3 Sheets—Sheet 1.

S. M. LILLIE.

Automatic Winding-Mechanism for Time-Locks.

No. 216,797. Patented June 24, 1879.

Fig. 1

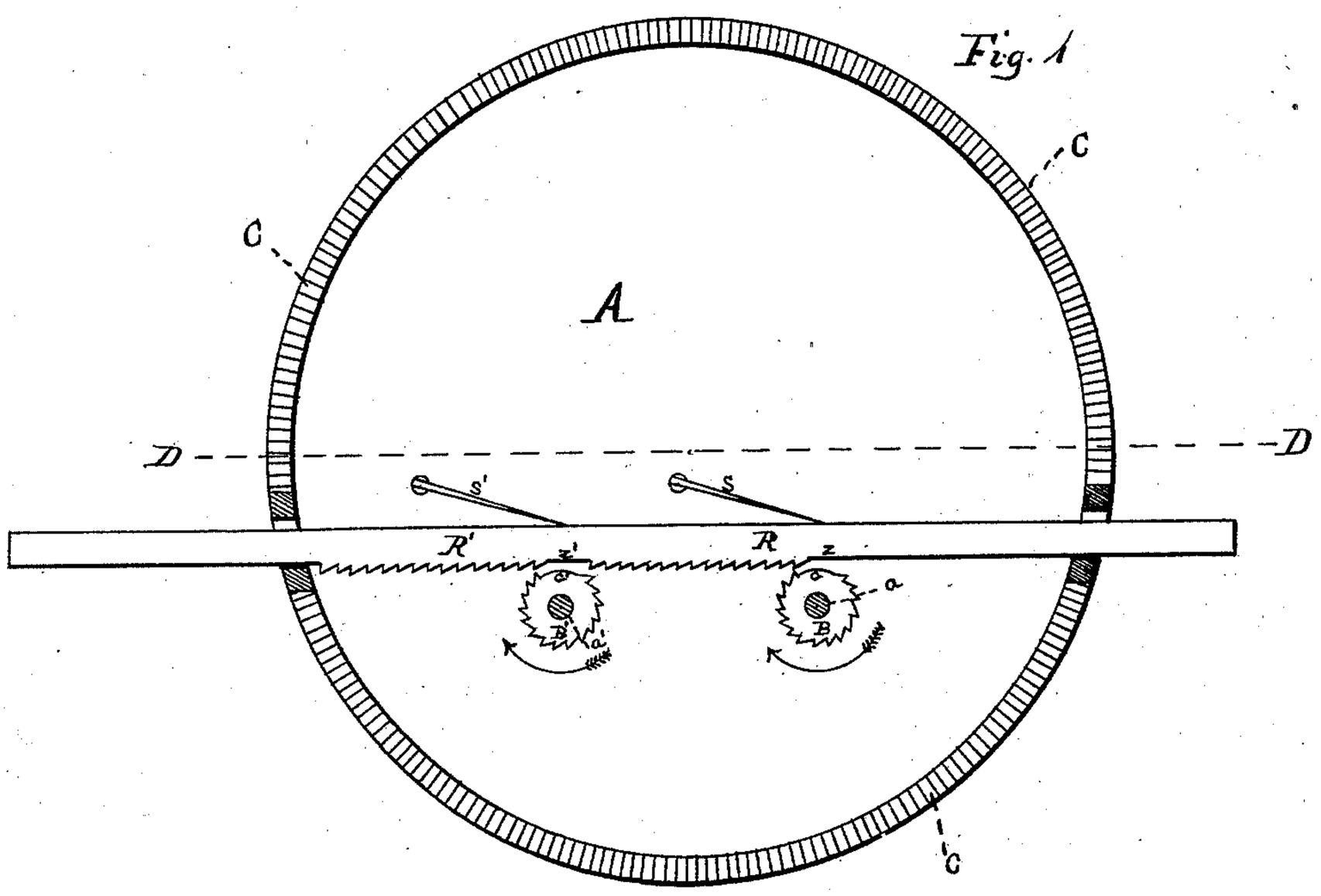
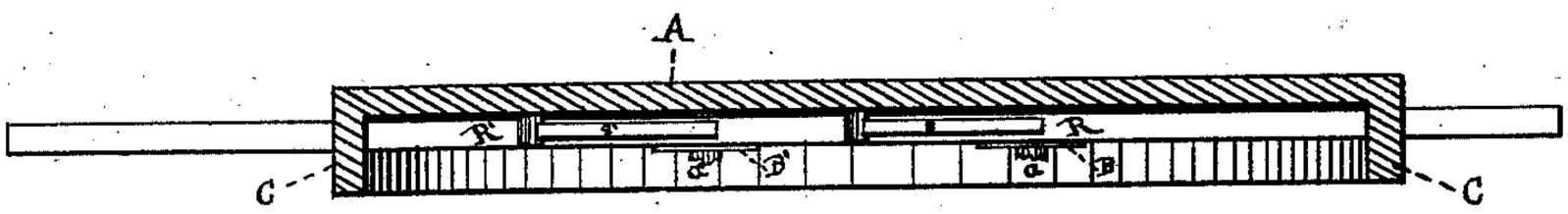


