2 Sheets—Sheet 1.

# S. M. LILLIE.

## Time-Lock.

**No. 206,887.** **Patented Aug. 13, 1878.**

*Fig. 1.*

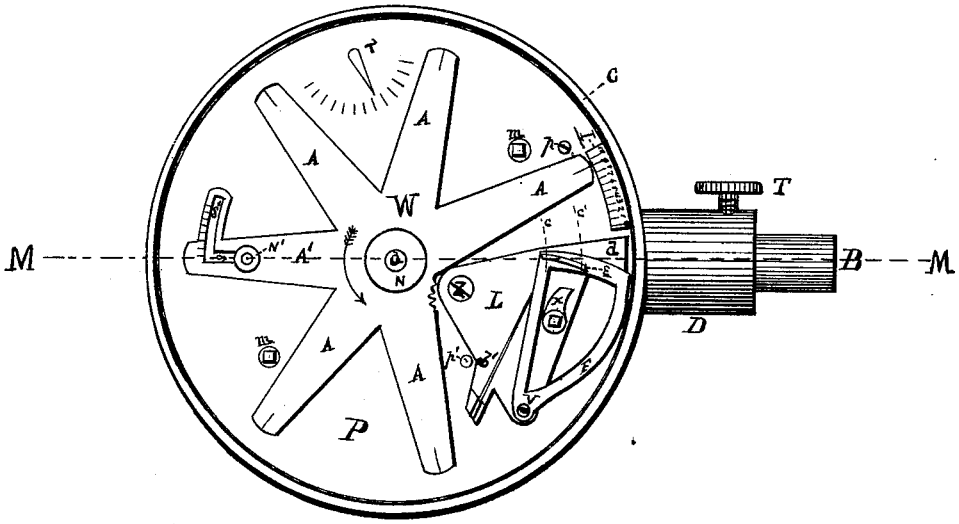



*Fig. 2*

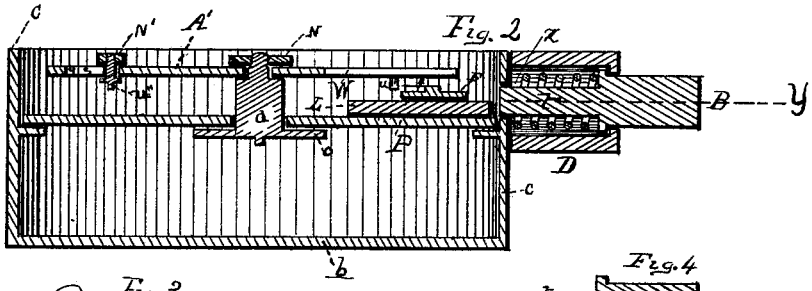



*Fig. 3*

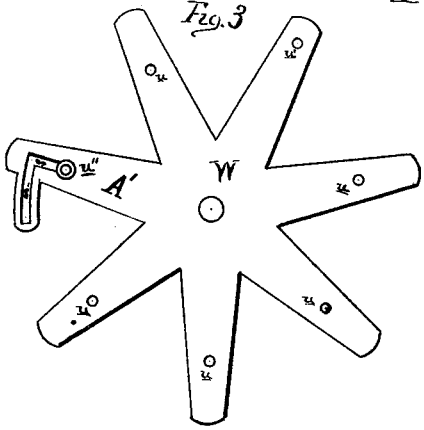
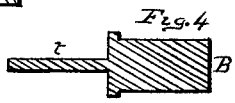



*Fig. 4*




*WITNESSES:*

David Lithgow

J. E. Bodine Jr.

S. Morris Lillie *INVENTOR*

# S. M. LILLIE.
## Time-Lock.

No. 206,887. Patented Aug. 13, 1878.

Fig. 7

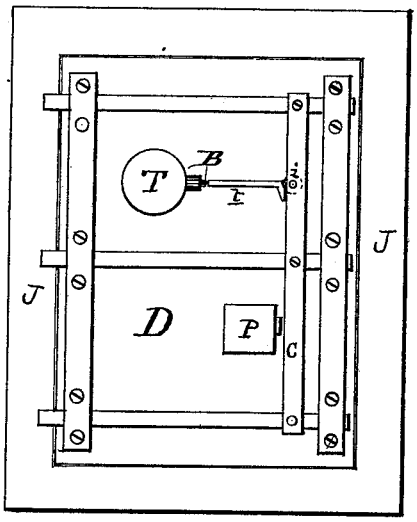



Fig. 6

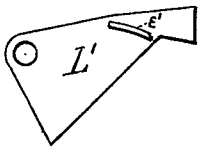
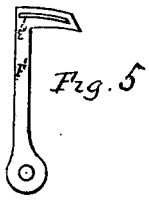



Fig. 5



WITNESSES:

David Lithgow
J. E. Bodine Jr.

S. Morris Lillie INVENTOR

# UNITED STATES PATENT OFFICE.

S. MORRIS LILLIE, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN TIME-LOCKS.

Specification forming part of Letters Patent No. **206,887**, dated August 13, 1878; application filed May 25, 1878.

