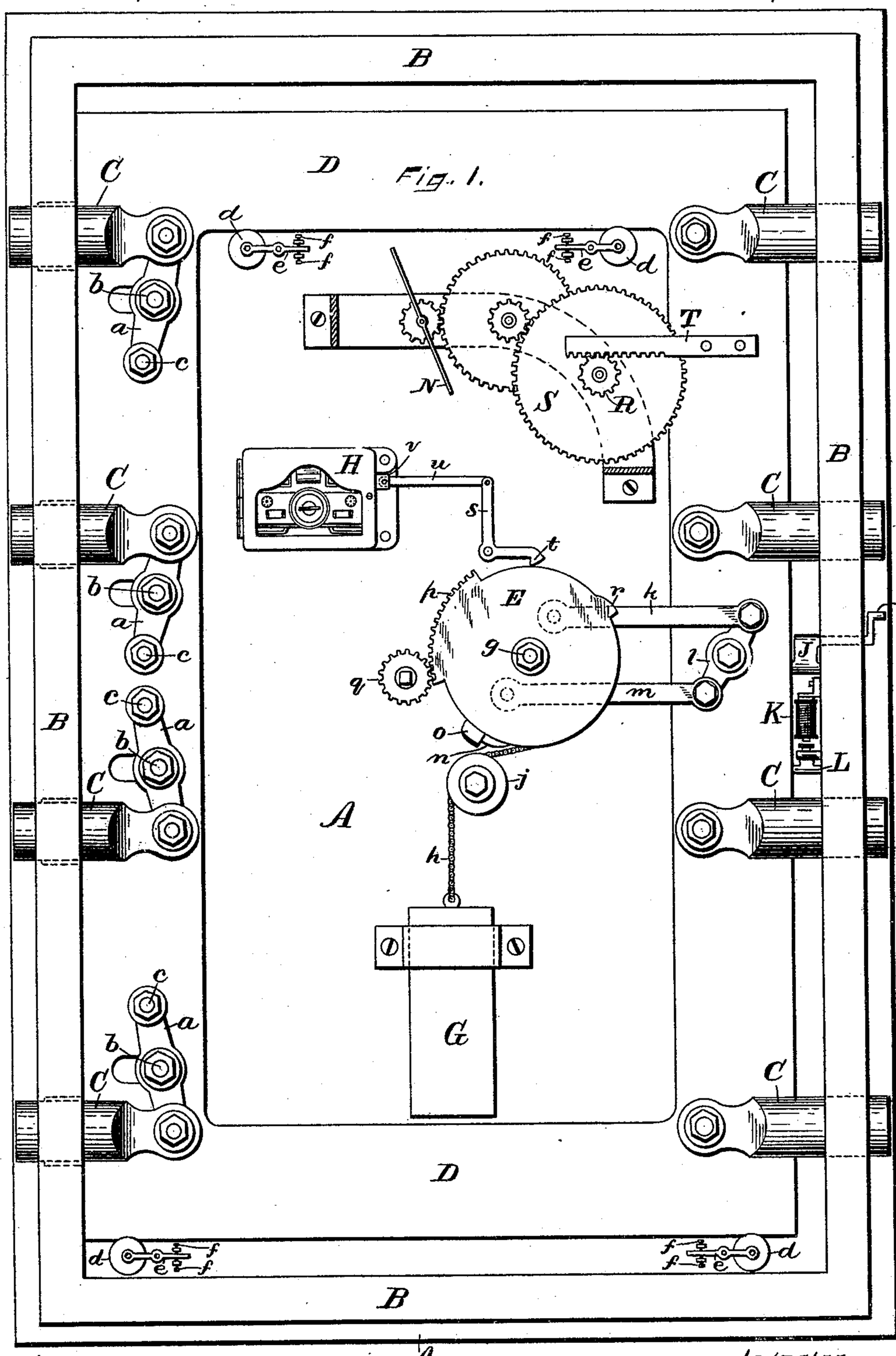
(No Model.) 2 Sheets—Sheet 1

O. E. PILLARD.

AUTOMATIC BOLT WORK.

