No. 891,276. PATENTED JUNE 23, 1908.

A. W. MARR.

SAFE, VAULT, &c.

APPLICATION FILED JUNE 30, 1906.

4 SHEETS—SHEET 1.

Fig. 1.

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4 SHEETS—SHEET 2.

Fig. 2.

Fig. 3.

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4 SHEETS—SHEET 3.

Fig. 4.

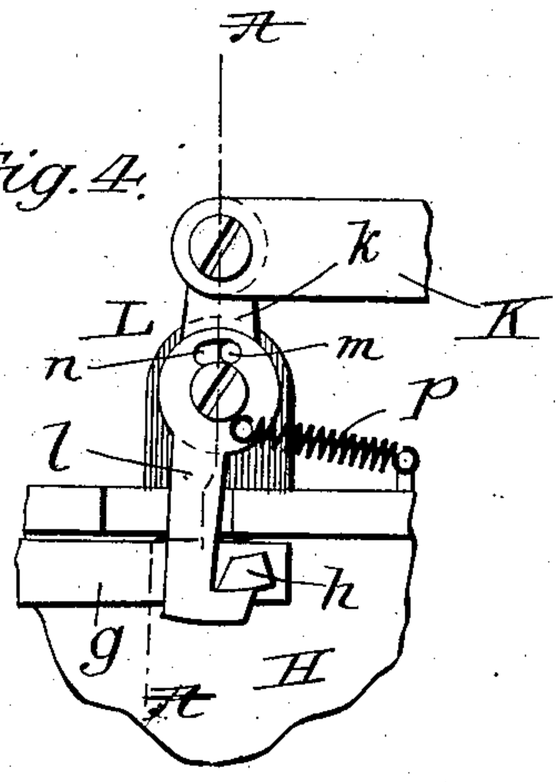


Fig. 5.

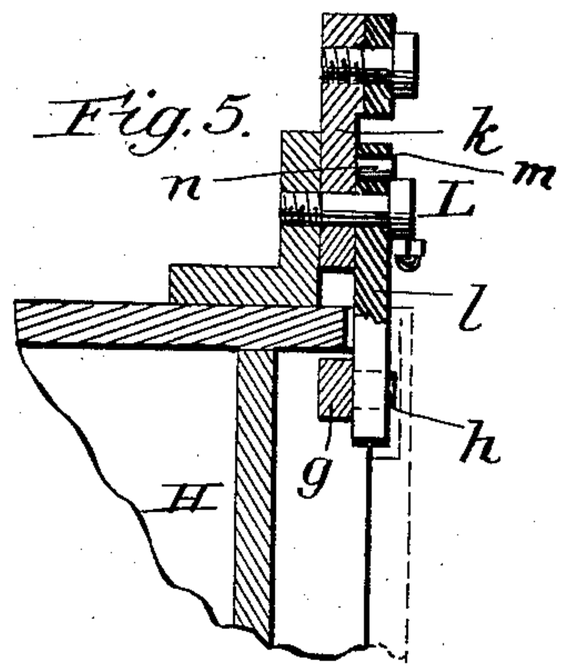


Fig. 6.