*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 new and useful Improvements in Time-Locks, of which the following is a specification, reference being had to the accompanying drawings, in which like parts are designated by like letters.

The object of my invention is to devise a time-lock that will afford a reliable protection to the time-movements against dirt and injury, and which will much delay the gradual fouling of them—one that necessarily unlocks for a time each day, but the length of which may be varied, so that it shall be anything from a few minutes to an indefinite period; one that, with respect to its daily locking, may be made by its user to have either of the following functions, viz: First, that, having been unlocked by the time-movements on a secular day not a holiday, it will not lock again until set to do so by the unlocking of the safe-door, and will then lock instantly whenever the safe-door is again locked; second, that, having been unlocked by the time-movements, it will be set by the unlocking of the safe-door—that is, by the throwing back or unlocking of its train-bolts or locking mechanism, so that it will instantly lock whenever they may be again thrown out or locked, and if that is not done before the expiration of a certain time it will then automatically lock itself; third, that, having been unlocked by the time-movements, it will not lock again before a certain time determined by the movements, and will at that time lock automatically, providing the door of the safe is closed and its train-bolts or locking mechanism thrown; fourth, that, when arranged for instantaneous locking, it will have a provision, in virtue of which the safe-door may be closed and locked by its ordinary locking mechanism without being locked by the time-lock; finally, a lock that will allow the safe-door to be kept open indefinitely without any detriment to the lock or trouble to the owner.

My invention consists—

First. In dividing the case of the lock into two compartments by a partition, one of which is accessible after opening the door of the lock-case, and the other of which is only so after opening the door of the case and removing the said partition, the accessible compartment to contain the locking and unlocking mechanism of the lock, and the other to contain the time-movements by which the said mechanism is operated, and the arbors passing through the said partition for winding and regulating purposes, and also for transmitting motion from the time-movements, having dust-tight bearings in the same.

Second. In a clogging device consisting of a pivoted lever having upon and moving with it a cleat; the said lever, when the time-lock is locked, clogging the bolt of the lock, which is pressed back into the lock by the unlocking of the safe-door on which the lock is.

Third. In a wheel consisting of a hub and a number of radiating arms, and arranged to be revolved by the time-movements once in as many days as the wheel has arms, each of the arms of the wheel bearing a movable lug which will, once in as many days as the wheel has arms, engage the cleat on the clogging device and move the latter so as to unlock the lock.

Fourth. In such a disposition of the clogging device, in connection with the bolt of the time-lock, that when the latter is pressed back into the lock by the unlocking of the safe-door on which the lock is, the lock having first unlocked, it will move the movable cleat of the clogging device so that it will be disengaged from the lug with which it may have been in contact, and by which it had been moved so as to no longer clog the lock-bolt, in consequence of which the clogging device will immediately move back and clog the lock-bolt on the withdrawal of the same by the locking of the safe-door.

Fifth. In a stop-pin suitably arranged, so that if the time-lock bolt is not pressed back before the expiration of a certain time after the lock has unlocked, so as to disengage the movable cleat from the lug with which it may be in contact, the clogging device will be stopped by the said stop-pin, and, consequently, also the operating-wheel bearing the arms and lugs, and will be kept stopped with the lock unlocked until such time as the lock-bolt is pressed back and the movable cleat is

thereby disengaged from the lug with which it may have been in contact, after which the operating-wheel will be allowed to continue its motion, and the clogging will be free to immediately clog the bolt after its withdrawal.

Sixth. In a suitable apparatus arranged in connection with the time-lock bolt so that, if desired, the safe-door may be closed and locked without withdrawing the said bolt from the lock, in consequence of which the lock cannot lock.

Seventh. In a detached movable cleat, and a detached clogging-lever having a fixed cleat, by the former of which the arrangement of the clogging device may be varied, and by the latter of which it may be replaced so that the operation of the lock may be varied, as hereinafter described.

In the drawings, Figure 1 represents the lock with the door or cover removed to show the interior. Fig. 2 is a section through Fig. 1 along the broken line M M. The remaining figures represent detached parts.

The case of the lock is, as shown, a circular box. Its form, however, is not material. It might be a rectangular box. The bottom or back, *b*, Fig. 2, forms one casting of metal with the sides C of the case. The top or front of the case is a door by means of which access may be had to the interior of the lock. This door does not appear in the drawing. Part way between the top and the bottom of the case the latter is divided by the plate P, Figs. 1 and 2, which is parallel to the bottom *b*, into two compartments, one above the plate and one below it. The circumference of the plate P has a perfectly dust-tight bearing on all sides against the walls C C of the case. The time-movements, which are not shown, as it is not essential to the description of my invention that they should be, are located in the compartment below the plate, and all the locking and unlocking mechanism is placed above and is accessible on opening the door of the case. The mainspring-arbors *m m*, Fig. 1, of the movements extend through and appear above the plate P for winding purposes, but have dust-tight bearings in the plate.

