

No. 658,646.

Patented Sept. 25, 1900.

J. T. HOUGH.
BANK VAULT.

(Application filed Dec. 13, 1899.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

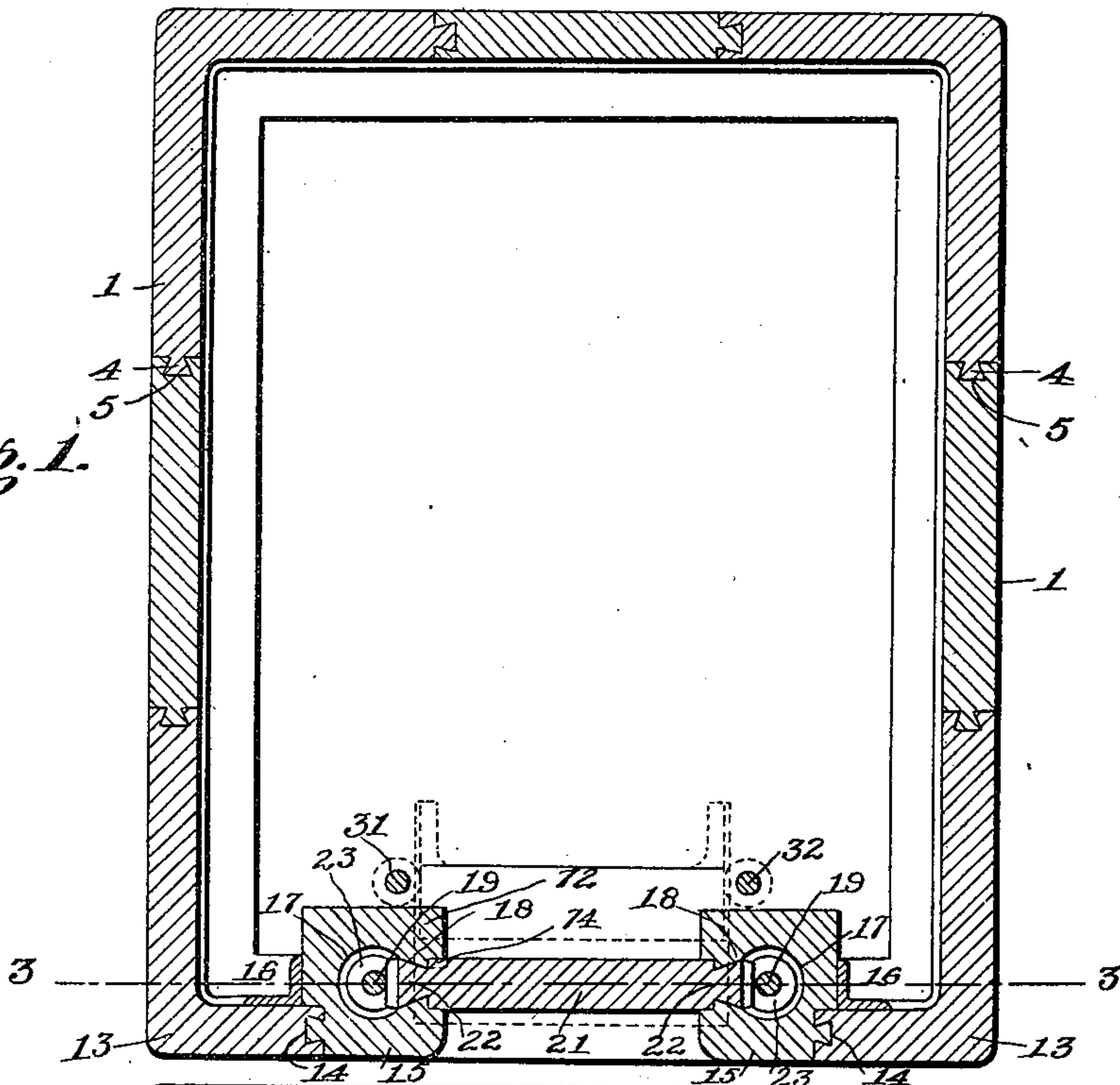
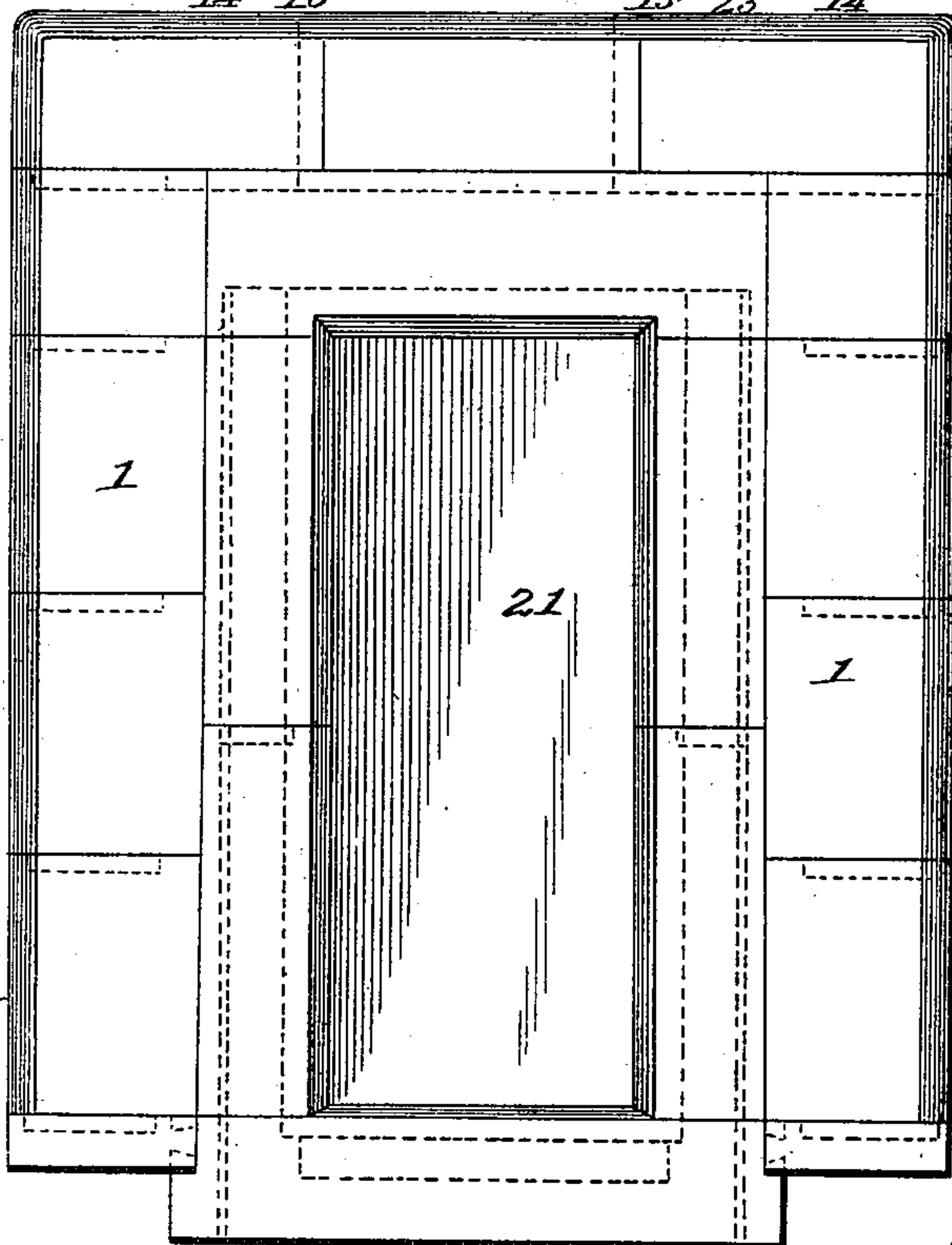


