual manner. The movement of the knob 26 throws the arm 35, and this acting on the strap 34 draws the bolt in, while the spring 45 shoots the bolt out into locked position when pressure on the knob 26 is relaxed. When the tumblers are in locked position, they prevent the inward movement of the bar 37 owing to the position of the tongue 40. When, however, the tumblers are adjusted so that their slots 65 coincide with the slots 61 and 61ª of the spacer-plates 59 and 59ª, the bar 37 may be moved inward, and through the medium of the pin 38 this bar will carry with it the bolt 32. Such inward movement of the bar 37 is brought about by turning the cross-piece 48 until the pawl 49 strikes the right-hand side of the end 47 of the arm 46. After the tumblers are adjusted into unlocked position and the pawl 49 is brought around into engagement with the right-hand side of the end 47 of the arm 46 the arm or lever 75 may be thrown from the position shown in Fig. 3 to its opposite position, whereupon the inner end of the arm will lie over the ratchet-plate 64, and return movement of the cross-piece 48 is prevented. This prevents operation of the lock to move the tumblers out of unlocked position and it allows the free operation of the parts 49, 46, and 37, as explained above. The arm 75 therefore enables the permutation lock mechanism to be thrown out of action whenever desired.

To operate the permutation mechanism, the combination being known, it is only necessary, assuming that the tumblers are lying at zero, to turn the indicator-plate 28 with the parts 22, 48, and 72 to zero position. This engages the point of the pawl 72 with the recess 70 in the top tumbler. Then the indicator-plate 28 should be turned back the number of degrees required by the combination. This will place the top tumbler in unlocked position. The indicator-plate 28 should then again be returned to zero, whereupon the pawl 72 will be dropped through the orifice 69 of the top tumbler engaged with the orifice 70 of the tumbler next below. By a return movement of the indicator-plate 28 and its attached parts this second tumbler will be moved to unlocked position. This operation should be repeated as often as there are tumblers in the lock. It is clear that any desired number of tumblers may be employed. The tumblers being moved to unlocked position—that is to say, with their slots 65 lying opposite the tongue 40—it then only remains to turn the knob 27 sufficiently to engage the pawl 49 with the right-hand side of the end 47 of the arm 46, and then the door may be opened at will. To lock the permutation mechanism, the knob 27 should be given several turning movements, each of which will result in throwing a tumbler out of position. When the tumblers are to be placed in unlocked position following a known permutation, it is necessary that they be first set at zero, so that the permutation members may be worked from zero. To set the tumblers at zero, it is only necessary to reverse the operation described above in connection with placing the tumblers in unlocked position. As the cross-piece 48 is turned it rides over the ratchet-disk 64, and when the cross-piece turns in that direction which sets the tumblers to unlocking position the pawl 49 clicks idly over the ratchet-ring. This produces a clicking noise, and since the teeth on the ratchet-ring are set in exact correspondence to the graduations on the indicator-plate 28 the combination may be counted from the clicks, as well as from the indicator-plate. Also the movement of the pawl due to its riding over the ratchet-ring will give the rod 51 a number of rapidly-succeeding inward movements, the spring 55 pushing the rod 51 outward after each inward movement. This causes a throbbing of the head 54, and also the spring 55, being in connection with the pawl 49 through the medium of the rod 51, increases the clicking noise of the pawl. Therefore if a person does not wish the clicking noise of the pawl to be heard (since if a stranger be present this clicking noise may divulge the combination of the lock) the head 54 may be pushed in slightly, so as to take the pressure of the spring 55 off of the pawl 49, and the clicking noise of the pawl will therefore not be audible. However, the pawl will move over the ratchet, and the rocking movement of the pawl due to the ratchet will thus be imparted to the rod 51, and the operator may therefore determine by the throb of the head 54 against the hand just how many teeth of the ratchet-ring are being passed over, and thus the movements may be counted so as to determine the extent to which the tumblers are moved.

It will be seen from the foregoing that this lock is especially adapted to be applied to house-doors and that every provision is made for the use of the lock as is customary in residences. Persons on the inside of the door (the side of the knob 26) may freely open or close the door, while persons on the outside (the side of the knob 27) must be aware of the combination before the door can be opened, unless at the will of persons within the house the arm 75 be adjusted to throw the permutation mechanism out of action.

Various changes in the form, proportions, and minor details of my invention may be resorted to at will without departing from the spirit and scope thereof. Hence I consider myself entitled to all such variations as may lie within the intent of my claims.

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

1. The combination of a bolt, a strap attached thereto, a knob, an arm in connection with the knob and coacting with the strap directly to operate the bolt, a bar having sliding connection with the bolt, a tumbler, means for operating the tumbler, an arm in connection with the bar, a second knob, and a part connected therewith and coacting with the arm.

2. The combination of a bolt, a strap attached thereto, a knob, an arm in connection with the knob and coacting with the strap directly to operate the bolt, a bar having sliding connection with the bolt, a tumbler, means for operating the tumbler, an arm in connection with the bar, a second knob, and a part connected therewith and coacting with the arm, the said bar having a tongue thereon and the tumbler having a slot adapted to be entered by the tongue when the tongue is in unlocked position.

3. The combination with permutation-lock mechanism, of a handle member for operating the same, a member mounted loosely on the handle member, and a connection between the second-named member and the lock mechanism to cause the second-named member to throb as the lock mechanism is operated.

4. The combination with a permutation-lock mechanism, of a ratchet-ring, a pawl working over the same, a rod engaging the pawl, a spring pressing the rod, and a handle for operating the lock mechanism, through which handle said rod extends.

