(No Model.) 4 Sheets—Sheet 1.

C. O. YALE.

SAFE OR VAULT LOCK.

No. 427,141. Patented May 6, 1890.

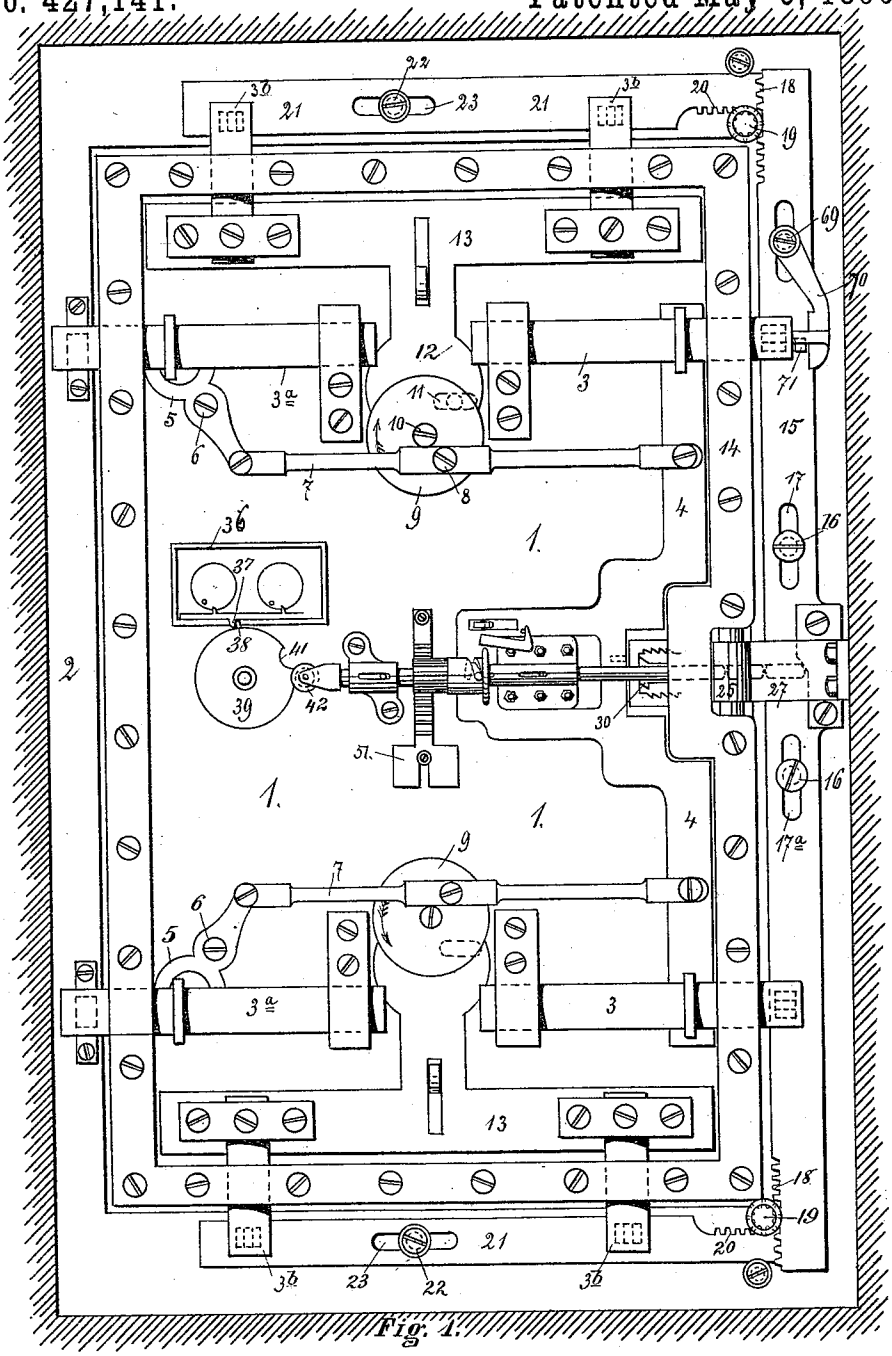


Fig. 1.

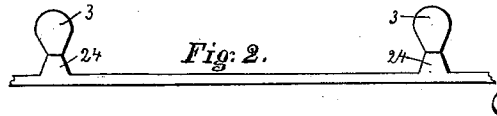


Fig. 2.

