(Model.) 2 Sheets—Sheet 1.

M. B. MILLS.

PERMUTATION LOCK.

No. 418,320. Patented Dec. 31, 1889.

Fig. 3.

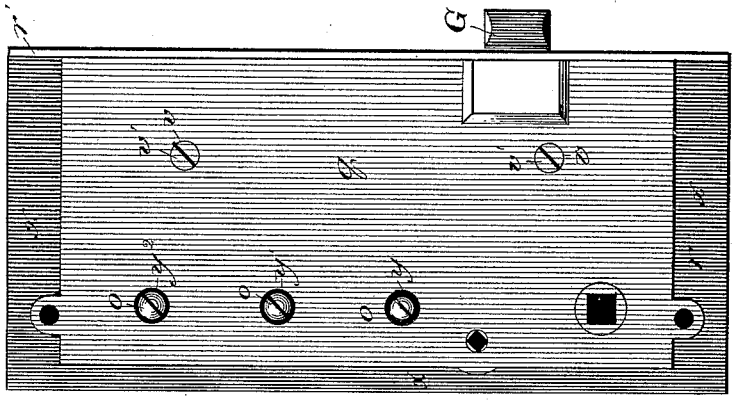


Fig. 2.

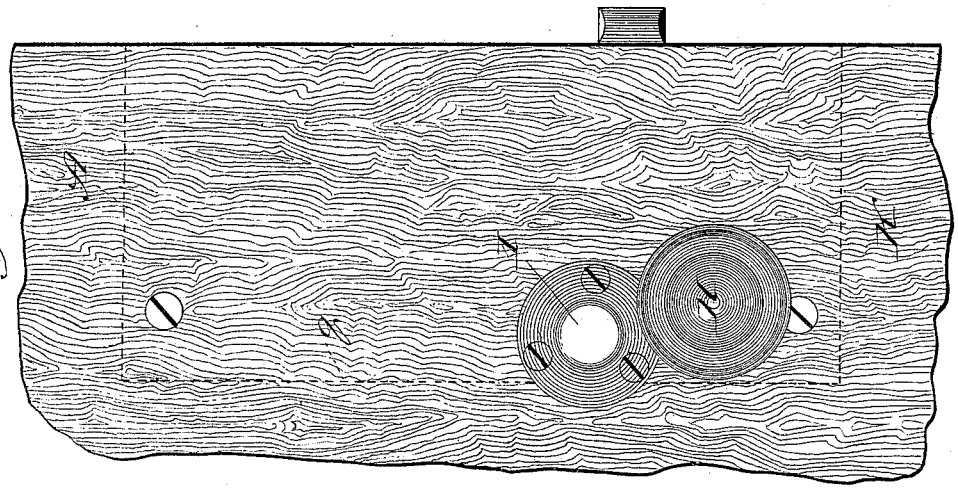
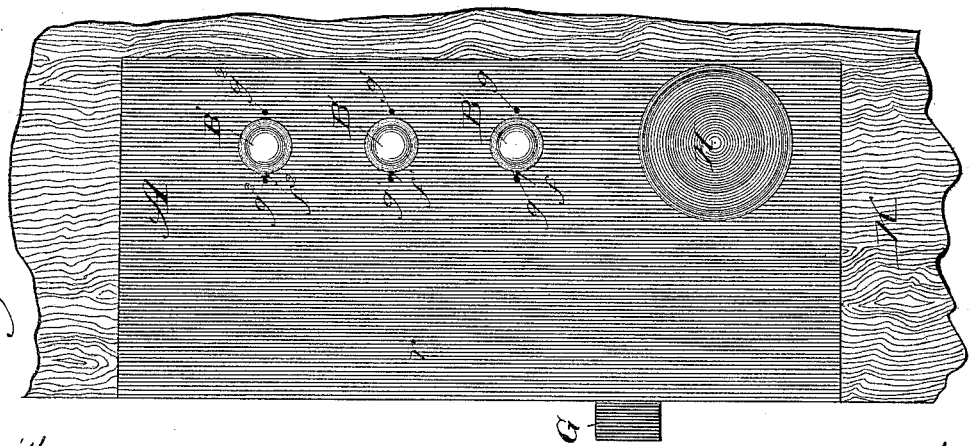


Fig. 1.



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(Model.) 2 Sheets—Sheet 2.

M. B. MILLS.

PERMUTATION LOCK.

