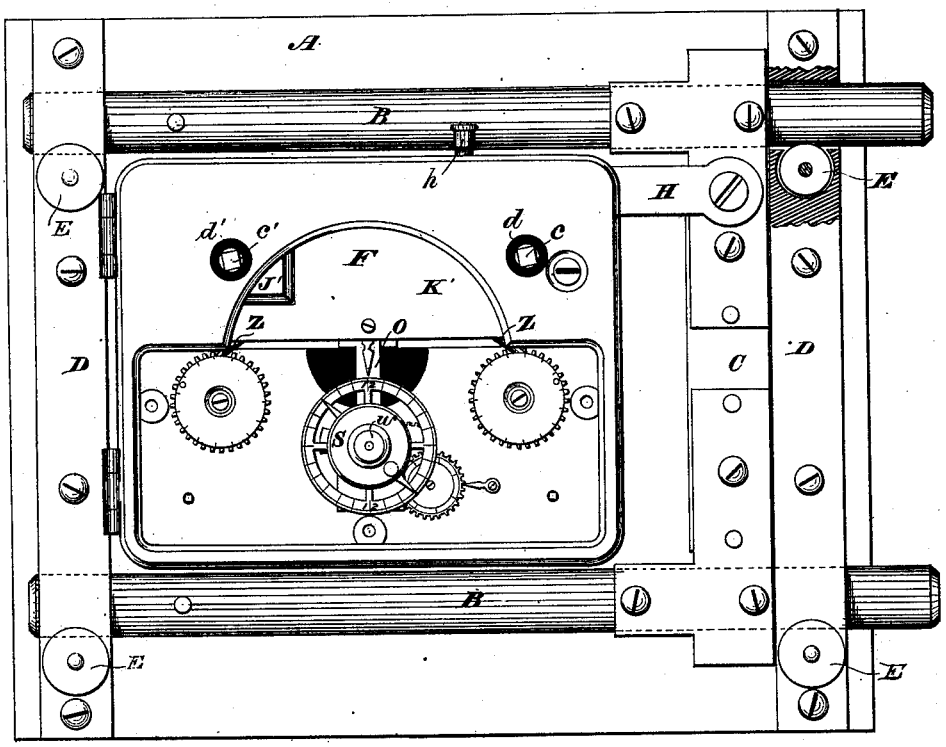
4 Sheets—Sheet 1

E. STOCKWELL.

Time-Lock.

No. 206,146. **Patented July 16, 1878.**

Fig 1.



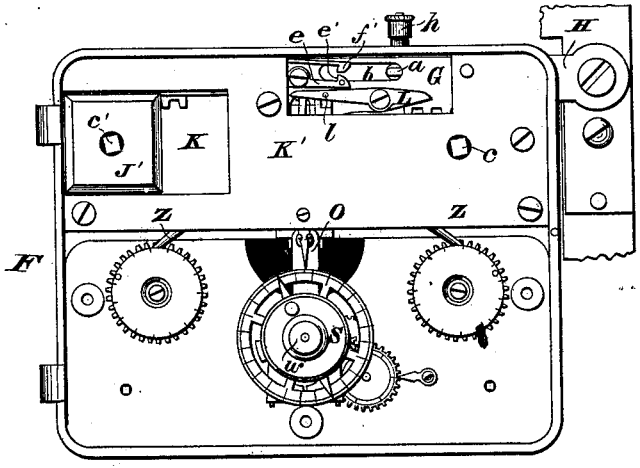


Fig 2.

WITNESSES

Wm A Skinkle

Roberdeau Buchanan.

INVENTOR

EMORY STOCKWELL

By his Attorneys

Baldwin, Hopkins & Peyton.

4 Sheets—Sheet 2

E. STOCKWELL.

Time-Lock.

