No. 609,416. Patented Aug. 23, 1898.

G. L. DAMON.

SAFE BOLTWORK.

(Application filed Dec. 15, 1896.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

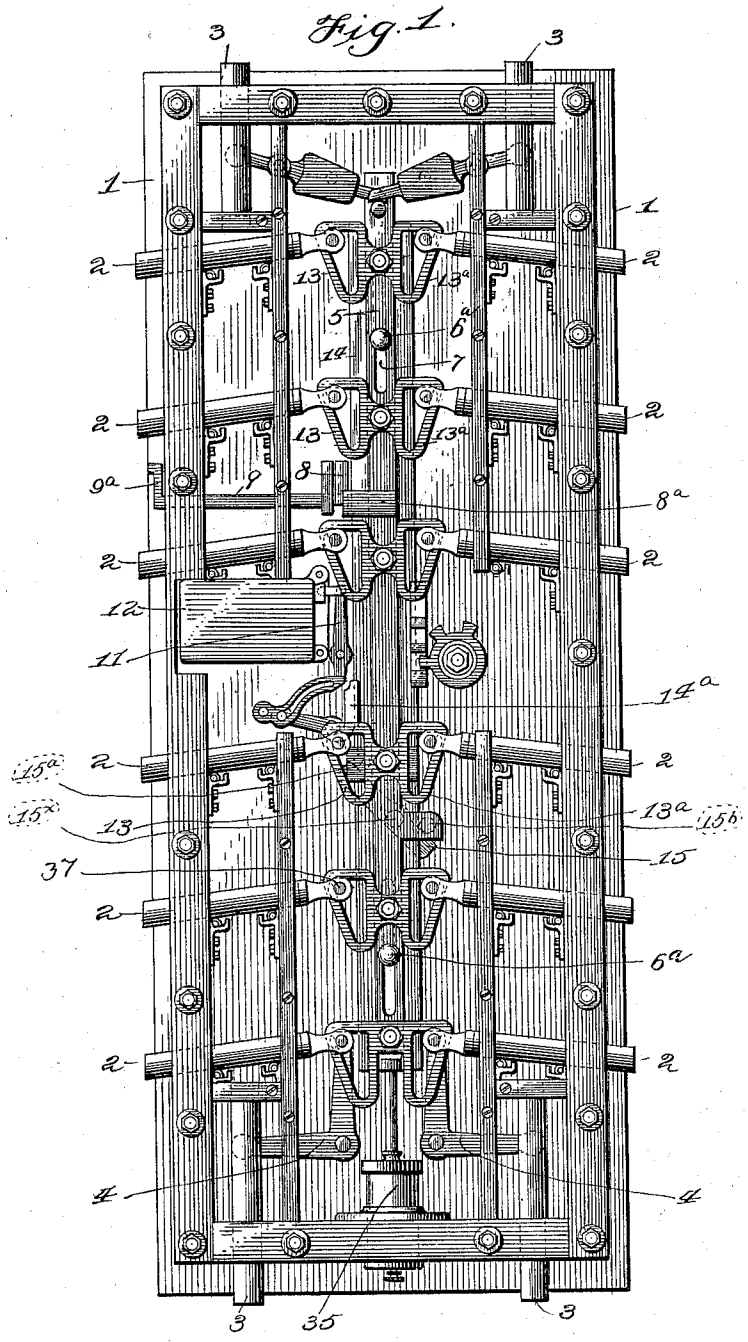
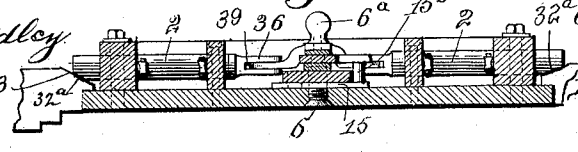


Fig. 1a.