WITNESSES.
Rich. George.
Edward A. Ridley

INVENTOR.
C. O. Yale
By Ridley & Ramsey
Attys

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(No Model.) 4 Sheets—Sheet 2.

C. O. YALE.

SAFE OR VAULT LOCK.

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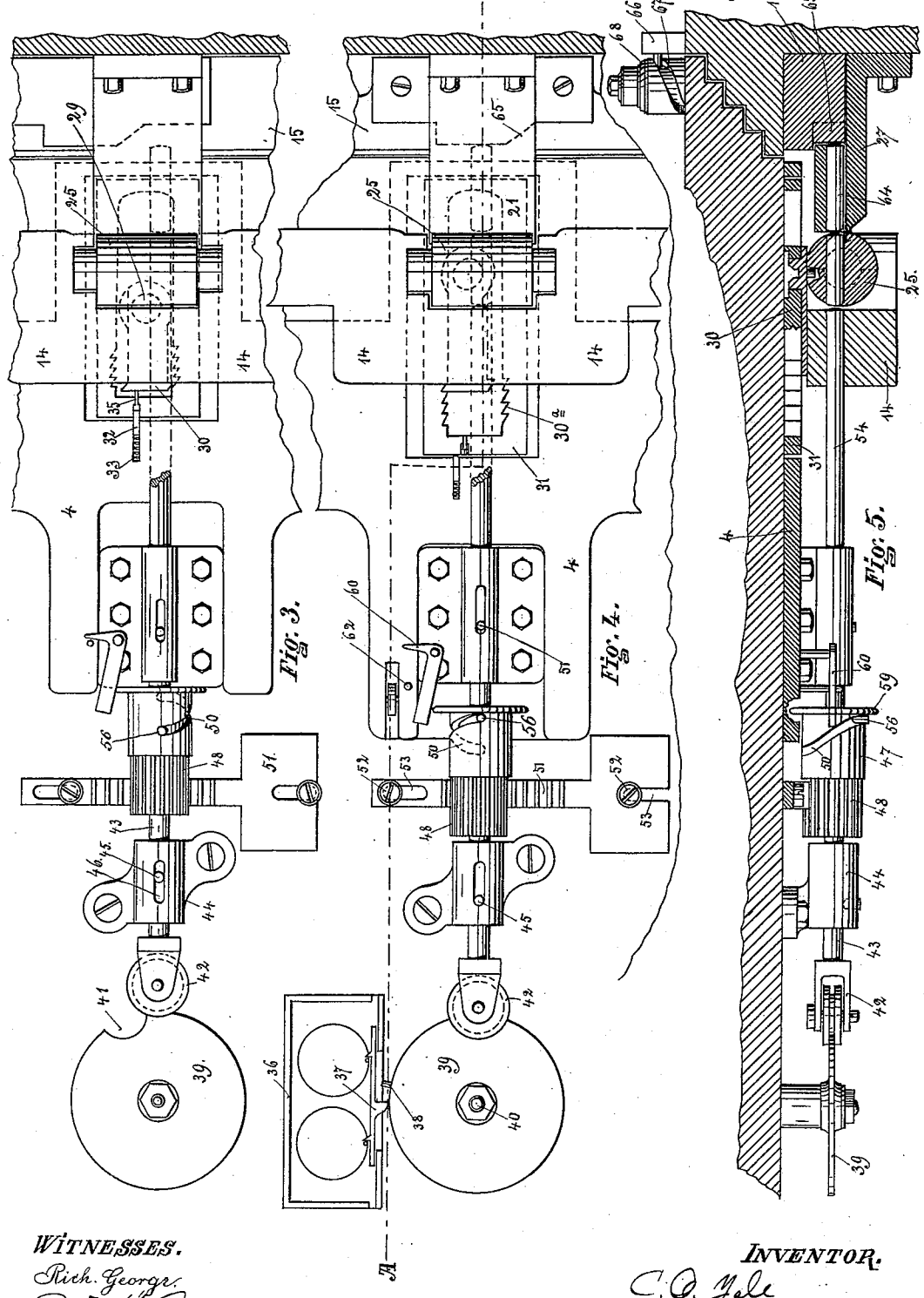


Fig. 3.

Fig. 4.

Fig. 5.

