(No Model.)

J. BOIS.

COMBINATION LOCK.

No. 532,758. Patented Jan. 22, 1895.

FIG. 1

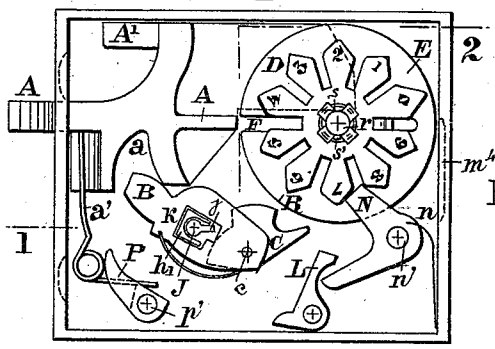


FIG. 6

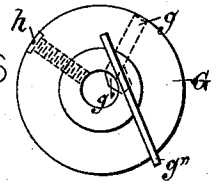


FIG. 5

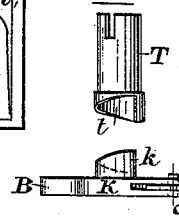


FIG. 7

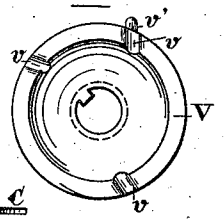


FIG. 2

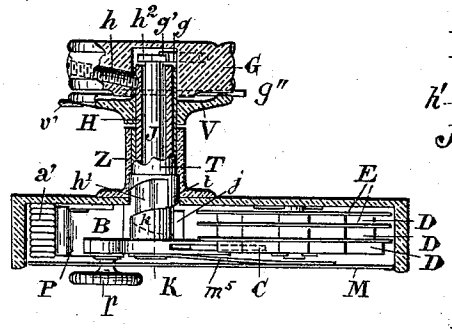


FIG. 8

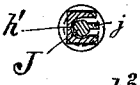


FIG. 10

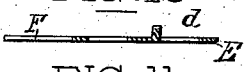
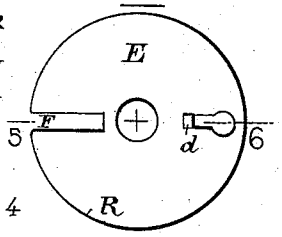


FIG 11



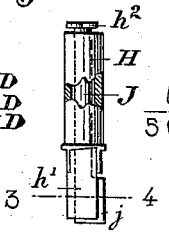


FIG. 3

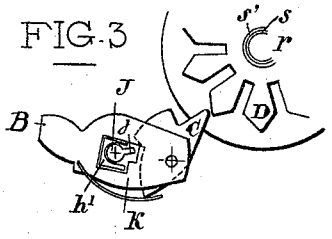


FIG. 4

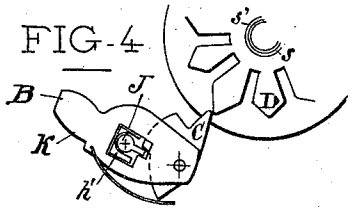
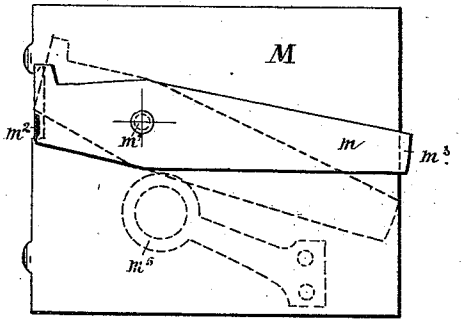


FIG. 9



Witnesses

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Jean Germain

Inventor

Jules Bois

UNITED STATES PATENT OFFICE.

JULES BOIS, OF LYONS, FRANCE, ASSIGNOR TO THE SOCIÉTÉ ANONYME DE LA SERRURE SANS CLEF, OF SAME PLACE.

COMBINATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 532,758, dated January 22, 1895.

Application filed January 9, 1894. Serial No. 496,236. (No model.) Patented in France April 8, 1892, No. 220,761, and in Germany April 25, 1892, No. 68,156.