Witnesses:
Herbert Bradley
H. N. Fleming

Inventor:
George L. Damon.
By Knight Bros
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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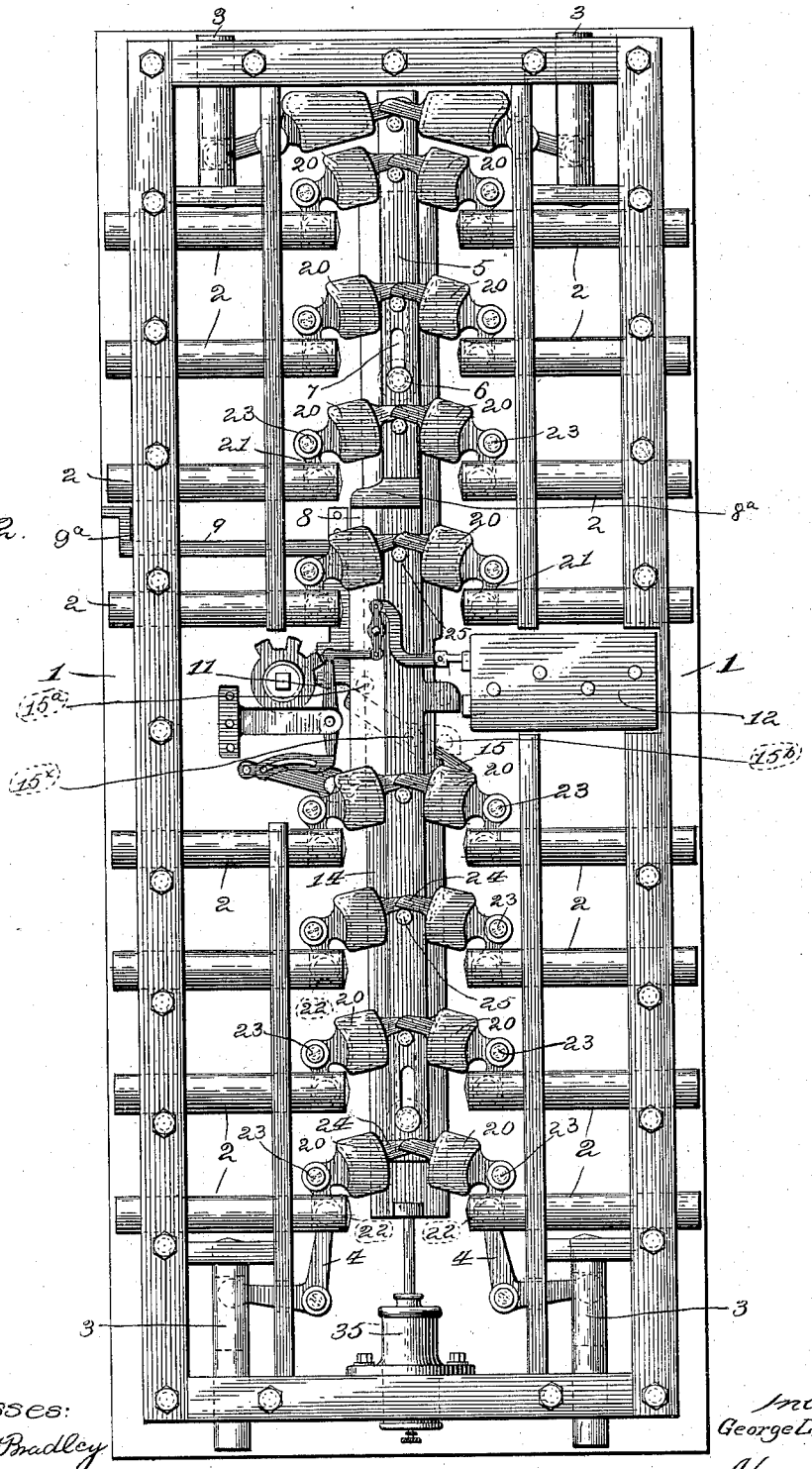
G. L. DAMON.

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Fig. 2.



Witnesses:
Herbert Bradley
W. Fleming

Inventor:
George L. Damon.
By Knight Bros
Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 609,416. Patented Aug. 23, 1898.