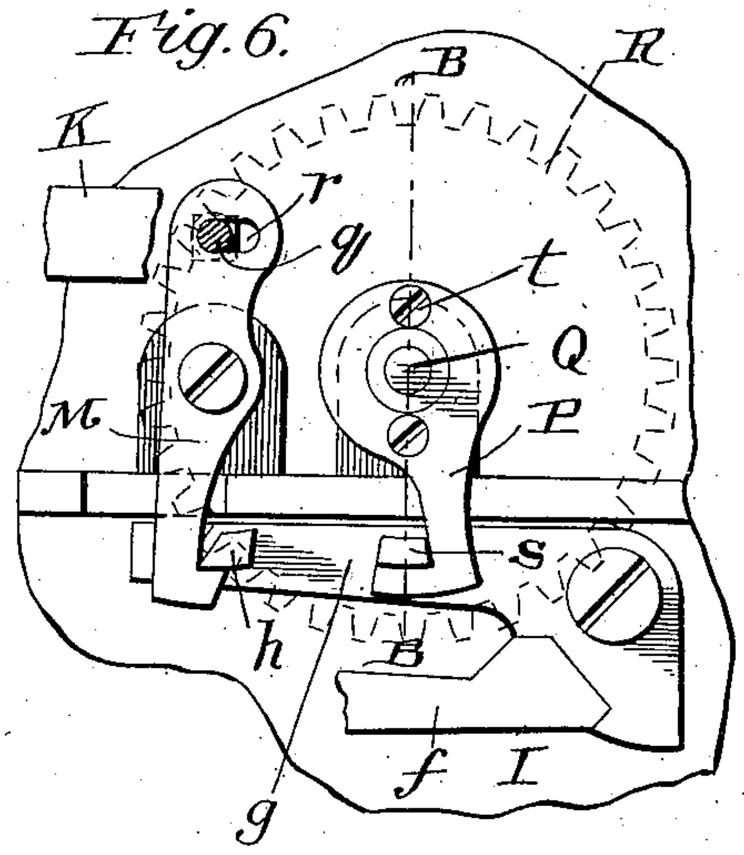
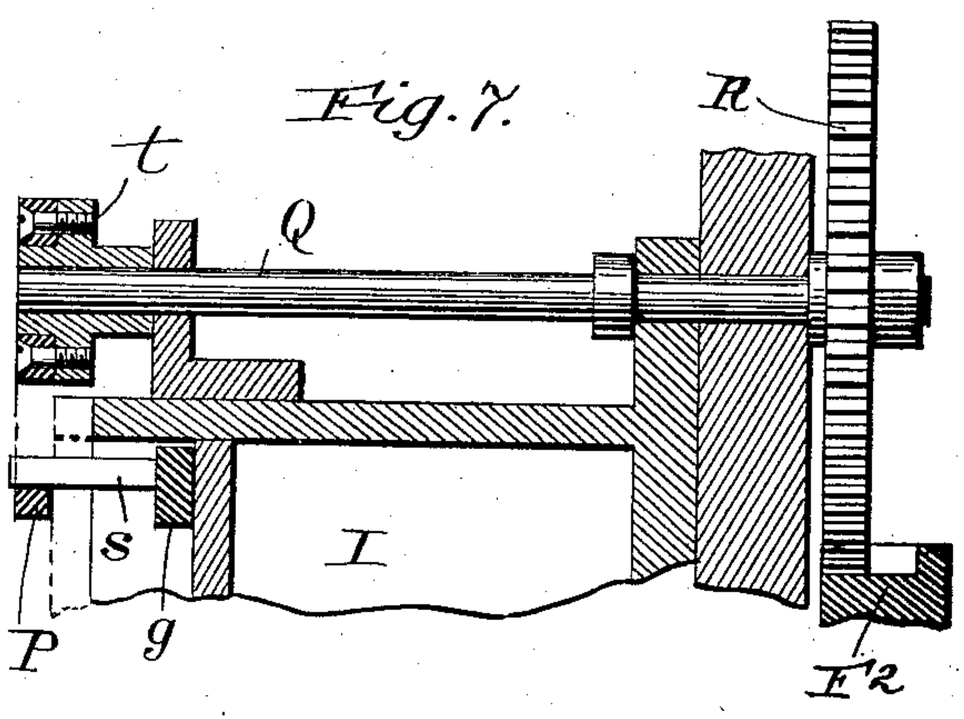


Fig. 7.



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4 SHEETS—SHEET 4.