To all whom it may concern:

Be it known that I, JULES BOIS, notary, a citizen of the Republic of France, residing at 31 Rue de l'Hôtel-de-Ville, Lyons, in the Republic of France, have invented certain new and useful Improvements in Combination-Locks, (for which I have obtained patents in France, No. 220,761, bearing date April 8, 1892, and in Germany, No, 68,136, bearing date April 25, 1892,) of which the following is a specification, reference beng had to the accompanying drawings.

This invention relates to a lock which possesses the double advantage of being a combination lock and requiring no key for opening it. According to the arrangement of the bolt placed either above, below or on the side, this lock may be employed for doors of apartments, desks, portmanteaus, safes and the like.

The improved lock is represented in the accompanying drawings.

Figure 1 shows a front elevation, the rear plate of the lock being supposed to have been removed, and Fig. 2 a sectional plan view on the line 1—2, Fig. 1. Figs. 3 and 4 are partial views in elevation showing some parts in operation. Fig. 5 is a plan of two parts hereinafter described serving to actuate alternately such or such a combination wheel Figs. 6 and 7 represent respectively the knob actuating the lock and the disk by the aid of which the said wheels are successively put in operation. These figures show the two faces of the said parts, the knob and the disk, which are contiguous. Fig. 8 shows and elevation and plan of the arrangement of the rod which, secured to the knob G, actuates the bolt and the various wheels through the intervention of the heel piece B and pawl C. Fig. 9 is an elevation of the closing plate of the lock provided with its catch. Figs. 10 and 11 show an elevation and a section on the line 5 to 6 and a plan of the disks of the wheels hereinafter described.

This lock substantially comprises—

First. The bolt A provided with a notch *a* serving to move it to the rear and consequently open the lock. According to the use to which the lock is to be applied the bolt may also be arranged for hooking in any direction, for example at the top, as also shown at A′.

Second. A knob, Figs. 2 and 6, serving to open the lock. To this knob is fastened by the aid of a key or a screw *h*, a hollow part H, Figs. 1, 2 and 8, which is round at its front extremity and terminates at its rear extremity in a square part *h′*, in the interior of which can oscillate freely a rod J carrying at its front end a part h^2 made in the form of a cam, and at its rear part, for a length approximately equal to the thickness of the wheels, a tongue *j* the object of which will hereinafter be set forth. This knob G is traversed by a pin *g* bearing at *g′* against the cam h^2 and which serves as an indicator, as will be seen in the operation. Against the inner face of this knob is fixed a pin or strip *g″* forming a spring which, engaging successively with notches or cavities formed in the neighboring disk V, Fig. 2, will automatically indicate how much the knob has to be turned in order that its pawl C may come exactly in engagement with such or such a combination wheel. Upon the square *h′* of the part H is mounted, so as to slide freely upon it, a part K terminating on one side in a heel piece B designed, on engaging with the notch *a*, to move the bolt to the rear and overcome the resistance of its spring *a′*. On this part K is articulated at *c*, in the manner of a fork, a pawl C serving to operate successively each of the combination wheels. This pawl, Figs. 1, 3, and 4, is so constructed that it will press and turn by its tongue *j* the rod J and therefore the cam h^2 only when it is disengaged, Fig. 4, from the long tooth with which each wheel is provided. To this part K is attached a tube *k* provided with a helical end the pitch of which corresponds to the total displacement which is rendered necessary in order that the pawl C may come into engagement with all the wheels.

Third. A disk V, Figs. 2 and 7, which serves to displace upon the square *h′* the whole part K and the pawl C so that the latter may actuate such or such a wheel. This disk V is keyed upon a tube T of the shape shown in Fig. 5 which is formed at its rear part so as to correspond exactly to the profile of the tube

k. This tube T, Fig. 2, is arranged in a recess existing on the part Z, and by turning the disk V and consequently the tube T in succession until a complete rotation has been made this tube gradually pushes the piece K to the bottom of the lock, the pawl of the said part being from that moment able to actuate the several wheels. In order to be automatically informed how much the knob has to be turned for the pawl to be moved just to the desired point for actuating such or such a wheel, notches are provided upon the inner face of the disk V which, when the spring g'' engages successively therewith, indicate that such wheel may surely be set in rotation. A small tongue v' secured to this disk serves as a mark for indicating, according to the engagement of the spring g'' with such or such a notch v, which wheel may be actuated at this moment.