G. L. DAMON.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 3.

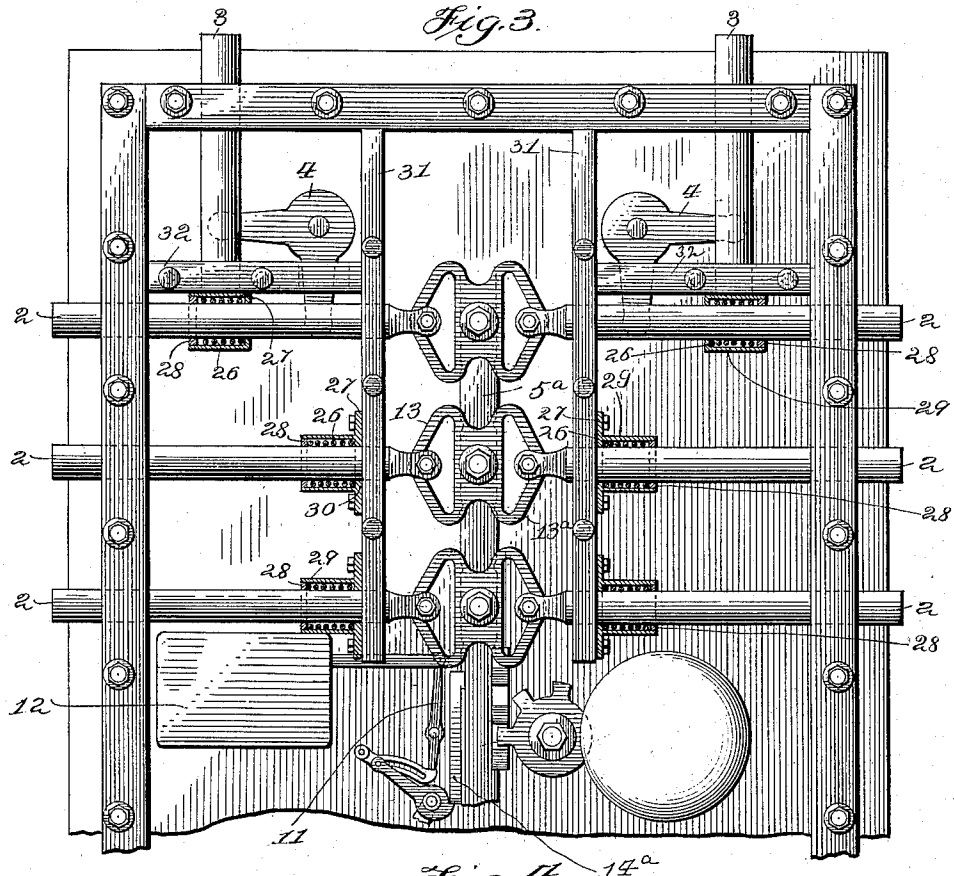


Fig. 4.

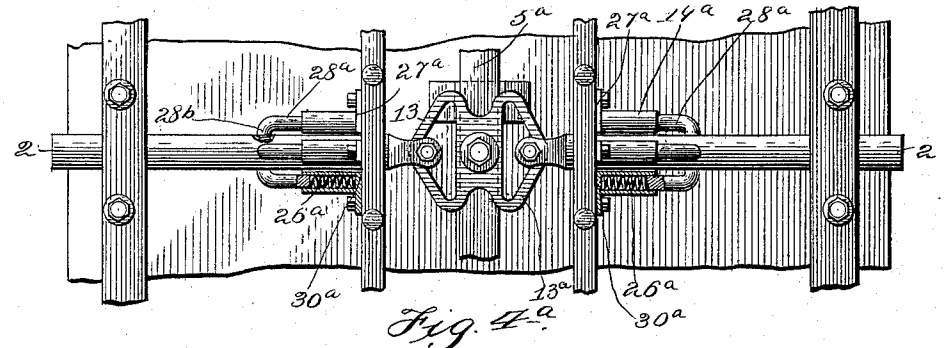
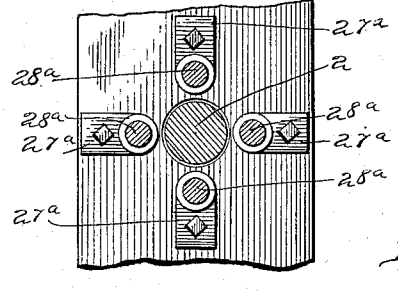


Fig. 4a.



Witnesses:
Herbert Bradley.
K. A. Fleming

Inventor:
George L. Damon.
By Knight Bros
Atty's.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GEORGE L. DAMON, OF BOSTON, MASSACHUSETTS.

SAFE-BOLTWORK.

SPECIFICATION forming part of Letters Patent No. 609,416, dated August 23, 1898.

Application filed December 15, 1896. Serial No. 615,761. (No model.)

To all whom it may concern:

Be it known that I, GEORGE L. DAMON, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Automatic Boltwork for Safes, of which the following is a specification.

