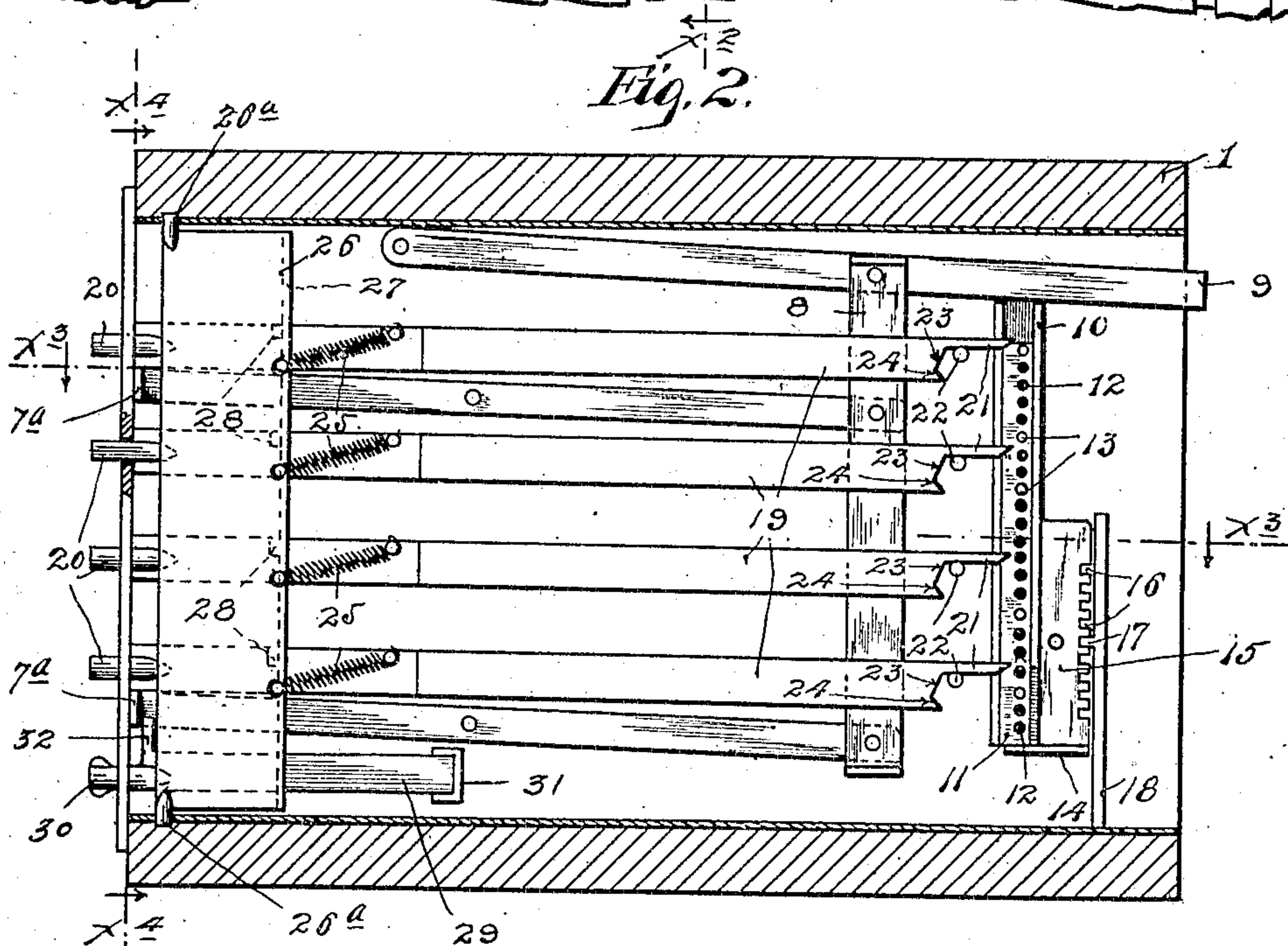