WITNESSES.
Rich. George
Edwin H. Ridley

INVENTOR.
C. O. Yale
By Ridley & Perry
Attys

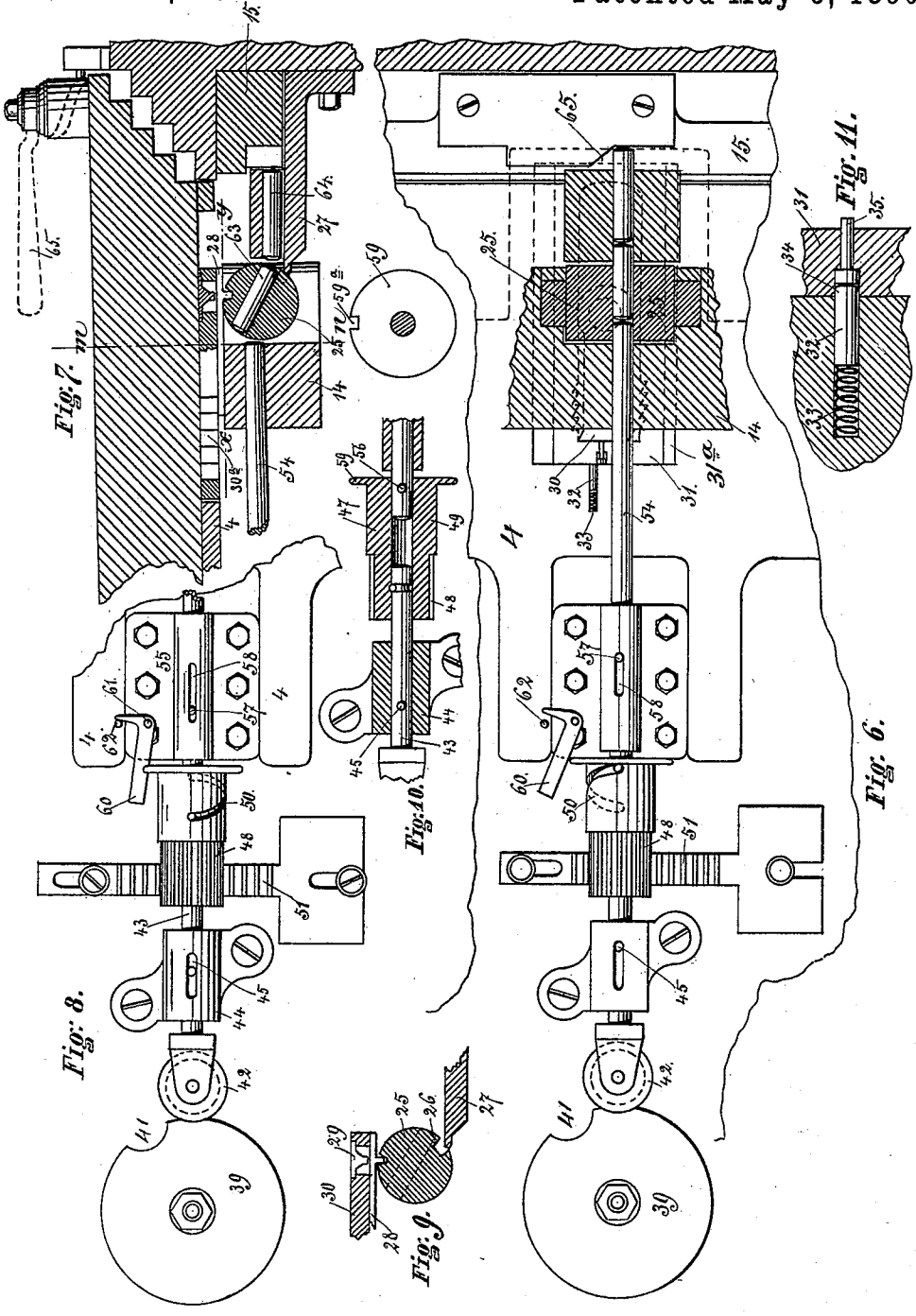
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C. O. YALE.

SAFE OR VAULT LOCK.

No. 427,141. Patented May 6, 1890.



WITNESSES.

Rich. George.

Edwin A. Ruby

INVENTOR.

C. O. Yale

By Ruby & Ramey

Attys

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(No Model.) 4 Sheets—Sheet 4.

C. O. YALE.

SAFE OR VAULT LOCK.