No. 206,146. **Patented July 16, 1878.**

Fig 3

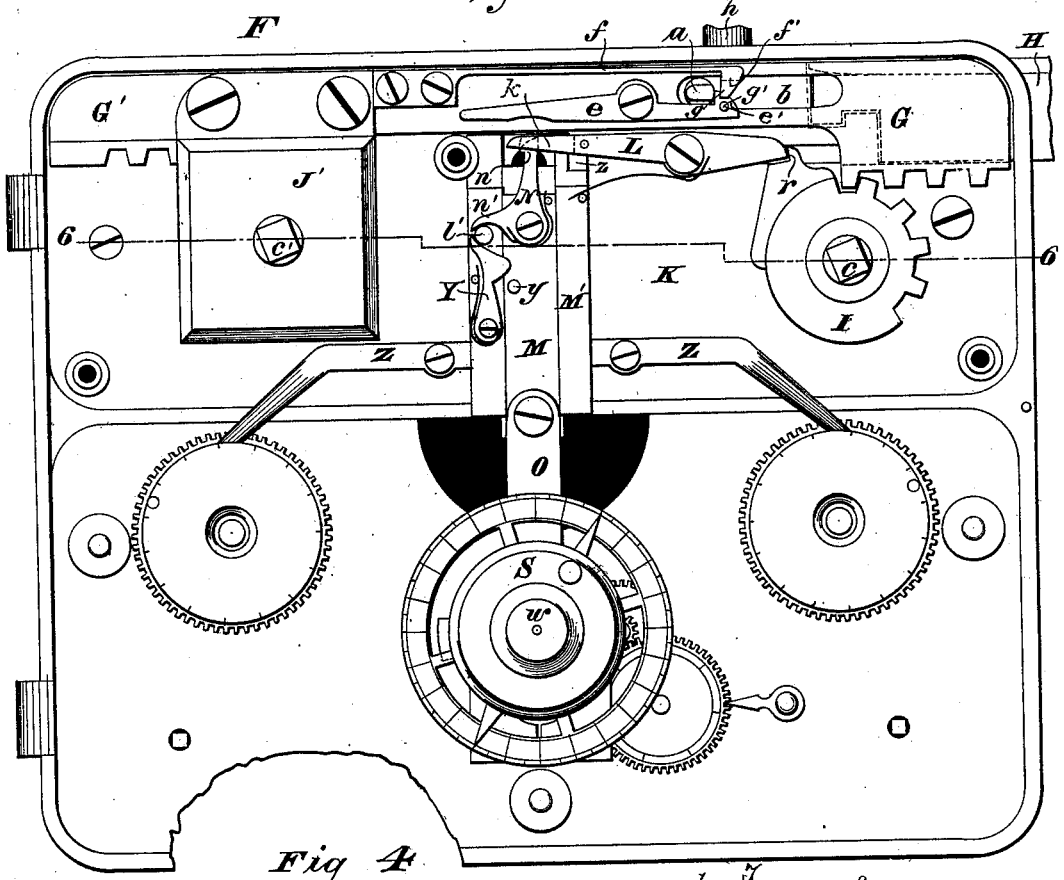
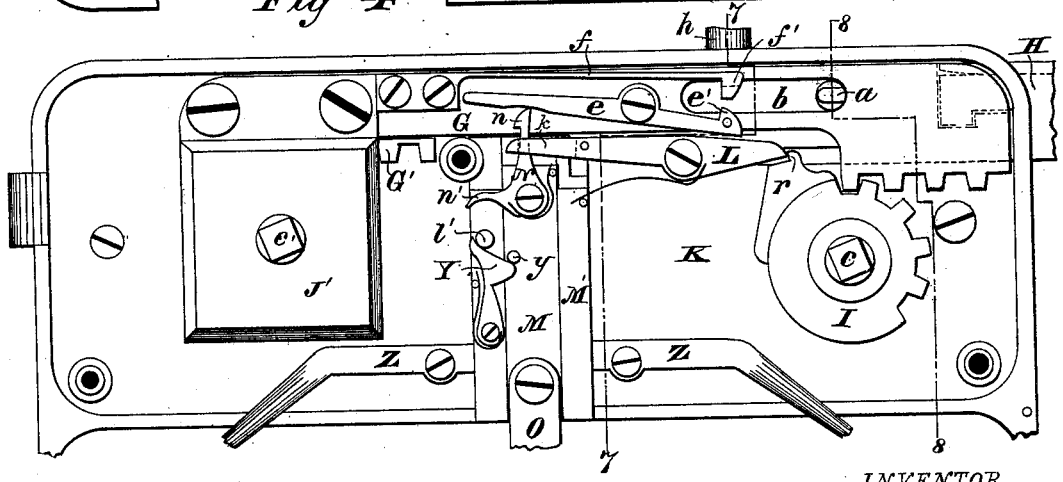


Fig 4



WITNESSES

Wm A Skinkle

Roberdeau Buchanan.

INVENTOR

EMORY STOCKWELL

By his Attorneys

Baldwin, Hopkins, & Peyton.

4 Sheets—Sheet 3

E. STOCKWELL.

Time-Lock.

No. 206,146. *Fig 5.* **Patented July 16, 1878.**

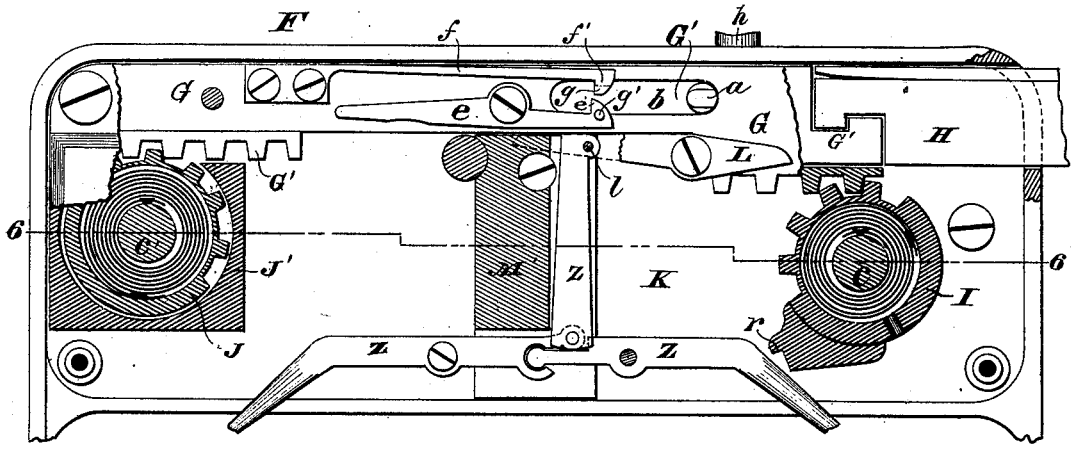


Fig 6.