Fig. 2



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Automatic Winding-Mechanism for Time-Locks.

No. 216,797. Patented June 24, 1879.

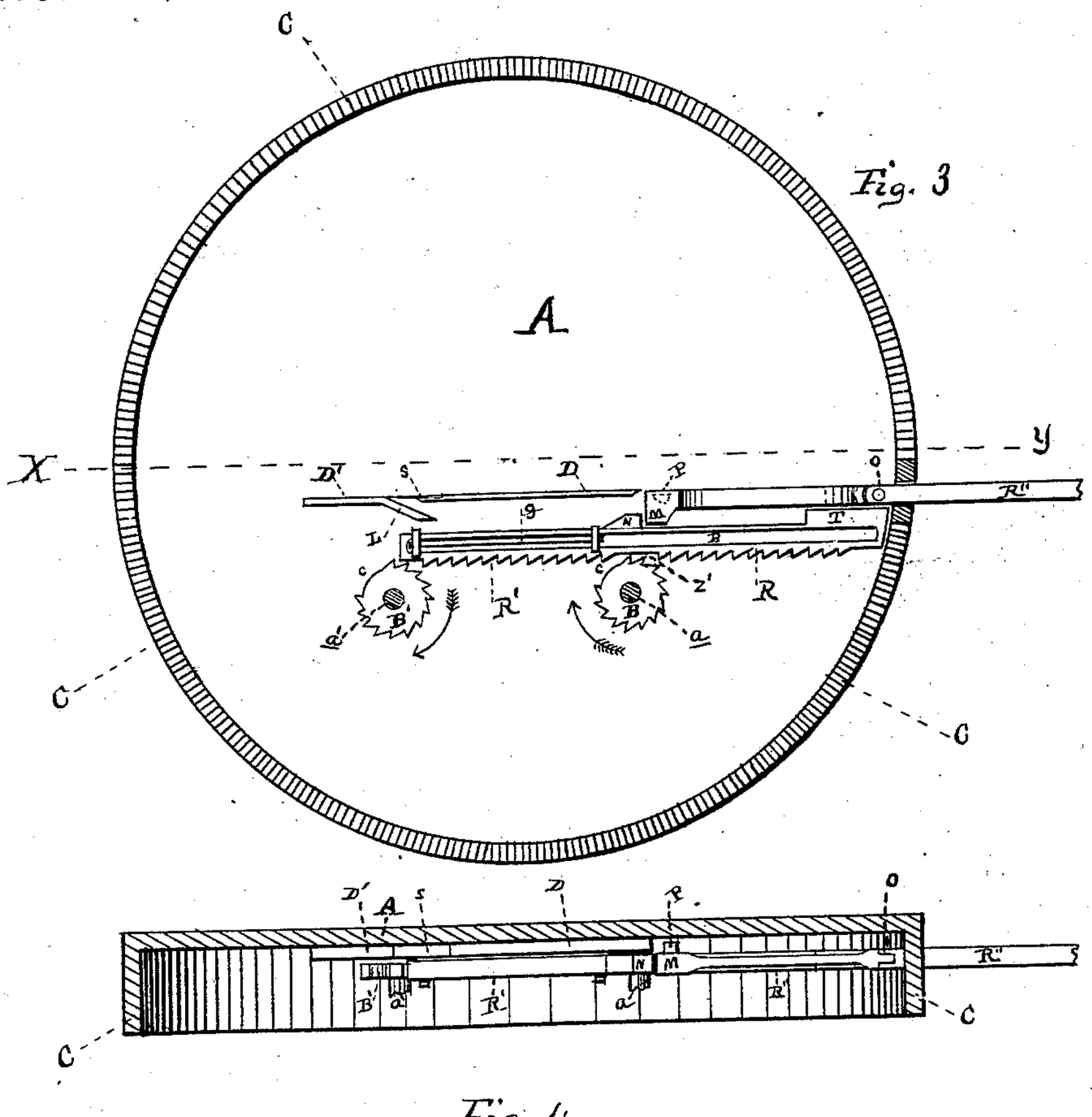