Another arbor or shaft passes from the regulator of the movements dust-tight through the plate, and is furnished above it with the pointer *r*, Fig. 1, by which the rate of the movements may be regulated as desired. Through the center of the plate P passes also dust-tight the shaft *a*, Figs. 1 and 2, which gears, by means of the gear-wheel *o*, Fig. 2, with and is revolved by the time-movements below, and actuates the mechanism above the plate. Thus, in a lock so constructed, the plate P "will afford a reliable protection to the time-movements against dirt and injury, and will much delay the gradual fouling of them." Above the plate P the shaft *a* bears the wheel W, which consists of a hub and seven radiating arms, A A, which are equally distant from each other, and divide the circumference of the wheel into seven equal arcs. In Fig. 1, one of these arms is broken away to show the mechanism underneath it.

The wheel W, Figs. 1 and 2, is supported by a shoulder on the shaft *a*, formed by turning the upper portion of the shaft to a smaller diameter than that of the lower portion. This smaller section of the shaft *a* forms the arbor of the wheel W, on which it rests loosely and free to turn until bound to it, as follows: Above the wheel W the shaft *a* is threaded, and on it is the nut N, Figs. 1 and 2. By screwing the nut N tightly against the wheel W, the latter is firmly bound between it and the shoulder on the shaft, and consequently is revolved by the shaft *a* at the same rate at which it is itself revolved by the time-movements beneath the plate P. When the nut N is loosened the wheel W may be turned independently of the shaft *a*, and consequently of the movements, to any position wished, and then set to the shaft by tightening the nut N. The shaft *a* is so geared with the time-movements that it, and hence the wheel W, is revolved by them in the direction of the arrow, Fig. 1, one revolution in just seven days, (one hundred and sixty-eight hours,) and therefore each of the arcs into which the circumference of the wheel W is divided by the seven arms A A is an arc through which the wheel revolves in twenty-four hours. Hence, if one arm, in virtue of its motion, performs a certain work at one moment to-day—as, for example, the unlocking of the lock—the next arm will, if the conditions are the same, perform the same work at the same moment to-morrow, and the next arm to that will, the day after to-morrow, and so on until the same moment one week from to-day, when one cycle will have been completed, and the first arm will be about to perform the work for the second time; and so, if desired, this same work will be performed at this same moment day after day and week after week, with no other attention than the winding of the movements, and the movements designed to be used in this lock require winding but once a week. It is the function of the wheel W to unlock or move each day the clogging device of the time-lock, so that the door of the safe or vault on which it may be, may be no longer locked by it.

B, Figs. 1, 2, and 4, is the bolt of the time-lock, arranged in the support D, in which it is capable of a motion toward and away from the center of the lock.

Fig. 4 is a section of the bolt in Fig. 2, along the broken line Y.

The bolt B is kept thrown out—that is, away from the center of the lock—by a spiral spring in the cylindrical chamber in the support D, through which chamber the bolt passes, or rather its tongue *t*, Fig. 2. The spiral spring in the chamber in D surrounds the tongue, and bears at one end against the shoulder on the bolt B formed by the juncture of the tongue and the cylindrical portion of the bolt, and at the other end against the case C of the lock. The case of the lock has a slit or open-

ing in it, through which the tongue *t* may pass.

If a pressure is exerted against the end of the bolt B it is moved toward the center of the lock, the tongue passes through the lock-case just above the plate P, and the spiral spring is compressed. On the removal of the pressure the spiral spring reacts, and throws out the bolt into the position shown.

The lock is so placed on a safe-door with respect to the train-bolts or locking mechanism of the door that the unlocking of the latter necessarily presses the tongue of the bolt B back into the case of the lock, and the locking of the same allows the bolt B to be thrown out again.

If the bolt is clogged, so that it cannot be pressed back, the door of the safe cannot be opened. The lock contains a device, which effects such a clogging of the bolt B, and which has such relations with the wheel W, that it is moved by the latter from behind the bolt, or unlocked, each morning, and locks again in one of the several ways mentioned in the statement of the objects of my invention. Several clogging devices, or parts with which to vary the working of the clogging device, accompany each lock, by the use of one or the other of which in the lock it may be made to lock in either of the ways desired.

I will first describe the clogging device, which, having been unlocked by the wheel W, will not lock again until set to do so by the unlocking of the safe-door, and which will then lock instantly whenever the latter is locked. It is shown in Fig. 1, and in section in Fig. 2. It consists of the lever L, which is pivoted to the plate by a screw-pivot at Z, a point between, and, more conveniently, a little below, the center of the lock and the bolt B. It moves freely around this pivot over an arc limited by the two stop-pins *p p'*. When resting against the lower pin, *p'*, it clogs the bolt B, so that it cannot be pressed back by means of the projection or part *d*, which then extends nearly to the inner circumference of the lock-case, and is directly back of the tongue *t* of the bolt B. The projection or part *d* presents but a small surface to the tongue of the bolt, and the revolving of the lever L over but a small arc toward the stop-pin *p* carries it from behind the bolt B, and the latter is then free to be pressed back. It is only when the lever L rests against the pin *p'*, or before it has been revolved through the small arc above mentioned, that the part *d* clogs the bolt B.