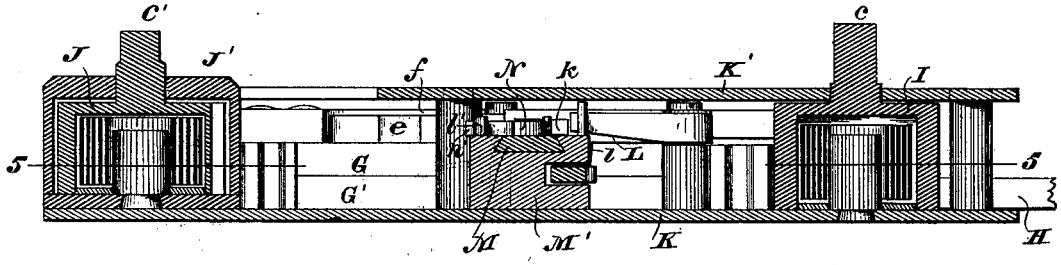


Fig. 7.

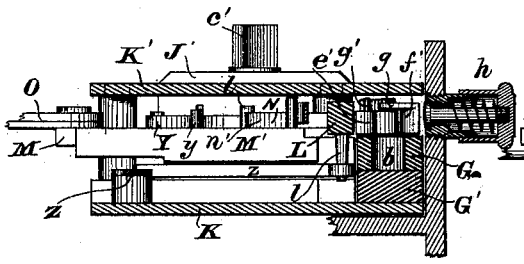
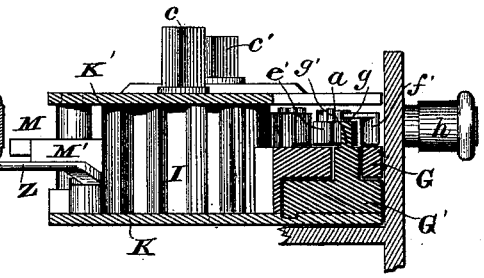


Fig 8.



WITNESSES

Wm A Skinkle

Roberdeau Buchanan.

INVENTOR

EMORY STOCKWELL

By his Attorneys

Baldwin, Hopkins, & Peyton.

4 Sheets—Sheet 4

E. STOCKWELL.

Time-Lock.

No. 206,146. Patented July 16, 1878.

Fig 9

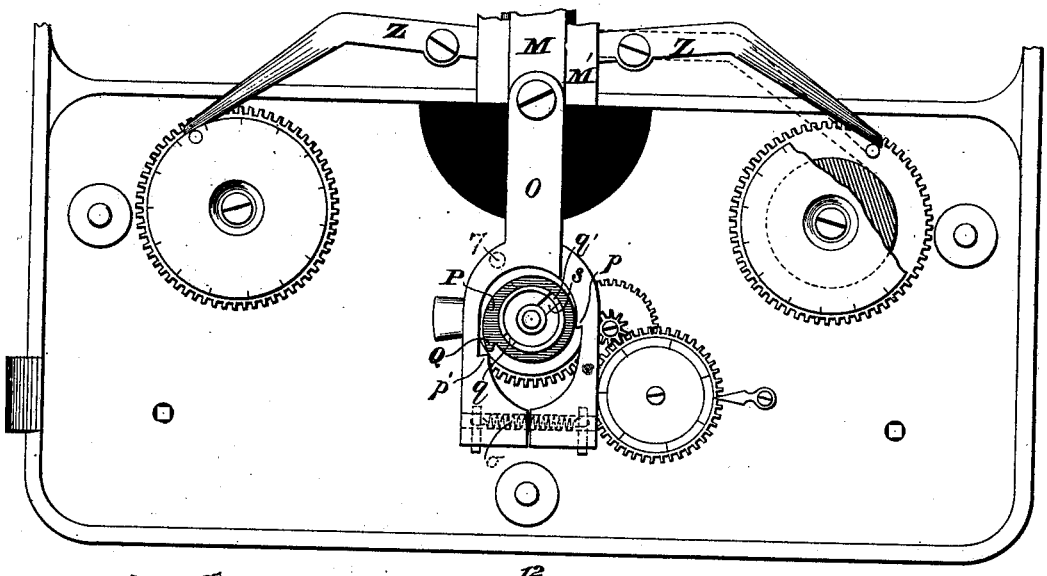


Fig 10.