Fig. 3

Fig. 4

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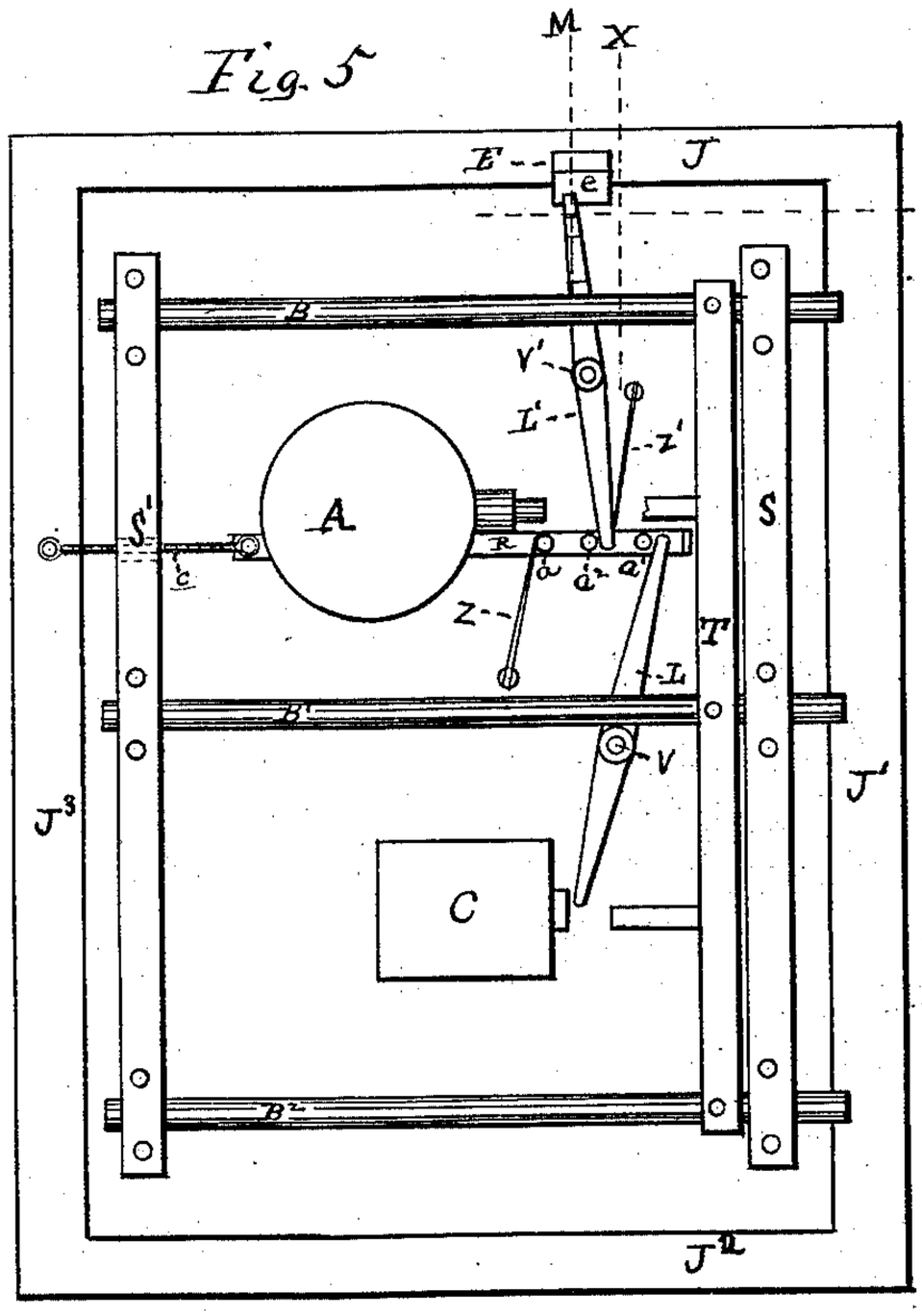
Automatic Winding-Mechanism for Time-Locks.

