2 Sheets—Sheet 1.

H. GROSS.

Time-Lock.

No. 209,561. **Patented Nov. 5, 1878.**

Fig. 1

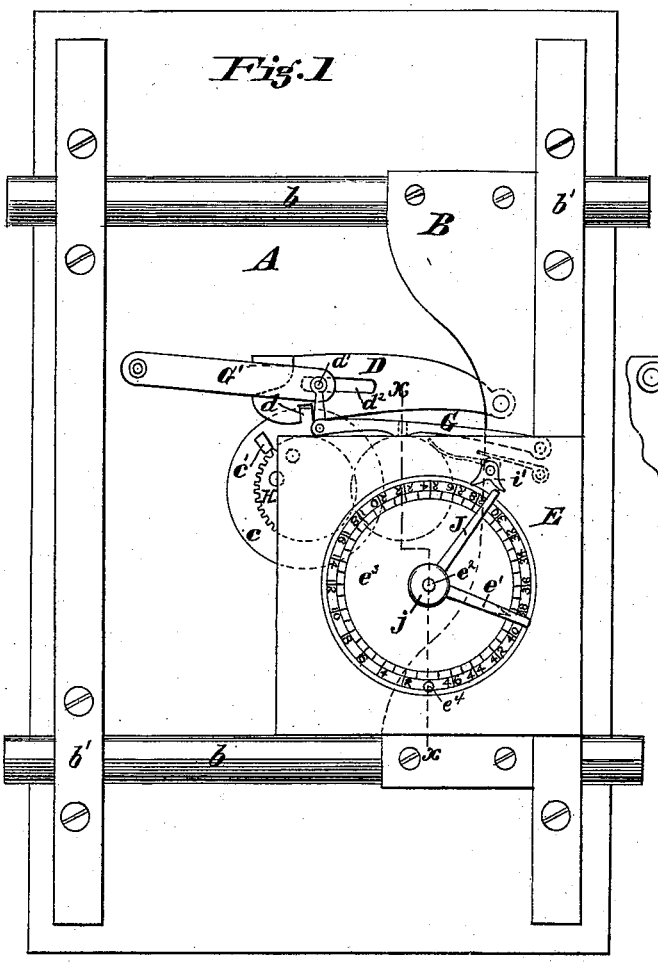


Fig. 2

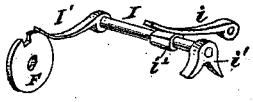


Fig. 3

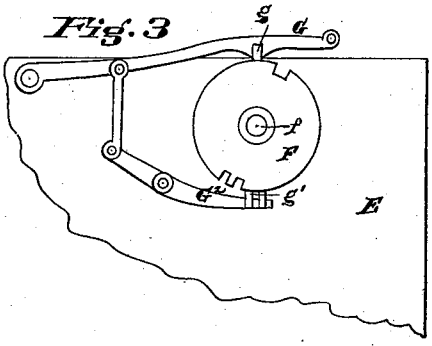
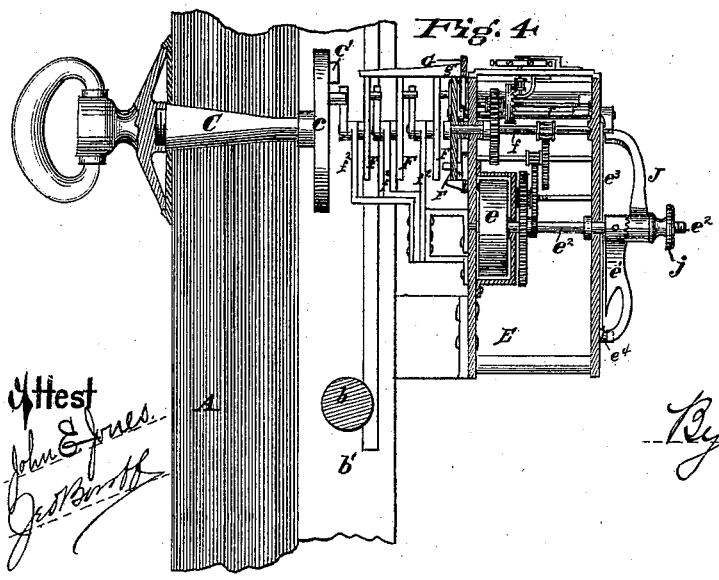


Fig. 4



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2 Sheets—Sheet 2.

