Feb. 7, 1939. E. A. ZUBER 2,146,134

LOCK

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Fig. 3

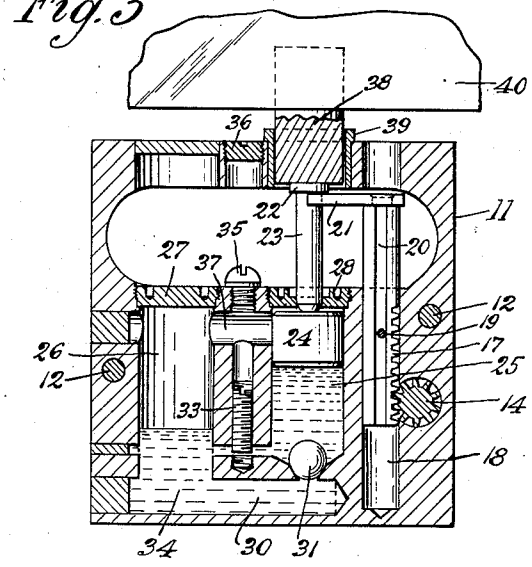



Fig. 2

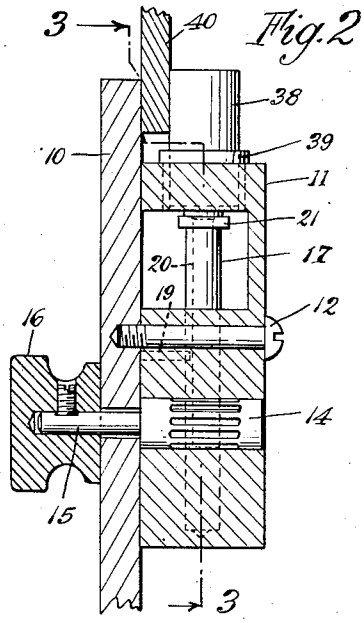



Fig. 4

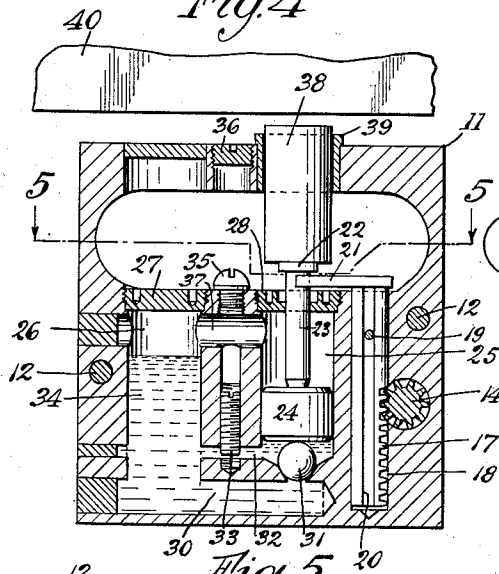



Fig. 6

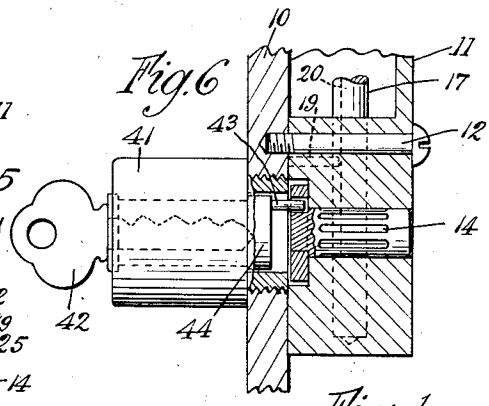



Fig. 5

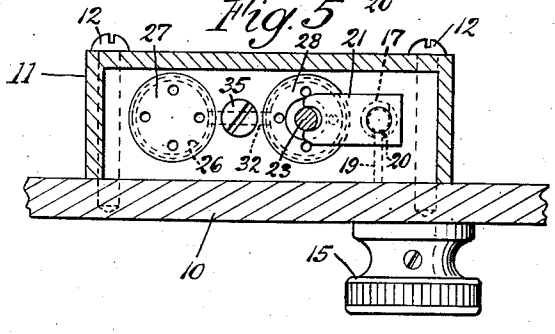
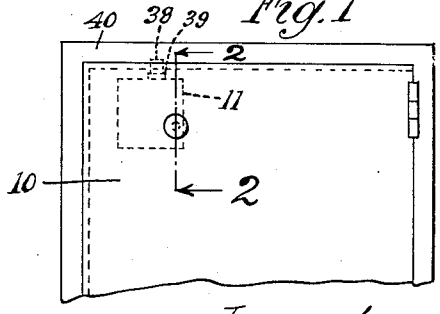



