No. 840,054. PATENTED JAN. 1, 1907.

O. M. FARRAND.

KEYLESS LOCK.

APPLICATION FILED AUG. 22, 1905.

3 SHEETS—SHEET 1.

FIG. 1.

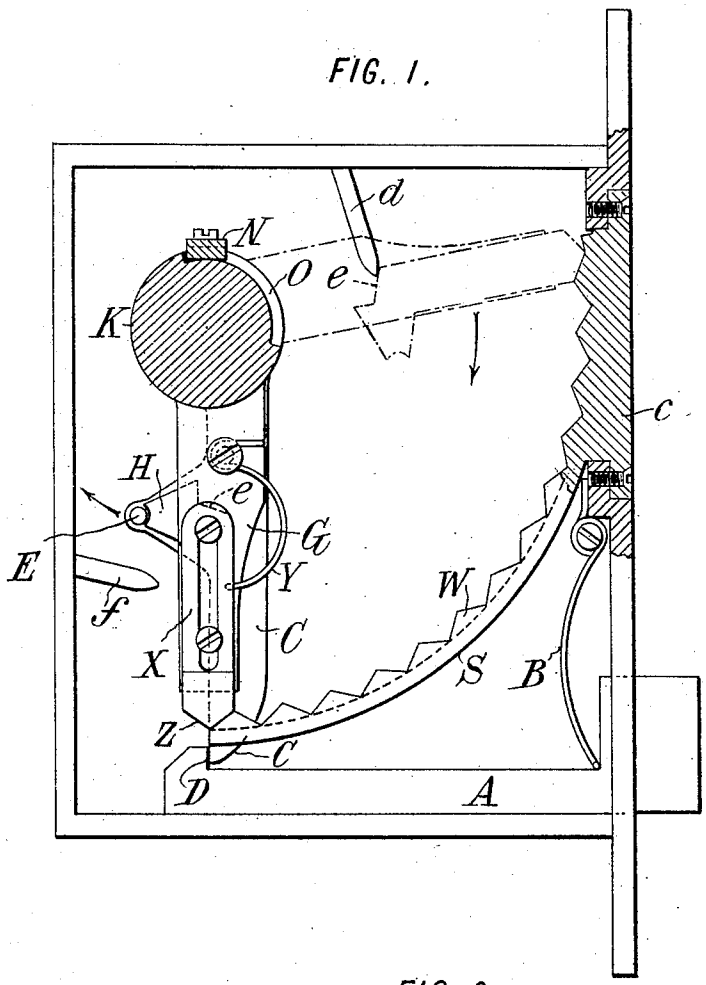
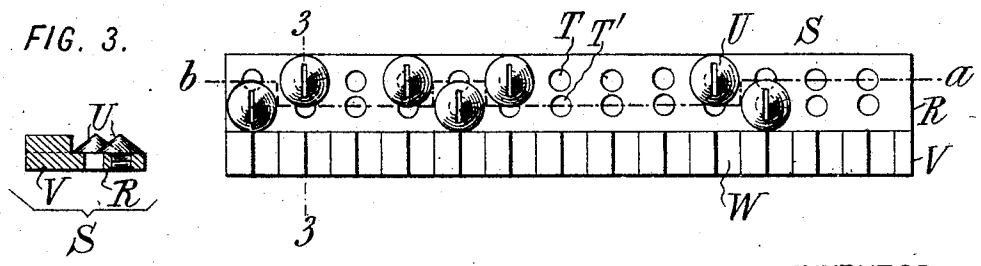


FIG. 2.

FIG. 3.



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3 SHEETS—SHEET 2.

FIG. 4.