No. 418,320. Patented Dec. 31, 1889.

Fig. 4.

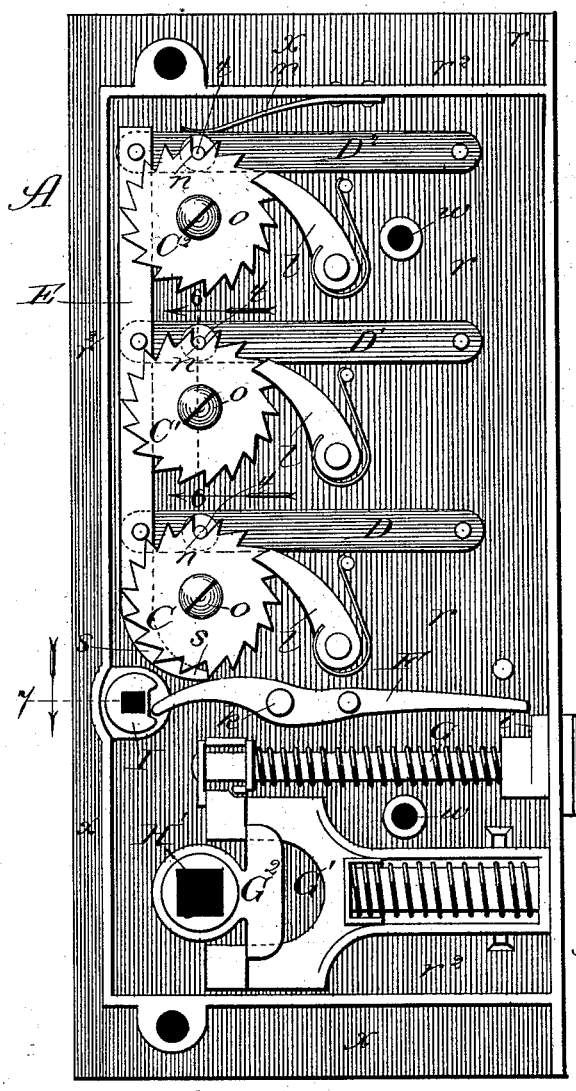


Fig. 5.

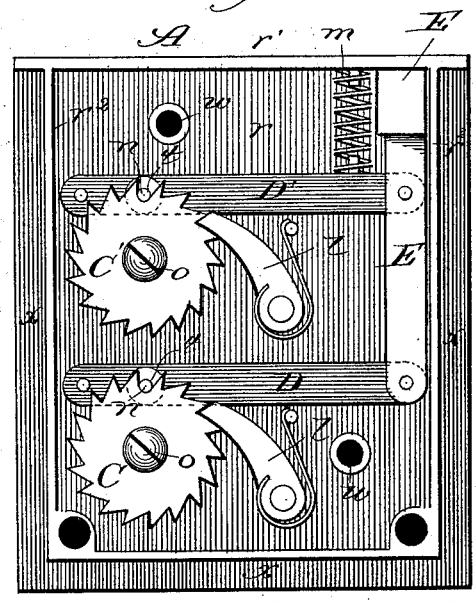


Fig. 6.

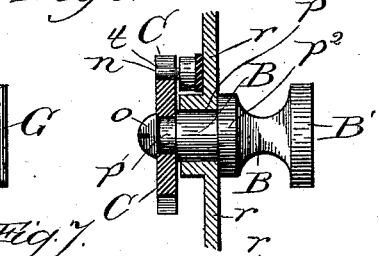
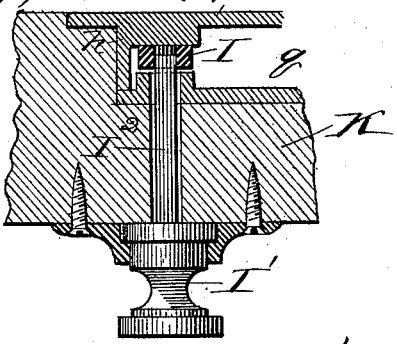


Fig. 7.



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UNITED STATES PATENT OFFICE.

MORTIMER B. MILLS, OF CHICAGO, ILLINOIS.

PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 418,320, dated December 31, 1889.

Application filed February 19, 1889. Serial No. 300,430. (Model.)

To all whom it may concern:

Be it known that I, MORTIMER B. MILLS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Permutation-Locks, of which the following is a specification.