Fig. 1




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Fig. 7

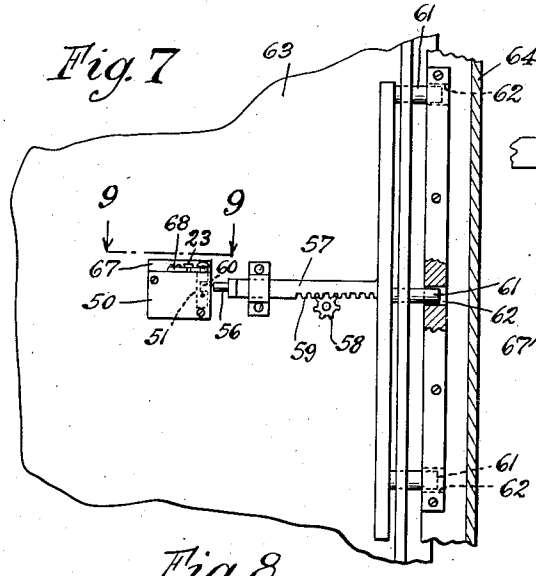



Fig. 12

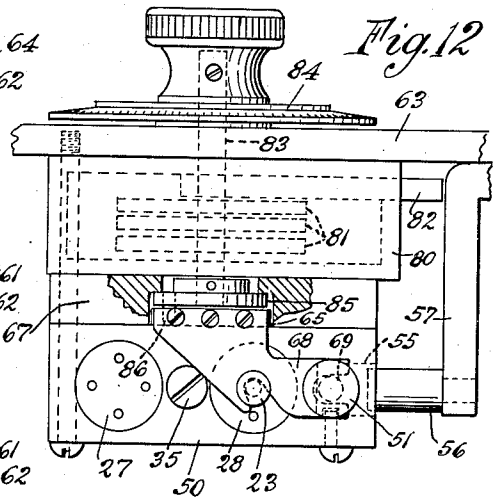



Fig. 8

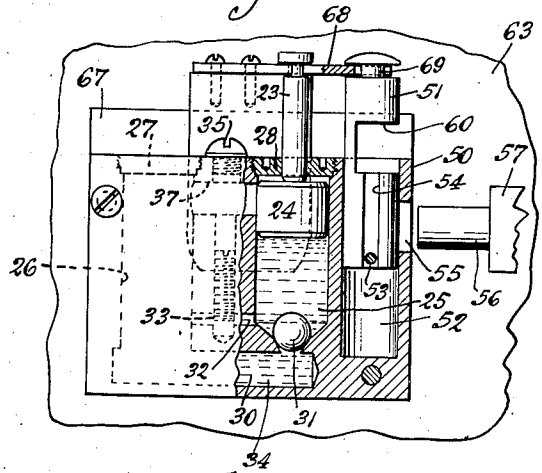



Fig. 10

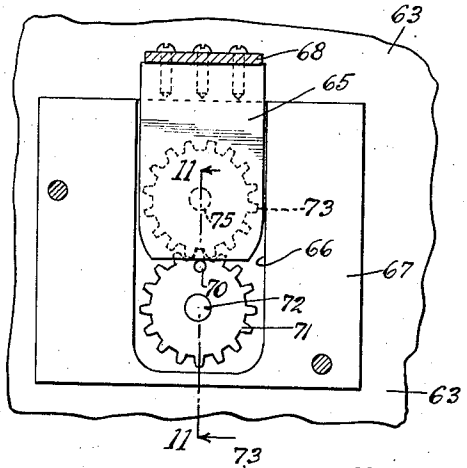



Fig. 9

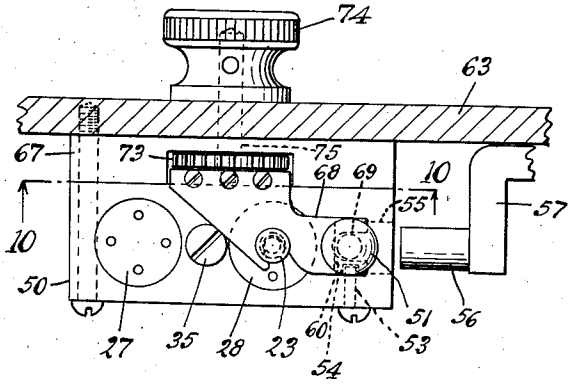
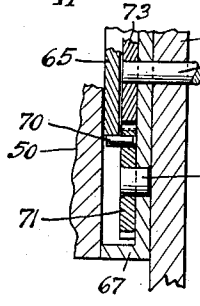



Fig. 11




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Patented Feb. 7, 1939

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# UNITED STATES PATENT OFFICE

2,146,134

## LOCK

Ernest A. Zuber, Chicago, Ill.; Marie Stressler, executrix of said Ernest A. Zuber, deceased

Application January 4, 1935, Serial No. 348

7 Claims. (Cl. 70—267)

The invention relates to time locks, especially adapted for use with that type of lock known as combination or permutation locks.

It is well known that especially in vault lock combinations tumblers are provided which must be turned in a certain direction and to a certain extent, so that gradually the recesses in said tumblers coincide before the bolt can be withdrawn from locked into idle position. According to the present invention, even after the tumblers have been properly actuated, the bolt is not released for movement into open position, although the lock comes to a stop, until the lapse of a predetermined period of time whereby unauthorized persons even though knowing the proper combination are misled into believing that the lock cannot be opened, and thus unauthorized or surreptitious opening of a safe or vault is effectively prevented.

It is a further object of the invention to provide in combination with a bolt and the means for actuating the same, means operated by said actuating means for releasing said bolt for actuation at a predetermined time.

A further object embraces the provision of means for varying the time during which the actuating means is retarded to effect complete opening of the lock.

A further object aims at providing automatic means for retarding the actuating means and moving the bolt from the locked into opened position.

Another object aims at providing gravity acting means for retarding the release of the bolt.

A still further object aims at providing certain details of construction and arrangement tending to enhance the effectiveness and reliability of a device of the character described.

With these and other equally important objects in view which will become apparent from a perusal of the invention, the latter comprises the means described in the following specification, particularly pointed out in the claims forming a part thereof, and illustrated in the accompanying drawings, in which:

Fig. 1 is a fragmentary front view of a safe to which my invention has been applied.

Fig. 2 is an enlarged section on the line 2—2 of Fig. 1.

Fig. 3 is a section taken along the line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 3 with parts in different positions.

Fig. 5 is a section on the line 5—5 of Fig. 4.

Fig. 6 is a fragmentary view similar to Fig. 2 of a variant form.

Fig. 7 is an inside view of a door and lock of a further modification.

Fig. 8 is an enlarged view of the lock illustrated in Fig. 7 with parts broken away.

Fig. 9 is a section on the line 9—9 of Fig. 7.

Fig. 10 is a section taken along the line 10—10 of Fig. 9.

Fig. 11 is a section taken on the line 11—11 of Fig. 10.

Fig. 12 is a plan view of still a further modification.

Like parts are illustrated by like symbols throughout the specification and drawings.

Referring to Figs. 1 to 5 of the drawings, 10 designates the door of a safe provided with a lock generally designated by 11 which may be secured to the door for example, by screws 12. Rotatable in the lock is a gear 14 which may be formed integral with an external shaft 15 to which any suitable knob or handle 16 may be secured. In mesh with the gear 14 is a rack bar 17, herein shown as cylindrical in shape and slidable in a cylindrical chamber 18 in the lock 11. Rotation of the rack 17 is prevented by means of a pin 19 engaging a slot 20 in the rack bar. Secured to the uppermost end of the rack bar is a slotted lifting member 21 which engages a head 22 of a plunger stem 23. Secured to or integral with the stem 23 is a piston 24 fitted in a chamber 25 formed in the lock 11. The lock is further provided with an additional chamber 26 closed by a plug 27, while a plug 28 closes the chamber 25. At the lower end the chambers 25 and 26 are in communication through a passage 30 controlled by a ball valve 31. A by-pass 32 establishes additional communication between the chambers and a set screw 33 extends therein to regulate the flow of liquid 34 from one chamber to the other. Access to the screw 33 for adjustment may be had by removing the screw 35 and plug 36 which are in alignment with the adjusting screw. The chambers 25 and 26 are further connected by a duct 37 adjacent the plugs 27, 28 and above the level of the liquid to which it possibly could rise. Seated upon the head 22 of the piston stem 23 is a locking bolt 38, projecting through a bushing 39 in the lock 11.