No. 216,797. **Patented June 24, 1879.**

Fig. 5



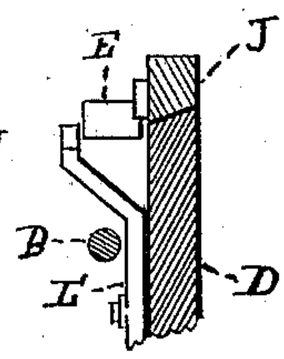


Fig. 6.

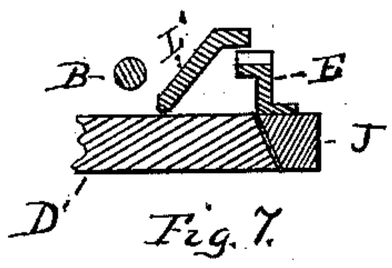


Fig. 7.

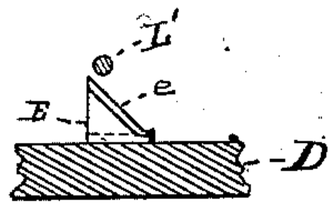


Fig. 8

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S. MORRIS LILLIE, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN AUTOMATIC WINDING MECHANISMS FOR TIME-LOCKS.

Specification forming part of Letters Patent No. **216,797**, dated June 24, 1879; application filed March 15, 1879.

To all whom it may concern:

Be it known that I, S. MORRIS LILLIE, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Time-Locks, of which the following is a specification.

The object of my invention is to do away with the care of winding the movements of a time-lock when in use on a safe, vault, or other door; and it consists in making such a connection between the movements of the time-lock and either one of the jambs of the door, or one of the operating-spindles passing through the door, that in the case of the former the opening of the door will wind the movements, and in the case of the latter it will, in performing its function, whether it be to throw bolts or to operate a lock, also wind the time-movements. Occasionally the operating-spindles pass through the jamb or walls of a safe, in which case, of course, the connection would be made between the time-movements and one of them.

In the drawings accompanying this specification I have only shown parts that are necessary for the understanding of my invention.

Figures 1 and 2 show one arrangement of that portion of my invention that is contained in the lock itself, and which constitutes the winding mechanism. Figs. 3 and 4 show another form of winding mechanism. Fig. 5 shows the back of a safe or vault door having a time-lock provided with my invention upon it, with ways of connecting the winding mechanism of the time-lock with the jambs and with the spindles of the train-bolts and combination-lock. Figs. 6, 7, and 8 are views of detached parts and sections of Fig. 5.

A, Figs. 1 and 2—Fig. 2 being a section of Fig. 1 along the line D D—is the back of the case of the time-lock patented by me August 13, 1878; and C C C is a part of the circular wall of the same, Fig. 1 being a section of the lock made parallel to the back of it. B B′ are two ratchet-wheels on the mainspring-arbors of the two time-movements, *a* being the mainspring-arbor of one movement, and a^1 the mainspring-arbor of the other movement. The mainspring-arbors, and consequently the wheels B B^1, are revolved in the direction of the arrows by the springs in unwinding and at the rate of one revolution in seventy-two hours. A small arc, *c c′*, of each of the wheels B B^1 is blank. Each is about one-sixth the circumference of its wheel, and therefore corresponds to a revolution of about twelve hours.