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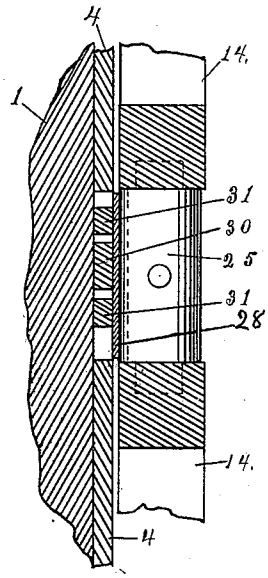


Fig. 13.

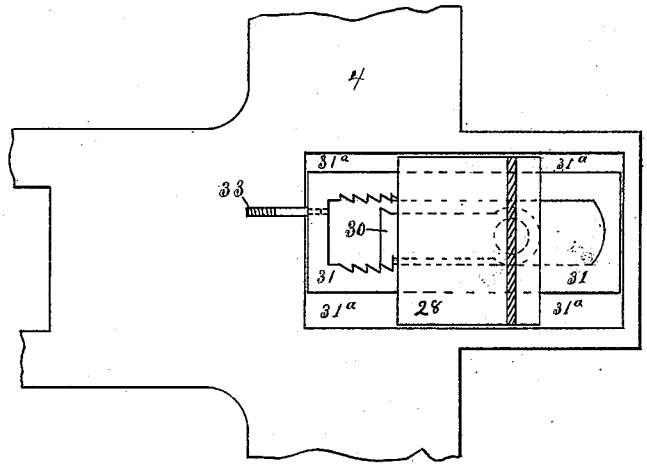


Fig. 12.

Witnesses.
Edwin H. Ruby
Milton E. Robinson

Inventor.
C. O. Yale.
By Risley Perry
Atty

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UNITED STATES PATENT OFFICE.

CHARLES O. YALE, OF NEW YORK, N. Y.

SAFE OR VAULT LOCK.

SPECIFICATION forming part of Letters Patent No. 427,141, dated May 6, 1890.

Application filed July 29, 1889. Serial No. 319,115. (No model.)

To all whom it may concern:

Be it known that I, CHARLES O. YALE, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Locking Devices; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form part of this specification.

My invention relates to an improvement in mechanism for locking safe or vault doors. By my present method the bolts for securing the door in closed position are thrown and drawn by the vibratory motion of the door, and in my present mechanism I interpose movable blocks or stops between the projected ends of the throw-bolts and the jamb of the door and provide mechanism for operating the bolts and blocks.

In the drawings which accompany and form part of this specification, and in which similar figures of reference refer to like or corresponding parts in the several figures of the drawings, Figure 1 shows the inner face of a safe or vault door, the surrounding jamb, and a partial section of the body on a line substantially with the inner face of the door, the bolt-work on the door, and the complete locked position. Fig. 2 is a detail figure relating to the bolts and blocks, hereinafter more fully explained. Fig. 3 shows a portion of the device in the position it assumes just before the complete locked position. Fig. 4 shows the same parts as Fig. 3 in the complete unlocked position. Fig. 5 is a section on line A B of Fig. 4, the parts shown being in the same position shown in Fig. 4, (except a small portion of the pawl which is broken out.) Fig. 6 is a view, partially in section, showing the complete locked position. Fig. 7 is a view, mostly in section, showing the position of the parts shown at the limit of movement on the outward vibration of the door. This section is taken on a line corresponding with that portion to the right of the perpendicular portion of line A B, Fig 4, except that the parts are in changed position. Fig. 8 shows a portion of the device shown in previous figures, and shows the parts shown in their position preparatory to locking, and which is also the corresponding position to that of the parts shown in Fig. 7. Figs. 9, 10, and 11 are detail views hereinafter more fully explained. Fig. 12 shows a section taken on line *x y* of Fig. 7, showing a face view of the throw-bar, racks, and pawl, and a movable plate that engages in the rotating cylinder. Fig. 13 shows a vertical section of a portion of the device, taken on line *m n* of Fig. 7, looking at that portion to the right of the line.

Reference being had to the drawings, and more particularly to the reference-numerals marked thereon, 1 indicates the inner face of a safe or vault door.

2 indicates the jamb of the door, in which the door may fit, with a number of offsets, as is usual in case of such doors, and as will be readily seen by reference to Fig. 7.