Fourth. Star wheels D having a greater or smaller number of teeth, which wheels are mounted each upon a disk E, Figs. 1, 2, 10 and 11, provided each with a recess F. These wheels and disks, the number of which is variable in accordance with the number of combinations which it is desired to have at disposal, are mounted on an axis r, preferably by means of two tubes s, s', engaging with one another with little friction. These tubes s, s', have for their object to facilitate the mounting of one upon the other outside the lock, and in the desired order, of the several disks and star wheels constituting the desired combination which is then mounted directly upon the axis R. To unite each disk with its corresponding wheel in the rotary movement, these disks are provided with a raised part d which takes between two teeth of their wheel. Moreover, each wheel has one tooth of greater length than the others for the purpose of actuating the indicator as will be set forth. On these several teeth is engraved a figure or sign, one of which corresponds to a mark H provided on each disk.

Fifth. Stop pawls N with springs n for each of the wheels D. These several pawls are mounted upon an axis n' carried by the box of the lock.

Sixth. A device L for lowering the stop pawls N, which is moved back when the combinations are to be changed.

Seventh. A stop P which, mounted upon the axis p', is from the outside preferably moved to the left by the aid of the knob p when the combinations are not to be employed and when therefore the bolt of the lock is to serve only as a latch. In this case the said stop P keeps the heel-piece B raised and always engaged with the notch a of the bolt A.

Eighth. The closing plate M on which is mounted at m' a flat catch with rotary action, attaching it to the box of the lock and which can operate only when the bolt is free. For this purpose the catch has a receding part m^2 forming a hook, which taking below the bolt permits the catch to occupy the position indicated in dotted lines, that is to say have its extremity m^3 disengaged from the cavity m^4 in the box of the lock only when the bolt, being moved to the rear, the hook m^2 may pass freely above the beveled part of the bolt. Upon the inner face of this closing plate is mounted a spring m^5 which has for its object to constantly press the part K, and consequently the tube k formed according to a convolution of a screw thread, against the part t, and also to facilitate the outward movement of the plate M when for the purpose of changing the combination the catch is moved from the position indicated in full lines to that indicated in dotted lines.

The mounting of the combinations is effected as follows: Suppose as in the present case that the lock comprises three star wheels D and consequently three disks E, and that it is desired to open the lock by the aid of the number 666. To this end, after having moved out the closing plate M, I disengage the wheels D from their stop pawls N by turning back the part L, which will cause the back movement of the pawl N; then moving the wheels from the lock and their double tube I place upon the outer tube s' the first wheel with its disk so that the figure 6 indicated on one of the teeth of this wheel corresponds to the mark R of the disk. Then I mount on the tube s' successively, each of the following wheels, taking care to arrange them upon their respective disk in such a manner that the figure 6 is also placed in front of the mark on each disk. I then introduce the second tube s into the first tube s', mount the whole of the wheels and disks in the lock, putting the recesses in the disks in correspondence with the bolt (position Fig. 1), then I remove the part L in order to permit the stop pawls N under the action of their springs to engage with their respective wheels. In this position of the disks the lock will be open, for the bolt under the action of the heel piece B can operate, its rear part being able to slide freely in the recesses of the several disks. Having replaced the closing plate and fixed the combination, if it is now desired to open the lock I proceed as follows: In the first place as it is preferable, at the commencement of the operation, to begin actuating the wheel at the bottom of the box, which position corresponds to the complete engagement one against the other of the two profiles in the form of helices of the tubes t and k, I turn the disk V until its mark or tongue v' is put opposite the spring pin g'' of the knob G. Then by the aid of the pawl C of this knob I turn (Fig. 4) this first wheel until the said pawl passing upon the long tooth will, in order to be disengaged therefrom (Fig. 5), bear upon the tongue j and turn the rod J a little, the cam h^2 of which, when acting against the pin g, pushes this pin back against the finger of the operator who from that moment is informed by the pressure that at this moment the pawl has just passed upon the tooth which has to be