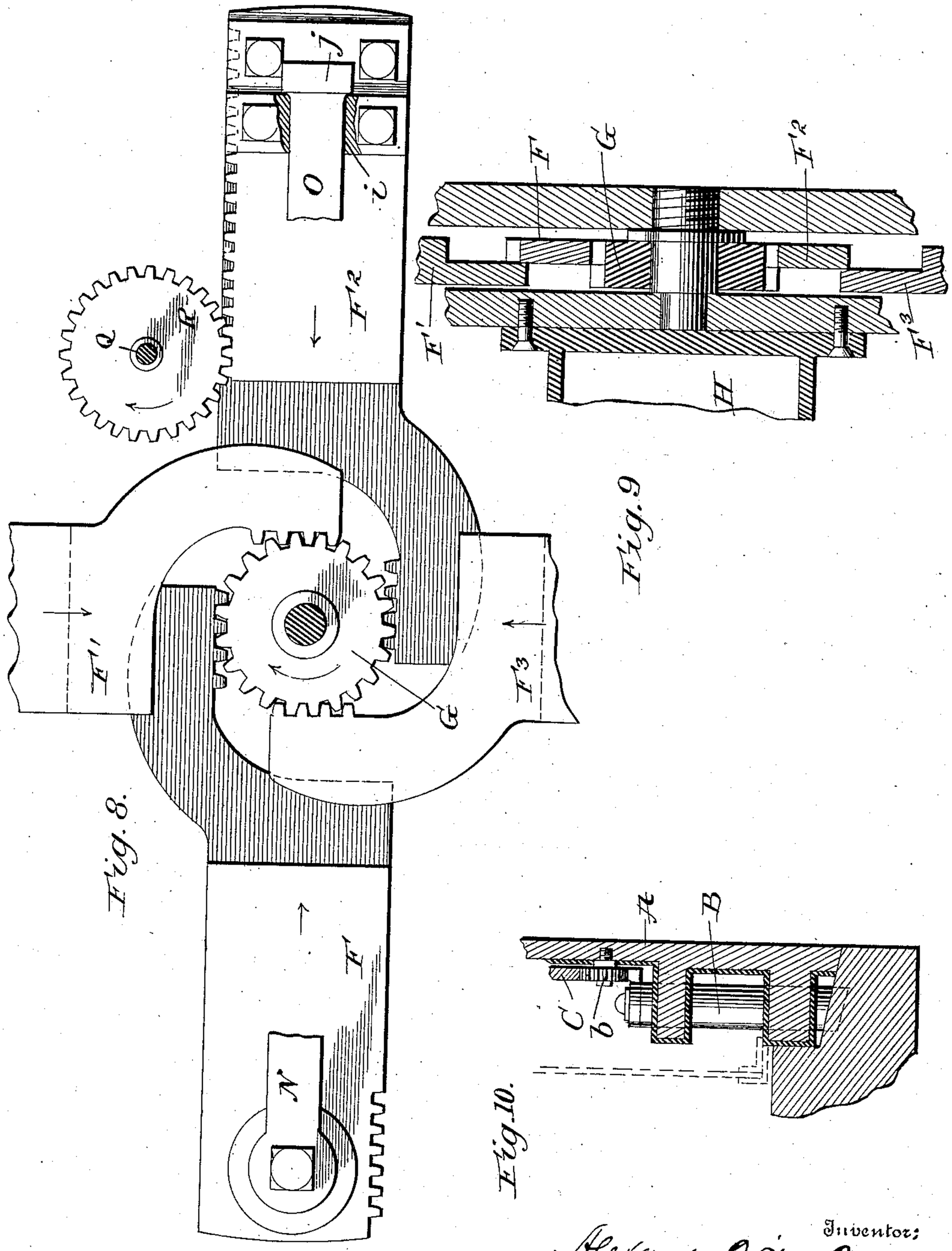

Fig. 9.

Fig. 8.

Fig. 10.

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UNITED STATES PATENT OFFICE.

ALEXANDER WILSON MARR, OF HAMILTON, OHIO, ASSIGNOR TO HERRING-HALL-MARVIN SAFE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

SAFE, VAULT, &c.

No. 891,276. Specification of Letters Patent. Patented June 23, 1908.