Fig. 2.



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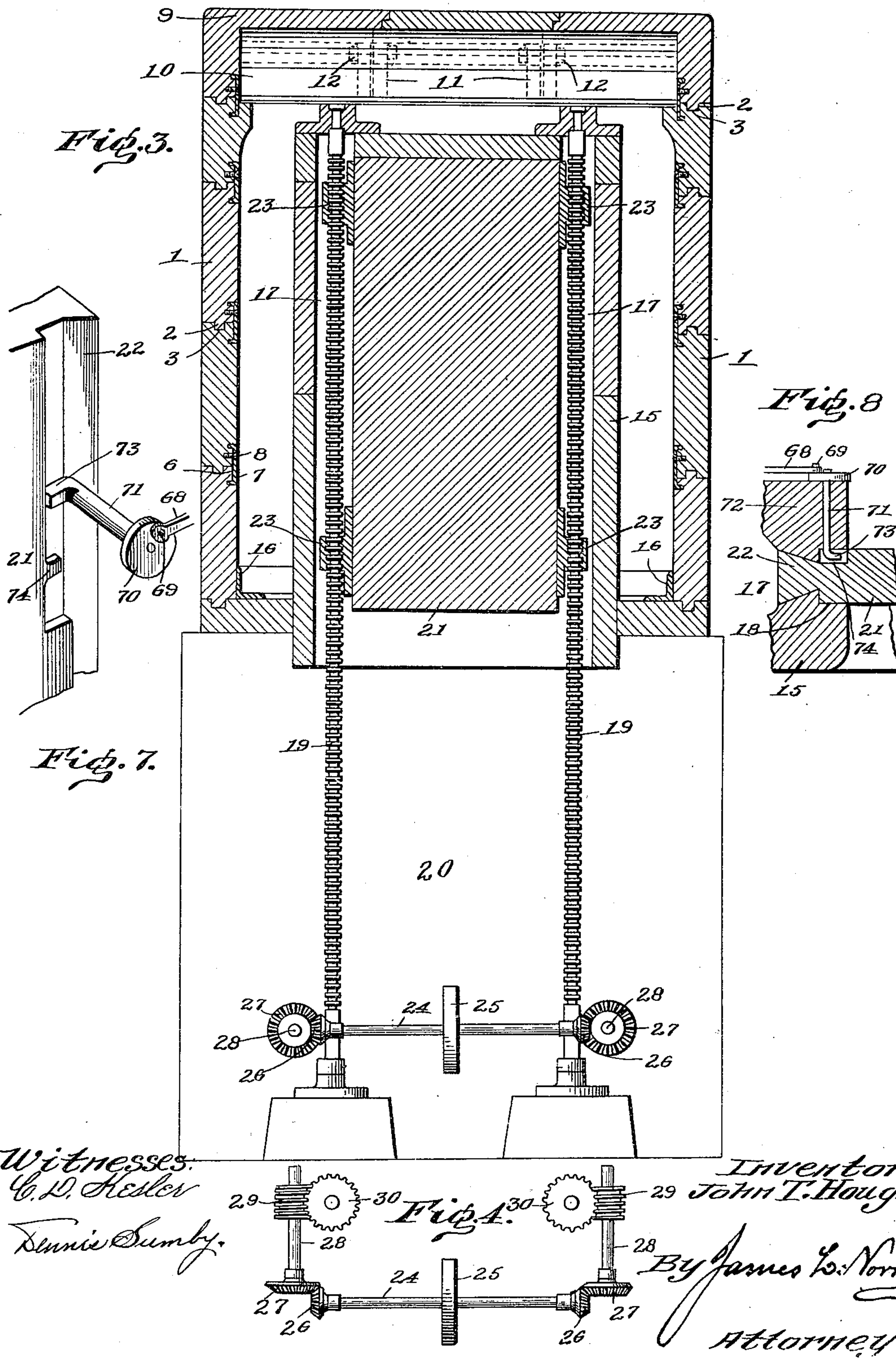
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3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

Fig. 6.