One object of my invention is to construct a system of boltwork for safes, vaults, and the like, so that while the operation of locking and unlocking is entirely automatic, as heretofore, each bolt will be projected not only automatically, but independently of all the rest.

A further object is to combine with such independently-projecting-bolt system means for taking up the back lash or lost motion by each bolt independently of the rest.

A further object is to combine with such system a common retracting power for all the bolts which will have no effect upon the projecting of the bolts at the time of locking other than to release them and permit each to be projected by its independent power.

A further object is to provide mechanism which operates to release the boltwork independently of any movement of the retracting power, so that the latter may be made ample and leave no chance of failure in unlocking, and the jar incident to arresting this power in an intermediate position by delicate unlocking mechanism is avoided.

A further object is to provide particular details of construction for the practical accomplishment of the objects above named.

The results of my invention are to secure greater safeguards against forcing the safe or other closure and also against lock-outs resulting from interruption in the operation of the automatic mechanism by single bolts becoming hung or interrupted.

My invention consists in combining with the requisite number of bolts means whereby each bolt is rendered independently operative and automatic in shooting or projecting.

It further consists in combining with such independently-operating and automatically-projecting bolt a common retracting power which may be under the control of the ordinary time or other locks and which has such working connections with all the bolts as will adapt it to act in common upon all of them to retract them in unlocking the safe and which will release its control over all the bolts at the time of locking without exerting any projecting influence over them, but leaving each one free to operate by reason of its own independent projecting influence.

It further consists in employing, instead of operating the bolts as heretofore, a separate reciprocating frame which is supported by the detent until the door is closed, when it drops to release the bolts, and a heavy gravitating bar which is elevated before closing the door until engaged by the unlocking-levers and which when the time-lock acts drops and through the medium of a lever raises the previously-dropped releasing-frame, which is comparatively much lighter.

By these arrangements not only are the above objects attained, but both the dropping parts are arrested only by the dash-pot or by fixed stops on the door and all undesirable jar is avoided.

There are a number of advantages in a system of independently and automatically projecting bolts, one of which is the opportunity which is given to employ wedging or equivalent means for taking up the backlash or lost motion between each individual bolt and the door-jamb or other part engaged by said bolt, and thus doing away with the necessity which has heretofore existed for having each bolt work freely in order not to interpose any resistance to the movement of the locking mechanism common to all bolts. Another advantage obtained from my improved system is the opportunity offered for employing an absolutely effective retracting mechanism common to all the bolts.

My invention will be fully understood upon reference to the accompanying drawings, in which—

Figure 1 is an inside elevation of a safe-door to which are applied boltwork and its controlling mechanism embodying the principles of my invention, Fig. 1ª being an end view of the same. Fig. 2 is a view similar to Fig. 1, illustrating another embodiment of the principles of my invention. Figs. 3 and 4 are views of modified forms of mechanism embodying the principle of independently and automatically projected bolts with a com-

mon retracting power, Fig. 4ª being a detail sectional view illustrating the construction shown in Fig. 4.

1 represents a door upon which are mounted lateral bolts 2 and vertical bolts 3, connected either with and operated from said lateral bolts by means of bell-crank levers 4, as shown in Fig. 3 and at the bottom of Figs. 1 and 2, or having independent gravitating power, as shown at tops of Figs. 1 and 2.

5 in Figs. 1 and 2 and 5ª in Fig. 3 represent gravity drop-frames which have heretofore been employed for shooting or projecting the bolts as well as for retracting them, but which I employ only for retracting the bolts and holding them retracted until the door is closed and then releasing them, so that they may then be automatically and independently projected, as will presently appear.

The pins 6 are secured to the door proper with their heads countersunk, as shown in Fig. 1ª. The drop-frame 5 and the gravity-bar 14 are each provided with slots through which the pin 6 extends, said bar and frame being secured on said pins by means of a suitable cap 6ª and washer, said pins acting as guides, affording fixed stops for arresting the downward movement of the frame and bar at the lowest limit of their movement.

8ª is a lug or projection extending from one side of the frame 5.