No. 420,563. Patented Feb. 4, 1890.



Witnesses.
John Edwards Jr.
Milton H. Bassett

Inventor.
Oliver E. Pillard.
By James Shepard Atty.

(No Model.) 2 Sheets—Sheet 2.

O. E. PILLARD.

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Fig. 2.

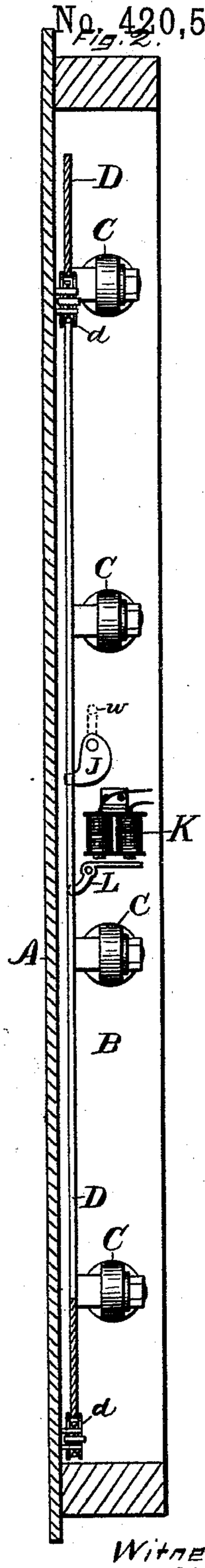


Fig. 3.

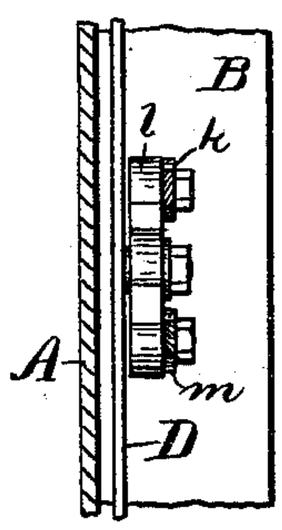


Fig. 4.

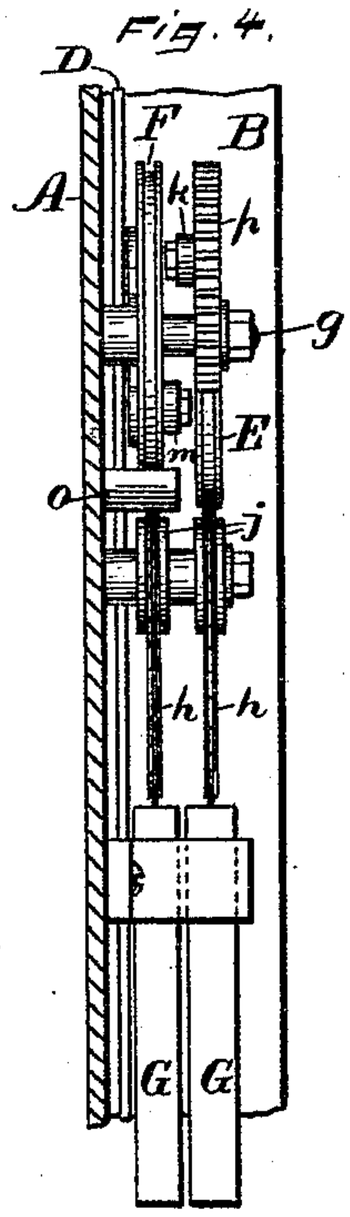


Fig. 5.

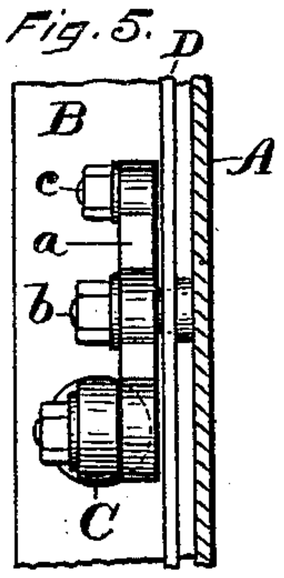


Fig. 6.