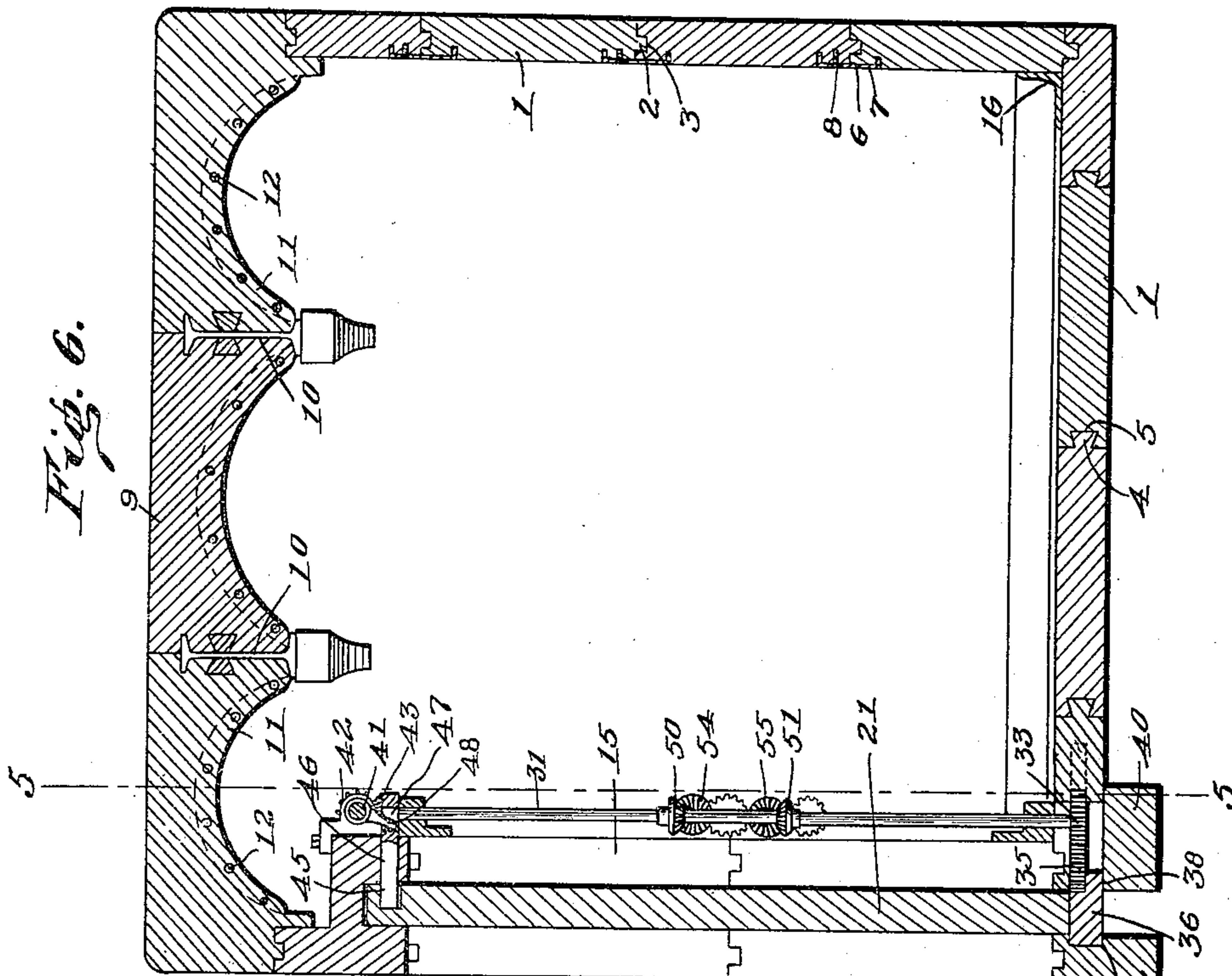
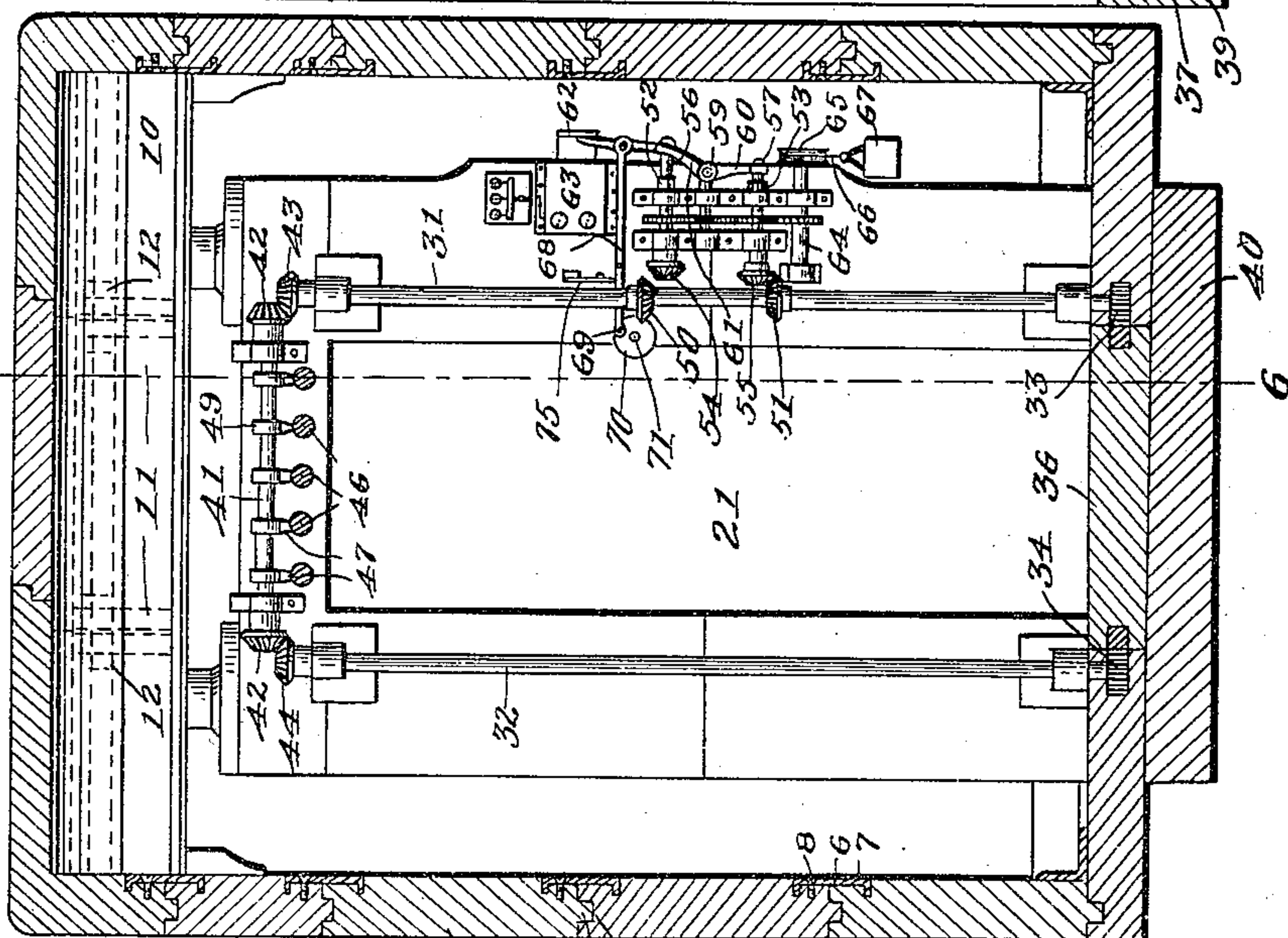


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN THOMPSON HOUGH, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF
ONE-HALF TO BENJIMAN S. LAW AND MALICHI G. LESLIE, OF SAME
PLACE.