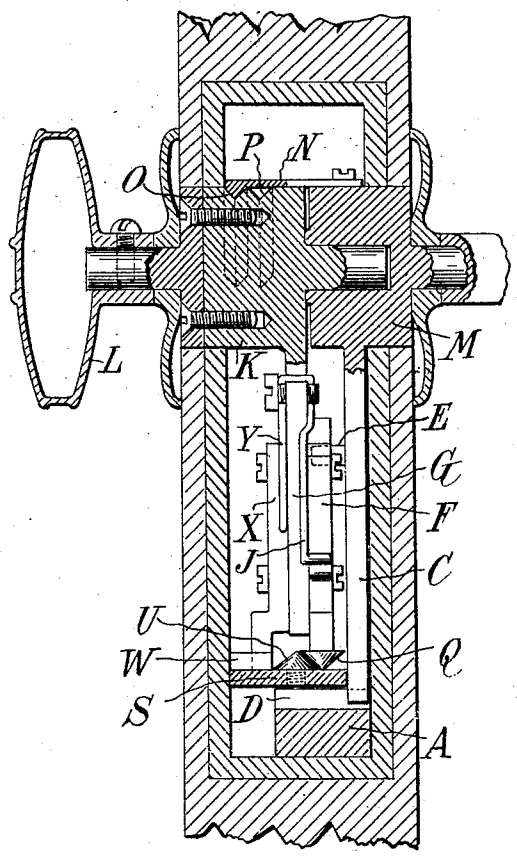


FIG. 5.

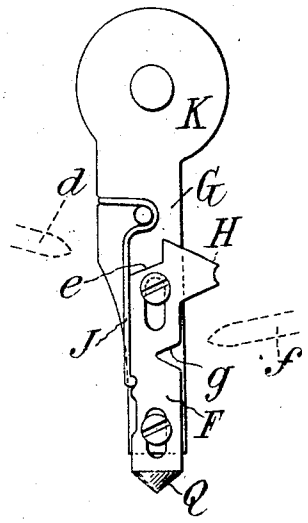
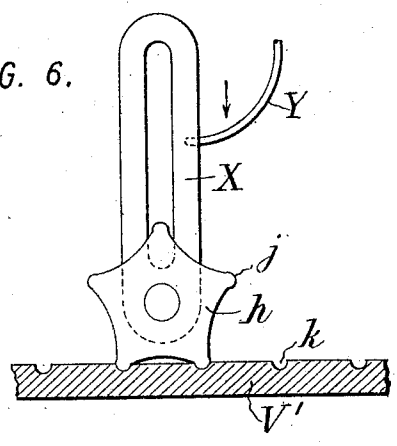


FIG. 6.



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3 SHEETS—SHEET 3.

FIG. 7.

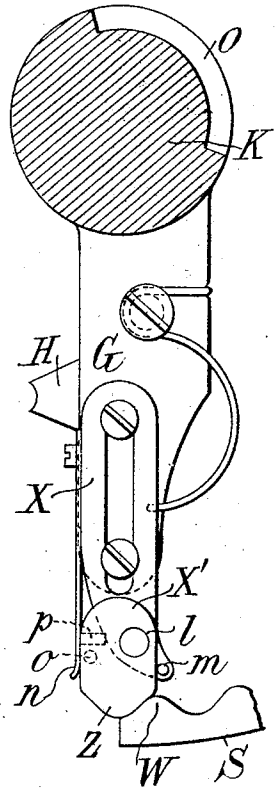


FIG. 8.

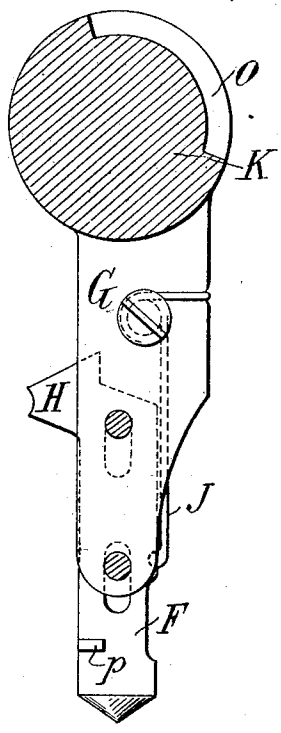


FIG. 9.