R R′ is a rack, or rather two racks in one, which works with the ratchet-wheels B B^1. At each end it extends through the walls of the case, which thus act as guides for it, and a connection is made between one of its extremities and one of the jambs of the door on which the lock is, or one of the operating-spindles passing through the door, so that the opening of the door in the former case, or the unlocking and locking of it in the latter case, will impart a reciprocating motion to the rack R R′, all as hereinafter described.

The portion R of the rack works with the wheel B, and the part R′ with the wheel B^1, and, as shown, the teeth on the racks are the same in number as those on the wheels.

Between the racks R R′ is the blank space *z′*, having no teeth, and on the right of the rack R is another blank space, *z*. When the rack is in its extreme position to the left, as shown, these blank spaces are directly over the ratchet-wheels B B^1, and they are consequently free to revolve independently of the rack R R′.

When the wheels B B^1 have their blank spaces up, facing the rack, as shown, the latter may be moved back and forth without any effect upon the wheels. When, however, the wheels B B^1 are in any other position, a motion of the rack from right to left revolves the wheels in the same direction and winds the movements, while a motion of it from left to right has no effect upon the wheels.

When the movements are fully wound the blank arcs *c c′* are up, facing the rack, so it is impossible for the latter to any more than wind the movements, no matter how many times it may be moved back and forth. The springs *s s′* keep the rack pressed down, so that its teeth will engage those of the ratchet-wheels.

The operation of the mechanism is as follows: The lock is placed on the door or jamb of the safe or vault. One end of the rack is connected, we will suppose, with the train-bolts, so that whenever the latter are retracted by their

spindle, to allow of the doors being opened and closed, the rack will be moved to its extreme position toward the left, with the blank spaces *z z'* over the ratchet-wheels, and whenever they are projected they will draw the rack to the extreme right, in which position the rack R' will be clear of the wheel B¹, and the blank space *z'* will be over the wheel B, and both wheels will be free to revolve.

Having thus placed the lock on a safe, the movements are fully wound with a key in the usual manner, which will bring the blank spaces of the ratchet-wheels under the rack. The safe-door is, of course, open, the train-bolts are thrown back, and the rack is in its extreme position toward the left, with its blank spaces *z z'* over the ratchet-wheels, leaving the latter free to revolve and the movements to run.

At the time of closing for the day the safe-door is closed and its bolts projected, which draws the rack to the extreme right, and carries the rack clear of the wheel B¹, and brings the blank space *z'* over the wheel B, and the wheels continue to be free to revolve and the movements to run. The rack remains in this position until the next unlocking of the safe occurs, which would ordinarily be the next morning, supposing it to be a secular day. Allowing this to be the case, by morning the ratchet-wheels will have revolved through a certain arc, say one of twenty-three (23) hours, in the direction of the arrows, and the blank spaces will no longer be up.

On unlocking the safe-door, by throwing back the bolts the rack will be moved toward the left, and will revolve both ratchet-wheels until their blank spaces allow the rack to slip by them, and the movements are thus fully wound again. So each morning, on unlocking the safe-door, the movements would be wound to the extent they had unwound since the last unlocking of the safe or throwing of the bolts the day before.

Every Monday morning the movements would have been running since the last throwing back of the bolts on Saturday—may be forty-eight (48) hours—but still the movements would be fully wound on retracting the bolts, as the ratchet-wheels and rack of the winding mechanism have a winding capacity of sixty (60) hours. Thus, having placed the time-lock on a safe and connected its winding mechanism with one of the operating-spindles of the safe, and having once fully wound its movements with the key, it will run indefinitely without further winding so long as more than sixty (60) hours do not elapse between the two unlockings of the safe-door. Should that occur, however, as when two holidays chance to come together, on opening the safe the movement should be wound with the key, as before.

If the ratchet-wheels were geared to revolve once in, say, ninety hours or ninety-six hours, the winding capacity could be increased so that even two days might pass without the safe being opened, and still not necessitate winding with the key.