The lever L bears upon its upper surface the arm F, which is pivoted to it at V by a screw-pivot. The spring *b'* keeps the arm F pressed against the eccentric *x*, which is also on the upper surface of the lever L and within the frame or skeleton of the arm F.

By turning the eccentric *x* more or less to the left, which may be done with the key used for winding the time-movements, the arm F may be pressed back a greater or less distance toward the pivot *z*, and there fixed as far as any motion away from *z* is concerned. The arm F has upon its upper surface the curved cleat *e*, the curve of which is an arc of a circle whose center is that of the pivot V.

The way in which this clogging device is operated by the wheel W is explained by the following: There are two arrangements of the arms of the wheel W for this purpose, one of which is shown by the arm A', Figs. 1, 2, and 3, and the other by the arms A A, &c., Figs. 1, 2, and 3, and the arms of the wheel W are all either like the arm A' or like the arms A A. The latter arrangement I will describe first, and as follows: Projecting from the under side of each arm A A is a fixed lug, *u*, Figs. 2 and 3. These lugs, as the wheel W revolves, engage the cleat *e* on the arm F, and, with one exception, are all at such a distance from the center of the wheel W as to engage the cleat *e* on the dotted arc *c*, Fig. 1. The remaining lug, *u'*, Fig. 3, is at such a distance from the center as to engage the cleat on the dotted arc *c'*, which crosses the cleat very near its extremity farthest from the center of the lock; indeed, the lug *u'* barely engages the cleat *e*. After one of the lugs *u* has engaged the cleat *e*, the continued revolution of the wheel W raises the lever L and carries its projection *d* from behind the bolt B, which is then no longer blocked by the clogging device. In consequence of the wheel W and the lever L not revolving around the same center, the lug, as the wheel revolves and the lever L is lifted, gradually approaches the other end of the cleat, until finally, when the upper edge of the lever L has reached the stop-pin *p*, the lug *u* will have nearly reached the other end of the cleat, and would be disengaged from the latter by a small additional revolution of the wheel W and the lever L. This, however, the pin *p* prevents by stopping the motion of the lever L, and, in consequence of the lug not being disengaged from the cleat *e*, it also stops the wheel W, and the lever L is held stationary, with the lock unlocked, between the pin *p* and the lug which is in contact with the cleat, and will remain so until the bolt B is pressed back, which frees the cleat from the lug, as hereinafter described, and allows the wheel W to continue its motion.

The tongue *t* of the bolt B of the lock is so broad, measured in the direction of the depth of the lock, that when pressed back into the lock it presses against and moves back the arm F, and consequently also the cleat *e*. The curve of the edge of the arm F which is presented to the end of the tongue *t* is such that into whatever position the lever L may have been moved by one of the lugs of the wheel W, providing it has been moved far enough to no longer clog the bolt B, the pressing back of the bolt B to the full extent will press back the arm F and cleat *e* so far that the latter will be disengaged from the lug with

which it may have been in contact, and the wheel W will revolve independently of the lever L, the latter remaining stationary.

The curve of the cleat *e*, as before stated, is the arc of a circle whose center is at V. This insures the cleat moving freely along the lug, as it is pressed back by the bolt B, and at the same time its preserving its contact with the lug, so that, when disengaged from it, a very slight further revolution of the wheel W would prevent a re-engagement of the two if the cleat *e* and arm F were allowed to be moved forward by the spring *b*, by the throwing out of the bolt B. This is further facilitated by making the cleat *e* thin and pointed at its extremity. It might be well to have the cleat formed of a strip of spring-steel, fastened to the face of the arm F where the dotted arc *e* cuts the cleat *e*, and, when in its normal position, a little more inclined toward the pivot V than the cleat *e* is. Then, whenever the arm F is pressed back by the bolt B, this spring-cleat would be slightly raised from its normal position, and, on passing from the lug with which it was in contact, would spring back, so that it would not engage the lug again, even though the bolt B was immediately allowed to spring out. The effect of all this is that the pressing back of the bolt B, at any time after the projection *d* of the lever L has been moved from behind it, disengages the cleat *e* from the lug with which it may be in contact, and that, consequently, whenever the bolt B is allowed to spring out again, the lever L, no longer held by the lug of the wheel W, falls by its own weight, and instantly clogs or locks the bolt B; and that, finally, if the bolt B is not pressed back before the lever L is brought in contact with the stop-pin *p*, which will require some ten hours or more, the movement of the wheel W will be stopped, and the lock will remain unlocked until such time as the bolt B is pressed back, by which the cleat will be disengaged from the lug of the wheel W, the latter will continue its motion, and the lever L will fall and instantly clog the bolt B, whenever the latter may be allowed to spring out again, be it in one hour or be it in ten. The falling of the lever L may be assured by a spring pressing against its upper edge in the same manner as the spring *b'* presses against the rear edge of the arm F.