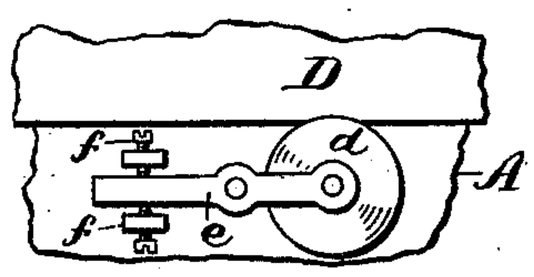


Fig. 7.

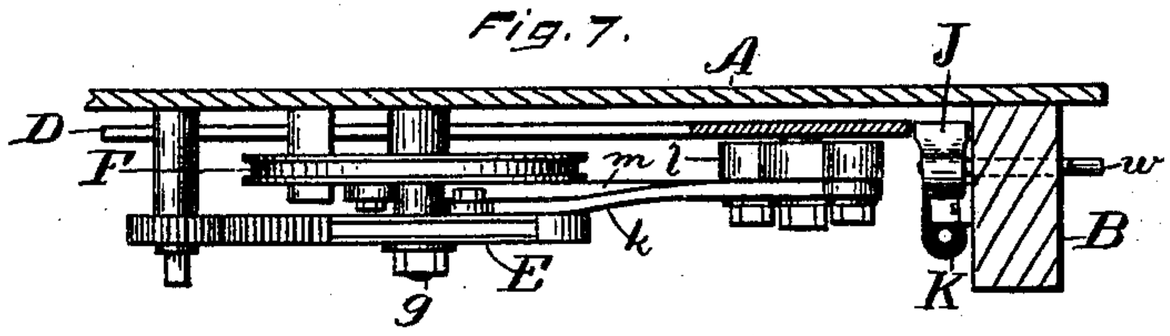


Fig. 8.

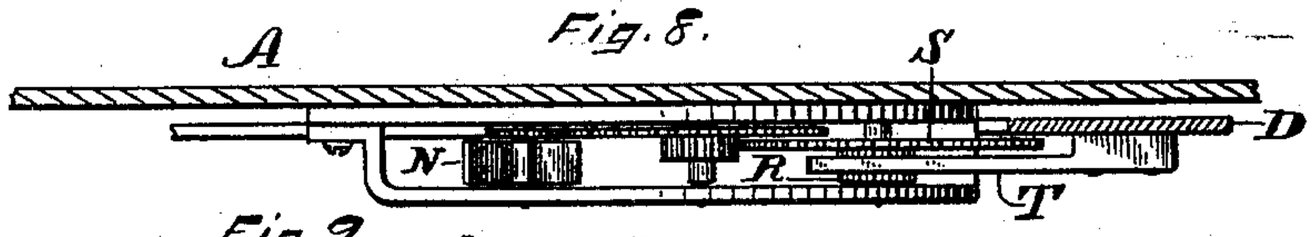
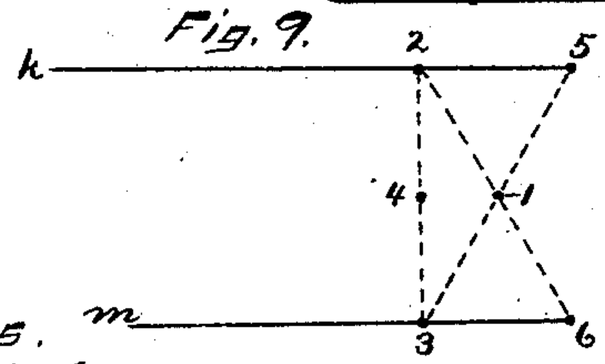


Fig. 9.