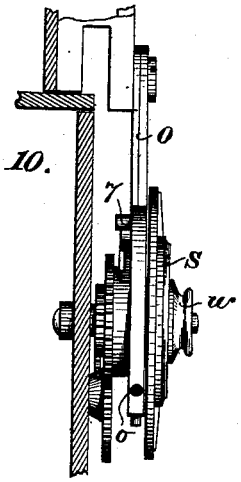


Fig 11

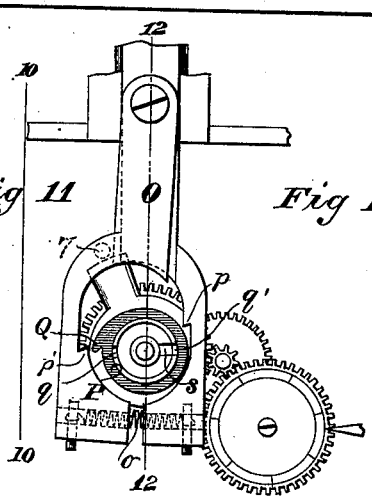


Fig 12

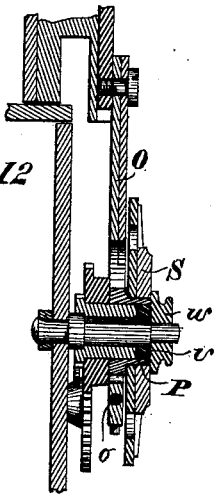


Fig 13

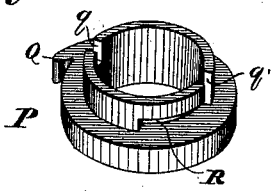


Fig 14

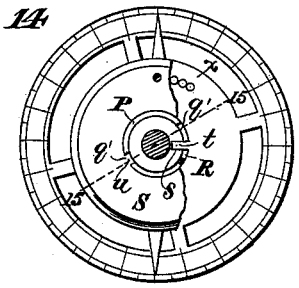
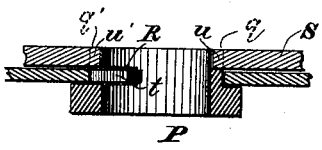


Fig 15.



WITNESSES

Wm A Skinkle

Roberdeau Buchanan.

INVENTOR

EMORY STOCKWELL

By his Attorneys

Baldwin, Hopkins, & Peyton.

UNITED STATES PATENT OFFICE.

EMORY STOCKWELL, OF STAMFORD, CONNECTICUT, ASSIGNOR TO THE YALE LOCK MANUFACTURING COMPANY, OF SAME PLACE.

IMPROVEMENT IN TIME-LOCKS.

Specification forming part of Letters Patent No. **206,146,** dated July 16, 1878; application filed April 6, 1878.

To all whom it may concern:

Be it known that I, EMORY STOCKWELL, of Stamford, in the county of Fairfield and State of Connecticut, have invented an Improved Time-Lock, of which the following is a specification:

My invention relates to a time-lock to be connected with an independent system of great door-bolts of a safe or vault, commonly termed "bolt-work," and to automatically cast and retract the same for locking and unlocking at predetermined times, to be regulated by the adjustment of certain peculiar mechanism.

My invention is particularly well adapted to apply to such improved safe and vault door fastenings as set forth in my application for patent filed March 16, 1878, although it may also be used in connection with ordinary sliding bolt-work as well.

Time-locks have heretofore been constructed to automatically retract their own bolts at predetermined times through the operation of their time mechanism, and also to cast them at the instant of closing the doors on which they were placed, the snubbing contact of the door-jambs on the ends of their bolts serving to trip certain fastenings set to hold them temporarily retracted to enable the doors to be closed. This casting them, however, was not through any action of the time mechanism, but was independently effected by the act of closing the doors, and no time-locks prior to mine, so far as I am aware, have ever been capable of use to throw and retract the ordinary independent gang-bolts or bolt-work of a door.

In my time-lock I provide peculiar means for securing such casting of the bolt-work by the act of closing the door, as just described; but while it is important, it is only secondary to the main purpose first mentioned, viz., causing the bolt-work to be automatically cast and retracted at predetermined times by the action of the time mechanism.

My time-lock is composed of several groups of mechanism, each having a more or less distinctive function, and all being connected together to make up the whole organization. These groups I distinguish, for convenience of description, as the time mechanism, the rack-bars, the actuating spring-barrels, the direct holding and releasing mechanism operating on the rack-bars and spring-barrels, the reciprocating tripping mechanism, the divided stirrup and its actuating mechanism, the seventh-day mechanism, and the supplemental unlocking mechanism.

I proceed now to describe these groups and their connections and relations in the order named by particular reference to the letters on the accompanying drawings, illustrating my invention, first premising in general, however, that—

Figure 1 is a front elevation of the inner face of a safe or vault door, showing the bolt-work thrown forward and my time-lock applied to secure the same in that position. Fig. 2 is a front elevation of my time-lock with its door removed, and a section of the strong bar of the bolt-work in the unlocked position. Fig. 3 is a front elevation of my time-lock, showing the details of its mechanism and both spring-barrels wound. Fig. 4 is a front elevation of the upper part of my time-lock, showing its details of mechanism and the right-hand spring-barrel only wound. Fig. 5 is an elevation, partly in section, on the line 5 5 of Fig. 6. Fig. 6 is a horizontal section on the line 6 6 of Fig. 5. Fig. 7 is a vertical section on the line 7 7 of Fig. 4. Fig. 8 is a similar section on the line 8 8 of Fig. 4. Fig. 9 is a front elevation of the lower portion of my time-lock, with some of the parts removed. Fig. 10 is a vertical section on the line 10 10 of Fig. 11. Fig. 11 is a front elevation of the stirrup and seventh-day mechanism. Fig. 12 is a vertical section on the line 12 12 of Fig. 11. Fig. 13 is a perspective view of the slotted cam-sleeve. Fig. 14 is a front elevation of the dial, with the pointer-disk partly broken away; and Fig. 15 is a section on the line 15 15 of Fig. 14.