It is not necessary that the number of teeth and the throw of the rack should correspond to the same number of hours as do the geared arcs of the ratchet-wheels. A number of teeth and a throw corresponding to thirty-six (36) hours would be sufficient. It would fully wind the movements every morning, saving Monday morning, when the movements might have run down as much as forty-eight (48) hours.

On Monday morning the unlocking of the safe would wind the movements thirty-six hours of the forty-eight, leaving twelve hours unwound. Tuesday morning they would be unwound, say, twenty-four hours more, or a total of thirty-six hours, which would be entirely wound up on unlocking the door.

Figs. 3 and 4, of which Fig. 4 is a section of Fig. 3 along the line *x y*, show another arrangement of my winding mechanism.

The rack R R', Figs. 3 and 4, does not extend through the case of the lock, but is guided in its motion by the guide *g*, which projects from the back of the lock through the slot in the rack. N is a lug on the upper surface of the rack. R'' is a rod extending through the case of the lock, and connected with one of the jambs or with one of the operating-spindles of the safe, so that a reciprocating motion will be given to the rack by the opening of the door, or by the unlocking of the same, as hereinafter more fully described.

The rod R'' has a joint at *o*, so that its end toward the left may be raised. Gravity, or in some cases a spring, tends to keep the portion of the rod on the left of the joint in the position shown.

At the left extremity of the rod is the lug M, projecting down toward the rack R R', which engages with the lug N of the rack when the rack and rod R'' are in the position shown—namely, in their extreme positions toward the right.

On the upper surface of the rack, at its extremity, toward the right, is the raised part T, whose upper surface is on a level with that of the lug *v*.

D, D¹, and L are a system of guides that project from the back of the lock-case, and govern the motion of the rod R'' by means of the pin P, which projects from the back of the lug M.

The ratchet-wheels B B¹ are the same in every particular, and revolve at the same rate, as those in the winding arrangement hereinbefore described.

The face of the rack and its teeth are also the same as in the other arrangement, excepting that the portion R is longer and has more teeth than the portion R'.

The working of this winding mechanism is as follows: As it is shown in the drawings, the ratchet-wheels B¹ B have been revolved by the movements more than two-thirds of a

revolution, and the movements have consequently run down between the fifty and sixty hours, as an entire revolution of the ratchet-wheels would correspond to seventy-two hours. The rack R R′ and rod R″ are in position for winding.

If, now, the rod R″ be moved toward the left by the jamb or operating-spindle, with which it may be connected, the lug M, bearing against the lug N on the rack, will move it also to the left, which, in turn, will revolve the ratchet-wheels and wind the movements.

As the rod R″ is moved toward the left the pin P on the back of it at length reaches and rides upon the incline L of the system of guides projecting from the back of the lock-case.

As the rod continues its motion the incline gradually raises it until its lug M is disengaged from that of the rack. which occurs just as the pin reaches the level guide D¹ and the rack has completed the winding of the movements, or, rather, just as the full throw of the rack is nearly completed and the blank space *s′* of the rack is over the wheel B¹. As the portion R of the rack is longer than that R′, some of its teeth are still above the wheel B, so that as the latter is revolved to the right by the unwinding of the movements its teeth will engage those of the rack and move it to the right, the rack being no longer under the control of the rod R″. While the rack is in its position to the extreme left the raised part T of the rack is partly underneath and partly to the right of the guide D, and consequently, until the movements have run long enough subsequent to winding to move the rack sufficiently to the right to carry the raised part T from under and a short distance to the right of the guide D, no further winding of the movements can occur, for if before then the rod R″ be drawn to the right the lug M will, when its pin P has passed from the guide D, rest upon the raised part T, and will be prevented from engaging with the lug N of the rack until the raised part has been moved sufficiently to the right by the movements to pass from under the lug M. Should the rod R″ be moved to the left before this, the pin P of the lug M will pass back upon the guide D, and so will not engage with the rack R R′ and wind the movements.

The length of time that must elapse after a winding of the movements before they can be wound again will depend upon the length of the raised part T, and can be made to be any number of hours, from one to a limit depending upon the throw of the rack and the rate at which the ratchet-wheels revolve. This arrangement would prevent the springs of the movements being kept always at nearly their utmost tension, as would otherwise be the case where the safe-door was locked and unlocked several times each day.