As hereinbefore mentioned, the lug *u'*, Fig. 3, of one of the arms A is at such a distance from the center of the wheel W that it engages the cleat on the dotted arc *c'*, Fig. 1. When the lug *u'* engages the cleat *e* the lever L is moved by the revolution of the wheel W, and the projection *d* is carried from behind the bolt B, and the latter may be pressed back. The lug *u'*, however, engages the cleat so near its extremity that after the expiration of a few minutes from the time at which the bolt B is just free to be pressed back, the motions of the wheel W and the lever L will disengage the lug from the cleat, and the lever L will fall, and again clog the bolt B, unless the latter has been pressed back in the interim. When the lock is on a safe-door the wheel W is always set so that the arm bearing the lug *u'* shall correspond to Sunday, and the effect is that each Sunday the lock is unlocked for a few minutes, during which the safe-door may be opened, and, having been opened, may be kept so indefinitely; but after the expiration of that time it cannot be opened, for, as before stated in this specification, "the lock is so placed on a safe-door, with respect to its train-bolts or locking mechanism, that the unlocking of the latter necessarily presses the bolt B back into the lock, and the locking of the same allows the bolt B to be thrown out again." By turning the eccentric *x*, Fig. 1, to the left, the lock may be made to thus unlock, temporarily, any secular holiday, and the time during which the lock will remain unlocked will depend upon how far the eccentric is turned. Thus, if turned so that the arm F, and consequently the cleat *e*, is pressed back to the fullest extent possible, it will remain unlocked for a few minutes only, viz., the same as on Sundays. If turned not so far, it will remain unlocked longer, for, in the first case, the lug would engage the cleat on the dotted arc *c'*, and in the other somewhere between the dotted arcs *c* and *c'*.

It is evident that until the eccentric *x* is turned back to its original position the lock will continue to unlock temporarily day after day, so that, after a holiday or a succession of holidays, it is neccessary that some one should be on hand the next day to open the safe while the time-lock is unlocked, after which the eccentric may be turned back to its original position, as shown in Fig. 1, and the lock placed in a condition to perform its ordinary functions.

Thus, by the above-described arrangement of the dogging device of the lock, in connection with the wheel W and the bolt B, I accomplish one of the objects of my invention, which, as stated at the commencement of this specification, is "that, having been unlocked on a secular day not a holiday, by the time movements, it (the lock) will not lock again until set to do so by the unlocking of the safe-door, and will then lock instantly whenever the safe-door is again locked."

By removing the stop-pin *p*, which can be easily done with a screw-driver, as it is a machine-screw, the dogging device will be no longer stopped when being moved by the wheel W even though the bolt B be not pressed back before a certain time, but the motion of the wheel and of the lever L will continue, and finally the cleat *e* will become disengaged from the lug with which it may be in contact, the lever L will fall and clog the bolt B, and the wheel W will continue to revolve. If the bolt B is pressed back at any time before the cleat is automatically disengaged from the lug, it

will set the clogging device for instantaneous locking, as before described.

Thus, by removing the stop-pin *p*, the lock will be made to function so as to accomplish another of the objects of my invention, viz., "that, having been unlocked by the time-movements, it will be set by the unlocking of the safe-door—that is, by the throwing back or unlocking of its train-bolts or locking mechanism, so that it will instantly lock whenever they may be again thrown out or locked, and if that is not done before the expiration of a certain time it will then automatically lock itself." By removing the screw-pivot V, Fig. 1, and substituting for the arm F the arm F′, Fig. 5, bearing the cleat *e″* and replacing the pivot, the stop-pin *p* being also removed, the pressing back of the bolt B will be prevented from setting the dogging device for instantaneous locking on the withdrawal of the bolt, and the lock will be able to lock only when, by the revolution of the wheel W, the cleat becomes disengaged from the lug by which the dogging device has been moved from behind the bolt B, and then it will fall and lock—that is, clog the bolt B, provided the latter is not pressed back into the lock. Sundays the lock will be only unlocked for a few minutes. The eccentric *x* will answer the same purpose hereinbefore described, viz., of causing the lock to be unlocked temporarily on secular days.

Thus, by substituting for the arm F, Fig. 1, the arm F′, Fig. 5, which accompanies the lock for the purpose, the lock is made to accomplish another object of my invention, viz., "that, having been unlocked by the time movements, it will not lock again before a certain time determined by the movements, and will at that time lock automatically, providing the door of the safe is closed and its train-bolts or locking mechanism locked."

I will now describe the other arrangement of the wheel W, namely, that in which each of the arms is arranged as the arm A′, Figs. 1, 2, and 3. With the wheel thus arranged the eccentric *x* is not used, for the lugs of the arms are movable and adjustable in a radial direction, as hereinafter described, and, consequently, by properly setting a lug, it may be made to engage the cleat *e* at any point desired, and the eccentric *x* is superfluous. With this wheel the lug is set to produce the desired result, while, with the wheel having fixed lugs, the cleat is set for the purpose by the eccentric *x*.