3, 3^a, and 3^b are the throw-bolts for locking the door in the jambs. The bolts 3 are connected with throw-bar 4, and are thrown and drawn thereby. The bolts 3^a are engaged by operating-levers 5, pivoted to the inner face of the door at 6 and actuated by connecting-rod 7, which connecting-rod connects with throw-bar 4. Connecting-rod 7 also engages at 8 disk 9, pivoted at 10 to the inner face of the door, which disk is provided with a pin 11, which engages in a slot in the arm 12 of bar 13, which bar carries two or more of the bolts 3^b. By this mechanism it will be seen that when the bolts are thrown and drawn through the medium of throw-bar 4 all the bolts are simultaneously thrown or drawn.

14 is a bar secured to the inner face of the door through which the throw-bolts pass, the bar 14 substantially corresponding in shape with the inner face of the door, except at the point where the operating mechanism of the bolt-work is located.

15 is a vertical rack-bar upon the jamb of the door, and is secured to the jamb by headed screws or bolts 16, which pass through slots 17 in the rack 15 and engage in the jamb. Rack 15 at its upper and lower ends is provided with teeth 18, which engage pinion 19, pivoted to the jamb of the door. These pinions 19 are also engaged by gear-teeth 20 of racks 21, which racks are secured to the inner

face of the door-jamb by screws or bolts 22, and have a lateral movement thereon permitted by slotted openings 23. Racks 15 and 21 carry blocks or stops 24, which at certain times are interposed between the projected ends of the locking-bolts and the jamb of the door. It will be observed that the door might be entirely surrounded by movable racks, as 15 and 21; but I do not find this construction necessary.

Pivoted or journaled in carrying-bar 14 is provided a vertical cylinder 25. (See Figs. 1, 3, 4, 5, 6, 7, and 9.) Cylinder 25 is provided with a recess 26, (see Fig. 9,) in which the cylinder 25 is engaged when the door is entirely closed, or nearly so, by projecting arm or nose 27, secured to the jamb of the door. Cylinder 25 also has a recess, (see Figs. 9, 7, and 5,) in which recess the cylinder is engaged by a projecting stud on movable plate 28.

To plate 28 is pivoted at 29 compound or double pawl 30, which moves with plate 28. Pawl 30 is so hung on its pivot that it will not swing to a lower position than that shown in the figures, but is capable of an upward movement from the position shown in the several figures. Pawl 30 is adapted to engage either of the racks of teeth 30^a or 30^b, which racks of teeth are constructed on compound rack-frame 31. Compound rack-frame 31 is contained in an opening 31^a in throw-bar 4 and has a vertical movement therein, but no longitudinal movement independent of the throw-bar 4. When the rack-frame is in its upper position, it is held by pin 32 in a hole or recess in the carrying-bar 4, which is backed and projected by a spring 33, the pin 32 being adapted to be projected into an opening 34 in the end of the compound rack-frame 31. Opening 34 also contains a pin 35, which is preferably larger at one end than the other and has its larger end toward pin 32. The opposite end of pin 35 is adapted to be projected into the space between the rack-teeth which at certain times is occupied by compound pawl 30.

Upon the inner face of the door is provided a time-lock 36, which is adapted to operate a tripper 37, which engages the pin 38 on disk 39, which disk is pivoted at 40 to the inner face of the door, and is provided in its periphery with a notch or recess 41. Engaging upon the periphery or circumference of disk 39 is roller 42, carried by rod 43, which rod passes through the box 44 and is provided with a stud or pin 45, which works in slot 46 in box 44 and prevents the rotation of rod 43 and limits the lateral movement thereof. Engaging upon the end of rod 43 is sleeve 47, which has a rotary movement independent of rod 43, but moves laterally with the same. Sleeve 47 is composed of a cog-gear 48 and a cylinder 49, having a spiral slot 50. Cog-gear 48 is engaged by weighted rack 51, which is secured to the inner face of the door by screws 52 and has a vertical movement, permitted and limited by slots 53. A rod 54, having bearing in box 55, secured to the face of the door, projects into sleeve 47 and has a pin 56, engaging in spiral slot 50, and a pin 57, engaging in slotted opening 58 in the box 55, which slot and pin prevent the rotation of rod 54 and limit its lateral movement. Sleeve 47 is also provided with a projecting rim 59, which is provided with a slot or notch 59^a, in which it is engaged by catch 60, pivoted to the box 55 on the inner face of the door at 61. Upon the projecting arm of throw-bar 4 is a pin 62, adapted to trip catch 60. Rod 54 at the opposite end from that engaged by a sleeve 47 projects into and at certain times through an opening in the carrying-bar 14. Cylinder 25 is provided with an opening containing a pin 63, which is substantially of the size of rod 54, and is so located in cylinder 25 and with reference to rod 54 that the ends and the openings containing each will, when the door is entirely closed, coincide. Contained within an opening in projecting arm or nose 27 is a pin 64, which pin is also substantially of the size of pin 63, and when the door is closed the end thereof and the opening containing the same correspond with the pin 63 in cylinder 25. Upon vertical rack 15 is an inclined face 65, which moves directly in front of the end of pin 64, and is adapted to be engaged thereby under certain conditions hereinafter stated.