A indicates a safe-door; B B, great door-bolts, connected by a string-bar, C, constituting ordinary reciprocating bolt-work, and moving in bearings in the carrying-bars D D. E E E E indicate friction-rollers at the lower sides of the bolt-bearing, on which the bolts

ride, and which greatly facilitate their movement to and fro. Each friction-roller is provided with a concave groove around its periphery, in which each great bolt rests. I set these rollers in sockets, in the carrying-bars under the bolts, and then place shouldered caps over the sockets, and pass screw-bolts through the caps and rollers into the bars to form the axles, on which the rollers turn loosely. These anti-friction appliances enable me to employ smaller motor-springs in my time-lock than would otherwise be necessary.

F indicates a time-lock having two time-movements, geared to revolve a single dial-arbor; but as there is nothing novel in that, I omit all description of details. In the upper part of the lock-case, above the time-movements, are two rack-bars, G G′, Fig. 3, the latter bar being in rear of the former, and connected in any convenient manner with the string-bar of the bolt-work by a link, H. These rack-bars bear against each other, and are loosely connected by a stud, *a*, Fig. 4, projecting from the rear bar G′ through an elongated slot, *b*, in the front bar G, so that one bar may move a certain distance longitudinally while the other is at rest.

I and J, Fig. 5, indicate two spring-barrels, provided with cogged sectors on their exteriors, for engagement with the respective rack-bars. The right-hand barrel I is pivoted to the back plate K and the front plate K′, and is stationary, and operates on the front rack-bar, while the left-hand barrel J is pivoted within a metallic case, J′, that is secured on the front rack; and this barrel moves with the front rack-bar and operates on the rear rack-bar. Each barrel contains a strong coiled spring, the one within the right-hand barrel being so applied as to turn it to the left, and the one within the left-hand barrel being so applied as to turn it to the right, and the barrels are provided with strong winding-posts or key-arbors *e* and *e′*. When the barrels are both unwound both of the rack-bars and the bolt-work are at the limit of their throw to the left—that is, are in the unlocked position. Being in this position, when the right-hand barrel is turned by the key to the right it carries both rack-bars and the bolt-work to the right, or in the direction of casting the great bolts for locking, because the left-hand barrel, being carried by the front rack-bar and being meshed in the rear rack-bar, moves this bar along with it. When the left-hand barrel is turned by the key to the left, (after the right-hand barrel has been turned to the right and secured in that position,) it carries the rear rack-bar and the bolt-work to the left, or in the direction of retracting the great bolts for unlocking. Now, supposing the lock-case door to be open, if the left-hand barrel should be turned by the key to the left before the right-hand barrel had been turned by the key to the right and secured in that position, the effect would be to move the front rack-bar to the right and to fasten it in that position, and at the same time to wind up and secure the right-hand barrel. In other words, the effect upon the rack-bars and bolt-work would be the same as if the right-hand barrel were first wound, and then afterward the left-hand barrel. It is consequently not absolutely necessary to have any key-arbor on the right-hand barrel at all. An elongated key-slot might be provided in the lock-case door to accommodate the movement of the left-hand cylinder while being thus wound; but the force required to wind both barrels at once in this way would be considerable, and it might be found inconvenient in practice. Hence I form the key-aperture *d* for the right-hand barrel in the door of my lock-case opposite the key-arbor *e*, and the key-aperture *d′* for the left-hand barrel opposite that position in which the key-arbor *e′* will stand when the right-hand barrel has been turned to the right by the key, and there secured, so that it will be impossible, while the lock-case door is shut, to reach the arbor of the left-hand barrel with the key until after the right-hand barrel has been turned and set in position.

My present time-lock, like my prior patented time-lock, is continuously operated by the time mechanism for locking and unlocking at regularly-recurring periods, and hence, as with that lock, there is no occasion, after once having adjusted it for ordinary daily service, to open the lock-case door, except for some extraordinary reason.

The front rack-bar carries on its front face a pivoted hook-lever, *e*, the long arm of which is much heavier than the short arm, so that it tends to drop and elevate the short arm, on the upper side of which is the hook *e′*. This hook-lever might be worked by a spring instead of by gravity. Its office is to engage by its hook with the stud *a* when the spring-barrels have been turned, respectively, to the right and left by the key, and thus to hold the rear rack-bar and the bolt-work in the retracted position to enable the door to be closed. It is afterward, at a predetermined time, tripped by the operation of the time-movements, through the instrumentality of mechanism that will presently be described, and the rack-bar and bolt-work are thereby released, and permitted to be thrown forward into the locked position.