Application filed June 30, 1906. Serial No. 324,197.

To all whom it may concern:

Be it known that I, ALEXANDER WILSON MARR, a citizen of the United States, residing at Hamilton, in the county of Butler and State of Ohio, have invented certain new and useful Improvements in Safes, Vaults, &c., of which the following is a specification.

This invention pertains to time-lock mechanism for the doors of safes, vaults and other structures, and consists in novel bolt-retracting mechanism comprising essentially two motors, and trip mechanism controlled by the time movement, the first motor serving normally to retract the bolts at the time for which the mechanism is set, and the second motor being held in reserve and coming into play only in the event that the first motor fails to retract the bolts. In such case the second motor operates shortly after the time for which the time mechanism is set, and serves to supplement the power of the first motor, or unaided, to retract the bolts.

The invention further consists in features, details and combinations hereinafter set forth.

In the accompanying drawings, Figure 1 is a face view or elevation of the inner face of a circular door embodying my invention; Fig. 2, an enlarged view of the double motor, the trip mechanisms, and a portion of the bolt work; Fig. 3, a horizontal section taken on the line E—E, of Fig. 1 and looking down; Fig. 4, an enlarged view of the trip of the primary motor; Fig. 5, a section on the line A—A of Fig. 4; Fig. 6, an enlarged elevation of the trip mechanism of the secondary bolt-retracting motor; Fig. 7, a section on the line B—B of Fig. 6; Fig. 8, an elevation of the bolt-actuating slides and the pinion common to the several slides; Fig. 9, a section on the line C—C of Fig. 3; Fig. 10, a section on the line D—D of Fig. 1.

In mechanism of this character it is usual to provide a spring motor to "shoot" or project the bolts when the door is closed, and another spring motor to retract the bolts when the time arrives for which the mechanism is set, the bolt-projecting motor being commonly tripped or the bolt work released by a trip on the door, moved in closing the latter, but as this constitutes no part of the present invention it is omitted here. In use it is found that from one or another cause the bolt-retracting motor occasionally fails to operate and the safe or vault is kept locked when it should be open, thus causing great inconvenience, and delaying the work of a bank or other establishment until experts can be sent to open the door. To meet such contingencies, I provide the secondary motor and trip mechanism, which I will now describe in connection with the usual bolt-retracting motor and bolt work.

Referring first to Fig. 1, A indicates a circular door for a safe, vault or other structure, provided with a series of radially movable bolts B, capable of being drawn within or protruded beyond the periphery of the door, as required. Instead of this arrangement, however, the bolts may be arranged at right angles to one another, as is in fact done with rectangular doors. With the radial arrangement here illustrated, each bolt B is provided with a rack bar *a*, which meshes with and is moved by a pinion *b*, one for each rack, the several pinions in turn meshing with and receiving motion from an annular gear C. This annular gear is held in proper relation to the pinions and to door A, by a series of flanged rollers D, the flanges of which overlap the face of the gear ring, while their bodies form bearings for the inner edge of said ring, as seen in Fig. 1. Within and meshing with inner teeth of gear ring C are pinions E, four being shown in Fig. 1, and these pinions also mesh with radially disposed rack bars F, F′, F^2, F^3, of the form best shown in Fig. 8, their inner ends being arranged to overlap, and all being toothed to engage with a central pinion G.

It will be apparent from the foregoing description that if any one of the rack bars F be moved longitudinally, like motion will, through pinion G, be imparted to all the other bars F, and each bar will in turn rotate the pinion E with which it meshes, thereby causing said pinions to move gear ring C in a circular path, to turn the pinions *b*, and thus to give longitudinal motion to rack bars *a* and bolts B. The direction in which the bolts move will of course depend upon whether the rack bars F, F′, etc., are moved inwardly or outwardly.

H and I indicate respectively the primary and secondary bolt-retracting motors, the bolt-projecting devices being omitted from this description because not involved in the present invention and being optional as to form and construction.