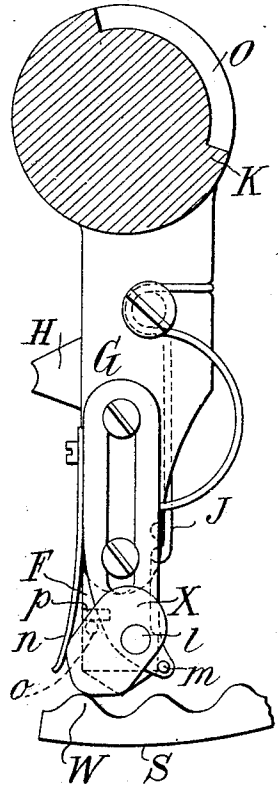
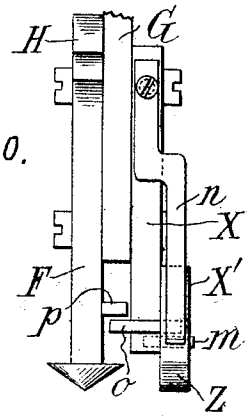


FIG. 10.



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KEYLESS LOCK.

No. 840,054. Specification of Letters Patent. Patented Jan. 1, 1907.

Application filed August 22, 1905. Serial No. 275,201.

To all whom it may concern:

Be it known that I, OLIVER M. FARRAND, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Keyless Locks, of which the following is a specification.

My invention aims to provide an improved keyless or combination lock, adapted for use wherever locks are necessary, from a satchel to a safe or vault, and adapted to be operated by the sense of touch, so that it can be operated by a deaf or a blind person. There is no dependence on gravity. Therefore the lock operates equally well in any situation, and the construction is extremely simple, involving few parts, so that it can be made very small or large, according to circumstances.

Other advantages are referred to in detail hereinafter.

The accompanying drawings illustrate an embodiment of the invention.

Figure 1 is an elevation of the mechanism partly in section, the front plate of the lock being removed. Fig. 2 is a development of the face of the controlling-plate. Fig. 3 is a section of Fig. 2 on the line 3 3. Fig 4 is a section through the shaft of the lock, indicating the principal parts of the mechanism in elevation. Fig. 5 is an elevation of the opposite face of the arm shown in Fig. 1. Fig. 6 is an elevation of a different type of indicating device for indicating the intervals through which the knob has been turned. Fig. 7, 8, and 9 are face elevations, and Fig. 10 an edge elevation of a different construction.

Referring to the embodiment of the invention illustrated, the lock is operated by successive rotary movements of the knob, all in the same direction, with axial movements between the successive rotary movements, the intervals of the movement being indicated by the sense of touch upon the knob—that is, by a series of slight shocks as a member of the mechanism passes over a series of teeth. The knob is movable axially as well as rotatable, and is shifted axially at the end of certain determined intervals, which are indicated in the manner above stated. If the knob be not shifted axially at proper intervals, the unlocking means are rendered inoperative. Preferably means are also provided for turning the mechanism to its operative position upon turning the knob to its starting-point, and preferably also means are provided for rendering the mechanism inoperative as soon as it has drawn the bolt back. The device is shown in connection with an inside knob for house-doors and the like, but for safes, satchels, or other cases, where an inside knob is unnecessary, this knob and the parts necessary to its use will be omitted.

The bolt A of any suitable type is thrown outward by a spring B and is drawn back by an arm C engaging a shoulder D on the bolt. The arm C carries a pin E, offset at one side thereof and projecting forward into the path of an operating device hereinafter described, which when the combination has been properly followed strikes the pin E and forces it in the direction of the arrow, thereby drawing the bolt A inward and unlocking the lock.

The operating device for moving the arm C is shown as a slide F, carried upon the rear face of an arm G and having a projecting portion H, which in its lowered position (indicated in Figs. 1 and 5) is in line to engage the pin E, but which may be raised to such a position as to clear the pin E. A spring J, taking into suitable notches on the edge of the slide F, holds it impositively in either its upper or its lower position.