Secured to the front rack-bar, and immediately over the hook-lever *e*, is a spring-catch, *f*, tending to keep itself elevated and inoperative, and provided with a hook, *f′*, at its free end, slightly to the right of the vertical plane of hook *e′*, for engagement, when desired, with the stud *a*. This spring-catch has a small downward projection, *g*, immediately over a lug, *g′*, on the hook-lever *e*. On the top of the lock-case is a spring-plunger, *h*, Fig. 7, which, when pressed down, passes through an aperture in the plate of the case, and bears down the hooked end of the spring-catch.

Instead of using a spring-plunger, I might

dispense with the spring of the plunger and rely on the resiliency of the spring-catch *f*; or instead of a plunger I might employ a small lever or trigger, or a thumb-piece or other projection, or hand-piece of any kind, provided it would merely project from the outside of the lock-case, and be in a position to be pressed down or pushed aside, or pulled or turned to bear down the spring-catch *f*. There are obviously many well-known ways in which skilled mechanics can accomplish this without the use of a spring-plunger, but still in accordance with my plan, or the idea or principle of my invention.

When the plunger is suddenly pressed down, the projection *g* strikes the lug *g'*, presses down the short arm of the hook-lever *e*, disengages the hook *e'* from stud *a*, (if they have previously been engaged by regularly winding the barrels,) and instantly engages the hook *f'* with the stud *a* in place of the hook *e'*. The purpose of the spring-plunger *h*, spring-catch *f*, downward projection *g*, and lug *g'*, having the mode of operation just described, is to give my time-lock, in addition to the capacity of automatically casting and retracting bolt-work, the capacity of locking instantly by the act of closing the door on which it is placed, and the manner of this action will presently be disclosed.

Pivoted to a post on the back plate K is a spring-pawl, L, the purpose and tendency of which are to engage with a ratchet, *r*, on the right-hand barrel and hold the barrel in the wound position. This pawl is provided with a rearwardly-projecting pin, *l*, and a slot, *k*, which respectively serve to connect it with peculiar parts operated by the time mechanism to tilt it and release the right-hand barrel, so that it will unwind, which parts I will now describe.

M indicates a vertically-reciprocating slide-bar, working in a guideway, M', secured to the back plate K. Pivoted on the upper end of this slide-bar is a spring-latch, N, having an inclined strike, and a hook, *n*, at its top, which enters the slot *k* in the spring-pawl L. When the slide-bar M and latch N are elevated, the latter will pass through the slot *k* and impinge against the long arm of hook-lever *e*, raise it, and (the spring-barrels being wound) disengage it from the stud *a*, when the left-hand barrel will revolve and throw the rear rack-bar and bolt-work forward into the locked position. This is the ordinary method of effecting locking. As the slide-bar M and spring-latch N descend, the hook *n*, by the operation of the latch-spring, will catch hold of the spring-pawl L and disengage it from the ratchet *r* on the right-hand barrel, when this barrel will unwind and throw both rack-bars and the bolt-work backward. This is the ordinary method of effecting unlocking.

In order that by the descent of the slide-bar M and spring-latch N the spring-pawl L may not be held out of position for engagement with the ratchet *r*, I provide a lug, *n'*, on one side of the latch N, which impinges against a pin, *l'*, secured on one side of the guideway M', and causes the latch to be tilted, so as to unhook or let go its hold upon the spring-pawl L, the slot *k* being sufficiently elongated to permit the operation.

In order to induce the reciprocal movement of slide-bar M, I pivot to its lower end a peculiarly-constructed stirrup, O, formed of two like parts, held together at their upper ends by their pivot and at their lower ends by a yielding spring, *o*, and forming, when thus united, an irregular oval aperture through the stirrup, provided with angular side projections *p* and *p'*. The dial-arbor projects through this oval aperture, and carries a sleeve, P, which loosely fits the arbor, and has a cam, Q, upon one side and radial slots *q q'* on top, the latter of which extends down into a transverse slot, R. The dial-arbor is provided with a slot, *s*, corresponding to the slot *q*, and the sleeve is to be placed upon the arbor so that these two slots will be coincident. This done, I place the dial over the sleeve so that its lug *t* will enter these coincident slots. I then place the pointer-disk S upon the arbor over the dial, so that the lugs *u u'* will enter the radial slots in the sleeve, when I add a washer, *v*, and secure the whole in place by the screw-cap *w*. The transverse slot R permits the sleeve and pointer-disk to be moved in an arc of a circle, of which arc the length of the transverse slot, measured by a right line, is the cord, the slot forming a space or way for the dial-lug *t* during such movement. I am able, therefore, within certain limits, sufficient for all practical purposes, to adjust the pointer-disk and sleeve and cam, whose relations to each other are always fixed with respect to the dial and arbor, whose relations to each other are also always fixed.

In order to set the pointer-disk in place and fix it to the dial when adjusted, I provide a small thumb-screw and a segmetal series of closely-contiguous screw-holes, *x*, in the dial.