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Time-Lock.

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Fig. 5.

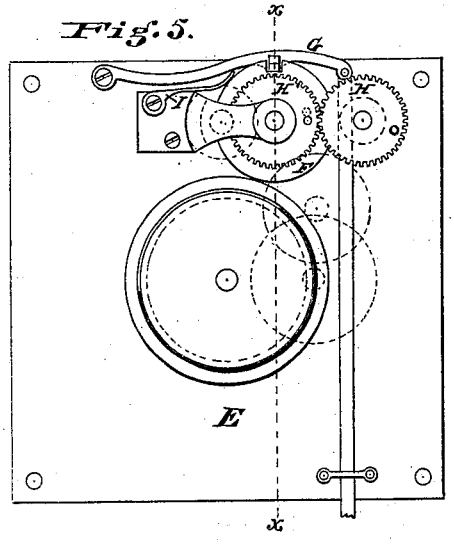

Fig. 6.

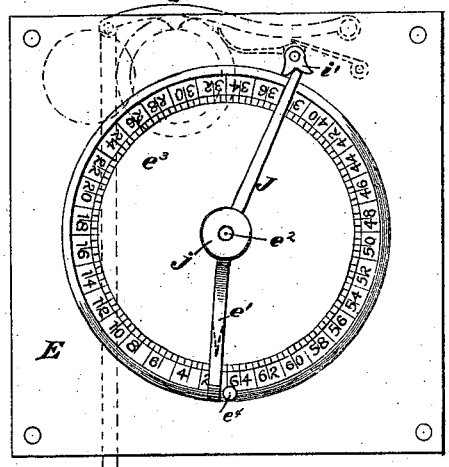

Fig. 7.