As a convenient means of producing a vibratory motion of the door by which I operate my bolts, I provide upon the outer face of the door a short cylinder 68, which is provided with a spiral slot 67, in which it is engaged by a projection 66 upon the jamb of the door, and is provided with a lever-handle 65 for operating the same.

Pivoted upon the jamb of the door at 69 is a hook 70, which in certain positions is adapted to engage projections 71 upon rack 15 and suspend the rack thereby.

Disk 39 embodies a stop back of bolt 43, and parts 54, 63, and 64 may be considered as parts of the same jointed or broken bolt, and part 43 and connecting-sleeve 47 might also be considered parts of the same bolt.

Having thus described the several parts composing the mechanism, the operation may be described as follows: Starting with the several parts in the positions shown in Fig. 1, and which is also the same position of the same parts shown in Fig. 6, the operation would be as follows: It will be observed that the positions of racks 15 and 21 are about midway between their limits of movement, and that the blocks 24, carried by said racks, are directly between the projected ends of the throw-bolts and the jamb of the door. (See Fig. 2.) The time-lock, having been set to run the required time, which had been predetermined, when that time has arrived, has rotated, by tripper 37, disk 39 into such a position that recess 41 may be entered by roller 42, and roller 42 is caused to enter the recess 41 by the weight of rack 15, which, acting on

inclined face 65 against the end of bolt 64, drives back the parts 64 63 54 47 43 and roller 42 into the recess. When rack 15 drops, as described, and causes a corresponding movement of rack 21, the blocks 24, carried by the racks, are moved from behind the bolts, so that the door may have a vibratory motion, which is determined by the distance from the bolt, when the door is entirely closed, to the point where it will come in contact with the jamb or the rack-bar upon the face thereof. It will be observed that at this time the compound rack-frame 31 is supported upon the upward-projecting tooth of pawl 30 and that the pawl 30 abuts against the left-hand end of the compound rack-frame. After the blocks have passed from between the bolt and jamb the door is caused to vibrate outward by lever-handle 65 and connecting parts as far as it is permitted to go. As this does so, the projecting arm or nose 27, engaging in cylinder 25, causes the same to make a partial rotation to the right, as shown in Fig. 7, which also moves plate 28 to the right and draws pawl 30 in the same direction, and as pawl 30 is drawn to the right from the position shown in Fig. 6, when it has come opposite to the first notch, the compound rack-frame 31 drops by its own gravity and engages the pawl at the first tooth. When the limit of outward movement has been reached, the motion of lever-handle 65 is reversed and the door is again forced back into the jamb. This movement rotates cylinder 25 in the opposite direction, and, through the connecting parts before described, forces pawl 30 to the left, and it, engaging in the upper set of teeth in the compound rack 31, causes the same and the throw-bar 4 and all the bolts operated thereby to be retracted equal to one tooth of rack 30^b. The door is then caused to make other outward and inward vibrations, the parts operating as before described until the pawl 30 has traveled the entire length of rack-teeth 30^b, at which time the bolts will have been entirely drawn and the door may be swung open.

To prepare the door for locking, rack 15 is moved upward until hook 70 engages projection 71, and rack 15 is suspended thereby. The time-lock is then set to run the required time. Rack 51 is raised, rotating sleeve 47 until catch 60 engages in the notch 59^a therein and prevents its rotation, and thereby suspends the weighted rack 51. The disk 39 is then rotated to the left until roller 42 engages upon the unbroken circumference of the disk, and compound rack-frame 31 is raised until opening 34 is brought opposite to the end of pin 32, which is projected into said opening by the action of spring 33, and thereby suspends rack 31 in the upper position.