taken as a mark for subsequently placing the recess of this wheel in the prolongation of the bolt. From the moment when this indicator has operated, the wheel is turned only six teeth, which figure corresponds to that of the combination, and at this moment the recess F of the said wheel is brought to the desired position for permitting ulteriorly the displacement of the bolt. Then causing the pin g'', by turning the disk V, to pass into the following notch v of the knob the part t will in its movement have pushed back a certain distance the part K and therefore the pawl C so that the latter may now actuate the following wheel. The operator acts in the same manner for this wheel as for the preceding wheel, that is to say he causes to turn again six teeth after having experienced once more the push of the indicator. For actuating the third wheel he displaces the disk as far as the following notch, then turns the said wheel under the same conditions as those before mentioned. All the recesses are then brought into the same horizontal plane, and the bolt can from that moment under the action of the heel piece B pass freely into all of them at the same time, which condition is indispensable for permitting the bolt to slide.

As will be seen, it is sufficient, after having chosen the number of the combination, to mount the wheels upon their respective disks, taking care to put opposite each mark the corresponding figure of the number chosen, then, for opening the lock after the combination has been fixed to turn successively each of the wheels until the push of the indicator is experienced, and from this moment to continue to turn the latter exactly a number of teeth equal to that of the figure placed opposite the mark at the time of the mounting.

This lock is of course susceptible of various modifications in the arrangement, dimensions and details of its parts according as it is employed, either for doors of apartments, or for desks, trunks, safes or the like.

What I claim is—

1. The combination in a lock, of a series of toothed wheels, an operating pawl adapted to engage with and turn said wheels, an indicating tooth provided on each of said wheels, an operating handle for the pawl, an indicator in said handle and means for operatively connecting said indicator to the pawl, substantially as specified.

2. The combination in a lock of a series of toothed wheels, one of the teeth of each wheel having a greater radial projection than the remaining teeth, a pawl adapted to engage with and turn said teeth, an operating handle for said pawl, an indicator adapted to said handle, a rod extending through the shank of the handle and having on one end a cam adapted to engage said indicator and on the opposite end a tongue adapted to be engaged by the said pawl, substantially as specified.

3. The combination of the series of toothed wheels, one tooth of each wheel having greater radial projection than its fellows, a pawl adapted to engage with said teeth, a carrying block to which said pawl is pivoted, an operating handle connected to said carrying block, an indicating pin carried by said handle, a rod extending through the handle and having at one end a tongue adapted to be acted upon by the pawl and at the opposite end a cam adapted to engage with the indicating pin, substantially as specified.

4. The combination of the series of toothed wheels, one of said wheels having greater radial projections than its fellows, a pawl adapted to engage with said teeth, a carrying block to which said pawl is pivoted, a tube forming the hub of said block said tube having at its end a helical cam, an operating handle connected to said block, a sleeve mounted upon the shank of said handle and a disk carried by said sleeve, said sleeve having a cam-shaped end portion adapted to engage with the hub of the block and to move the latter longitudinally upon the shank of the handle, substantiatly as specified.

5. The combination of the series of toothed wheels, a pawl adapted to engage with said teeth, a carrying block to which said pawl is pivoted, a handle, G, a hollow spindle, H, to which said handle is secured and upon which said block is free to move longitudinally, an operating disk V, a sleeve carrying said disk, cams, k and t carried by the block and sleeve respectively whereby on the turning of the disk, V, the block is moved longitudinally upon the hollow spindle, H, substantially as specified.

6. The combination of the series of toothed wheels, a pawl adapted to engage with said teeth, a carrying block to which said pawl is pivoted, a hollow spindle, H, upon which said block is movable longitudinally, a rod, J, extending through said spindle, a tongue, j, on one end of said rod, with which tongue the pawl is adapted to engage, a handle secured to the hollow spindle, a pin extending through said handle and a cam, h^2, mounted upon the opposite end of the rod, J, and adapted to engage with said pin, substantially as specified.

7. The combination of a series of toothed wheels, a pawl adapted to engage therewith, a carrying block to which said pawl is pivoted, a hollow spindle, H, on which said block is free to move longitudinally, a cam, k, on said block, a handle secured on the spindle, H, a disk, V, a sleeve surrounding said spindle and upon which said disk, V, is mounted, said sleeve having a cam, t, adapted to engage with the cam, k, a rod, J, extending through the hollow spindle, a tongue, j, upon one end of said rod and adapted to be engaged by the pawl, a cam, h^2, upon the opposite end of said rod and a pin carried by the handle with which said cam, h^2, is adapted to engage, substantially as specified.