My invention relates to an improvement in the class of lock the construction of which adapts it to be set to a certain combination necessary to be produced in order to permit the bolt to be shot backward to permit opening of the barrier to the inclosure locked by the device.

My improvement may be used for any of the various purposes for which permutation-locks are commonly employed, including the application to safes; but I design it more particularly for use on the doors of houses and rooms, or analogous inclosures in houses, and also, in a somewhat modified form, for desk and other drawers. Inasmuch, therefore, as I have invented my improved device particularly for application to doors, for the sake of convenience, and to avoid prolixity, I confine the description hereinafter contained and the drawings to the device as applied to such doors, and show and describe it also in the form which adapts it for use on drawers.

One object of my invention is to provide a permutation-lock of such simple and readily operative construction that the internal gear-wheels may be formed in the least expensive manner—that is to say, by merely casting them, and without requiring them to be subsequently handled for finishing.

Still another object, particularly in connection with the doors referred to, is to provide novel means for setting the locking mechanism to prevent, when desired, its performing its locking function, even by disturbing the unlocking-combination, and for permitting a door locked by the device to be readily unlocked from the inner side of the door without thereby affecting the combination to which the permutation-lock may have been reduced in disturbing the opening-combination; and it is, finally, my object to provide a generally-improved construction of permutation-locks.

To these ends my invention consists in the general construction of my improved device; and it further consists in details of construction and combinations of parts.

In the accompanying drawings, Figure 1 presents a view in elevation of my improved lock as seen from the outer side of a door, of which a broken portion is shown. Fig. 2 presents the same kind of view as Fig. 1, but taken from the inner side of the door. Fig. 3 shows in elevation a rear view of the lock disconnected from the door. Fig. 4 shows the same view as is presented in Fig. 3, but enlarged and having the covering-plate removed to disclose the internal mechanism. Fig. 5 shows a modified construction to adapt the lock for use particularly on drawers, the view being like that presented in Fig. 4; and Figs. 6 and 7 are sectional views showing details of construction, being taken, respectively, on the lines 6 6 and 7 of Fig. 4.

Referring particularly to Fig. 4, and incidentally to Figs. 1, 2, and 3, A is the case, which should be of metal, and, though it may comprise any other suitable construction than that shown, involves, especially for use of the device on doors, a rectangular face-plate r, having extending at a right angle from one lateral edge a flange r', to be let into the outer edge of a door K, and having on its rear side (being the same beyond which the flange r' extends) sufficiently far from the other three edges of the plate r to leave extensions x thereof, flanges r^2, extending like the flange r', but narrower than the latter, and forming with it and the plate r a housing for the internal mechanism hereinafter described. The housing is closed by a covering-plate q, having openings y in line with each other, and serving to permit access to screws o, with which they coincide, for a purpose hereinafter explained, and openings v, to admit screws v' through the cover into posts w on the inner side of the plate r, and which screws serve to secure the cover in place.

The plate r is provided, near its edge opposite that from which the flange r' extends, with openings p, Fig. 6, flanged on the inner side of the plate in any desired number more than one, though three is the number I provide for the construction shown in Fig. 4, and two for that shown in Fig. 5. Through each opening p is inserted, from the outer side of the plate r, a spindle B, which fits in-

side the flange of the opening, and where it extends beyond the same is reduced in diameter to afford a hub or bearing p', Fig. 6, for a ratchet-wheel, hereinafter described, and in the end of the part p' of the spindle B is formed a threaded opening to receive a screw o, which secures or clamps the ratchet-wheel rigidly in place and causes it to turn by turning the spindle. The spindle is prevented from entering the case farther than is necessary by a flange p^2, beyond which it terminates in a milled head B'.

The ratchet-wheels C (shown in Fig. 4) are three in number, necessitating a spindle B in an opening p for each, the ratchet-wheels having central openings to fit around the hubs p'. The ratchet-wheels may be provided, within proper limits, with any number of teeth, depending upon the number of different combinations desired, which, of course, is further controlled by the number of the wheels employed, which may be two, or as many more than two as desired. As illustrated, I provide eighteen teeth in each wheel, and make the space between two teeth on each wheel somewhat deeper, as shown at t, on the respective wheels C than the spaces between the other teeth.