BANK-VAULT.

SPECIFICATION forming part of Letters Patent No. 658,646, dated September 25, 1900.

Original application filed May 9, 1899, Serial No. 716,132. Divided and this application filed December 13, 1899. Serial No. 740,186. (No model.)

To all whom it may concern:

Be it known that I, JOHN THOMPSON HOUGH, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Bank-Vaults, of which the following is a specification.

My invention relates to vaults for banks, safe-deposits, and the like, one object of the same being to provide improved means of mounting and operating the door and improved locking and unlocking means for the door which is entirely automatic in its action.

Other objects and advantages of the invention will hereinafter appear, and the novel features thereof will be set forth in the claims.

In the drawings forming part of this specification, Figure 1 is a horizontal section of a vault constructed in accordance with my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a vertical section on the line 3 3 of Fig. 1. Fig. 4 is a plan view illustrative of a portion of the gearing for raising and lowering the door. Fig. 5 is a vertical section on the line 5 5 of Fig. 6. Fig. 6 is a similar section on the line 6 6 of Fig. 5, and Figs. 7 and 8 are views showing details of construction.

Like reference-numerals indicate like parts in the different views.

The frame or casing of the vault, which is made the subject of a separate application for patent, Serial No. 716,132, filed May 9, 1899, upon which Letters Patent No. 649,455 were granted the 15th day of May, 1900, and of which this application is a division, is made up of a number of metallic plates 1 1, the upper and lower edges of which are formed, respectively, with ordinary tongues 2 and grooves 3, the tongues of one set of plates fitting within the grooves of the adjacent set. The opposite ends of said plates are formed, respectively, with dovetailed tongues 4 and corresponding grooves 5, the tongues 4 on one set of plates fitting within the grooves 5 on the adjacent set. In building up the structure it will of course be understood that the lower horizontal row is first laid, the different plates making up said row being interlocked one with the other by slipping the tongues 4

thereon into the grooves 5 by a vertical movement. When the lower row has been completed, the second row is put in place upon the top thereof in a similar manner, it being of course understood that the tongues 2 and grooves 3 on the horizontal edges of the respective plates will fit into each other without the necessity of a sliding or longitudinal movement of the plates with respect to each other. The dovetailed tongues 4 fitting in the correspondingly-shaped grooves 5 serve to effectually lock the plates in each horizontal row together without other securing means. In order, however, to provide means whereby the members of each horizontal row may be secured to the members of the adjacent horizontal rows, I form in the inner surface of the plates, adjacent to the upper and lower edges thereof, grooves 6 6, in which are fitted clamping-bars 7 in the form of channel-iron, the flanges of said iron fitting within said grooves and the web or body which connects said flanges overlapping the horizontal joint and lying flush with the inner surfaces of said plates. The clamping-bars themselves are secured against lateral movement by means of bolts 8, as shown. The means of assembling and locking the plates 1 of which the vault is made up which I have described above is extremely simple and effective and at the same time can be carried out at a minimum expense.

The roof or top of the vault is made up of a plurality of plates or blocks 9 9, which are connected to the upper ends of the plates 1 in a manner similar to that above set forth. Lap-joints are provided between the adjacent members of the plates or blocks 9, and the same are supported by I-beams 10, which extend from one end or side of the vault to the other. Flanges 11 11 are also formed on the underside of the plates or blocks 9, through which securing or locking bolts 12 pass.

It will be observed that the corner-plates 1 are L-shaped—that is, they extend around and form parts of two sides of the vault. The front corner-plates 13 are provided with vertical dovetailed grooves 14, in which are secured the vertical blocks 15, constituting the door-frame. These blocks are further se-

cured in place by means of angle-iron braces 16, which extend entirely around the vault on the inside. Extending through the blocks 15 are vertical openings 17, preferably circular in form, which extend from the upper ends of said blocks down through the lower ends thereof. These openings 17 are intersected by slots 18, which extend from the inner walls of the blocks 15, as shown. Through the blocks 17 extend the threaded shafts 19 19, which are mounted in suitable bearings at their upper and lower ends, the said lower ends terminating within a recess or well 20 beneath the floor of the vault. Through the shafts 19 19 the vault-door 21 is operated. The said door is constructed of suitable metal, having dovetailed side edges 22, which fit and move within corresponding sockets or grooves in the blocks 15 15 and are provided with internally-screw-threaded sleeves 23 23, through which pass the shafts 19 19, the threads on which mesh with the internal threads on said sleeves. By this construction it will be understood that by rotating the shafts 19 19 the door 21 will be raised or lowered, according to the direction of rotation. When the door 21 is in its raised position, it closes the opening leading into the vault. When in its lowered position, it lies out of the way and out of sight within the recess or well beneath the floor of the vault.