The office of the pointer-disk is to indicate the hours when the locking and unlocking will occur, the pointers on the disk being given the proper relation to the cam Q for that purpose in the construction of the lock.

The operation of the parts just described for reciprocating the slide-bar M will now be readily perceived. The time-movements, or either of them, rotating the dial-arbor in the direction of the arrow, will carry around with it the dial, the pointer-disk, and the sleeve, and at the proper time the cam Q will strike the angular projection *p*, which stands in its path, and elevate the stirrup and superimposed parts, already described, to effect locking. Were it not for the yielding spring at the bottom of the stirrups, the projection, formed, as shown in the drawings, to insure engagement with the cam, might prevent the complete revolution of the sleeve and stop the time-movements;

but that spring permits the two parts of the stirrup to separate slightly, if necessary, and the cam to pass on, and then it brings the parts together again. Continuing its revolution, the cam will, at the proper time, strike the projection *p'* and depress the stirrup and superimposed parts, to effect unlocking.

As my lock is represented in the drawings, the locked and unlocked periods would occur at the same hour a. m. and p. m., and be of equal duration, the time mechanism being geared to revolve the dial-arbor and the parts carried by it once in twenty-four hours; but it is obvious that, by a different relative adjustment of the cam and projections in the stirrup-aperture, any desired difference in duration, within practical requirements, between the locked and unlocked periods may be secured.

Connected with the time-movements, and located behind the stirrup, is a train of gearing and a seventh-day cam, such as described and illustrated in the patent of Samuel A. Little, No. 146,832, granted January 27, 1874; and I employ it for the same purpose as indicated in that patent, viz., to prevent unfastening on Sundays. This gearing is so arranged that, before the regular time for unfastening by the devices for daily performing that function arrives on Sunday mornings, the seventh-day cam will come in contact with the pin 7, which projects a short distance from the rear of one of the parts of the stirrup, and will press the pin and that half of the stirrup carrying the pin and the projection *p'* aside, and hold it there until the cam Q has passed the projection *p'*. The yielding spring allows the parts of the stirrup to separate to accommodate this action, and then, when the seventh-day cam has passed the pin 7, it brings them together again. To secure this function of the seventh-day cam with certainty, I provide a friction spring-stop, Y, Fig. 3, on the guide-way M', which, by the force of its spring, impinges against a pin, *y*, in the slide-bar M, and, while it does not materially impede the elevation or depression of the slide-bar by the power of the time-movements, it prevents its descent by gravity to bring the pin 7 so far down in the path of the seventh-day cam as to be struck by the side of the cam.

In order to prevent an accidental lock-out through a failure to sufficiently wind the time mechanism, I employ a supplemental unlocking mechanism in connection with the time mechanism like that patented to me, No. 186,177, granted the 9th day of January, 1877, with only a difference that I will now point out. Connected with the pivoted triggers Z Z, which are substantially the same as in my patent, is a link, *z*, Fig. 5, in the socket in the upper end of which rests the pin *l*, already above described as projecting rearwardly from the spring-pawl L. When the long arms of the triggers, or either of them, are raisd by the of operation of the time mechanism and special supplemental gearing, and their short arms are depressed, which always happens just before the mainsprings are completely unwound, the link *z* is drawn downward, and tilts the spring-pawl L and releases the right-hand barrel, which instantly unwinds and retracts the bolt-work.

Having now described all of the different groups of mechanism in my lock, it will be easy for those skilled in the art to understand the combined operation of the whole as applied to use.

Assuming all the parts to have been properly adjusted and connected in the mechanical construction of the lock, the time mechanism to be wound and running, the dial mechanism set to indicate the times when it is desired to have locking and unlocking of the safe or vault occur, the spring-barrels to be unwound, and the rack-bars and bolt-work retracted, the first step is to wind the right-hand barrel, which will carry both rack-bars and the bolt-work forward into the fastening position, and secure them there by the action of spring-pawl L. But the slot *b* will permit stud *a* and the rear rack-bar and bolt-work to be thrown back again, and that is next accomplished by winding the left-hand barrel and the engagement of hook-lever *e* with stud *a*. The door is now in a condition to be closed. If it be desired to lock it instantly upon closing, the spring-plunger *h* must be suddenly depressed, which will displace hook-lever *e* and replace it with spring-catch *f*. This spring-catch, as before explained, tends to keep itself elevated and out of engagement with the stud *a*, and it is only held in engagement by the friction due to the pressure of the stud *a* under the force of the left-hand cylinder-spring. Now, if the bolts have a very slight snub on the jamb in closing the door, it will relieve this pressure, and the catch will spring out of engagement with stud *a;* and, as soon as the door is fully closed, the rear rack-bar and bolt-work will be thrown forward into the locked position by the unwinding of the left-hand spring-barrel, and the safe or vault will be locked.

If it be desired to have the door remain unlocked for a short period, and then automatically lock by the operation of the time-movements at the time predetermined and indicated by the dial mechanism, that will be accomplished by the cam Q striking the projection *p*, elevating the stirrup, slide-bar M, and spring-latch N until the latter impinges against the long arm of hook-lever *e*, and lifts it and disengages its hook from stud *a*, when the locking will instantly occur, as just described.