5. In a permutation-lock, the combination with a tumbler and means for operating the same, of a bolt, an arm connected with the bolt, a knob, a shank attached to the knob and having connection with the means for operating the tumbler, a ratchet-ring, and a pawl arranged to turn with the shank and working over the ratchet-ring, for the purpose specified, said pawl being arranged to engage the arm of the bolt, to draw the bolt.

6. In a lock, the combination with a tumbler and means for operating the same, of a bolt, an arm connected with the bolt, a knob, a shank attached to the knob and having connection with the means for operating the tumbler, a ratchet-ring, a pawl arranged to turn with the shank and working over the ratchet-ring, for the purpose specified, said pawl being arranged to engage the arm of the bolt, to draw the bolt, a rod running through the shank and knob and engaged with the pawl, and a spring pressing the rod.

7. In a permutation-lock, the combination of a bolt, tumblers, means for operating the tumblers, an arm attached to the bolt and adapted to be engaged by a part of said means, whereby to operate the bolt, and a stop-arm movable into engagement with said tumbler-operating means to prevent the operation of the tumblers, for the purpose specified.

8. The combination of a bolt, an arm attached thereto, a tumbler, a pawl arranged to operate the tumbler, a turning member carrying the pawl, means carried by said turning member for engaging the arm to operate the bolt, and a stop-arm movable into the path of said means, for the purpose specified.

9. The combination of a bolt, an arm attached thereto, a tumbler, a pawl arranged to operate the tumbler, a turning member carrying the pawl, means carried by said turning member for engaging the arm to operate the bolt, and a stop-arm movable into the path of said means, for the purpose specified, the said means for engaging the arm comprising a pawl and a ratchet-ring over which the pawl works.

10. In a lock, the combination of a bolt, an operating device directly connected thereto, a bar having sliding connection with the bolt, for the purpose specified, an arm carried by the bar, a tumbler, a second operating member, a turning member connected to the second operating member, and a pawl carried thereby and adapted to coact with the tumbler to set the same, said turning member being adapted to engage the said arm.

11. In a lock, the combination of a bolt, a tumbler, a pawl arranged to operate the tumbler, a member carrying the pawl and having a part adapted to operate the bolt, and a stop-arm movable into the path of said part to render the same inoperative.

12. In a lock, the combination of a bolt, means connected for directly operating it, a bar having sliding connection with the bolt, a tumbler, a pawl arranged to operate the tumbler, means carrying the pawl and having a part coacting with the said bar to operate the bolt, and a stop-arm movable into the path of said part to render the same inoperative.

13. A permutation-lock, comprising the combination with the bolt, of tumblers coacting with the bolt, said tumblers each having a central orifice and an arc-shaped orifice outward therefrom, an operating-spindle passed through the central orifice of the tumbler, and a pawl carried by and moving with the operating-spindle and working through the arc-shaped openings in the tumblers, to actuate the tumblers.

14. A permutation-lock, comprising the combination with the bolt, of tumblers coacting with the bolt, said tumblers each having a central orifice and an arc-shaped orifice outward therefrom, an operating-spindle passed through the central orifice of the tumbler, and a pawl carried by and moving with the operating-spindle and working through the arc-shaped openings in the tumblers, to actuate the tumblers, and each of said tumblers also having a third opening or orifice situated from the center of the tumbler a distance equal to that of the aforesaid arc-shaped opening, the third opening of the tumblers coacting with the bill of the pawl, to facilitate the movement of the tumblers.

15. A permutation-lock, comprising the combination with the bolt, of tumblers coact-

ing with the bolt, said tumblers each having a central orifice and an arc-shaped orifice outward therefrom, an operating-spindle passed through the central orifice of the tumbler, a pawl carried by and moving with the operating-spindle and working through the arc-shaped openings in the tumblers, to actuate the tumblers, an arm in connection with the bolt, and a member turning with the operating-spindle and adapted to strike said arm to move the bolt.

16. In a permutation-lock, the combination with the bolt and means for operating the same, of a plurality of independently-movable superimposed tumblers, an operating-shank passing centrally through them, said tumblers having openings therein outward from the shank registering with each other upon certain positions of the tumblers, a pawl arranged to pass through said openings to independently engage and operate the several tumblers, and means for mounting the pawl on the shank at one side thereof.

17. In a permutation-lock, the combination with the bolt and means for operating the same, of a plurality of independently-movable superimposed tumblers, an operating-shank passing centrally through them, said tumblers having openings therein outward from the shank registering with each other upon certain positions of the tumblers, a pawl arranged to pass through said openings to independently engage and operate the several tumblers, and means for mounting the pawl on the shank at one side thereof, the tumblers also having each a second opening therein adapted to receive the bill of the pawl, whereby to connect the pawl with any one of the tumblers.

18. The combination with a permutation-lock mechanism, of a means for operating the same, a member loosely mounted in the lock and projecting to the exterior thereof, and a connection between said member and the lock mechanism to cause said member to throb upon the operation of the lock mechanism.

19. In a permutation-lock, the combination of the bolt, a bolt-operating means, a tumbler, a ratchet-ring juxtaposed to the tumbler, a pawl working over the ratchet-ring, a rod engaging the pawl and extending to the exterior of the lock, a spring compressing the rod, an operating-spindle, and means carried thereby for adjusting the tumblers.

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

IRA G. FRENCH.

Witnesses:
JAMES D. KIMBALL,
ERASTUS ASH.