The following is a description of the arm A′, Figs. 1, 2, and 3, and consequently of all the arms of the wheel W as thus arranged: The arm A′ has a radial slot, *s*, the end of which farthest from the center joins with a curved slot, *s′*, of the same cross-section as the slot *s*, concentric with the wheel W, and branching from the arm in a direction contrary to that in which the wheel revolves. The lug *w″*, Figs. 2 and 3, of the arm A′ extends through the slot, and is movable within the limits of the radial and curved slots. The portion of the lug protruding above the arm is threaded, and bears the nut N′, Figs. 1 and 2. Beneath, and bearing against the under surface of the arm, it has a shoulder. The section of the lug between the shoulder below the arm and the threaded portion above has a square cross-section, so that the lug cannot turn in the slots but can be moved along and be passed from the radial to the curved slot, or vice versa. By screwing down the nut N′ tightly against the surface of the arm the lug is bound in the position in which it may be at the time, and by loosening the same the lug is free to be moved to any position desired. The radial slot is so situated in the arm A′ that when the lug is moved as far as it can be toward the center, it will be in the same position as the fixed lugs on the secular-day arms of the wheel W, arranged as previously described; and when it is moved to the opposite extremity of the radial slot it will be in the same position as the lug on the Sunday-arm of the other wheel, viz., the lug *w′*, Fig. 3, and it would only unlock the lock temporarily for a few minutes and at the usual unlocking hour. If, now, the lug be moved along the curved slot, this temporary unlocking will be deferred in proportion to the distance that the lug is moved away from the radial slot, so that, instead of the unlocking occurring at the usual hour of unlocking, it may, by properly setting the lug in the curved slot, be made to occur at any time in the morning or afternoon within the limits of the curved slot.

With a wheel having each of its arms arranged as the arm A′ the operation is as follows: The lugs of six of the arms are set at the inner ends of their radial slots, and the lug of the remaining, or seventh day, is set at the outer end of its slot, or somewhere in the curved slot. The wheel is then set by loosening the nut N, which binds it, and turning it to the desired position and again tightening the nut, so that the seventh arm shall correspond to Sunday, and consequently the other six to the secular days of the week; and it is also set so that the lock will unlock on the secular days at the desired hour, say, 8 a. m. Then, without any other attention than winding the movements once a week, the lock will unlock each secular day at 8 a. m., indefinitely, and will lock again at a time and in a manner depending upon which arrangement of the clogging device is used, precisely as described for the wheel with fixed lugs, with the exception that the eccentric *x* is not used, and it will be unlocked each Sunday, for a few minutes at a time, depending upon the position of the lug in the curved slot of the Sunday-arm. On the occurrence of a secular holiday the lock may be caused to remain locked over it by moving the lug of the arm corresponding to that day to the outer extremity of the radial slot, and setting it in the curved slot to correspond to the time at which it is desired to have the temporary unlocking

occur. Thus, supposing the secular holiday to occur on Thursday, and that it is wished that the lock shall be unlocked for a few minutes, commencing at 12 o'clock, noon—that is, four hours after the usual unlocking hour, 8 a. m—at any time before closing the safe-door for the night on Wednesday, the lug of the Thursday-arm is moved to the outer extremity of the radial slot and along the curved slot four divisions, each of which corresponds to an hour. Then Thursday the lock will remain locked excepting for a few minutes, commencing at 12 o'clock, noon. Should anything occur before noon, Thursday, that would render it desirable to have access to the contents of the safe, such access may be had by being on hand at 12 o'clock, noon, or within a few minutes thereafter. By moving one or more lugs to the outer extremities of their respective radial slots the lock may be made to remain locked over one, two, or more consecutive secular days.

After a holiday the lug must be moved back to the inner end of the radial slot, in order that on the recurrence of that day the lock may not remain locked. The temporary unlocking on a Sunday or holiday may be made to be of any length desired, by setting the lug of that day's arm in the proper position in the radial slot. The unlocking would, of course, occur at the usual hour in the morning.

The branches that bear the curved slots $s'$ could be readily made movable in a radial direction on their respective arms, so that the lugs could be set not only in position radially, but also at any distance from the arm within the limits of the curved slot, and consequently the temporary unlocking could be caused to be of any duration, and to commence at any desired time after the usual hour of unlocking.

The wheel W, arranged with the movable lugs, works in connection with the clogging devices precisely as described for the wheel arranged with the fixed lugs, excepting that the cleat $c$ is never set by the eccentric $x$, the lugs being set instead, which answers the same purpose. Nor is the arm F', Fig. 5, which, when the wheel with the fixed lugs is used, is, for a certain purpose hereinbefore described, substituted for the arm F, Fig. 1, of any use, as it is only used in order that the cleat $c''$ may be movable and able to be set by the eccentric $x$, so that when the wheel with movable lugs is to be used to effect the same results, namely, the locking as well as the unlocking of the lock automatically, with no setting for instantaneous locking by the bolt B, a movable cleat is not necessary, and a lever, L', Fig. 6, with a fixed cleat, $c'$, may be substituted for the lever L and movable cleat, Fig. 1, by unscrewing the pivot Z, removing the lever L, and replacing it by the lever L', Fig. 6. The lever L' can also be used with the wheel with fixed lugs, in which case the lock could not be set to remain locked over a secular day, except by setting the wheel W so that the Sunday-arm would correspond to that day.