The wheels B B¹ being ratchet-wheels, and the rack having ratchet-teeth to correspond, prevent the rack binding the wheels together, so that one cannot move without the other moving also. If one movement, and of course its corresponding wheel too, should stop, the other movement would continue running, and its wheel would move the rack toward the left, the teeth of the rack sliding over the teeth of the stopped wheel like so many clicks.

Were the wheels B B¹ spur-wheels and the racks corresponded, there would have to be a rack for each wheel, for a common rack would unite the wheels, so that if one stopped revolving the other one would also have to stop.

It is not necessary that all of the parts of this winding mechanism should be inside of the case of the lock, as shown in Figs. 3 and 4, for the rack R R′ could extend through the walls of the case, as in Figs. 1 and 2, and have the lug N and the raised part T on the section projecting from the case. The guides D, D¹, and L would then be placed on the face of the door, and the rod R″ would work, with reference to the lug N, raised part T, and guides D, D¹, and L, precisely as when those parts were all within the case of the lock.

Nor is it necessary that the ratchet-wheels should be on the mainspring-arbors. They may, on the contrary, be on other arbors which are geared with the mainspring-arbors. In many movements the mainspring-arbor does not revolve as the movements run down, but the "barrel" does, in which case the ratchet-wheels would be attached to or geared with the barrels, and the latter so arranged that they could be revolved contrary to the unwinding direction to wind the springs.

Figs. 5, 6, 7, and 8 show the time-lock on a safe or vault door, and methods of making connections with the train-bolt spindle, combination-lock spindle, and with the jambs of the door, so that in the case of the spindles the unlocking and locking of the door by either of them will wind the movements, and in the case of the jambs the pulling open of the door will wind them.

Referring to Fig. 5, D² is the door, and J, J¹, J², and J³ are the jambs. On the back of the door is the system of train-bolts, consisting of the three bolts B², B³, and B⁴, the tie-bar T, and staple bars *s s′*.

A is the time-lock. C is the combination-lock; and *b* is the bolt of the combination-lock, which is shown in its retracted position, the combination-lock being unlocked.

The train-bolts are thrown by a spindle passing through the door in the usual manner, and the combination-lock is operated and its bolt thrown back and forth by its own spindle passing through the door. Neither of the spindles appears in the drawings.

R, Fig. 5, is the prolongation of the rack of the winding mechanism, as shown in Figs. 1 and 2, or of the rod R″, as shown in Figs. 3 and 4. On its upper surface is the lug *a*, against which bears the spring Z, tending to keep the rod R thrown to the extreme right, in which position its extremity bears against

the tie-bar of the train-bolts, they being in their projected position.

It is evident that when the train-bolts are retracted by their spindle the rod R will be pressed back into the lock, which, as hereinbefore described, will wind the movements, and that on projecting the bolts again by their spindle the rod R will be made to follow after by the spring Z, and the winding mechanism will be in position for a subsequent winding of the movements. Thus a connection is shown between the train-bolt spindle and the time-movements of the time-lock, such that the movements will be wound by the spindle while performing its ordinary function of operating the train-bolts.

On the upper surface of the rod R is a second lug, a^1. Bearing against this from the right is one arm of the lever L, pivoted at V, the extremity of the other arm of which bears against the end of the bolt *b* of the combination-lock C.

When the combination-lock bolt is thrown out by the lock-spindle it vibrates the lever L on its pivot V, causing the end of it in contact with the lug a^1 to press the rod R back into the lock and wind the time-movements. The drawing back of the bolt by the lock-spindle allows the rod R to be thrown out again by the spring Z and place the mechanism in position for a subsequent winding. Thus a connection is shown between the time-movements of the time-lock and the spindle of the combination-lock, by means of which the movements may be wound by the said lock-spindle. Similarly a connection might be made between the movements and any other spindle passing through the door.

I do not wish to limit myself to the particular means shown for connecting the movements with the spindles, as they will vary with the arrangement of the mechanism on the door, and means that might be adapted to one door would not at all answer for some other door.