To lock the door, swing the same into the jambs and engage the projecting stud 66 in the cam-groove 68, and then, by operating handle 65, force the door entirely into the jambs, which operation, the projecting arm 27 having engaged cylinder 25, rotates cylinder 25, and, through connecting mechanism, the pawl 30 is retracted over rack 30^a with each inward vibration of the door, and with each outward vibration forces the rack and throw-bar and locking-bolts connected therewith out, throwing the bolts a certain distance with each outward vibration. With the last outward vibration pin 62 upon throw-bar 4 engages catch 60 and disengages the catch 60 from sleeve 47, and with the same outward vibration the end of the bolt 3 engages hook 70 on the jamb and disengages it from the stud 71, which allows the rack 15 to drop until the projections or blocks 24 thereon engage upon the top of the several bolts, thereby suspending the rack while the door is in its outer vibration. With the inward vibration of the door the opening in cylinder 25 is brought into line with rod 54, and as this occurs the weighted rack 51 descends, forcing rod 54 partially through cylinder 25, and thereby forcing pins 63 and 64 into their farthest position to the right, and also as the door swings in its last inward vibration the block 24 upon rack 15 falls behind or between the projected ends of the bolts and the jamb, where they are suspended by the projected end of pin 64 engaging upon incline face 65 of rack 15. With the last inward vibration of the door pawl 30 is driven against the end of pin 35 in compound rack-frame 31, and, driving said pin back, forces pin 32 back into its recess against spring 33 and out of opening 34, and when this happens compound rack-frame 31 drops until it is suspended on the upper tooth-pawl 30, as seen in Fig. 6. In these positions the locking is complete.

The pin or bolt 64 may be omitted and the incline face on rack 15 brought close up to the surface of cylinder 25; and it is obvious that various other alterations, variations, and modifications in, of, and from the construction shown may be made, whereby the same results may be accomplished, without departing from the spirit of my invention, and which alterations, variations, and modifications I should consider the equivalents of my construction.

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

1. The combination, with locking-bolts, of movable blocks adapted to be interposed behind the projected ends of the locking-bolts, and a stop or catch for securing the blocks in position behind the projected ends of the bolts.

2. The combination, with locking-bolts, of the movable blocks adapted to be interposed between the projected ends of the bolts and a jamb and time mechanism for operating the blocks.

3. The combination of a locking-bolt, a pivoted cylinder, a connection between the cylinder and locking-bolt, and a projection upon the jamb adapted to engage the cylinder.

4. The combination, in a locking-bolt work, of the pivoted cylinder, the projection on the jamb for engaging the cylinder, the pawl operated by the cylinder, the locking-bolt, and the rack connecting with the bolt and adapted to be engaged by the pawl.

5. The combination, in a locking device, of the rotating cylinder, the projection upon the jamb adapted to engage the cylinder, the pawl operated by the cylinder, the locking-bolt, and compound rack adapted to be engaged by the pawl.

6. In a locking device, the combination of the rotating cylinder upon the door, the projection upon the jamb adapted to engage the cylinder, and the compound rack-frame connecting with the locking-bolt, having two racks with oppositely-disposed teeth, each rack being adapted to be engaged by the pawl.

7. In a locking device, the combination of the movable bar, carrying blocks adapted to be interposed between the projecting ends of the locking-bolts and jamb, and hook for securing the bar, substantially as set forth.

8. The combination, in a locking device, of the vertical movable bar, carrying blocks adapted to be interposed between the jamb and the projected ends of the bolts and having an inclined face thereon, and a bolt adapted to engage on the inclined face to secure the rack, substantially as set forth.

9. In a locking device, a rotating cylinder having an opening containing a section of a bolt, the section of bolt adapted to enter the opening in the cylinder and move the section of bolt contained in the opening in the cylinder, substantially as set forth.

10. In a locking device, the combination of the movable blocks adapted to be interposed between the projected ends of the bolts and the jamb, the inclined face on the bar carrying the blocks, the bolt adapted to engage on the inclined face, and the stop back of the bolt operated by time mechanism.

11. The combination of the bolt 54, sleeve 47, having spiral slot 50, the pin working in the slot secured to the bolt, and the weighted rack, substantially as set forth.

12. The combination of the bolts 54 and 43, the sleeve upon the bolts having a spiral slot engaged within the slot by a pin upon one of the rods and laterally movable with the other, and the stop back of the bolt.