It is plain from the foregoing description of the lock that it may be kept unlocked—that is, the bolt B may be kept pressed back indefinitely—without any harm to or disarrangement of the lock, and consequently the safe on which the lock is may be kept open indefinitely without any detriment to the lock or trouble to its user. The wheel W may be set so that the daily unlockings shall occur at the hour desired, by means of the graduated arc I, Fig. 1, and the marks or pointers on the upper surface of the arms. The divisions of the arc I each correspond to one hour's motion of the wheel W, and the arc is so placed that when the pointer of an arm coincides with the division marked zero (0) on the arc the lock has just been unlocked by that arm; when it coincides with the division marked 1 the lock has been unlocked one hour; when with the division marked 2 it has been unlocked two hours; when with 3, three hours; with 5, five hours. In short, the number of the division to which the indicator of the arm points is the number of hours during which the lock has been unlocked. Hence, for example, if the lock is being set at 2 o'clock in the afternoon on Thursday, and it is wished to set the wheel so that the lock shall unlock each day at 8 a. m., the wheel W is set so that the indicator or mark of the Thursday-arm shall coincide with the sixth division of the graduated arc, for 2 p. m. is six hours after 8 a. m., and the wheel W will then be in just the position it would have been in had it unlocked the lock that morning at 8 o'clock, and it will follow that the lock will unlock each morning at 8 o'clock, day after day, indefinitely.

It is sometimes wished to shut a safe for a time during the day, and lock it with the combination-lock, with the privilege of opening it again later in the day. This, however, could not be done in the case of a safe-door having this time-lock upon it, arranged with the instantaneous clogging device, consisting of the lever L and arm F, as shown in Fig. 1, without some special provision for preventing the locking of the time-lock on the closing and locking of the safe-door. Such a provision is the thumb or set screw T, Fig. 1, on the support D, which, when screwed down, protrudes into the interior of the latter. If, when the bolt B is pressed back into the lock, and the clogging device of the lock is thereby set for instantaneous locking, as hereinbefore described, the set-screw T be screwed down until it presses tightly against the surface of the bolt B, it will hold the latter so that it can no longer be thrown out by the spiral spring in D, and the door of the safe may be closed, and the train-bolts thrown out and locked by the combination-lock without the locking of the time-lock, for the latter cannot occur until after the bolt B has been thrown out by the spring in D. Hence, if it is wished to close and lock a safe-door with the train-bolts or

locking mechanism and the combination-lock, with the privilege of opening it again later in the day, it is only necessary, before closing the door, to give the set-screw T a few turns, which will bind the bolt B, and the door may be closed and locked by the combination-lock without being so by the time-lock. On opening the door again the set-screw must be loosened, in order that on closing the door for the night it may be locked by the time-lock.

Thus, another object of my invention is accomplished, viz., "that, when arranged for instantaneous locking, it (the lock) will have a provision in virtue of which the safe-door may be closed and locked by its ordinary locking mechanism without being locked by the time-lock."

This lock would be of value for express safes or chests which are sent over long routes, and which, after being closed before starting, would not need to be opened before the end of the journey was reached. For this use the wheel could be constructed with a greater number of arms—say, twelve—and connected with movements that would revolve it once in twelve days and that would require to be wound but once in twelve days. One cycle would then consist of twelve days instead of seven, which is the case with a seven-armed wheel, as described. Let it be supposed, for example, that an express-safe provided with such a lock is to be started over a route that will be finished ten days hence at 10 o'clock a. m., if there is no delay. Then, before the safe is closed, the lugs—if the wheel be one with movable lugs—of all the arms up to the one that corresponds to the tenth day are set at the outer extremities of their radial slots. That of the tenth-day arm is set at the inner end of its slot. The wheel is set so that the unlocking-hour is 10 a. m., and the door is closed. The safe cannot then be opened before the tenth day thereafter at 10 a. m., viz., the hour at which the trip of the safe will have been completed.

Fig. 7 of the drawings shows the lock applied to a safe-door. In it D is the back of a safe-door. J J are the jambs. B B B are the bolts of the door, and C is the carrying-bar, by which the bolts are combined to form the train-bolts. The train-bolts are thrown from the outside of the safe by a spindle, in the usual manner. T is the time-lock, and P is the combination-lock.

The train-bolts are represented as thrown back—that is, unlocked—and the time-lock bolt as pressed back into the lock. Consequently the time-lock is set for instantaneous locking.