D, D', and D^2, as illustrated in Fig. 4, are flat bars or arms pivoted near their ends adjacent to the flange r', one above the other, to the plate r and extending therefrom nearly to the opposite flange r^2, where each is pivoted to a bar E, extending across the ratchet-wheels between them and the plate r, and which thus pivotally connect the free ends of the bars D, D', and D^2 together, and the end of the bar E which extends adjacent to the lower ratchet-wheel C should be bent, as shown at s, or otherwise caused to extend over an end of a pivotal dog F, hereinafter described. Pins n project inward, respectively, from the bars D, D', and D^2, into the paths of the teeth of the ratchet-wheels, and if the device be used in a vertical position the gravity of the bar E and bars pivotally connected with it, or if not used in vertical position a spring m, or, in the former case, the spring assisted by gravity, will serve to maintain the pins n in engagement with the teeth of the respective ratchet-wheels, each of which is prevented from being rotated in more than one direction (toward the right) by a suitable spring-dog l.

Adjacent to the lowermost ratchet-wheel C is pivotally supported on the plate r, to extend across the case, the dog F, the pivot being provided at k behind the center of gravity of the dog. Lengthwise of the dog F extends an ordinary form of spring-bolt G, which projects through an opening in the flange r', and engaging with the spring-bolt is an ordinary form of sliding spring-pawl G', which is engaged by the double-acting oscillatory pawl G^2, through which the stems H' of the knobs H extend, so that by turning a knob H in either direction the spring-bolt G will be withdrawn into the casing from its normal position of projecting through the flange r'.

The parts G, G', G^2, H, and H', as thus described, present no features of novelty, being employed in other locks, and are not, as shown to be constructed, essential adjuncts to my improvement; hence I do not describe them more in detail.

On the inner end of the head of the spring-bolt G, on its upper side, I provide a shoulder i, Fig. 4, adjacent to which one end of the dog F extends, and with which the dog, owing to the manner of pivoting it at k, tends normally to engage when the lock is used in the vertical position referred to, whereby the bolt G cannot be withdrawn by the mechanism described for the purpose until the end of the dog has been moved from its engagement with the head of the bolt. If the lock be not used in vertical position, a spring may be employed to produce the desired tendency of the dog F to engage with the bolt G at the shoulder i.

The release may be effected in the manner hereinafter described in explaining the operation of the ratchet-wheels and mechanism connected therewith; and it may also be effected from the inner side of the door by turning against the upper side of the shorter end of the dog F a revoluble cam I, actuated from a handle I', Fig. 7, on a stem I^2, passed through the door K into the cam, which is confined between lugs h and h', respectively, on the opposing or inner faces of the plates r and q. Therefore, when the dog F extends, as it normally does, between the extremities of the cam, as shown in Fig. 4, the bolt G may, if the ratchet-wheels be set to permit, be withdrawn, and also when the end of the dog adjacent to the cam is forced downward by the latter, since thereby the opposite end of the dog is raised from its engagement with the shoulder i on the head of the spring-bolt.

On the outer side of the plate r, adjacent to the respective openings p, are guides g, provided preferably on diametrically-opposite sides of the openings, and in the form of pins or in other form recognizable to the touch, and on the flanges p^2 of the spindles p are guides f, also preferably in the form of laterally-projecting pins, as shown.

The operation of the device, as illustrated in Fig. 4, is as follows: From the foregoing description of the construction it will be understood that when the ratchet-wheels are in such position (as shown) with relation to the pins n on the pivotal arms D, D', and D^2, the pins can enter, respectively, the deeper spaces t, between the teeth of the ratchet-wheels, and the bar E is in its lowest or most advanced position toward the dog F, on the short end of which it bears, thereby moving and holding its opposite end out of engagement with the head of the bolt G, which permits the bolt to be shot back and forth. The aim, therefore, in manipulating the lock