14ª is a lug secured on the bar 14, which is adapted to engage a system of time-levers 11 and when so engaged holds the bar 14 in its elevated or locked position. While in this position the bar 5, Fig. 1, through the lug 8ª is under the control of the crank-arm 8 on rock-shaft 9, which is provided with a second crank-arm 9ª, adapted to be moved by contact with the door-jamb in the act of closing the safe, so as to withdraw the supporting crank-arm 8 from beneath the shoulder or lug 8ª on the frame 5 and permit said frame to drop, when the bolts are free to be projected by gravity. I thus provide a construction wherein each bolt is independent and automatic in its projecting or shooting movement. The parts remain in this position so long as the door is locked and until again moved by the operation of the system of unlocking time-levers 11 under control of time-lock 12. At the proper time for unlocking the time-lock 12 releases the levers 11 from the lug 14ª. In the construction shown in Fig. 3 this has the effect of permitting the frame 5ª to continue its movement to its lowest position, and by this last movement, through the medium of its double cams 13, it again retracts the bolts. By the construction shown in Fig. 1 this releasing of the unlocking-levers permits an additional and a heavier gravity-bar 14 to drop, such bar being set beforehand and supported on the unlocking-levers. As the heavy gravity-bar 14 drops the pin 15ª on the bar 14 (shown in dotted lines, Fig. 1) strikes one end of the lifting-lever 15, whereupon the other end of the lever 15 strikes the pin 15ᵇ on the frame 5, said pin being represented in dotted lines, thus raising the frame 5 so that its cams 13 13ª retract the bolts. The lever 15 is pivoted at 15ˣ.

The operation of the construction shown in Fig. 2 is as just described in connection with Fig. 1 except that weights 20 are employed in place of the cams 13 and 13ª.

It has heretofore been customary to cause the cams 13 or 13ª on the drop-frames 5 or 5ª to move the bolt inward by the raising of the drop-frame to its upper limit, to force them outward by the movement of the drop-frame to its intermediate position, and to draw the bolts again inward by the falling of the drop-bar to its lower limit. In using this method of shooting the bolts for locking it has always been necessary to allow sufficient space between the bolts and the jamb with which they engage so that there could not be any obstruction offered by the jamb to the movement of the bolt, as such would interrupt the dropping of the frame, and consequently prevent shooting the bolts to the full-locked position. It therefore became necessary in order to take up the backlash or lost motion of the door to interpose by separate mechanism or additional connections wedges or filling-pieces in order that no space might be left between the meeting faces of the step work which would permit introduction of explosives or tools. I now avoid the complication of the aforesaid separate mechanism or additional working connections by making each bolt with a beveled end, so that it can in use be made to project automatically and independently upon an inclined or wedging seat on the door-jamb, and not only do I thereby overcome possibility of a lock-out resulting from obstruction being offered by one bolt to the movement of the others, but as the fitting of each bolt necessarily varies from the others I also accomplish independent firm seating of the bolts and tightening of the door at the location of every bolt.

Each cam 13 13ª instead of operating in both directions upon its bolt operates only in the direction of retracting, and instead of the opposite or inner wall of the cam-slot there is a straight edge, leaving an unobstructed space, so that any bolt might remain in retracted position without interrupting the drop of the frame or withholding it from its intermediate position, where it must be to permit the full projection of any bolt. In other words, the gravity-bar may move to intermediate position independently of the projection of any of the bolts, and when in such position each bolt is free to be projected by its own independent power.

The individual automatic projecting or shooting powers for the bolts may consist in independently-operating gravity devices or means whereby each bolt may when released gravitate to its seat, or such individual powers may consist in an independent spring applied to each bolt. Generally speaking, the lateral

and vertical bolts which are adjacent to each other at the corners may be coupled together in the usual way without defeating the objects of my invention, inasmuch as the bolts of each pair thus coupled will naturally be affected by substantially the same conditions of fitting between the corner and the jamb, and they will therefore seat uniformly. For intermediate top bolts it is desirable to employ separate gravitating projecting means when the lateral bolts are arranged to gravitate by their own weight.

In Figs. 1 and 1ª the lateral bolts 2 are mounted on a slight incline and adapted to run out by gravity when released, antifriction-bearings being employed to insure their projection when released. These antifriction-bearings are especially constructed for safe-boltwork, and they consist of brackets having elongated bearings and concave rollers which receive the bolts in their peripheries and which have trunnions which travel in the elongated bearings. By this means the rollers travel on their bearings during the movement of the bolts which rotates the rollers, and friction between the roller and its bearings is avoided, and the trunnions may be made amply large for strength without producing undue friction.