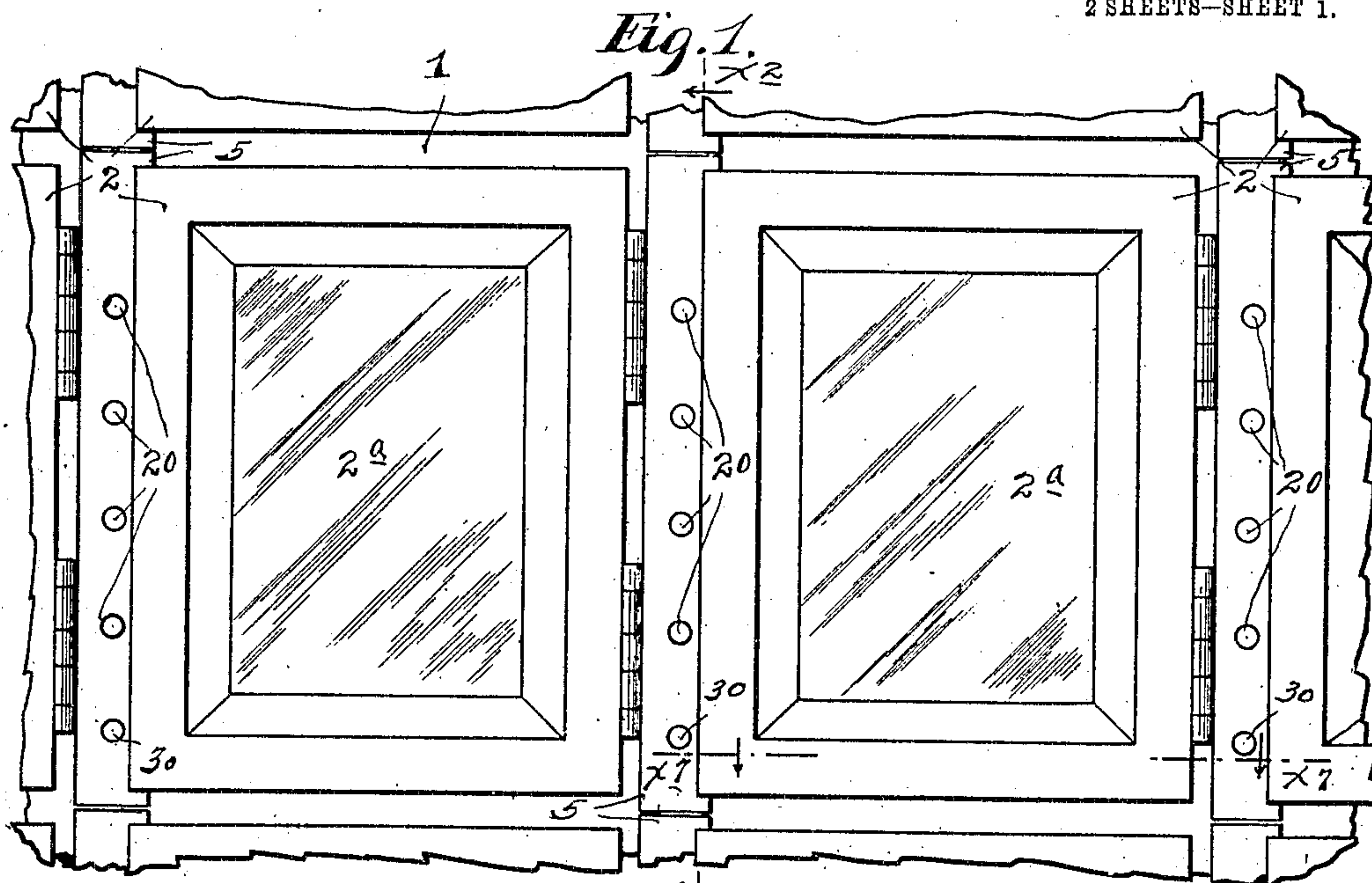