For rotating the shafts 19 19 I employ a system of gearing located at any suitable or convenient point, preferably within the recess or well 20, the same comprising a transversely-extending horizontal shaft 24, having a drum 25 thereon and beveled pinions 26 on its opposite ends. The pinions 26 mesh with beveled gear-wheels 27 27 on the horizontal shafts 28, located at right angles to the shaft 24 and carrying worms 29 29, meshing with worm-wheels 30 30 on the shafts 19. By rotating the shaft 24 in one direction or the other the shafts 19 will be operated in unison to raise or lower the door 21. The shaft 24 is actuated by means of a motor or other suitable mechanism within reach of the proper officer of the bank, the connection between said motor and said shaft being made through the drum 25.

From the foregoing description it will be seen that the vault-door 21 may be operated positively in either direction and that when the same is open it is seated within the well or recess 20 below the vault and out of the way. When it is desired to open or close the same, it being understood that the locking mechanism is free, all that is necessary to be done is to throw the motor into operation, which action, through the gearing described, will cause a rotation of the shafts 19 19 in one direction or the other, said shafts acting through the threaded sleeves 23 to move the door 21 in its vertical guideways.

In connection with the operating mechanism for the door 21 above described I have provided automatic mechanism for locking

and unlocking said door. Upon the inside of the blocks or plates 15, heretofore referred to, are mounted in suitable bearings the vertical shafts 31 32, carrying pinions 33 34 upon their lower ends, which mesh with rack-teeth 35 upon the opposite ends of a sliding block 36. The block 36 is mounted in suitable ways in the framework of the vault adjacent to the base thereof, and when the door 21 is open or ready to be opened said block occupies a position inside the plane of movement of said door. It is adapted, however, to be projected outwardly beneath the door when the latter is in its raised or closing position, so that it acts as a stop or lock for preventing downward movement of said door. When in its outward or locking position, it is located beneath the lower edge of the door 21 and rests upon the ledges or shoulders 37 38 on the base beams or plates 39 40, located, respectively, on the front and rear side of the guideway of the door. The pinions 33 34, as heretofore stated, engage the rack-teeth 35 on the block 36, and of course when the shafts 31 and 32 are rotated in opposite directions it will have the effect of throwing said block 36 into its forward locking position or into its rearward unlocking position, according to the direction of rotation of said shafts. The shaft 31 is connected to the shaft 32 by means of a horizontal oscillating shaft 41, mounted in suitable bearings in the door-frame and carrying pinions 42 upon its opposite ends, which mesh with corresponding pinions 43 44 upon the upper ends, respectively, of said shafts 31 32. By this construction it will be seen that as the shaft 31 is rotated it will transmit its motion to the shaft 32, causing the latter to rotate in an opposite direction. In the rear side of the door 21, adjacent to its upper end, are a plurality of bolt-sockets 45, adapted to receive the bolts 46, the latter being provided with vertically-extending slots 47 therein, in which fit and move fingers 48, secured to the shaft 41. The said fingers may be formed upon sleeves or collars 49, which embrace and are clamped to said shaft 41. As the latter shaft is rocked in one direction or the other it will be obvious that the bolts 46 will be projected into or withdrawn from the bolt-sockets 45 in the door 21. As the shaft 41 is rocked by the shaft 31 and as the shaft 32 is also actuated by the shaft 31, it will be understood that by turning said shaft 31 the sliding block 36 and the locking-bolts 46 will be actuated for the purpose of locking and unlocking the door. The whole locking mechanism therefore is dependent upon the operation of the shaft 31.

I have provided automatic mechanism for controlling and operating the shaft 31, the same being constructed as follows: On said shaft, adjacent to the center thereof, are secured two beveled pinions 50 51, the teeth of which face in opposite directions, and in bearings on one of the blocks 15 are mounted two horizontal hollow shafts 52 53, the shaft 52

having a beveled pinion 54 thereon, which is adapted to mesh with the pinion 50, and the shaft 53 having a beveled pinion 55 thereon, which is adapted to mesh with the pinion 51.

5 The pinions 54 and 55 have a spline-and-feather connection with the shafts 52 and 53, respectively, so that the rotary movements of said shafts will be transmitted to said pinions, but longitudinal movement of said pinions with respect to said shafts is permitted.

10 Extending through the hollow shafts 52 and 53 are rods 56 57, which are rigidly connected to the pinions 54 and 55, respectively. Fulcrumed at a point between the shafts 52 and

15 53 is a bell-crank lever 59, one arm 60 of which embraces the rod 57 and the other arm 61 the rod 56. The connection between the arms of said bell-crank lever and said rods 56 and 57 is such that longitudinal movement to the

20 rods may be imparted by the lever, but rotary movement of said rods may be permitted independent of said lever. The arm 61 is extended upwardly, as shown, and lies within the path of movement of an actuating-bar

25 62 of a time-lock 63, so that when said bar 62 is drawn inwardly it will throw outwardly the arm 60 of the bell-crank lever, which in turn draws outwardly the rod 57 and disconnects the pinion 55 from the pinion 51. At