J indicates a time mechanism, here repre-

sented conventionally, but which may be of any usual form or character. It is provided with a lever or member, which, at the time for which the mechanism is set, imparts a longitudinal movement to a trip-actuating bar K, which is formed with a slot *c* to receive a pin or stud of the actuating lever of the time mechanism.

Motors H and I consist essentially of strong springs, which are put under compression by means of a wrench, crank or like device, and are held under compression by suitable detents until required to operate.

The specific construction of the motor is immaterial to the present invention, which is concerned chiefly with the trip mechanism of said motors. Each motor is provided with an arm *d*, which swings about the axis of an arbor or staff *e*, as the springs are compressed or freed and permitted to expand. Each arm *d* is in turn held by a locking lever *f*, of elbow form, best seen in Fig. 2, and each lever *f* is in turn held by a similar lever *g*, levers *f* and *g* being each formed with a seat or recess to receive and hold the end of the lever with which it coacts, as will be readily understood upon referring to Fig. 2. By introducing the system of levers, I am enabled to hold the powerful springs under compression, yet to move or to free the power end of the final lever *g* of each series through the application of very slight force. Levers *g* are each provided with a lug *h* to be engaged by a final detent.

L indicates a detent for the lever *g* of motor H, and M indicates the detent for the lever *g* of motor I. The first of these motors, H, is constructed preferably to both project the bolts at the time of closing the door of the safe or vault, and to withdraw them at the time for which the time mechanism is set, but the motor I is designed simply to retract the bolts. Accordingly, motor H has its draw-rod N directly bolted or otherwise made fast to a stud projecting from the rack bar F immediately behind it. Since motor I is not intended to operate ordinarily or at any time except upon the failure of the primary motor H, the draw-rod O of said motor I has a sliding connection with the rack bar F^2 immediately behind it. This may be conveniently formed as shown in Figs. 1, 2 and 3, by providing the rack bar F^2 with a slotted post or stud *i*, between the arms of which passes the shank or body of the draw-rod O, the T-head *j* of said draw-rod O reaching beyond the slot or opening in the stud or post *i*, as seen in Fig. 2, and serving to engage said post and carry it and its rack bar F^2 inward in the event that said draw-bar O is itself moved inward. The rack bar F^2 may, however, move in and out freely without in any manner affecting the draw-rod O, assuming that said rod is in its outer position as shown in Figs. 1, 2 and 3.

In order that the detent L may be actuated and caused to disengage the lug *h* of its motor-locking lever without withdrawing detent M from its locking lug *h*, the detent-actuating bar K has a pin-and-slot connection with detent M, as shown in Figs. 2 and 3, whereby the bar K is enabled to move a distance sufficient to actuate and withdraw the detent L without affecting the position of detent M. On the other hand, it is desirable to set up, that is, to wind and set for action the secondary motor I before setting up the primary motor H, and to this end the detent L is made in two parts, *k* and *l*, as seen in Figs. 2, 4 and 5, said parts being provided with a pin-and-slot connection, *m* and *n*, as shown in said figures, whereby the lower or engaging end of the detent may be swung backward out of the path of the lug *h*, without affecting its upper end and without moving the bar K with which its upper end is connected. A spiral spring, *p*, connected with the lower member *l* of detent L, holds its hooked portion normally in locking engagement with the lug *h*, as in Fig. 4.