No. 849,714.

PATENTED APR. 9, 1907.

H. A. ALM.  
PERMUTATION LOCK.  
APPLICATION FILED MAY 11, 1906.

2 SHEETS—SHEET 1.



Witnesses.  
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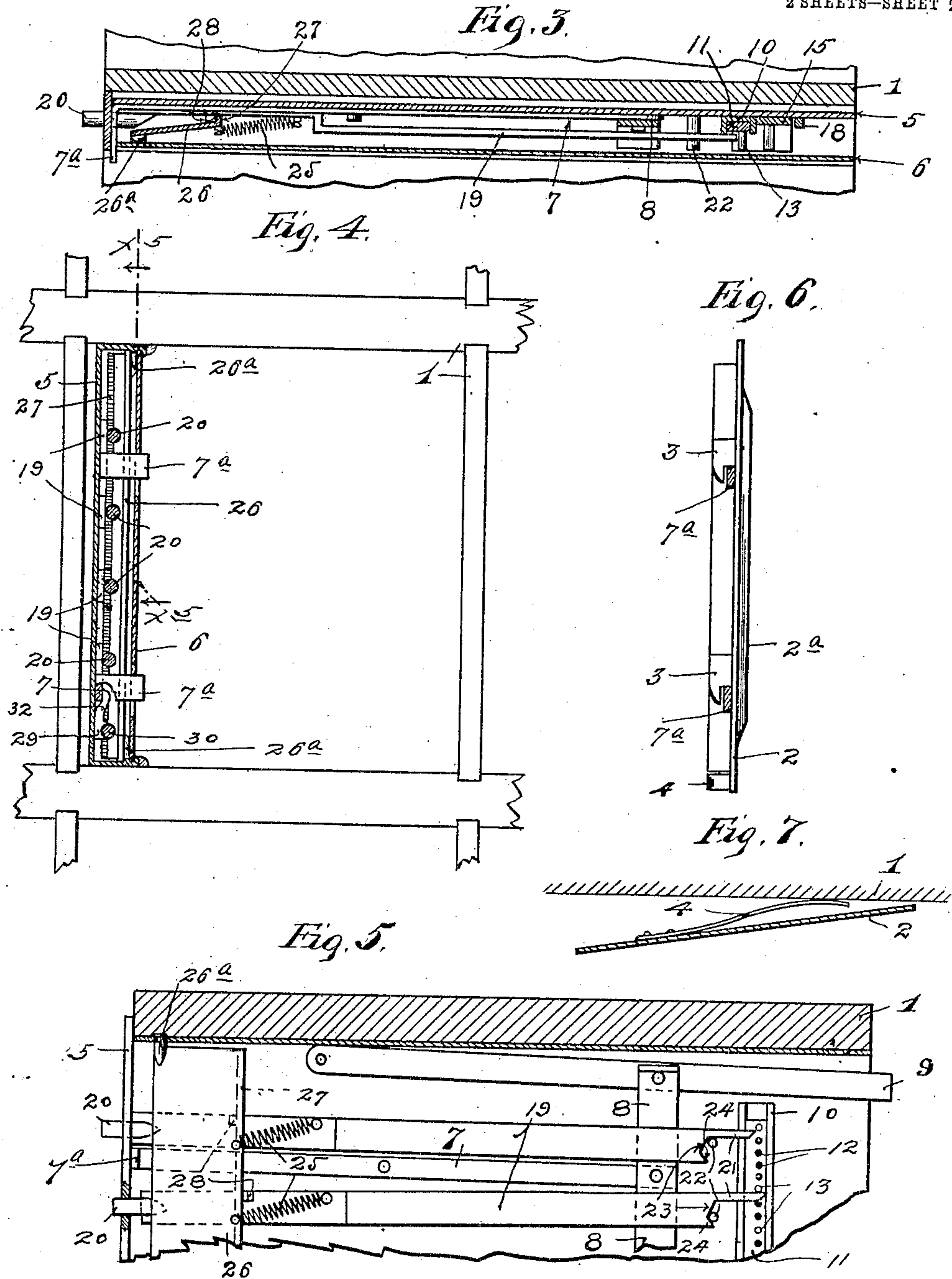
William M. Machand

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2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

HANS A. ALM, OF HANKINSON, NORTH DAKOTA.

## PERMUTATION-LOCK.

No. 849,714.

Specification of Letters Patent.

Patented April 9, 1907.

Application filed May 11, 1906. Serial No. 316,282.

*To all whom it may concern:*

Be it known that I, HANS A. ALM, a citizen of the United States, residing at Hankinson, in the county of Richland and State of North Dakota, have invented certain new and useful Improvements in Permutation-Locks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates particularly to locks for post-office boxes, and has for its especial object to provide an improved permutation or combination lock therefor.