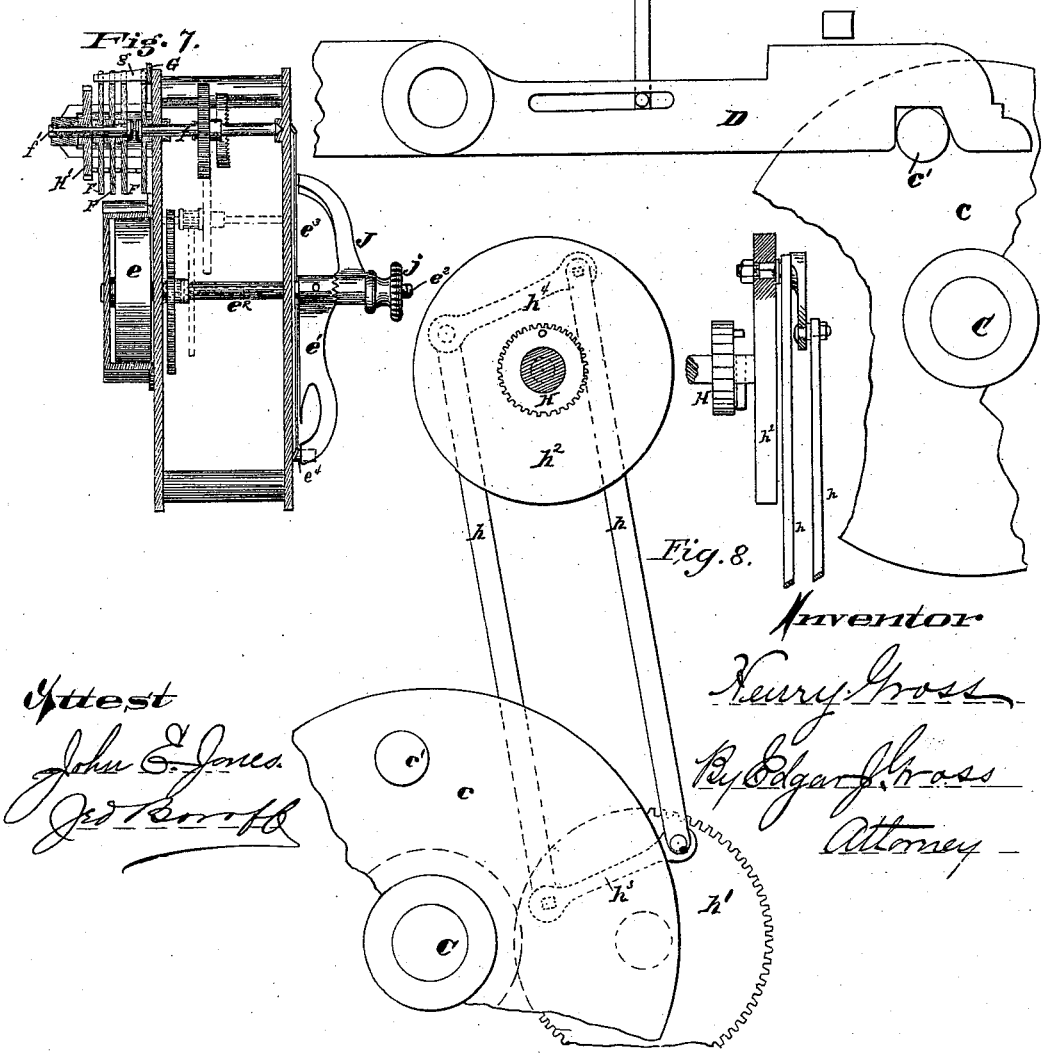

Fig. 8.

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UNITED STATES PATENT OFFICE.

HENRY GROSS, OF CINCINNATI, OHIO.

IMPROVEMENT IN TIME-LOCKS.

Specification forming part of Letters Patent No. **209,561**, dated November 5, 1878; application filed November 2, 1877.

To all whom it may concern:

Be it known that I, HENRY GROSS, of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Safe-Locking Devices, of which the following is a full, clear, and exact description.

This invention relates to that kind of locking devices for safes which consist of train-bolts thrown by the arbor by means of a detachable link, and including a time-movement adapted to maintain the separation of the link from the arbor against all outside manipulation for a determinate time after the closing of the safe.

My invention is applied to locking devices of this character where a separate combination-lock is dispensed with, and where in lieu of it a mere set of permutation-tumblers is introduced between the link and the time-movement, to govern the link as regards its position with reference to the arbor, the last one of the tumblers being adapted to be moved by the time-movement, so that, while all the tumblers are at all times in operative connection with the arbor, it will nevertheless be impossible to set up the combination while the time-movement is running and guarding the door. After the time-movement ceases its guard on the door these permutation-tumblers continue to guard it, for they must all be set up by proper manipulation of the arbor before the link can be connected therewith to throw the train-bolts. They will likewise guard it at any time when the door is locked without starting the time-movement.

The invention consists of certain means for suspending the operation of the time-movement on the permutation-tumbler for any desired time after the movement has been started and the safe-door locked, and for then automatically starting such operation of the time-movement on such tumbler.

It consists, also, of means for neutralizing the pressure of the link and connections on that permutation-tumbler which is at times affected by the time-movement.

In the accompanying drawings, Figure 1 is an elevation of the interior surface of a safe-door provided with my improved locking devices. Fig. 2 is a perspective view of the brake that assists in determining the time when the time-movement shall begin to operate. Fig. 3 is an elevation of the device whereby the pressure of the angle-bar upon the controlling-tumbler is equalized. Fig. 4 is a sectional elevation of the safe-door and locking devices, taken upon the line *x x*, Fig. 1. Fig. 5 is a rear elevation of the time-movement. Fig. 6 is a front view of the same, showing a modified connection with the link that connects the bolt-work with its operating-arbor. Fig. 7 is a sectional elevation of the time-movement, taken on line *x x*, Fig. 5, and minus the devices shown in Fig. 2. Fig. 8 is a modified form of the connection between the bolt-arbor and the permutation-tumblers, whereby the latter may be operated.

The same letters of reference are used in all the figures in the designation of identical parts.

The door A is provided with the usual frame-bars *b' b'*, for supporting the train-bolts *b b*, which are secured together by the connecting-bar B in the ordinary manner. The train-bolts are operated from the exterior of the safe by the arbor C through means of the drive-wheels *c* and a link, D, which is so pivoted to the connecting-bar of the train-bolts that a notch, *d*, in its free end may be engaged by a wrist-pin, *c'*, on said drive-wheel *c*.