It will be observed from what has been said that if through the running of the time movement the actuating bar K be moved to the right, or in a direction indicated by the arrow in Fig. 2, the detent L will be swung about its pivot so as to disengage its hooked end from beneath the lug *h* of lever *g*. Thereupon lever *g* will swing downward by reason of the pressure exerted upon its short arm by the long arm of lever *f*, in turn moved downward by the arm *d* of the motor, which it controls. This will release the motor H, permitting it to draw inward the rack bar F, which through the central pinion G will cause a like motion of the rack bars F′, F^2 and F^3, but without affecting the draw-rod O of motor I. So long as motor H continues to function properly, motor I remains wound and ready for action, but is held out of operation by its detent M. Should it happen, however, that for any cause motor H fails to function in response to the movement of its detent L and release of its locking levers, the time mechanism continuing to operate, will move actuating bar K farther to the right, causing the pin *q*, which has already been carried to the end of the slot *r*, to engage the end wall of said slot and to swing detent M about its pivot sufficiently to release the lug *h* of the locking lever *g* of motor I. Motor I being thus tripped, its draw-rod O will be drawn inward and its T-head *j* engaging the stud *i* of rack bar F^2 will move inward said rack bar, and through the central connecting pinion G will impart like motion to the other rack bars F, F′ and F^3. As already explained, the movement of these rack bars acts through the pinions E to turn the annular gear ring C, which in turn rotates the pinions *b* and imparts longitudinal movement to the bolts B.

The failure of motor H to function properly may arise through the weakening of its springs, through one of its springs breaking (it being customary to employ a plurality of springs in such motors), through the bolt work becoming rusty or dirty and offering more than normal resistance, or from other cause. In such case, the primary motor H, while pressing upon and tending to move the rack bar F, may not exert sufficient force unaided to accomplish this result, but when motor I is tripped its power is added to that of motor H, and the two will act together. It is intended, however, that motor I shall be of sufficient power to actuate the bolt-work even though motor H break down completely, or from any cause fail to act.

It is desirable that when the secondary motor I is called into action notice be given those in charge of the safe or vault, in order that the cause of its being brought into action may be ascertained and that any necessary repair or adjustment of the primary motor H may be made. To this end and also as a guard against accidental tripping of the secondary motor, I provide a third detent P, carried by a shaft or spindle Q journaled in bearing on the upper side of the secondary motor I, and extending across the top thereof to a point directly over rack bar F^2. The inner or rear end of the shaft Q carries a pinion R, which meshing with said rack bar F^2, imparts motion to shaft Q and consequently to the detent P carried thereby. The angular position of the detent P upon its shaft is such that when the bar F^2 moves its normal distance inward in retracting the bolt work, the hooked end of the detent P will pass beneath a lug *s* formed on lever *g* of motor I, thus holding up said lever *g* and preventing the motor from being tripped, even though the detent M be withdrawn. If, however, the motor I be brought into action through the tripping of its detent M to retract the bolt work, the movement of detent P will be precisely the same as before, but by reason of lever *g* having been released and having been thrown down, the hooked end of detent P will swing inward directly over the lug *s* of lever *g* of motor I and prevent the re-setting of said motor until the detent P is removed. In this way the attention of the proper person or persons will be directed to the fact that the primary motor H has failed to operate and that the secondary motor I has been called into action, and this notice will be given when the safe is first opened, hence the whole day will be available for repairing or adjusting the primary motor.

Detent P is made fast to a boss or hub on the spindle Q by means of two screws *t*, or in any other convenient way, this means of attachment being adopted to compel the use of a special tool to restore the parts to their normal position, so that the detent may not be simply thrown back manually and as a matter of course, but that its re-setting shall impress itself upon the minds and attention of those in charge of the safe or vault, and thus insure the prompt repair or adjustment of the motor H.

Assuming now that the primary motor has failed for any cause to withdraw the bolts at the proper time, and that the secondary motor has performed this operation, in which event detent P will have swung over lug *s* and locked the parts against resetting, the operation of "setting up" or resetting the mechanism will be as follows: On opening the safe the position of the detent P will at once attract the attention of the person in charge, and show that the primary motor has failed to function. The proper person will then be called upon to examine the motor mechanism and to restore it to working condition. In view of the fact that the detent P will have swung to a position above the stud *s*, and that the parts cannot be restored to position while this relation continues, it becomes necessary to remove the detent P which, under the construction described, is accomplished by withdrawing the screws *t*. When this has been done the parts of the secondary motor may be restored to position by placing the wrench or crank upon the winding arbor *e* of said motor, and turning it in the ordinary way. This will restore the several levers *d*, *f*, *g*, and permit detent M to reëngage stud *h*. The detent P may then be replaced and secured by the screws *t*, preparatory to its operating again in the described manner in case of necessity. The motor H having been cleaned or repaired, as the case may be, is set up by applying the crank or wrench to its winding arbor in the same manner as was done with the secondary motor I.