To the above ends the invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a view in elevation looking at the outer faces of several post-office boxes and showing my improved lock applied to the several boxes, some parts being broken away. Fig. 2 is a vertical section taken on the line  $x^2 x^2$  of Fig. 1. Fig. 3 is a horizontal section taken on the line  $x^3 x^3$  of Fig. 2, some parts being broken away. Fig. 4 is a vertical section taken on the line  $x^4 x^4$  of Fig. 2. Fig. 5 is a vertical section approximately on the line  $x^5 x^5$  of Fig. 4. Fig. 6 is an edge elevation of the door of one of the boxes; and Fig. 7 is a horizontal section taken on the line  $x^7 x^7$  of Fig. 1, some parts being broken away.

Post-office boxes, as is well-known, are usually arranged both in horizontally and vertically extended rows and at their outer ends are provided with hinged doors having transparent panes, which permit the contents of the boxes to be seen from the outer side of the tier of boxes. This arrangement is indicated in Fig. 1; but in the description which will follow a single box and lock mechanism will be described, the others being duplicates thereof.

The numeral 1 indicates the box, which is open at its inner end and at its outer end is provided with a hinged door 2, having a transparent pane 2<sup>a</sup>. The door 2, as shown, is provided at its free edge with inwardly-projecting hook-like lugs 3 and at its lower edge is provided with a leaf-spring 4, that is

compressed against the end of the box when the door is closed and which serves to impart an initial opening movement to the door when the said door is released.

Secured in an upright position within the box at one side thereof and adjacent to the free edge of the door 2 is an upright lock-case 5, which is provided with a removable side plate 6. Intermediately pivoted to the fixed side plate of the case 5, one above the other, is a pair of lock-levers 7, the outwardly-projecting ends of which are bent laterally at 7<sup>a</sup> for engagement one with each of the lock-lugs 3 of the door 2. The inner ends of these lock-levers 7 are pivotally connected to a vertical bar 8, the upper end of which bar is pivotally connected to the intermediate portion of a lock-releasing lever 9. This lock-releasing lever 9 at its forward end is pivoted to the fixed plate of the case 5, and the rear end thereof projects beyond the box, so that an attendant on the inner side of the door of the box may unlock the door of the box simply by pressing upward on the set end of the lever 9. By reference to Fig. 6 it will be noted that the depending portion of the lock-lugs 3 are beveled, so that when the door is pressed closed it will cam downward the forward ends of the lock-levers 7 and cause the ends 7<sup>a</sup> of said levers to automatically engage with the said lock-lugs to lock the door after the manner of a spring-lock. It may be here stated that, if desirable, the lock-cases 5 may form the partitions between adjacent boxes.

The permutation or combination devices for releasing the door-lock are as follows: Mounted for vertical movements in a channel-guide 10, secured to the fixed side of the lock-case 5, is a releasing bolt or slide 11, which has a plurality of closely-positioned pin-seats 12, arranged in a vertical row. The numeral 13 indicates so-called "combination-pins," which are adapted to be inserted in any desired number and in different arrangements within the pin-seats 12. The lower end of the releasing-bolt 11 normally rests upon the foot-flange 14 of an adjustable bolt-setting block 15, which block, as shown, is provided with a plurality of notches 16, any one of which are adapted to be engaged with a tooth 17 of a vertical post 18, rigidly secured to the bottom of the case 5, as best shown in Fig. 2. The distance between the successive perforations 12 of the releasing-bolt 11 should be the same as the distance