The arm G extends from the shaft K of the outer knob L, which is free to turn relatively to the shaft M of the inner knob and which is also free to shift axially a slight distance, the axial movement being limited by a leaf-spring N, preferably fixed at one end upon the shaft M of the inside knob and which has a beveled tooth at its free end taking into one or the other of the two transverse grooves O and P in the shaft K of the outer knob. The arm C is thus pivotally supported and adapted to receive the successive rotary and axial movements necessary for operating the bolt.

The slide F has a pointed, preferably conical, end Q, which passes over the portion R, Fig. 2, of a plate, which is indicated as a whole by the letter S. The portion R is provided with a series of screw-holes in pairs T T′, which are separated by a distance equal to the play between the grooves O and P of the shaft—that is to say, the axial play of the knob and the arm G and slide F. Tapered, preferably conical, stops U are screwed into one of the holes T or T′ of each pair in such an arrangement that the slide F in order to pass over the plate must move during a certain number of intervals over the outer line of holes T, and must then be shifted axially and pass over a certain number of holes T′ of the

inner line, and so back and forth until it escapes at the end with the portion H in position to strike the pin E and draw the bolt. If the combination is not correctly worked, the operating device or slide F is rendered inoperative, the tapered end Q of the slide striking one of the tapered stops U and lifting the slide out of its operative position where it will be held by the impositive spring J, and the lock will fail to open. The indicating of the intervals is accomplished by means of another portion V of the plate S, or it may be a separate plate, which is provided with fixed teeth W at intervals corresponding with the distance between successive holes T or T′, in combination with a detent preferably in the form of a slide X, which is carried upon the front of the arm G and which is pressed always downward by a spring Y, so that its pointed end Z transmits a slight shock to the knob as it rides over each of the teeth W.

The stops U being removable may be set to any desired combination. In the example shown the operating-slide F moves over the path indicated by the broken line *a b*, and which would be represented in numbers as "3, 5, 1, 3, 1." A very convenient arrangement is provided for changing the combination. The plate S, or at least the portion R thereof, is mounted in the lock by means of an extension *c*, which is fastened from the outside into the edge of the lock-casing, so as to be inaccessible either from outside or inside when the door is shut, the plate S proper being passed through a suitable opening in the casing of the lock, and being unconnected to any other parts of the casing or of the mechanism, so that it may be freely withdrawn from the outside and replaced after the combination has been altered.

In turning the outer knob back to its starting position it is not essential to reverse the combination. The slide F may be allowed to strike the stops U and to be thrown to its inoperative position. Means are provided for restoring it to its operative position upon the return of the knob to its starting position. These means may consist, for example, of a pin *d*, having a beveled end which engages a beveled edge *e* of the slide to throw it to its outward or operative position. It may also be desirable to render the operating means inoperative as soon as the work of drawing the bolt has been accomplished, and means may be provided for this purpose. Such means, for example, may consist of a pin *f*, having a beveled end in position to engage a beveled edge *g* upon the slide when the latter is moved slightly beyond the position necessary to withdraw the bolt. The relative positions of the pins *d* and *f* and the beveled edges *e* and *g* of the slide are indicated diagrammatically in Fig. 5.

The slide X, instead of being provided with a pointed end which passes frictionally over the teeth W, may be provided with a rotating wheel *h*, Fig. 6, having teeth *j*, spaced properly to engage in succession grooves *k*, corresponding to the grooves between the teeth W. As the slide X is swung over the plate V′ the wheel *h* will roll along, the teeth *j* dropping into successive grooves *k* with sufficient force to transmit a shock to the hand of the operator, but with less noise than occurs in the case of the frictional engagement between the point Z and the teeth W. The noise, in fact, is so slight that a person standing behind the operator will not be able to learn the combination by counting the successive clicks.