In Fig. 2 the individual projecting powers consist of independently-operating weights 20, each carried on one arm of a bell-crank lever 21, the other arm of which works in a slot 22 in the end of a bolt or is otherwise connected with said bolt, said levers being fulcrumed at 23 and the weights being formed with extensions 24, which adapt them for engagement by pins 25 or equivalent projections on the drop-frame 5, so that when said frame is raised the weights are raised and the bolts drawn in; but when said frame drops every weight is left free to exert its gravitating effect upon the bolt with which it is connected. The levers which work the top bolts are straight, owing to the direction in which the bolt is to be worked. At the bottom the bolts are connected by bell-crank levers with the adjacent lateral bolts and receive their retracting movement from the same source as the said lateral levers. The projection of these bottom bolts is obviously by gravity. As indicated by dotted lines, the slots in these bottom bolts are elongated, so that they simply have lifting connection with said bolts, and the bottom bolts can therefore offer no retardation to the shooting of the lateral bolts.

In Fig. 3 the individual projecting power consists of a spring 26, having a fixed bearing at 27, which may be upon a portion of the bolt-mounting, and 28 represents a collar fixed upon the bolt and receiving the other end of said spring 26. The spring may have a casing 29, carried by a flange 30, which serves to mount the spring either upon one of the vertical portions 31 of the frame or upon one of the horizontal portions 32, the former arrangement being employed for intermediate bolts and the latter for corner bolts. It will be seen that each one of the lateral bolts carries one of these springs.

By referring to Figs. 4 and 4ª a different construction of spring projecting power will be seen, which consists of a number of springs 26ª, having fixed bearing at 27ª and acting upon pistons 28ª, which are connected with the bolt in any suitable manner—such, for instance, as shown at 28ᵇ—and these springs are each mounted in a casing 19ª and supported upon a flange 30ª. As shown in the transverse sectional Fig. 4ª, this particular form of casting power preferably comprises a symmetrical arrangement of springs 26ª, although one or more of said springs may be sufficient for the work.

As shown in Fig. 1ª, each bolt has a beveled face 32ª, which is intended in practice to ride upon an inclined or wedging seat 33, located upon the door-jamb in proper position to receive the bolt. When the door is forced shut by the customary means, these bolts will be projected by their individual projecting powers sufficiently to secure the door at every point in the tightest possible relation with the jamb to which it has been forced, and this will be true of each independent bolt regardless of uniformity in the adjustment of the wedging faces and their seats, so that the door will be held in absolutely tight relation at all points.

35 represents a dash-pot of ordinary construction for relieving the mechanism of shock incident to the dropping of the gravity-frame in Fig. 3 or unlocking power in Figs. 1 and 2. This dash-pot is employed in my present construction of boltwork because I employ a gravity unlocking power of such weight as to make hanging or obstruction practically impossible when the bar is released. This I am better able to do because I provide for doing away with catching this part in an intermediate position.

The connection between the bolts and the retracting devices may consist of bifurcated ends 36, into which project the ends of the levers or the cams, and the pintle 37, passed through the bifurcated end and through the interposed lever ends and antifriction-roller, (not shown,) a sufficient space being left at 39 in the bifurcated end to avoid contact between the bolt and the outside of the cam.

I am aware of Letters Patent No. 521,842, granted June 26, 1894, to C. O. Yale, wherein it is proposed to introduce a spring between each bolt and the throw-bar for simultaneously operating all of the bolts in such a manner that should one or more of the bolts hang the spring or springs could be compressed and the movement of the throw-bar could continue to shoot the remaining bolts; but this is objectionable on the ground that as each bolt hangs or comes to its seat it thereafter opposes to the extent of the strength of its spring the further shooting movement of the

throw-bar, so that the last bolt to seat is not pressed with as much power as the first, hence an unequal action; but in my system of boltwork each bolt is under a normal tendency to project. All the bolts have equal projecting powers which are constantly operative, and the controlling means engages them only in the direction of retracting the bolt and holding the constantly-operative projecting powers under detent. Hence when the powers or bolts are released all the bolts are seated with uniform pressure and the previous seating of one bolt has not the slightest effect on the effective seating of the others.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In combination with a safe or vault, independently-operating and normally-projecting bolts, and means for retracting the bolts and holding them against their tendency to project, until released, substantially as described.