To effect unlocking, the cam Q, at the predetermined time, strikes projection *p'* and carries down the stirrup, slide-bar, and spring-latch until the latter, by its hook, takes hold of the spring-pawl L and tilts and disengages it from the ratchet *r* of the right-hand barrel,

when the barrel unwinds and retracts the rack-bars and bolt-work.

It will be perceived that with my time-lock, combined with independent door-bolt work, it will not be necessary to have any spindle or other connection with the outside of the door to operate the bolt-work, as is the case with time-locks that are in general use, and that serve merely to dog and release the bolt-work. Hence the danger of attack by means of explosives or otherwise through the bolt-spindle, which is a very vulnerable point, is entirely removed. Furthermore, the labor of casting and retracting the great bolts by hand, which is liable to be imperfectly performed or forgotten entirely, is wholly dispensed with, and the ample power of a strong coiled spring is availed of for locking, and of another strong coiled spring for unlocking, the safe or vault.

The same operation that winds and sets the locking and unlocking springs places the bolt-work in the proper position for shutting the door.

The simple appliances by which I can instantaneously change my lock by pressure of the hand on the spring-plunger from one that locks at a certain period by the operation of the time mechanism to one that locks by the act of closing the door, I deem of much utility and importance, because it will enable bank-officers to successfully defend against sudden attacks by masked robbers.

It should be habitual, as a matter of prudence, to wind the spring-barrels and time-movements in the morning upon entering the bank and opening the depositories, and it will then be only the work of an instant, in case of alarm, to push down the spring-plunger and close the door past all power from without to open it.

By my invention I secure this advantage without the necessity of access to the interior of the time-lock, and I have the convenience, also, of not being obliged to have my time-lock, if set, lock at the instant of closing the door.

What I claim as new and of my invention, and desire to secure by Letters Patent, is—

1. The combination of a time mechanism, coiled springs that are wound by a key, one for casting and the other for retracting bolt-work, and mechanism connecting with independent bolt-work, all so constructed and arranged that the operation of winding the springs places the bolt-work in the proper position for shutting the door, substantially as described.

2. The combination, in a time-lock, of a time mechanism, a mechanism to automatically cast and retract independent bolt-work, a mechanism for holding and casting the bolt-work by snubbing action, and a projecting part on the exterior of the lock-case, which, when operated by hand, shifts the fastening from the automatic bolt-work-actuating mechanism to the snubbing-acting mechanism, substantially as described.

3. The combination of the rack-bars, the spring-barrels, and the bolt-work, substantially as described.

4. The combination of the rack-bars, the spring-barrels, and the spring-pawl, substantially as described.

5. The combination of the rack-bars, the spring-barrels, the spring-pawl, and the hook-lever, substantially as described.

6. The combination of the rack-bars, the spring-barrels, the spring-pawl, the hook-lever, and the spring catch and plunger, substantially as described.

7. The combination of the rack-bars, the left-hand barrel moving with the front bar, the right-hand barrel for moving the front bar, and the stud and slot loosely connecting the bars, substantially as described.

8. The combination of the spring-plunger, the spring-catch, the hook-lever, and the stud *a*, for operating together substantially as described.

9. The combination of the stud *a*, the hook-lever, the spring-latch, and the reciprocating slide-bar, substantially as described.

10. The combination of the right-hand spring-barrel, the spring-pawl, the spring-latch, and the reciprocating slide-bar, substantially as described.

11. The combination of the slide-bar, the spring-latch, the pin *l'*, the spring-pawl, and the hook-lever, substantially as described.

12. The combination of the slide-bar, the spring-latch, the friction-spring stop, the pin 7, the stirrup, and the seventh-day cam, substantially as described.

13. The combination of the slide-bar and the stirrup having a central aperture, provided with projections, substantially as described.

14. The stirrup composed of two parts, pivoted together at the top, held together at the bottom by a yielding spring, and having a central aperture provided with projections pointing in opposite directions, in combination with cam Q, substantially as described.

15. The sleeve P, provided with cam Q and radial and transverse slots, substantially as described.

16. The combination of the sleeve, the stirrup, and the seventh-day cam, and pin 7, substantially as described.

17. The combination of the dial and arbor, rigidly connected, and the pointer-disk and sleeve and cam, rigidly connected, and capable of simultaneous adjustment with respect to the dial and arbor, substantially as described.

18. The combination of the supplemental unlocking mechanism with the reciprocating link *z*, spring-pawl, and right-hand spring-barrel, substantially as described.

19. The combination of the front rack-bar for carrying the left-hand spring-barrel, the winding-arbors of the spring-barrels, and the key-apertures through the lock-case door, so arranged that the right-hand barrel must be

wound first, and that the winding of it will bring the arbor of the left-hand barrel opposite the left-hand key-aperture, substantially as described.

20. The combination of the bolt-work, the grooved friction-rollers, the roller-sockets, and the shouldered caps and screw bolts, substantially as described.

In testimony whereof I have hereunto subscribed my name.

EMORY STOCKWELL.

Witnesses:
GEO. H. SMITH,
SCHUYLER MERRITT.