The lock may also be constructed so as to render the operating device inoperative as soon as the pressure upon the knob by which it holds the bolt drawn is released. For example, in the lock illustrated the slide F may be arranged to be thrown to its upper inoperative position as soon as the knob is released, and the bolt A is thrown back to its locked position, the lifting of the slide F being accomplished by the engagement of the end of the detent X with the last tooth W of the plate S. Figs. 7 to 10 illustrate a suitable construction. The lower end of the slide X consists of a member X′, pivotally connected at *l* with the upper portion of the slide. This lower portion X′ may carry a sliding point Z, as illustrated, or a rolling point *h* equally well. The main portion of the slide X is provided with the pin *m*, engaging the rear edge of the portion X′, so that the latter cannot swing backward as the arm swings downward to open the lock, and so that the slide X will be lifted and lowered over the teeth W, as before described. When the bolt has been drawn fully backward and the knob is released, the entire arm G is drawn backward thereby, and the point of the portion X′ will strike the last tooth W and yield, in the manner indicated in Fig. 9, against the resistance of a light spring *n*. By this yielding action a pin *o* upon the rear face of the portion X′ swings up under a forward projection *p* upon the operating-slide F, so as to lift the latter from its operative to its inoperative position, the spring J holding it up so that the bolt cannot be again drawn until the knob is swung back to its starting position and then forward, according to the proper combination.

In order to secure the greatest number of possible combinations, we must suppose that the stops U will sometimes be not near the lower end of the plate S. If there are no stops U near the lower end, then when the lock is opened and the knob released the short distance which it moves back under the influence of the spring B will not be enough for the operating-slide F to engage a stop U and throw the slide out of operative position, and for this reason the construction above

described, whereby the operating-slide is thrown out of position by the action of the spring B in throwing the bolt, is of particular value. If it be desired to leave the lock in such condition as to permit its being immediately reopened without working the combination, the knob may be released gently, so that the arm G will be thrown only far enough to bring the end of the pivoted portion X' against the last tooth W, as shown in Fig. 7, but not to cause it to ride up upon said tooth. Therefore by releasing the knob gently the lock is in condition to be reopened immediately, or by releasing it quickly the lock can only be reopened according to the combination.

Though I have described with great particularity of detail certain specific embodiments of my invention, yet it is not to be understood therefrom that the invention is limited to the specific embodiments disclosed. Various modifications thereof in detail and in the arrangement and combination of the parts may be made by those skilled in the art without departure from the invention.

What I claim is—

1. A keyless lock having a knob, means for operating the lock by successive rotary movements of the knob all in the same direction, with axial movements between the successive rotary movements, and means for indicating the intervals of the movements by the sense of touch alone.

2. A keyless lock having a knob, means for operating the lock by successive rotary movements of the knob all in the same direction, with axial movements between the successive rotary movements, a toothed plate, and a member operated by the knob traveling over said plate and indicating the intervals by its passage over said teeth.

3. A keyless lock having a knob, means for operating the lock by successive rotary movements of the knob all in the same direction, with axial movements between the successive rotary movements, a toothed plate, an arm operated by said knob, and a yielding detent carried by said arm and moving over said plate and indicating successive intervals by its passage over the successive teeth.

4. A keyless lock including in combination a pivoted and axially-movable arm, means controlled by giving said arm successive rotary movements all in the same direction and shifting it axially between the successive rotary movements for operating the lock, and means indicating to the sense of touch the successive intervals passed over by said arm.

5. A keyless lock including in combination an arm adapted to receive successive rotary movements, all in the same direction, with axial movements between the successive rotary movements, to unlock the lock, operating means for turning said arm in said direction, and means for rendering the operating means inoperative at the end of the unlocking movement.

6. A keyless lock including in combination an arm adapted to receive successive rotary movements, all in the same direction, with axial movements between the successive rotary movements, to unlock the lock, operating means for turning said arm in said direction, means for rendering the operating means inoperative if it is not turned in a determined manner, and means for rendering the operative means operative again upon the return of said arm to its starting position.

7. A keyless lock including in combination fixed teeth and movable stops, a device constructed to engage said fixed teeth to indicate successive intervals by its passage over said teeth, and an operating device controlled by said movable stops.