Assuming that the parts of the lock are in the unlocked position, as illustrated in Fig. 4, clockwise rotation of the knob 16 and associated gear 14, as viewed in said figure, will cause the rack bar 20 to rise and by means of the member 21 lift the piston 24 and also the locking bolt 38 into

locking position, illustrated in Figs. 2 and 3, with the bolt 38 projecting inside and above the opening of the front panel 40 of the vault. The rise of the piston 24 causes a partial vacuum and the liquid flows from the chamber 26, past the ball valve 31 into the chamber 25.

In order to open the door 10, the knob 16 and gear 15 are rotated counter-clockwise until the rack bar 20 assumes the position illustrated in Fig. 4, however, the length of time necessary for the locking bolt and piston to descend may be varied between two minutes and approximately ten hours depending on the adjustment of the set screws 33.

Only after the locking bolt 38 has cleared the wall 40 of the vault can the door be opened.

As will be readily understood, the locking bolt 38 and piston 24 are of sufficient weight to force the liquid 34 back into the chamber 26 through the by-pass 32.

In place of the knob 16 I may employ a barrel lock 41 illustrated in Fig. 6 operable by its key 42. The barrel lock may be secured by any suitable means to the door 10. For an illustration I have provided the barrel lock with a screw threaded sleeve in screw threaded relationship with the door 10. A pin 43 secured to the rotatable barrel 44 serves to rotate the gear 14. The importance of the invention will thus become evident as the unauthorized opening of a vault, safe, chest and the like is effectively prevented.

In Figs. 7 to 11 modifications are illustrated. The time lock housing 50 is similar to the lock housing 11, but, instead of the rack bar 17, I have employed a locking bolt 51 slidable in a correspondent recess 52 and held against rotation therein by a pin 53 in engagement with a vertical slot 54.

The locking bolt 51 controls an aperture 55, through which a pin 56 of any suitable vault locking member 57 may be thrust by means of the customary external handle, which rotates a gear 58 in engagement with the rack 59 associated with the vault locking member 57.

It will be realized, that if the locking bolt 51 is in the position illustrated in Figs. 7 and 8, the vault locking member 57 is held in locking position. The bolt 51 prevents lateral movement of the member 57 to the left until a recess 60 in the locking bolt 51 is in alignment with the aperture 55 into which the pin 56 may recede sufficiently to permit the prongs 61 of the locking member 57 to clear their corresponding apertures 62 and thus unlock the vault door 63 of a vault or safe 64.

I have illustrated in Figs. 7 to 11 modified means for raising the locking bolt 51. A sliding member 65, slidable in a slot 66 in a bearing block 67 is provided with a slotted lifting plate 68, one slot embracing a reduced portion of the piston stem 23 of the piston 24 and a second slot engaging a reduced portion 69 of the locking bolt 51.

It will be seen that the sliding member 65, the piston 24 and the locking bolt 51, move in unison. The sliding member 65 is raised by means of a pin 70 on a gear 71 rotatable on a pin 72, a second gear 73 in engagement with the gear 71 may be rotated by means of an external knob 74 and shaft 75.

The device illustrated in Figs. 7 to 11 may be employed with any suitable combination lock 80 (Fig. 12) in which a plurality of tumblers 81 are utilized for effecting a predetermined setting of said tumblers, before a locking bolt 82 can be withdrawn sufficient to permit lateral movement of the vault locking member 57 into unlocked position, when the recess 60 of the locking bolt 51 is again in alignment with the pin 56 of the member 57.

The timing mechanism above referred to may be actuated by means of a shaft 83 normally employed for setting of the tumblers 81 and manipulated by means of any suitable dial 84, to which a driving member 85 is secured including a pin 86, which serves to raise the sliding member 65 to its uppermost position.