In Fig. 5 are also shown methods of connecting the movements of the time-lock with the jambs of the safe or vault, in virtue of which the opening of the door will wind the movements.

On the upper surface of the rod R is shown a third lug, a^2, against which bears one end of the lever L′, so that a motion of that end of the lever toward the left will impart a like motion to the rod R. One lug answers the purposes of the two lugs *a* and a^2. (Shown in Fig. 5 of the drawings.) The lever L′ is pivoted at V′, and its other arm extends nearly to the upper edge of the door, and passes underneath the bolt B^2. Immediately above the bolt B^2 this arm bends away from the back of the door some distance, then bends again, and extends parallel to the door. This bending is shown more plainly in Fig. 6, which is a short section of Fig. 5 along the line X, and in Fig. 7, which is a partial section of Fig. 5 along the line M.

Fastened to the face of the jamb J, and extending from the same over the door and beneath the end of the lever L′, is the piece of metal E, which offers an incline, *e*, for the end of the lever L′ to ride upon when the door is pulled open. When the door is closed and the rod R of the winding mechanism is in its extreme position to the right the end of the lever L′ is over the highest portion of the incline *e*, as more plainly shown in Fig. 8, which is a partial section of Fig. 5 along the line N. The lower end of the lever is held against the lug a^2 by the small spring Z′. On opening the door of the safe the upper end of the lever slides down the incline *e*, and in consequence is moved toward the right, causing the other end and the rod R to move to the left and wind the time-movements of the time-lock. Immediately as the end of the lever L′ passes clear of the incline *e* the spring Z reacts and throws the rod R and the lever into the position in which they were before the door was opened.

On closing the door again the upper end of the lever L′ bears against the under side of the incline *e*, and is moved to the left until it passes clear of the left-hand and highest end of the incline, when the small spring Z′, which has been pressed back, reacts and moves the upper end of the lever over the incline *e* and the lower end against the lug a^2, and everything is in position, so that when the door is again opened the movements will be wound, as just described.

The piece E, bearing the incline *e*, can be placed on either of the jambs J, J^1, or J^2, in connection with a lever, L′, substantially as described. If it is placed on the jamb J^1, the lever L′ would more conveniently be an elbow-lever.

The jamb J^3 may be connected with the rear end of the rod R, at *r*, by means of a flexible cord or jointed connecting-rod, *c*, Fig. 5, so that on opening the door the rod R would be pulled to the left and wind the movements of the time-lock, and on again closing the door the spring Z would move the rod to the right, and everything would be in position for a subsequent winding of the time-movements by an opening of the door.

I have thus shown methods of connecting the movements of the time-lock with the various jambs of the safe, so that the opening of the door will effect the winding of the movements.

In Fig. 5, on the single door D^2, are shown connections between the rod R and the spindles of the train-bolts and combination-lock, and between the rod R and the jambs of the door.

It is not likely that more than one of these connections would be made on one safe; but I have shown them all in the one figure in order to avoid a multiplicity of figures, which would be necessitated if one were devoted to the illustration of each connection.

Having thus described my invention, I claim and wish to secure to myself by Letters Patent—

1. The rack R R′, in combination with the wheels B B¹ and the movements of a time-lock, substantially as and for the purpose specified.

2. In a time-lock, the jointed rod R″ and the guides D, D¹, and L, in combination with the rack R R′, substantially as and for the purpose specified.

3. The combination, with the time-movements of a time-lock placed on a safe or vault, of a winding mechanism consisting of the wheels B B¹, and rack R R′, and mechanism connecting the rack with one of the spindles of the safe or vault, through the medium of which the winding mechanism will be operated to wind the time-movements by the said spindle while performing its ordinary functions, substantially as and for the purpose specified.

4. The connection between the winding mechanism of a time-lock on a safe or vault and the combination-lock spindle by means of an oscillating lever and the bolt of the combination-lock, substantially as and for the purpose specified.

5. The winding mechanism of a time-lock, any spindle of the safe or vault on which the lock is placed, and intermediate mechanism connecting the two, operating to wind the time-movements of the lock while the said spindle is performing its ordinary functions, substantially as and for the purpose specified.

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