to permit shooting of the bolt is to bring the ratchet-wheels into the positions described, and shown in Fig. 4 of the drawings. After being brought into these positions, if any one of the ratchet-wheels be turned to bring the pin on the adjacent pivotal transverse bar into a space between another pair of teeth, this space, being shallower than that described as the deeper space, will raise the bar E away from the dog F, thereby allowing its longer end to fall or spring into engagement with the shoulder *i*, and thus lock the bolt. The setting of the combination to permit shooting of the bolt G is done with reference to the guides *g* on the outer side of the plate *r* and the guides *f* on the flanges p^2 of the spindles B. If with the pins *n* in the deeper spaces between the teeth of the respective ratchet-wheels the guides *f* on the flanges p^2 be caused to coincide (as they are shown to do) with the guides *g*—say those at the left on Fig. 1—on the plate *r*, whenever the guides are brought into these relative positions the device will unlock, and the operator knowing the combination can without looking and merely by feeling manipulate the knobs B′ to cause the guides to coincide. It is more likely, however, that the combination would be different from that shown and described. Each turn of a knob B′ occasions a clicking sound, produced by each passage of a tooth of a ratchet-wheel beyond the adjacent spring-dog, and also simultaneously a fainter clicking sound, (which, however, is not audible over that produced by the spring-dog,) occasioned by the passage of a ratchet-tooth beyond a pin *n*. Therefore, if the first or lowermost wheel C be set, for example, as shown in Fig. 4—namely, with the pin *n* in the space *t* and the guide *f* coincident with the guide *g*, (on the left,) the second wheel C with the pin *n* in the space *t*, and the guide *f* beyond the guide *g*, (in line with the aforesaid guide *g*,) and such a distance beyond as would be produced by the turning of one tooth of the said wheel C beyond the adjacent pawl *l*, which would be indicated by one click of the pawl after bringing the said guides *f* and *g* coincident, and the third wheel C with the pin *n* in the space *t*, and the guide *f* beyond the guide *g*, (in line with the aforesaid guide *g*,) and such a distance beyond as would be produced by the turning of two teeth of the uppermost wheel C beyond the adjacent pawl *l*, which would be indicated by two clicks of the pawl after bringing the respective guides *f* and *g* coincident—then, to permit shooting of the bolt G by turning the knob H on the outer side of the door, the operator first brings the guide on each flange p^2 of the spindles B coincident with the respectively adjacent guide *g* on the plate *r*, after which he will turn the knob B′ of the middle wheel C one click and that of the uppermost wheel C two clicks. Obviously the combination may be changed *ad libitum* by turning the guide on any or each of the flanges p^2 a certain number of clicks beyond the coincidence thereof with the adjacent guide *g* on the plate *r*, while the pins *n* remain in the deeper spaces *t*. This may be done, on taking the lock off the door without removing the plate *q*, by loosening the screw *o* at the adjacent opening in the cover of the spindle B to be turned, which permits the turning to be accomplished without rotating the respective ratchet-wheel to any desired number of clicks (within the limit of the number of teeth—eighteen—on the ratchet-wheel) beyond the coinciding point of the guide. By providing the guides *g* at diametrically-opposite sides of the openings *p* in the plate *r* the combinations can be arranged for nine teeth on each ratchet-wheel, the manipulator then selecting either the guides at the right or the left of the openings *p* from which to calculate the clicks, after bringing the guides on the flanges p^2 coincident with them.

In using the lock on, say, the entrance-door of a house, entrance is gained as readily in the dark as in the light, by any one having knowledge of the combination, on turning the knobs B′ to bring the guides *f* into coincidence with the guides *g*, then moving the knobs requiring to be moved (if at all) the respective predetermined number of clicks for each, and turning the knob H to shoot the bolt G. On gaining entrance it is desirable that the combination be upset by turning one or more of the knobs B a click, or several clicks, in order that it shall not be open to inspection by any one who might desire to examine and note it. This upsetting of the combination, however, would prevent backward movement of the bolt G, and consequently closing of the door, were it not that the dog F may then be raised by turning the cam I at the knob I′ on the inside of the door, which, when the door has been closed, can be turned back again to permit the dog F to engage with the shoulder *i* on the bolt-head, and thus prevent turning of the handle H. With the door thus locked an inmate of the house, to gain egress, has but to turn the knob I′ to disengage the dog F from the bolt, and then turn the handle H on the inner side of the door to open it; but unless he leave the knob I′ so turned and the door thus unlocked he cannot close the latter without first setting the combination from the outside of the door, after doing which and closing the door he should then upset the combination to effect the locking.