It will be understood that the parts for raising said sliding member are so positioned, that, when the locking member 82 is in the unlocked position, the pin 86 is sufficiently lowered to permit the sliding member 65 to assume its lowest or unlocking position.

While the drawings show preferred embodiments of the invention, numerous changes and variations may be made without departing from the spirit of the invention. I, therefore, do not limit myself to details of construction and arrangement as shown, but claim my invention as broadly as the state of the art permits.

I claim:

1. In a lock, an external locking control means having an unlocked and a locked position, a bolt, a piston mounted vertically in a chamber and so connected to said bolt that bolt and piston reciprocate sympathetically, a fluid inlet into said chamber with check valve, a fluid outlet from said chamber, fluid in the system, and a single locking train responsive to the unlocked or locked position of said external control means and adapted to engage said bolt upon a locking movement only.

2. In a lock, an external locking control means having an unlocked and a locked position, a bolt, a piston mounted vertically in one of two parallel chambers and so connected to said bolt that said bolt and piston reciprocate sympathetically, said chambers being connected at their bases by two passages, constituting respectively an inlet and an outlet for the piston chamber, a check valve preventing back flow in the inlet passage, an adjustable valve controlling the rate of flow in the outlet passage, sufficient fluid to overflow both passages regardless of the position of said piston, and a single locking train responsive to the unlocked or locked position of said external control means and engaging said bolt only upon a locking movement, whereby on a locking movement, said bolt is locked, the piston sucks fluid into its chamber, and on an unlocking movement, the bolt is unlocked as the piston by gravity expels the fluid from the chamber past the adjustable valve.

3. In a lock having a bolt, a piston mounted vertically in one of two parallel chambers and so connected to said bolt that the bolt and piston reciprocate sympathetically, said chambers being connected at their bases by two passages, constituting respectively an inlet and an outlet for the piston chamber, a check valve preventing back flow in the inlet passage, an adjustable valve controlling the rate of flow in the outlet passage, sufficient fluid to overflow both passages regardless of the position of the piston, and a single locking train adapted to control the locking movement only of said bolt.

4. In combination with a separately controlled bolt train, a blocking member responsive to the unlocked and locked positions of an external control means, said blocking member adapted to retain said separately controlled bolt train in

locked position when said external control means is in locked position, and an hydraulic retarding mechanism comprising two parallel chambers, said blocking member being mounted vertically and piston-like in one of said chambers, said chambers being connected at their bases by two passages forming a fluid circuit through the piston chamber having one direction only, and an adjustable valve in said fluid circuit for controlling the rate of flow from the piston chamber.

5. In a lock having a bolt, a piston mounted vertically in one of two closed chambers and so connected to said bolt that the bolt and piston reciprocate sympathetically, said chambers being connected at their base by two passages, constituting respectively an inlet and an outlet for the piston chamber, a check valve preventing back flow in the inlet passage, an adjustable valve controlling the rate of flow in the outlet passage, sufficient fluid to overflow both passages regardless of the position of the piston, a single locking train adapted to control the locking movement only of said bolt, and a third connecting passage between the upper portions of said chambers unflowed by fluid whereby said piston may reciprocate uninfluenced by air pressures.

6. In a lock, a casing comprising three chambers, a vertical driving piston reciprocable by action of an external control means in the first chamber, in the second chamber a vertical locking piston having a shoulder engaged on its lower side by the driving piston, inlet and outlet passages between the second and third chambers, fluid overflowing both passages, a ball check valve in the inlet passage to assure one-way flow, and an adjustable control valve in the outlet passage.

7. In a lock, a casing comprising an open vertical chamber in which reciprocates a driving piston and two closed chambers, in one closed chamber a locking piston having a shoulder engageable on its lower side by said driving piston, said closed chambers being interconnected by three passages, one being an inlet passage at the base of the locking piston chamber with a check valve to prevent back flow of fluid, a second passage being an outlet above the inlet passage and having therein a needle valve to control rate of flow, and a third passage into the upper portion of the locking piston chamber, and fluid overflowing at all times the two lower passages only, whereby on a locking movement of the driving piston, as the locking piston rises the first closed chamber is filled with fluid, and upon an unlocking movement of the driving piston, the locking piston by gravity expels the fluid from the first closed chamber past the needle valve at a predetermined rate.

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