8. A combination-lock including in combination a casing having an opening in one edge and means for determining the combination and which is removable through said opening for the purpose of changing the combination.

9. A combination-lock including a plate provided with means for determining the combination, said plate being entirely disconnected from any mechanism within the lock, a casing having an opening in one edge through which said plate may be passed, and means for fastening said plate in position in the edge of the casing.

10. A keyless lock including in combination a shaft K adapted to be successively moved in the same direction, an arm G carried by said shaft, detents X and F on said arm, a toothed member over which the detent X travels to indicate the intervals, and a member R provided with stops U in the path of said detent F and which can only be avoided by the shifting of said shaft K in an axial direction at certain intervals during its rotation.

11. A keyless lock including in combination a shaft K adapted to be successively moved in the same direction, an arm G carried by said shaft, detents X and F on said arm, a toothed member over which the detent X travels to indicate the intervals, a member R provided with stops U in the path of said detent F and which can only be avoided by the shifting of said shaft K in an axial direction at certain intervals during its rotation, and a spring N, said shaft K having grooves O and P into which said spring N projects to hold the shaft impositively in either one of two positions to which it may be shifted axially.

12. A keyless lock including in combination a shaft K adapted to be successively moved in the same direction, an arm G carried by said shaft, detents X and F on said

arm, a toothed member over which the detent X travels to indicate the intervals, a member R provided with stops U in the path of said detent F and which can only be avoided by the shifting of said shaft K in an axial direction at certain intervals during its rotation, and a pin *d*, said detent F having a beveled edge *e* in position to be engaged by said pin *d* upon the return of the arm to its original position, whereby the detent is thrown to its operative position.

13. A keyless lock including in combination a shaft K adapted to be successively moved in the same direction, an arm G carried by said shaft, detents X and F on said arm, a toothed member over which the detent X travels to indicate the intervals, a member R provided with stops U in the path of said detent F and which can only be avoided by the shifting of said shaft K in an axial direction at certain intervals during its rotation, and a pin *f*, said detent F having a beveled edge *g* in position to be engaged by said pin when the arm is moved slightly beyond the position necessary to withdraw the bolt, whereby the detent is thrown to its inoperative position.

14. A keyless lock including in combination a shaft K adapted to be successively moved in the same direction, an arm G carried by said shaft, detents X and F on said arm, a toothed member over which the detent X travels to indicate the intervals, a member R provided with stops U in the path of said detent F and which can only be avoided by the shifting of said shaft K in an axial direction at certain intervals during its rotation, an arm C normally in engagement with the bolt and having a pin E adapted to be engaged by the detent F when the latter is in its operative position so as to draw the bolt.

15. A keyless lock including in combination a shaft, operating means for turning said shaft, means for unlocking the lock upon the turning of the shaft and means for rendering the operating means inoperative upon releasing the shaft at the end of the unlocking movement.

16. A keyless lock including in combination a shaft, operating means for turning said shaft, means for unlocking the lock upon the turning of the shaft and means for rendering the operating means inoperative upon quickly releasing the shaft at the end of an unlocking movement, but not upon a gradual release of said shaft.

17. A keyless lock including in combination an arm carried upon a pivotal shaft, a detent carried by said arm, a pivoted member carried by said detent and adapted to be swung on its pivot by a backward movement of said arm, teeth over which said detent rides and by which it is swung backward and means for rendering the mechanism for unlocking the lock inoperative upon the swinging of said pivoted member.

18. A keyless lock including in combination an arm G carried upon a pivotal shaft, a detent X carried by said arm, a yieldingly-slidable pivoted member X′ constituting the end of said detent and adapted to swing in a backward direction only, a series of teeth over which the end of said detent travels as the arm is moved, thereby effecting a sliding movement of said detent when the arm is turned in the forward direction, and a swinging movement of said pivoted member when the arm is swung in the backward direction, and means operated by the swinging movement of said pivoted member for rendering the mechanism for unlocking the lock inoperative.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

OLIVER M. FARRAND.

Witnesses:

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