Extending from the carrying-bar C, and bearing against the end of the time-lock bolt, is the tongue *t*. This tongue is not rigidly fastened to the carrying-bar, but is hinged or pivoted thereto, *i* being the pivot, in order that it may be turned up so as not to bear against the end of the time-lock bolt. The effect of this is, that when the door is unlocked, the train-bolts thrown back, and the bolt of the time-lock pressed back into the lock, all as shown in Fig. 7, by raising the end of the tongue *t*, which bears against the end of the time-lock bolt, the latter is allowed to spring out and be locked. The tongue *t* may then be allowed to rest upon the upper surface of the bolt of the time-lock, and then, whenever the safe-door is shut and the train-bolts are thrown, the tongue *t* will be drawn forward until its end clears the end of the bolt of the time-lock, and will fall back into its normal position—that is, with its end abutting against that of the time-lock bolt, and the train-bolts will be thereby instantly locked. By thus raising the tongue *t* daily all danger of the spring that throws the time-lock bolt losing its stiffness will be removed.

I wish here to make particular mention of what is, I think, one of the peculiarities of this lock, and which I consider an advantageous one. I refer to that provision in it whereby it unlocks, temporarily, for contingencies, each Sunday and holiday over which the lock may have been set to remain locked. Such a provision has, I believe, never been embodied in a time-lock, and, if so, I wish to claim it as my invention.

I claim as my invention—

1. In a time-lock, a plate or partition, P, dividing the case of the lock into two distinct compartments having no inclosed passages between them, one of which, containing the clogging or locking devices and the mechanism by which they are worked, is accessible after opening the door of the time-lock, and the other of which, containing the time-movements, is accessible only after opening the door and removing the plate P, substantially as and for the purpose specified.

2. In a time-lock, a wheel arranged to be revolved by the time-movements, having a number of radiating arms, each bearing a lug movable and adjustable in a radial and curved slot, which lug the revolution of the wheel causes to engage and unlock the locking or clogging device of the lock at stated periods determined by the time-movements and the position of the lug in the slot, substantially as and for the purpose specified.

3. In a time-lock, a clogging device consisting of the lever L, bearing the movable arm F and cleat *e*, and limited in its motion by the stop-pin *p*, in connection with the bolt B and wheel W, having either fixed or movable lugs, so that if the bolt B is not pressed back before a certain time to set the clogging device for locking the wheel W will be stopped and will remain so, keeping the lock unlocked until such time as the bolt B is pressed back, and the dogging device thereby set for locking, substantially as and for the purpose specified.

4. In a time-lock, a clogging device, consisting of the lever L, having upon it the movable arm F bearing the cleat *e*, in connection with the wheel W, having either fixed or movable lugs, and with the bolt B, which, when pressed

back into the lock, disengages the cleat *e* from the lug with which it may be in contact, so that it will lock instantaneously on the withdrawal of the bolt B, substantially as and for the purpose described.

5. In a time-lock, a clogging device consisting of the lever L′ and fixed cleat, in connection with a wheel, W, bearing lugs movable and adjustable in radial and curved slots, by which the clogging device is unlocked and allowed to lock again at stated times determined by the time-movements and the positions of the lugs in the slots, substantially as and for the purpose specified.

6. The thumb-screw T, in connection with the bolt B, and clogging device having the movable arm F and cleat *e*, substantially as and for the purpose specified.

7. In a time-lock, a clogging device arranged to be unlocked periodically by a mechanism operated by the time-movements, and so constructed and arranged in connection with the said mechanism and the bolt of the time-lock, that, having been unlocked by the said mechanism, it cannot lock again until set to do so, this setting being accomplished by the passage of the time-lock bolt back into the case of the lock, which is effected by the unlocking of train-bolts or locking mechanism of the door on which the lock is, substantially as and for the purpose specified.

8. In a time-lock having its locking and unlocking mechanism so constructed that it may be set to remain locked over Sundays and holidays, an arrangement, substantially as herein described, of the said locking and unlocking mechanism, in virtue of which the lock will unlock and remain so during a few minutes, to allow for contingencies, each Sunday and each holiday over which the lock may have been set to remain locked, and in virtue of which it will lock again at the expiration of those few minutes, providing the locking mechanism of the door on which the lock is is not at that time unlocked.

9. The connection between the bolt B of the time-lock and the train-bolts of a safe-door by means of the hinged bar or tongue *t*, whose movable end bears against the end of the bolt of the time-lock, and which, after the throwing back of the train-bolts and the opening of the safe-door, may be raised so as to no longer have such a bearing, whereby the lock-bolt, which was pressed into the lock by the throwing back of the train-bolts, may be allowed to spring out again, after which the said movable end of the tongue may be allowed to rest upon the upper surface of the lock-bolt, so that when the safe-door is closed and the train-bolts again thrown, the tongue will fall back into its original position with its movable end, bearing against the end of the time-lock bolt, and instantly bring the train-bolts under the control of the time-lock, substantially as and for the purpose specified.

S. MORRIS LILLIE.

Witnesses:
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I. B. TEVIS.