30 the same time the arm 61 throws inwardly the rod 56 and makes connection between the pinion 54 and the pinion 50. The shafts 52 53 are geared together, so as to operate in unison in the same direction, and the shaft

35 53 is also geared to a counter-shaft 64, having a drum 65 thereon, around which passes a cord 66, carrying a weight 67. Said weight, through its connections with the shafts 52

40 and 53, holds said shafts normally under tension and when they are released rotates them by unwinding the cord 66 in a manner well understood. Pivotaly connected to the arm

45 61 of the bell-crank lever 59 is a link 68, which is connected at its opposite end to a wrist-pin 69 on a disk 70, secured to the end of a shaft 71, extending through the inner plate 72 of the door-frame. The opposite end of said

50 shaft is bent laterally, forming a crank-arm 73, by means of which said shaft may be rocked. Said arm 73 is adapted to be engaged by the lug 74 on the door 21 for this purpose, it being held against a movement in one direction by means of a spring 75. The operation

55 of this part of my device is as follows: The normal position of the arm 73 is in line with the link 68 and within the path of movement of the lug 74, at which time the pinion 54 is in mesh with the pinion 50 and the pinion 55 is out of mesh with the pinion 51 and the door is

60 in its lowered position. Upon operating the elevating mechanism for the purpose of closing the door the lug 74 on the latter is brought into contact with the arm 73, rocking the shaft 71, thereby throwing outwardly the link 68

65 and the upper arm 61 of the bell-crank lever 59, the said lug passing beyond the arm 73.

This action of the bell-crank lever throws outwardly the rod 56 and throws inwardly the rod 57, with the result that the pinion 54 is disconnected from the pinion 50 and the pinion 55 is thrown into engagement with the pinion 51. When this takes place, the door 21 has reached its uppermost closing position, with the bolt-sockets 45 opposite the bolts 46.

70 The weight 67 then acts to unwind the cord 66 from the drum 65 and turns the shaft 64, the motion of the latter being transmitted, through the gearing described, to the hollow shafts 52 and 53, rotating both of them in the same direction. As the shaft 52 is disconnected from any other operative part, it rotates idly. As the pinion 55, however, is in mesh with the pinion 51, the motion of the shaft 53 is transmitted to the shaft 31, turning the latter to the left. In so doing the motion of the shaft 31 is in turn transmitted to the shafts 41 and 32 and through the pinions 33 and 34 to the sliding block 36, throwing said block outwardly beneath the bottom of the door 21 and through the fingers 48 on the shaft 41, projecting the bolts 46 outwardly.

80 When said block 36 and said bolts 46 have reached their outermost positions, of course the further downward movement of the weight 67 is stopped, and the door 21 remains locked until released by the means which will now be described.

I have shown in the drawings and heretofore referred to a time-lock 63, which is set in the usual manner for the time at which it is desired the vault shall be opened. When this time arrives, the actuating-arm 62 thereof is drawn inwardly, which action shifts the bell-crank lever 59, so as to force inwardly the link 68 and the rod 56, carrying the pinion 54, and throw outwardly the rod 57, carrying the pinion 55. The said pinion 54 is now in mesh with the pinion 50 and the pinion 55 is out of mesh with the pinion 51. The further downward movement of the weight 67 is now permitted, the action of which will be to further unwind the cord 66 from the drum 65 on the shaft 64, the movement of the latter shaft being transmitted by the gearing referred to to the shafts 53 and 52. The shaft 53 is now an idler, whereas the shaft 52 transmits its motion to the shaft 31 to rotate the latter in a direction opposite to that in which it formerly rotated. The result is that the bolts 46 are withdrawn from the bolt-sockets 45, and the sliding block 36 is withdrawn from its seat beneath the door 21. The said door is now free to be opened upon the actuation of the lowering mechanism described. As the said door passes downwardly it of course shifts the arm 73 downwardly; but as soon as the lug 74 passes beyond said arm the latter is returned to its normal position within the path of movement of said lug by means of the spring 75. Upon again elevating the door, therefore, it will be seen that the operation above set out will be repeated.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a vault, of a sliding door therefor, longitudinally-movable locking-bolts for the door mounted upon a stationary part of the vault, and means actuated by the closing of the door for throwing said bolts into locking engagement with said door.

2. The combination with a vault, of a vertically-movable door therefor, locking-bolts for said door mounted upon a stationary part of the vault, means actuated by the closing of the door for throwing said bolts into locking engagement with said door, and a time-lock for releasing said bolts.

3. The combination with a vault, of a sliding door therefor, locking-bolts for said door mounted upon a stationary part of said vault, a rotary shaft for operating said bolts, and means actuated by the closing of the door for rotating said shaft.

4. The combination with a vault, of a sliding door therefor, locking-bolts for said door mounted upon a stationary part of said vault, a rotary shaft having engaging portions thereon for said bolts for operating said bolts simultaneously, means actuated by the closing of said door for rotating said shaft and projecting said bolts into locking positions, and a time-lock for withdrawing said bolts from their locking positions.