A lever, G, pivoted at one end to any fixed point, (in the example shown it is pivoted on the back of the case of the time-movement,) has its other end connected by a rod to the link D, which has a slot, d^2, where the pivot-pin d^1 of said connecting-rod passes through it, to provide for the independent play of the link in throwing the train-bolts.

The connection between the link and the lever G may be steadied by the use of an arm, G^1, pivoted at one end to a fixed point and at the other end to pin d^1, as shown in Fig. 1.

The free end of link D is thus suspended on the lever G, a laterally-projecting arm, *g*, of which rests upon a series of permutation-tumblers, F. When the notches in the tumblers are brought into line under arm *g*, the latter will permit the lever G to descend with the free end of link D, which will then be in position to be engaged by the wrist-pin of drive-wheel *c* of the arbor; but when the tumblers are disarranged the arm *g* rides on their pe-

ripheral edges, lifting lever G and link D so high that the latter cannot be caught by the wrist-pin of said drive-wheel *c*.

The tumblers F are driven from the drive-wheel *c* of the arbor in any preferred manner. Thus in Fig. 4 the axis of the tumblers is in line with the axis of the arbor, and the first tumbler is driven by a pin on the drive-wheel acting on a crank-arm of the journal of said first tumbler, a pin on the back of which acts in turn on a crank-arm of the journal of the second tumbler. In this figure the respective tumblers, excepting the last or controlling tumbler, which is governed by the time-movement, as will be presently explained, are supported in separate bearings f^2.

As shown in Figs. 1, 5, 6, and 7, the drive-wheel operates upon the tumblers through intermediate gear-wheels H and H′.

Fig. 8 exhibits a mechanical movement for imparting, by a gear-wheel on the arbor, a positive rotary motion to a wheel, H, for driving the tumblers at a considerable distance from the arbor, consisting of a gear-wheel, h^1, meshing into the gear-wheel of the arbor, and transmitting its motion by a fixed crank-arm, h^3, through links *h h* and a fixed crank-arm, h^4, on a disk, h^2, to the shaft of wheel H.

To guard the door against surreptitious unlocking for any predeterminate length of time from any given hour, the last tumbler of the series is connected with a time-movement in such a manner that while it may be indiscriminately turned from the arbor at all times, yet so long as the time-movement is running the said tumbler will move in unison with it whenever released from outside pressure or friction, or from resisting strain exerted through the drive-pin of its next adjacent tumbler.

In arranging the tumblers for connecting the link of the train-bolts to the drive-wheel on the arbor, this last tumbler must be set up first; but by reason of the aforesaid connection it cannot, after the time-movement has begun its guarding action and while that is running, be maintained in this set-up position for a time sufficient to set up the other tumblers, for in the very act of setting up the next in the series it will be released from pressure or resistance and at once begin to turn with the time-movement.

In the example shown this last or governing tumbler is mounted upon the shaft *f* of the time-movement, it being frictionally connected thereto, so that the shaft will turn it when unrestrained. At the same time the friction between this tumbler and shaft *f* is not so great but what the time-movement will continue to turn the shaft in the tumbler if the latter is turned by exterior force or held by a resisting strain great enough to overcome the friction between it and its shaft *f*.

The governing tumbler may be made somewhat smaller in diameter than the rest of the tumblers, so that the latter must all be arranged with their respective notches all under arm *g* before this arm can touch the periphery of the controlling-tumbler and press down on it.

If the weight of lever G, with that of the link and other connecting parts, were allowed to rest on the controlling-tumbler, it might put so great a strain on shaft *f* as to stop the time-movement. To guard against such a contingency, I neutralize this pressure on the controlling-tumbler by an equalizing-lever, G^2, pivoted on the case of the time-movement, one end being linked to lever G, while the other end is provided with a lateral arm or arms, *g′*, to reach under the controlling-tumbler. The arrangement is such that the respective arms *g* and *g′* of the levers G and G^2 will simultaneously touch the controlling-tumbler on opposite sides and merely clamp it without subjecting shaft *f* to any strain, that being transferred to the fulcrum-pin of the equalizing-lever G^2. The controlling-tumbler is provided with notches for the reception of the arms *g′* when in proper position.