Witnesses.
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UNITED STATES PATENT OFFICE.

OLIVER E. PILLARD, OF CAMBRIDGE, MASSACHUSETTS.

AUTOMATIC BOLT-WORK.

SPECIFICATION forming part of Letters Patent No. 420,563, dated February 4, 1890.

Application filed June 5, 1888. Serial No. 276,076. (No model.)

To all whom it may concern:

Be it known that I, OLIVER E. PILLARD, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Automatic Bolt-Works, of which the following is a specification.

My invention relates to an improvement in automatic bolt-work for the doors of safes, vaults, &c., and the principal object of my invention is to improve the efficiency of the device and particularly to make it sure in its action.

In the accompanying drawings, Figure 1 is a front elevation of my bolt-work as applied to a door. Fig. 2 is a vertical section of the door and the bolt-carrier, together with a side elevation of some of the other parts. Fig. 3 is a detached view showing part of the door and bolt-carrier, the operating-lever, and a section of the operating bars or links. Fig. 4 is a detached view showing principally a side elevation of the weights and disks for throwing the bolt-work. Fig. 5 is a detached view showing part of the door and bolt-carrier, with the lever which operates the bolts at the left-hand edge of the door. Fig. 6 is a detached view showing principally an enlarged view of one of the adjustable rollers on which the bolt-carrier is mounted. Fig. 7 is a plan view of the disks for throwing the bolt-work and contiguous parts. Fig. 8 is mainly a plan view of the train for retarding the movement of the bolt-work; and Fig. 9 is a diagram illustrating the action of the bolt-throwing lever under the influence of the links, disks, and weights.

A designates the inner sheet of the door, rigidly attached to which is the frame B, through which the several bolts C work. The bolts upon one side of the frame (the right-hand side, as shown in the drawings) are attached directly to the bolt-carrier D, and the bolts upon the other side are pivotally attached to the levers *a*, which are pivoted upon studs *b*, rigidly connected to the inner sheet of the door. The other ends of said levers are pivotally connected at *c* to the bolt-carrier, the bolt-carrier being slotted, as shown in Fig. 1, to permit the movement of the carrier while the pivotal studs *b* pass through said slots. That end of each lever which is pivoted to the bolt-carrier at *c* should also be slotted slightly in the longitudinal direction of the lever in order to prevent the lever from binding during its swinging movement. The bolt C, to which these levers are connected, may also have a slight swinging movement, and to accommodate such swinging movement I counterbore the holes in the frame-work, through which said bolts pass, as indicated by broken lines in Fig. 1. This arrangement of the bolts and levers enables the bolts upon both sides of the frame-work to move in the same direction under a given movement of the bolt-carrier—that is to say, when the bolt-carrier moves to the right, the bolts upon both sides of the door are projected, and when the bolt-carrier is moved to the left the bolts upon both sides are withdrawn.

I mount the bolt-carrier D upon adjustable rollers *d*, an enlarged view of which is shown in Fig. 6. These rollers are grooved on their periphery to receive one edge of the bolt-carrier, and said rollers are mounted on a lever *e* on the inner sheet of the door, the opposite end of each lever resting between adjusting-screws *f* in studs affixed to the inner sheet of the door, so that by adjusting said screws the levers *e* may be moved to adjust the rollers up or down to bring the bolt-carrier into the proper position, so that it may work free and easy, thereby making its action more certain when operated in connection with a weight or weights, as hereinafter described.