between the notches 16 of the bolt-setting block 15. The releasing-bolt 11 is arranged to work in the plane of the releasing-lever 9, and its upper end is adapted to engage the said lever and force the same upward, and thereby unlock the door, whenever the said bolt is given a certain movement, which is predetermined by the setting of the block 15 with respect to a post or standard 18. Vertical step-by-step movement will be imparted to the releasing-bolt 11 by the proper manipulation of a plurality of finger-actuated keys, preferably in the form of bars 19, the forward ends of which form trunnion-like finger-pieces 20, that work freely through suitable seats formed in the front plate of the lock-case 5. The rearwardly or inwardly projected ends of the key-bars 19 are reduced to the form of fingers 21, that rest loosely upon the studs or pins 22 on the fixed side of the lock-case 5. Just forward of the fingers 21 the ends of the key-bars 19 are formed with inclined cam-surfaces 23, that terminate in stop projections 24. The key-bars 19 are yieldingly drawn forward, so that their finger-pieces 20 are projected, as shown in Figs. 2 and 5, by means of light coiled springs 25, attached to said bars and to the free edge of a latch-plate 26, that is hinged to the top and bottom of the lock-case at 26<sup>a</sup>. At its free edge this latch 26 has a vertically-extended inturned flange 27, that is yieldingly pressed against the sides of the key-bars 19 by means of the springs 25. The key-bars 19 are provided with cam-lugs 28, the beveled rear faces of which have a camming action on the flange 27 when the key-bars are pressed rearward or inward. When the key-bar is forced inward, its lug 28 passes inward of the said flange 27, and the said flange then acts upon said lug to lock that key-bar in its most inward position. When the next key-bar is forced inward, however, the free edge of the latch-plate 26 is forced away from the latch-bars, and its flange 27 releases the lug 28 of the last previously-operated key and permits the said key to be returned to its normal or outermost position under the action of its spring 25. Below the key-bars 19 and below the lowermost lock-lever 7 is a so-called "resetting-key" 29, the body of which is shown as flat and the trunnion-like outer end 30 of which works through the front plate of the lock-case 5. The flat inner end of this resetting-key 29 rests loosely in a flat open seat 31, formed on the fixed side of the lock-case 5. The arrangement of this resetting-bar 29 is such that when it is given a partial rotation or rocking movement it will engage the flange 27 of the latch-plates 26, and thereby cause the lock to release the last set key-bar 19. On the front end portion of the resetting-key 29 is a cam-finger 32, with which the forward end of the lower lock-lever 7 engages when forced downward. When the

said cam-finger 32 is engaged by said lock-lever, the resetting-key 29 will be rocked, with the result above stated.

In the following illustration the key-bars 19 are referred to as "first," "second," "third," and "fourth" keys from the top successively to the bottom members. As shown in Fig. 2, the bolt-setting block 15 is lowered five notches from its extreme uppermost position, so that the releasing-bolt 11 will require five steps of movement to carry it high enough to first engage the releasing-lever 9 and to then force the said lever high enough to cause the ends 7<sup>a</sup> of the lock-levers 7 to be disengaged from the lock-lugs 3 of the door. The pins 13 are set in the seats 12 of the releasing-plunger for the following combination, to wit: "- 2-1- 4 - 2 - 3-," which means that the second, first, fourth, and again the second and then the third keys must be operated in succession. When the second key is forced inward, its lifting-finger 21 engages under the immediately-overlying pin 13, and then the cam-surface 23 by its engagement with the fixed pin 22 causes the said finger 21 to move upward and to thereby impart one step of movement to the said releasing-plunger. This movement brings the uppermost pin 13 into a position which is above the finger 21 of the first or uppermost key-bar, so that when this lock-key is forced inward a second step of upward movement will be imparted to the said releasing-plunger. The above movement of the first or uppermost key brings the lowermost pin 13, which is above the finger 21, of the fourth or lowermost key-bar, so that when this fourth key is forced inward a third step or upward movement will be imparted to the said releasing-plunger. This movement of the fourth or lowermost key brings another pin 13 into position just above the finger 21 of the second key, so that this second key may then be again operated. This second operation of the said second key imparts a fourth step of upward movement to the releasing-plunger 11, and thereby brings a pin 13 into a position just above the finger 21 of the third key-bar, so that when this latter key-bar is moved inward a fifth step of upward movement will be imparted to said releasing-plunger 11 and the door of the box will be unlocked, as already described. As already indicated, the releasing movement of the lower lock-lever 7 rocks the resetting-key 29, and thereby causes the latch-plate 26 to release the last actuated key-bar 19. When this last actuated key-bar returns to normal position, the releasing-plunger 11 is permitted to drop back to normal position upon the foot-flange 14 of the block 15.

From what has above been said it is evident that with a small number of keys a very great many different possible combinations are provided. It is also evident that any or



all of the keys may be used several times in the same lock-releasing operation.

The expression "lock-releasing bolt" is herein used in a broad sense to include any part which is mounted for progressive movement to release the locking mechanism, and the term "keys" and "key-bars" is also used in a broad sense to include finger-actuated elements arranged for action on said lock-releasing bolt.

What I claim is—

1. In a permutation-lock, the combination with locking mechanism, of a releasing member arranged to release said locking mechanism, by a predetermined step-by-step movement, and a plurality of key members having portions exposed where they may be engaged by the fingers and operative on said releasing member, in a predetermined order of succession, to impart the successive step-by-step releasing movement thereto, substantially as described.