5. The combination with a vault, of a vertically-movable door therefor, a sliding block, and means thrown into operation by said door for positively projecting said block beneath said door when the latter is in its raised position, as and for the purpose set forth.

6. The combination with a vault, of a vertically-movable door therefor, a sliding block adapted to be projected beneath said door when the latter is in its raised position, and means actuated by the movement of said door for operating said block to cause it to be positively projected beneath said door.

7. The combination with a vault, of a vertically-movable door therefor having bolt-openings therein, a series of bolts adapted to fit within said openings, a rotary shaft, engaging portions on said shaft for actuating said bolts, and means thrown into operation by the closing of said door for rotating said shaft.

8. The combination with a vault, of a vertically-movable door therefor having bolt-openings therein, bolts adapted to fit within said openings and provided with slots, a rotary shaft having projecting fingers or engaging portions thereon fitting within said slots, and means thrown into operation by the movement of said door for rotating said shaft.

9. The combination with a vault, of a vertically-movable door therefor, a block adapted to be projected beneath said door when the latter is in its raised position, rack-teeth on said block, rotary shafts having pinions

thereon engaging said rack-teeth, connections between said shafts, whereby the rotation of one will cause the rotation of the other in the opposite direction, and means thrown into operation by the closing of said door for operating said shafts, as and for the purpose set forth.

10. The combination with a vault, of a vertically-movable door therefor, having bolt-openings therein, bolts adapted to fit within said openings, a rock-shaft having engaging portions thereon for actuating said bolts, a sliding block adapted to be projected beneath said door when the latter is in its raised position, rack-teeth upon the opposite ends of said block, rotary shafts having pinions upon their lower ends meshing with said rack-teeth, and intergeared with said rock-shaft, and means for operating said rotary shafts, as and for the purpose described.

11. The combination with a vault, a sliding door therefor, locking mechanism for said door and a rotary shaft for operating said locking mechanism, of means for rotating said shaft in opposite directions, consisting of a pair of pinions secured thereto, gear-wheels meshing with said pinions, a motor for rotating said gear-wheels, and automatic means for alternately shifting said gear-wheels into and out of mesh with said pinions.

12. The combination with a vault, a sliding door therefor, locking mechanism for said door and a rotary shaft for operating said locking mechanism, of means for rotating said shaft in opposite directions, consisting of a pair of pinions on said shaft, gear-wheels adapted to mesh, respectively, with said pinions, a bell-crank lever connected with said gear-wheels, and means for automatically rocking said bell-crank lever for throwing said gear-wheels alternately into and out of connection with said pinions.

13. The combination with a vault, a sliding door therefor, locking mechanism for said door and a rotary shaft for operating said locking mechanism, of means for rotating said shaft in opposite directions, consisting of a pair of pinions on said shaft, gear-wheels adapted to mesh, respectively, with said pinions, hollow shafts having a spline-and-feather connection with said gear-wheels, a motor for rotating said hollow shafts, rods secured to said pinions and extending through said hollow shafts, a bell-crank lever fulcrumed between said rods and whose arms are connected thereto, and means for automatically shifting said bell-crank lever for alternately throwing said gear-wheels into and out of engagement with said pinions.

14. The combination with a vault, a sliding door therefor, locking mechanism for said door and a rotary shaft for operating said locking mechanism, of means for rotating said shaft in opposite directions, consisting of a pair of pinions on said shaft, gear-wheels adapted to mesh, respectively, with said pinions, hollow shafts having a spline-and-feather

connection with said gear-wheels, a motor for rotating said hollow shafts, rods secured to said gear-wheels and extending through said hollow shafts, a bell-crank lever fulcrumed
5 between said rods and having its arms connected, respectively, thereto, a time-lock, and connections between said bell-crank lever and said door and lock, whereby said lever is adapted to be rocked in one direction by said
10 door and in the opposite direction by said lock, as and for the purpose set forth.

15 15. The combination with a vault, a sliding door therefor, locking mechanism for said door and a rotary shaft for operating said locking mechanism, of means for rotating said shaft in opposite directions, consisting of a pair of pinions on said shaft, gear-wheels adapted to mesh, respectively, with said pinions, hollow shafts having a spline and feather
20 connection with said gear-wheels, a motor for rotating said hollow shafts, rods secured to said gear-wheels and extending through said

hollow shafts, a bell-crank lever fulcrumed between said rods and having its arms connected, respectively, thereto, a time-lock, connections between said lock and one arm of
25 said bell-crank lever, a lug on said door, a rock-shaft in the door-frame having a crank-arm thereon lying within the path of movement of said lug, and a link eccentrically connected to said rock-shaft and to said bell-
30 crank lever, whereby the closing action of the door will rock said bell-crank lever in one direction and said lock will rock the same in the other direction, as and for the purpose set
35 forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN THOMPSON HOUGH.

Witnesses:

CHAS. K. HAYS,
B. H. SMYERS.