2. In combination with a vault or safe, a series of locking-bolts each operative independently of the rest, an independent constantly-operative projecting power for each bolt, and a retracting means operating as a detent for the projecting powers to hold them against their tendency to project the bolts until it releases them, substantially as specified.

3. In a safe or vault, the combination with independently-mounted bolts of independently-operating automatic projecting means for the respective bolts, and a common retracting means operated by gravity.

4. In combination with the bolts of a vault, safe or other closure, means whereby each bolt is projected automatically and independently of the rest, a common gravitating releasing-frame, and a gravitating unlocking-bar, independent of the locking-frame but controlling the same.

5. In combination with the bolts of a vault, safe or like closure, the individual levers engaging the respective bolts and independently operative in the manner explained, the gravitating weights on the levers for projecting the bolts, and a common retracting power operating on all the bolts through the medium of their levers.

6. In boltwork for safes, vaults and the like, the combination of the independently-movable bolts disposed in suitable locking relation to the door, projecting means operating independently upon the respective bolts, the frame having retracting connection with the bolts and retracting power controlling said frame.

7. In combination with the independently-operating automatically-shooting bolts of a vault, safe or the like, a gravitating retracting device engaging the bolts by movement in one direction to retract them and releasing said bolts by movement in the opposite direction, whereby it has no effect upon the projection of the bolts at the time of locking other than to permit each to be projected by its independently-projecting power.

8. In combination with a vault or closure, a number of independently tight-seating bolts, a gravitating frame for releasing the bolts, and a fixed stop on the door for said frame.

9. In combination with the independently-moving bolts, the frame gravitating out of retracting relation thereto, a fixed stop on the door for said frame, the independent retracting power also having a stop fixed on the door, the unlocking-levers, and means for elevating the retracting power into engagement with the unlocking levers when setting the mechanism.

10. In an automatic locking mechanism for vaults or the like, the combination of bolts each provided with an independent projecting means having bearing upon a fixed part of the structure and which is set by the retraction of the bolt, and means for retracting the bolts to unlock the safe and releasing them so that they will be automatically projected to lock the door substantially as described.

11. In an automatic locking and unlocking mechanism for vaults and the like, the combination of bolts; a gravitating frame permitting the projection of the bolts by its downward movement, and retracting them by its upward movement; an independent drop-bar having connections for elevating the gravitating frame; means for releasing the frame at the closing of the vault; and means for releasing the bar when the vault is to be unlocked, substantially as set forth.

12. In an automatic locking and unlocking mechanism for vaults and the like; the combination of bolts having independently-projecting powers; a vertically-reciprocating frame having retracting connection only with said bolts, withdrawing them and setting the projecting powers by its movement in one direction and releasing them to be independently projected, by its movement in the opposite direction, and a reciprocating bar of relatively greater power than the frame, having connection with the frame for moving it in the direction to retract the bolts, and means for releasing the frame and bar respectively at the closing of the door and time for unlocking the same, substantially as explained.

13. In an automatic locking mechanism for vaults and the like, the combination of bolts, a gravitating frame controlling the projection and retraction of the bolts, a relatively-heavier gravitating bar, a pivoted lever engaging the frame and bar by its respective ends, whereby the dropping of the bar on one end of the lever raises the frame by the other end of said lever; and means for releasing the frame and bar successively, for the purposes herein explained.

14. In a locking mechanism for safes or vaults, the combination of a series of bolts,

a corresponding series of independently-operating projecting powers each having connection with one of the bolts and projecting it independently of all the rest when released, and a retracting power common to all the bolts and having connections through which it engages the projecting powers and sets them only when it moves in the direction for retracting the bolts and releases them for independent automatic action when it moves in the opposite direction, substantially as specified.

15. In combination with a vault or safe, a series of independently-operating gravity-projected bolts, and a retracting power engaging said bolts only in the direction for withdrawing them, substantially as explained.

16. In combination with the independently-operating automatic shooting bolts of a vault or safe, a gravity retracting device for the bolts, engaging them only in the direction of retracting, whereby it has no effect upon the projection of the bolts at the time of locking other than to release them and permit each to be projected by its independently-projecting power.

GEORGE L. DAMON.

Witnesses:
JOSEPH CUMMINGS,
I. G. RITCHIE.