2. In a permutation-lock, the combination with locking mechanism, of a releasing member arranged to release said locking mechanism, by a predetermined step-by-step movement, means for setting said releasing member in different normal positions, a plurality of key members operative on said releasing member, in a predetermined order of succession, to impart a successive step-by-step releasing movement thereto, and means for changing the operative order of succession of said key members, substantially as described.

3. In a permutation-lock, the combination with locking mechanism, of a releasing-bolt having a plurality of pins or projections, and a plurality of key-bars and coöperating cam devices, which key-bars are operative on the pins or projections of said releasing-bolt, in a predetermined order or succession, to impart a step-by-step movement thereto, and thereby causing the same to release the said locking mechanism, substantially as described.

4. In a permutation-lock, the combination with locking mechanism, of a lock-releasing bolt operative, by a predetermined step-by-step movement, to release said locking mechanism, an adjustable stop-block for setting said bolt in different normal positions, adjustable combination-pins on said releasing-bolt, and a plurality of key-bars operative on the pins of said releasing-bolt, in a predetermined order of succession, to impart a step-by-step lock-releasing movement to said bolt, substantially as described.

5. In a permutation-lock, the combination with locking mechanism, of a lock-releasing bolt operative by a predetermined step-by-step movement to release said locking mechanism, a plurality of spring-retracted key-bars operative on said releasing-bolt, in a predetermined order of succession, to impart a step-by-step lock-releasing movement thereto, and a yieldingly-pressed latch-plate oper-

ative on said key-bars to hold the last operated key-bar in its operated position and to release the last previously-operated key-bar, substantially as a described.

6. In a permutation-lock, the combination with locking mechanism, of a lock-releasing bolt having a plurality of adjustable combination pins or projections, and operative, under a predetermined step-by-step movement, to release said locking mechanism, an adjustable stop-block for setting said bolt in different normal positions, a plurality of key-bars operative on the pins of said releasing-bolt, in a predetermined order of succession, to impart a step-by-step lock-releasing movement to said bolt, a spring-pressed latch-plate operative to lock the last operated key-bar in an operated position, and to release the last previously-operated key-bar, and means whereby said latch-plate is given a key-bar-releasing movement, simultaneously with the last step of movement of said lock-bolt, substantially as described.

7. In a permutation-lock, the combination with locking mechanism, of a lock-releasing bolt or member arranged to release said locking mechanism, by a predetermined step-by-step movement, a plurality of key-bars operative on said releasing-bolt, in a predetermined order of succession, to impart a step-by-step lock-releasing movement thereto, a latch-plate for locking the last operated key-bar in an operated position, and for releasing the last previously-operated key-bar, and means independent of said key-bars for imparting a releasing movement to said latch-plate, at will, substantially as described.

8. The combination with locking mechanism, of a releasing-bolt having a plurality of pins, and arranged to release said locking mechanism by a predetermined step-by-step movement, and a plurality of key-bars and coöperating fixed cam pins or projections, said key-bars having cam-surfaces that act upon said fixed cam-pins, and having projecting fingers that operate on the pins of said releasing bolt or member, substantially as described.

9. The combination with a post-office box having a hinged door at its outer end, of a lock-lever coöperating with the locking element on said door, to lock the same in a closed position, a releasing bolt or member operative, by a predetermined step-by-step movement, to move said lock-lever and unlock said door, and a plurality of key-bars operative on said releasing-bolt, in a predetermined order of succession, to impart a step-by-step lock-releasing movement thereto, said key-bars having finger-pieces exposed at the exterior of said box, substantially as described.

10. The combination with a post-office box having a hinged door at its outer end, of a lock-lever coöperating with the locking element on said door, to lock the same, a lever

connection extending to the inner end of said box, whereby the door may be unlocked, at will, a lock-releasing bolt operative, by a predetermined step-by-step movement, to impart a step-by-step lock-releasing movement to said bolt, and a plurality of key-bars operative on said releasing-bolt, in a predetermined order of succession, to impart a step-by-step lock-releasing movement thereto,

said key-bars having finger-pieces exposed at the front of said box, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HANS A. ALM.

Witnesses:

E. L. KINNEY,  
L. J. BLEECKER.