The time-movement is contained in a case, E. The mainspring *e* drives shaft e^2, to which the hand e^1 is directly secured, so that the whole power of the mainspring drives it. The hand moves over a suitable dial, e^3, at the zero-point of which a fixed stud, e^4, is secured. In setting the time-movement the hand is turned back from the stud e^4 the number of hours it is designed to run. At the lapse of these hours the hand strikes stud e^4, whereby the time-movement is stopped. The time-movement must be set each time on locking the safe-door at the close of each day. It starts to run at once; but it is desirable to suspend its guarding action for some time after the door has been shut. This I accomplish by a spring-brake, I′, acting on the controlling-tumbler with a sufficient friction to overcome the friction between such tumber and the shaft *f*, so as to hold the tumbler at any point to which it may be turned by the arbor, notwithstanding the continued motion of the time-movement. The brake I′ is secured to a shaft, I, the outer end of which carries a double trigger, i^1, through which it is oscillated, to throw the brake on and off by a tripping-finger, J. The hub of this finger has radial teeth, interlocking with similar radial teeth on the hub of hand e^1, in unison with which the tripping-finger moves. The finger is secured to the hand at any desired angle by nut *j*. The shaft I has a many-sided collar, i^2, on which a spring, *i*, presses, to hold it in either position to which it may be turned by finger J. The trigger i^1 points to and is near the dial, so that it is easy to so adjust the finger J with reference thereto that it may trip the trigger at any desired hour after the time-movement has been started and the safe-door locked.

In turning the trigger it will lift brake I′ and relieve the controlling-tumbler, which, if otherwise unrestrained, will at once begin to turn with the time-movement.

The tripping-finger cannot be turned back

past the trigger without turning the latter back to its original position, and thus again applying the brake, so that the daily turning back of the hand in setting the time-movement will ordinarily be accompanied by an automatic application of the brake, and adjustment of the finger J will be required only on days before and after holidays. The finger J should be made to clear stop-pin e^4 on the dial.

The operation of the locking devices described may be briefly summarized as follows: Before locking the safe-door at the close of the day the hand of the time-movement is turned back from the stop-pin e^4 the number of hours that must elapse before the opening of business on the next business-day, care being taken to see that the brake is also applied, and that the tripping-finger J is so placed with reference to trigger i^1 that it will operate it to throw off the brake after the lapse of a determined period of time, beginning with the starting of the time-movement. The door is then closed, the train-bolts are thrown to enter their keepers, and, after the arbor has been turned far enough to disengage the link, it should be whirled several times to disarrange the tumblers, which will then support the lever G and link D in an elevated position, so as to prevent an engagement of the link by the wrist-pin on the drive-wheel of the arbor. While the brake is on the controlling-tumbler any one knowing the combination may still set up all the tumblers, and thereby lower the link, so that it can be caught by the wrist-pin on the drive-wheel of the arbor, and the safe opened; but the moment the brake is thrown off by finger J the controlling-tumbler can no longer be maintained in the set-up position, for the time-movement will turn it immediately on its release from the drive-pin on the next adjacent tumbler, which release necessarily accompanies the act of setting up the latter. The time-movement will thus guard the door until it stops, whether that be by accident before the appointed hour, or at the appointed hour. Whenever such stoppage occurs all the tumblers may again be set up to lower the link by proper manipulation of the arbor, for the controlling-tumbler will then, like the rest, remain in any position to which it may be turned by the arbor. While the time-movement is standing still, as it may during the day, the tumblers are useful in guarding the door when locked against unlocking by unauthorized persons, and serve the purposes, though not possessing the characteristics, of a combination-lock.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, substantially as specified, of one of the set of permutation-tumblers, the time-movement adapted to move such tumbler, a brake to stop the tumbler from turning with the time-movement, and means for automatically throwing the brake off.

2. The combination, substantially as specified, of the time-movement, the permutation-tumbler adapted to be turned thereby, the link-suspension lever, and the equalizing-lever.

In testimony of which invention I hereunto set my hand.

HENRY GROSS.

Witnesses:
EDGAR J. GROSS,
J. L. WARTMANN.