13. The combination of the recessed disk 39, the bolt engaging against the disk, the spirally-slotted sleeve, the weighted rack engaging the sleeve, the inclined face upon the rack carrying the blocks, and the broken bolt extending from the sleeve to the inclined face, substantially as set forth.

14. The combination of the recessed disk, the roller running upon the circumference thereof, the rod carrying the roller, the spirally-slotted rotating sleeve, the weighted rack engaging the sleeve, the bar carrying the movable blocks having an inclined face, and the rod extending from the sleeve to the inclined face, substantially as set forth.

15. The combination of the rods 43 and 54, the spirally-slotted rotating sleeve mounted upon the adjacent ends of the rods, the pin engaging in the spiral slot, the weighted rack, and the catch for securing the sleeve from rotating, substantially as set forth.

16. In a locking mechanism, the combination of the rotating cylinder having an opening containing a movable bolt and a projection upon the jamb adapted to engage and operate the cylinder.

17. The combination, with the locking-bolt, of the compound movable rack connected therewith, and the movable pawl adapted to engage the rack.

18. In a locking mechanism, the combination of the locking-bolt, the compound rack-frame connecting with the bolt, the pawl engaging in the rack, and the pins 32 and 35, for supporting and releasing the rack-frame, substantially as set forth.

19. In a locking mechanism, the combination of the movable blocks adapted to be interposed between the projected ends of the locking-bolts and the jamb, the bar carrying the blocks and having an inclined face thereon, the rotating cylinder having an opening containing a movable bolt, the projection upon the jamb adapted to engage the cylinder, the pawl operated by the cylinder, the rack engaged by the pawl and connected with the locking-bolt, the bolt adapted to enter the opening of the cylinder containing the bolt, the spirally-slotted sleeve connected therewith within the slot by a pin upon the bolt, the weighted rack engaging the sleeve, the disk having a cut-away surface, and the bolt extending from the disk to the sleeve, substantially as set forth.

20. In a locking mechanism, the combination of the movable blocks 24, a bar carrying the blocks and having an inclined face 65 thereon, the bolts 64, 63, and 54, the cylinder 25, the projection 27 upon the jamb adapted to engage the cylinder, the pawl operated by the cylinder, a rack connected with the locking-bolt, the spirally-slotted sleeve engaged within the slot by pin upon the bolt 54, the weighted rack engaging the sleeve, the disk having cut-away face, and the bolt extending from the sleeve to the disk.

21. The combination, in a locking device, of the blocks adapted to be interposed between the projected ends of the bolts and the jamb, the bar carrying the blocks and having an inclined face thereon, the bolt adapted to engage against the inclined face, the spirally-slotted sleeve, the weighted rack engaging the sleeve, the disk having a recessed circumference, the rod extending from the sleeve to the disk, and the time mechanism for operating the disk, substantially as set forth.

22. In a locking mechanism, the combination of the blocks adapted to be interposed

between the bolts and jamb, the bar carrying the blocks, the hook for supporting the bar carrying the blocks, the locking-bolt, the rack connected with the bolt, the pawl engaging the rack, the cylinder for operating the pawl, and the projection on the jamb for engaging the cylinder, substantially as set forth.

23. The combination, in a locking mechanism, of the movable blocks adapted to be interposed between the projected ends of the locking-bolts and the jamb, the bar carrying the blocks, the inclined face thereon, the rotating disk having a broken-out circumference, the rod extending from the bar carrying the blocks to the disk and adapted to engage against the inclined face, and the time mechanism for operating the disk.

24. The combination of the locking-bolt, the block adapted to be interposed between the projected end of the locking-bolt and the jamb, the bar carrying the bolt having an inclined face, the hook upon the jamb for supporting the bar carrying the blocks, the rotating cylinder, the projection upon the jamb adapted to engage and operate the cylinder, the pawl operated by the cylinder, the rack connected with the throw-bar carrying the locking-bolt, the bolt adapted to engage against the inclined face of the bar carrying the blocks, the rotating sleeve engaging upon the said bolts and having a spiral slot engaged within by a projection on the bolt, the rack engaging the rotating sleeve, the catch for engaging and preventing the rotation of the sleeve, the pin upon the throw-bar for tripping the catch, the disk having a broken-out circumference, the bolt extending from the sleeve to the disk, and the time mechanism for operating the disk.

In witness whereof I have affixed my signature in presence of two witnesses.

CHARLES O. YALE.

Witnesses:
JONATHAN MARSHALL,
JAMES M. TULLY.