8. The combination of the series of toothed

wheels, a disk, E, adjustably secured to each wheel, each of said disks having a bolt-receiving slot, a pawl adapted to engage with the teeth of the wheels and a bolt actuating block to which said pawl is pivoted, substantially as specified.

9. The combination of the series of toothed wheels, the spaces between the teeth of each wheel being adapted to receive the rear end of the bolt, a disk, E, having a bolt receiving slot, adapted to be secured to each wheel, a projection, *d*, on each disk for securing the disk to the wheel, a pawl adapted to engage with the teeth of the wheels and a bolt actuating block to which said pawl is pivoted, substantially as specified.

10. The combination of a series of toothed wheels, one of the teeth of each wheel having greater radial projection than its fellows and forming an indicator tooth, a pawl, C, adapted to engage therewith, a carrying block, K, to which said pawl is pivoted, a hollow spindle, H, having a squared end portion, *h'*, upon which the block is free to move longitudinally, a handle, G, secured to said spindle, an indicating pin, *g*, extending through said handle, a tube, *k*, forming the hub of the block, K, and having a helical cam at its outer end a sleeve, T, upon the spindle, H, a disk, V, secured to said sleeve, a cam, *t*, upon the end of the sleeve adapted to engage with the cam of the sleeve, *k*, a rod, J, extending through the spindle, H, a tongue, *j*, upon one end of the rod, J, extending through an opening in the side of the portion, *h'*, of the hollow spindle, said tongue being adapted to be acted upon by the pawl, C, and a cam, h^2, formed on the opposite end of the rod, J, and adapted to engage the indicator pin, *g*, substantially as specified.

11. The combination of the series of toothed wheels, an indicator tooth provided upon each wheel, a bolt, a bolt actuating block, a pawl, C, pivoted to said block and adapted to engage with the teeth of the wheels, a hollow spindle, H, carrying said block, a rod, J, extending therethrough, a tongue, *j*, carried by the rod and adapted to be acted upon by the pawl, C, a cam, h^2, at the opposite end of said rod, J, a handle, G, secured to the hollow spindle, an indicating pin carried by said handle and adapted to be acted upon by the cam, h^2, a sleeve, T, having an end cam, *t*, a cam, *k*, upon the block, K, with which the cam, *t*, is adapted to engage, a disk, V, secured to the sleeve, T, and a pin or strip, *g''*, adapted to engage with the series of orifices formed in the face of the disk, V, substantially as specified.

12. The combination of the series of wheels, a bolt actuating block, a bolt, a pawl adapted to engage with the wheels, said pawl being pivoted to the block, a cam, *k*, formed on said block, a hollow spindle, H, having squared end portion, *h'*, on which the block is free to move longitudinally, a spring, m^5, adapted to act upon the block, a handle, G, secured to the spindle, *h'*, an indicating pin, *g*, carried by said handle, a rod, J, having at one end a cam, h^2, engaging with said pin, *g*, a tongue, *j*, at the opposite end of said rod, J, and extending into the path of the pawl, C, a sleeve, T, having a cam, *t*, to engage with the cam, *k*, a disk, V, secured to said sleeve, there being in the face of said disk, a series of openings, *v*, a pin, *g''*, carried by the handle and adapted to engage in said openings and an indicating tongue, *v'*, carried by said disk, substantially as specified.

13. The combination of a series of toothed wheels, a bolt, an actuating block therefor, a series of stop pawls, N, engaging with said toothed wheels and a pivoted arm, L, adapted to engage with said pawls to move the same out of engagement with the toothed wheels, substantially as specified.

14. The combination with a series of toothed wheels having bolt receiving slots, a bolt, a block, K, having a bolt actuating portion, B, a pawl, C, carried by the block and adapted to engage with the toothed wheels and a pivoted stop piece, P, adapted to engage with the block, K, and prevent the turning of the latter to effect the engagement of the pawl with the toothed wheels, substantially as specified.

In testimony whereof I have hereunto set my hand this 1st day of December, 1893.

JULES BOIS.

Witnesses:
XAVIER JAINCOT,
JEAN GERMAIN.