Upon a stud *g*, rigidly affixed to the inner sheet of the door, I mount two disks E F, both being grooved at their periphery, or otherwise fitted for receiving a cord, chain, or band. These disks are mounted so as to revolve loosely upon their axis, and to each disk a cord or chain *h* is attached, which extends over a friction-pulley *j* to a weight G. To the disk E one end of a bar or link *k* is pivoted, the other end of which link is pivoted to the lever *l*, mounted on a stud rigidly attached to the bolt-carrier. To the opposite end of this lever *l* there is another bar or link *m*, whose opposite end is pivoted to the disk F. This disk F is provided with a stop-lug *n*, (shown in Fig. 1,) which engages a stop-lug *o* on the inner sheet of the door and limits the movement of said disk in that direction. The disk

E is provided with a segment of a gear or circular rack *p*, which meshes into a pinion or gear wheel *q*, as shown in Fig. 1, said pinion being provided with a squared shaft or other convenient means for the application of a crank-wrench or operating-handle. The disk E is also provided with a holding-lug or projection *r*. Affixed to the inner sheet of the door is an angle-lever *s*, one arm of which has a hook or latch *t*, adapted to engage the holding-lug *r* of the disk E, while the other arm of said angle-lever is pivoted to a link or bar *u*, the other end of which link or bar is pivoted to the bolt *v* of a time-lock H. This time-lock may be any known lock of that class which will draw a bolt horizontally inward, which locks, being well known, require no description. An example of such a lock may be seen in the patent to Henry F. Newbury, No. 265,933, October 10, 1882.

In order to enable the bolt-work to be set for automatic action as soon as the door is closed and to prevent it from acting before, I provide the weighted dog J, which is pivoted in the frame-work of the bolt, Figs. 1, 2, and 7, so that its point comes immediately in front of the edge of the bolt-carrier, thereby preventing the movement of said carrier so long as the point of the dog is in front of it. The dog is of such form as to be held in the position illustrated by gravity. This dog is provided with an upwardly-projecting arm *w*, Figs. 1 and 7, also indicated by broken lines in Fig. 2, which, when the door is being closed, will strike against a suitable projection on the jamb, and thereby throw the dog from in front of the bolt-carrier as soon as the door is fully closed, thereby leaving the bolt-work free to the action of the bolt-throwing mechanism.

Sometimes it may be desirable not to lock the door when it is closed, and at the same time to have the door so arranged that it can be locked from any convenient point at any desired time. For this purpose I arrange an electro-magnet K in close proximity with an angle lever or dog L, the point of which also comes in front of the bolt-carrier the same as does the dog J. This magnet may be connected by suitable wires leading to any desired point, with the usual appliances for manipulation, so that after the bolt mechanism is set and the door closed the bolt-throwing mechanism may be free to act at any desired time by merely sending a current of electricity through the magnet K, thereby operating the dog L to draw the point of said dog from in front of the bolt-work.

In order that the bolt-work may move slowly and regularly under the action of the bolt-throwing mechanism, I connect the bolt-carrier D to a fly-wheel train, Figs. 1 and 8. This train consists of a suitable fan or fly N and a train of wheels and pinions mounted in a suitable frame, the pinion R on the first wheel S of said train meshing into a rack T, which is rigidly affixed to the bolt-carrier D, whereby a movement of said carrier will impart a movement to the fly-wheel.

In using the device the time-lock is set so that it will withdraw its bolt at any predetermined time. The pinion or wheel *q* is turned to revolve the disk E and bring the engaging-lug *r* back of the hook or latch *t* on the angle-lever *s*, so as to hold the disk E in the position thus set. The movement of the disk E will, through the link or bar *k*, lever *l*, and link or bar *m*, also move the disk F in the same direction, so as to lift or wind up both of the weights G. In making this movement of the disk the lever *l* merely rocks upon its pivotal stud without imparting any movement to the bolt-carrier.