Having thus described my invention, what I claim is:

1. In combination with the bolt work, primary and secondary bolt-retracting motors, and time mechanism of a safe, vault or like structure; a detent for the primary bolt-retracting motor; a detent for the secondary bolt-retracting motor; connections between the time mechanism and the detents whereby the first is withdrawn at the time for which the mechanism is set, and thereafter the second is withdrawn if the first motor fails to fully retract the bolts; and a locking device actuated simultaneously with the bolt work and serving, in the event that the secondary motor is released, to prevent the resetting of such motor.

2. In combination with bolt work and with time mechanism therefor, primary and secondary bolt-retracting motors H and I; detents L and M for holding said motors out of action; and a bar K connecting said detents with the time mechanism and with

each other, the detent L being made in two parts, one movable independently of the other, and the detent M being connected with bar K by a joint permitting limited movement of the bar independently of the detent, whereby the detent L may be actuated without actuating the detent M, and may be set and reset regardless of said detent M.

3. In combination with bolt work, time mechanism therefor, and bolt-retracting motors; detents for said motors; and connections between the time mechanism and said detents, the detent for the first motor comprising two members *k* and *l*, connected by a pivot pin or joint, one of said parts movable a limited distance relatively to and independently of the other; and a spring serving normally to maintain said members in proper relation to each other.

4. In combination with the bolt-work, primary and secondary bolt-retracting motors, and time mechanism of a safe, vault, or like structure; a detent for the primary bolt-retracting motor; a detent for the secondary bolt-retracting motor; connections between the time mechanism and the detents whereby the first detent is withdrawn at the time for which the mechanism is set, and thereafter the second is withdrawn if the first motor fail fully to retract the bolts; and a removable locking device actuated simultaneously with the bolt-work and serving, in the event that the detent of the secondary motor is stripped, to prevent the resetting of such motor until said locking device is removed.

5. In combination with the bolt-work, primary and secondary bolt-retracting motors, and time mechanism of a safe, detents for said motors; connections between the time mechanism and the detends whereby the detent of the primary motor is withdrawn at the time for which the mechanism is set, and thereafter the detent of the secondary motor is withdrawn if the first motor fail to withdraw the bolts fully; a shaft or arbor geared to a moving member of the bolt-work; and a detent carried by said shaft or arbor and serving to lock the secondary motor against acting if the primary motor fully retract the bolts, and to lock said secondary motor against resetting if it be tripped and caused to operate.

6. In combination with the bolt-work and time mechanism of a safe, vault or like structure, and with motors for retracting said bolts; a bar F^2 constituting a moving member of the bolt-work, provided with gear-teeth; an arbor Q having a pinion R meshing with said teeth; and a locking device P carried by said arbor and adapted to swing to one or the other side of a movable member of the secondary motor and to lock the same in the position in which it stands after the bolts are retracted.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALEXANDER WILSON MARR.

Witnesses:
W. C. FULLER,
H. H. HAMES.

Corrections in Letters Patent No. 891,276.

It is hereby certified that in Letters Patent No. 891,276, granted June 23, 1908, upon the application of Alexander Wilson Marr, of Hamilton, Ohio, for an improvement in "Safes, Vaults, etc.," errors appear in the printed specification requiring correction, as follows: In line 28, page 3, the word "bearing" should read *bearings;* in line 34, page 4, the word "stripped" should read *tripped*, and in line 40, same page, the word "detends" should read *detents;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of July, A. D., 1908.

[SEAL.]

E. B. MOORE,

Commissioner of Patents.