Obviously the cam I and parts serving to operate it need not be provided on the lock if applied to a safe or to a drawer, for which last application the construction illustrated in Fig. 5 is desirable. In this modified form of the device I show the smallest number of the ratchet-wheels that will serve my purpose—namely, two; and I dispense with a pivotal dog F and cam I, with the parts for operating them, and instead of the spring-bolt mechanism shown in Fig. 4 make the

bar E serve the purpose of a spring-bolt by causing its free end to protrude through the flange r', to accomplish which, however, renders it desirable that the bars D and D′ be pivoted to the plate r at their ends near the ratchet-wheels, and extend thence toward the bar E at the opposite side of the case from where it is shown in Fig. 4. In this form of the device the spring m tends to maintain the bolt or bar E normally in unlocked position—that is, not protruding from the case, into which it is retracted when the pins n coincide with the spaces t; but when either wheel C is turned to upset such coincidence the bars D and D′ are lifted beyond the bases of the deeper slots, and thereby shoot the bar E, forming the bolt, out to effect the locking.

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

1. In a permutation-lock, the combination, with the case of rotatory ratchet-wheels, each having a space between two of its teeth deepened, spindles for turning the ratchet-wheels and adjustably connected therewith to permit at will turning of the one independently of the other, pins pivotally supported on the case, one for each ratchet-wheel and engaging with teeth thereof, guides for indicating by their relative positions the starting-points from which to turn the spindles to acquire the combination, dogs engaging with the teeth of the ratchet-wheels and preventing turning thereof in one direction, and a bolt unlocked by the entrance of the said pins into the said deepened spaces between the teeth of the ratchet-wheels and locked by their entrance between other teeth, substantially as described.

2. In a permutation-lock, the combination, with a case A, of rotatory ratchet-wheels C, each having a deepened space t between two of its teeth, spindles B, with which the ratchet-wheels are connected, guides f and g, respectively, on the spindles and case and serving to indicate by their relative positions the starting-points from which to turn the spindles to acquire the combination, pivotal arms D, carrying pins n, normally engaging with the teeth of the ratchet-wheels, a bar E, with which the free ends of the arms D are pivotally connected, and dogs l, engaging with the teeth of the ratchet-wheels, substantially as and for the purpose set forth.

3. In a permutation-lock, the combination, with a case A, of ratchet-wheels C, each having a deepened space t between two of its teeth, spindles B, with which the ratchet-wheels are connected, guides f and g, respectively, on the spindles and case and serving to indicate by their relative positions the starting-points from which to turn the spindles to acquire the combination, pivotal arms D, carrying pins n, normally engaging with the teeth of the ratchet-wheels, a bar E, with which the free ends of the arms D are pivotally connected, dogs l, engaging with the teeth of the ratchet-wheels, a spring-bolt G, means, substantially as described, for actuating the spring-bolt, and a pivotal dog F, extending at one end into the path of the bar E and at its opposite end into engagement with the bolt G, substantially as set forth.

4. In a permutation-lock, the combination, with a case A, of ratchet-wheels C, each having a deepened space t between two of its teeth, spindles B, with which the ratchet-wheels are connected, guides f and g, respectively on the spindles and case and serving to indicate by their relative positions the starting-points from which to turn the spindles to acquire the combination, pivotal arms D, carrying pins n, normally engaging with the teeth of the ratchet-wheels, a bar E, with which the free ends of the arms D are pivotally connected, dogs l, engaging with the teeth of the ratchet-wheels, a spring-bolt G, means, substantially as described, for actuating the spring-bolt, a pivotal dog F, extending at one end into the path of the bar E and at its opposite end into normal engagement with the bolt G, and a cam I adjacent to the rear end of the dog F and provided with means for turning it, substantially as set forth.

5. A permutation-lock comprising, in combination, a case A, having a cover q, provided with apertures y, and containing ratchet-wheels C, each having a deepened space t between two of its teeth, spindles B, extending into the case from the outer side thereof, through the wheels C, and having threaded openings in their ends containing screws o, coinciding with the openings y in the cover and serving to secure the wheels and spindles adjustably together, guides f and g, respectively, on the spindles and outer side of the case, pivotal arms D, carrying pins n, normally engaging with the teeth of the ratchet-wheels, a bar E, pivotally supported on the arms D toward their free ends, dogs l, engaging with the teeth of the ratchet-wheels, a spring-bolt G, having a shoulder i on its head, means, substantially as described, for actuating the spring-bolt, a pivotal dog F, extending at one end into the path of the bar E and at its opposite end into normal engagement with the shoulder i, and a cam I, adjacent to the rear end of the dog F and provided at the inner side of the lock with means for turning it, the whole being constructed and arranged to operate substantially as described.

MORTIMER B. MILLS.

In presence of—
M. J. BOWERS,
J. W. DYRENFORTH.