In the diagram Fig. 9 the pivotal point of the lever *l* is designated by the point 1, while the points 3 and 5 represent the position of the lever in Fig. 1, and the points 2 and 6 its position after the weights are wound. The door is now ready to be closed. The dogs J and L, provided both are present, or the dog J, if the dog L is omitted, hold the bolt-work against the action of the weights and prevent the bolts from being thrown before the door is closed. In closing the door the projection *w* on the dog J comes in contact with the jamb and the point of said dog is withdrawn. The magnet K and dog L may or may not be used, as the device is complete without them, and when used they are in the nature of an addition to the other parts. Whenever the obstruction or obstructions in front of the bolt-carrier—as, for instance, the dogs J and L—are withdrawn, the bolt-work is free to be acted upon by its operating mechanism, and one of the weights G will operate to throw the disk F, (the disk E being held against rotation by the latch *t*,) which, through the bar or link *m*, will move the lever *l* and operate the bolt-carrier to project all of the bolts, the upper end of the lever *l* at its pivotal connection with the link *k* (illustrated as the point 2 in the diagram, Fig. 9) becoming for the time being the fulcrum of said lever, the free or lower end of said lever moving from the point 6 to 3, whereby the pivotal stud of the lever *l* and the bolt-carrier are moved a distance equal to that from the point 1 to 4 in said diagram. The door is now locked and will remain so until the hour arrives for the time-lock to act. The action of the time-lock is to draw in the bolt *v*, thereby pulling on the upper end of the angle-lever *s* to trip the latch *t* and release the disk E, which, under the action of its weight, is revolved and through the bar or pitman *k*, and operates the lever *l* to move the bolt-carrier in a reverse direction and withdraw the bolts, leaving the parts in the position shown in Fig. 1. In thus withdrawing the bolts under the action of disk E and its weight the lower end of the lever *l* where it is pivoted to the link *m* (represented by the point 3 in the diagram) becomes the fulcrum of said lever, and thereby the bolt-carrier is moved in opposite

directions by the separate action of the two weights. In unlocking, the free or upper end of the lever *l* moves from the point 2 to 5 in the diagram, thereby throwing the bolt-carrier a distance and direction corresponding to that of 4 to 1 in the diagram.

When the door is closed, if the bolt-work binds, or if, for any reason, the bolts are not fully thrown, and therefore the weight is arrested in its descent before the stop *n* strikes the stud or stop *o*, then as soon as the time-lock releases the disk E both disks will revolve together under the action of both weights until the stops *n* and *o* engage with each other, after which the separate action of the disk E, under the influence of its weight, will operate to withdraw or unlock the bolts the same as if they had been fully thrown in the operation of locking.

In prior automatic bolt-works operated by a weight, so far as I know, if the bolts were not fully thrown in locking, they would fail to be unlocked when the time-lock acts; but with my improvement the bolts will always be unlocked whenever the time-lock releases the throwing mechanism, whether they were thrown a greater or less distance in the act of locking.

The train and fly-wheel connected with the bolt-carrier slackens the speed of the bolt-carrier in its movements, so as to avoid all shock or concussion under the action of the weights.

While I prefer to use weights for actuating the disks, and refer to said disks in one claim as "weighted," I do not thereby intend to release any of my rights to the use of known equivalents for weights.

I claim as my invention--

1. The combination of an automatic bolt-throwing mechanism, the bolts, bolt-carrier, and adjustable rollers on which the bolt-carrier is mounted, substantially as described, and for the purpose specified.

2. The combination of the bolts and bolt-carrier with the weighted disks E F, a latch for holding the disks, a time-lock for tripping said latch, and connecting mechanism between the disks and bolt-carrier, substantially as described, and for the purpose specified.

3. The combination of the bolts and bolt-carrier with the lever *l*, pivotally mounted on said carrier, the disks E F, mounted on the door, the links or bars *k m*, having one end connected to the respective ends of said levers and the other end to the respective disks, and mechanism for holding, releasing, and moving said disks, substantially as described, and for the purpose specified.

4. The combination of the disks E F, the lever *l*, the links or bars *k m*, the bolts and bolt-carrier to which said disks, lever, and links are connected, and the dog J, for holding and releasing said bolt-carrier, substantially as described, and for the purpose specified.

5. The combination of the bolts and bolt-carrier, an automatic bolt-throwing mechanism, the dog L, for blocking the movement of said bolt-carrier, and an electro-magnet for tripping said dog, substantially as described, and for the purpose specified.

OLIVER E. PILLARD.

Witnesses:
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ALBERT H. CHOATE.