(Model.) 2 Sheets—Sheet 1.

W. CORLISS.

SAFE BOLT WORK.

No. 261,532. Patented July 25, 1882.

FIG. 1.

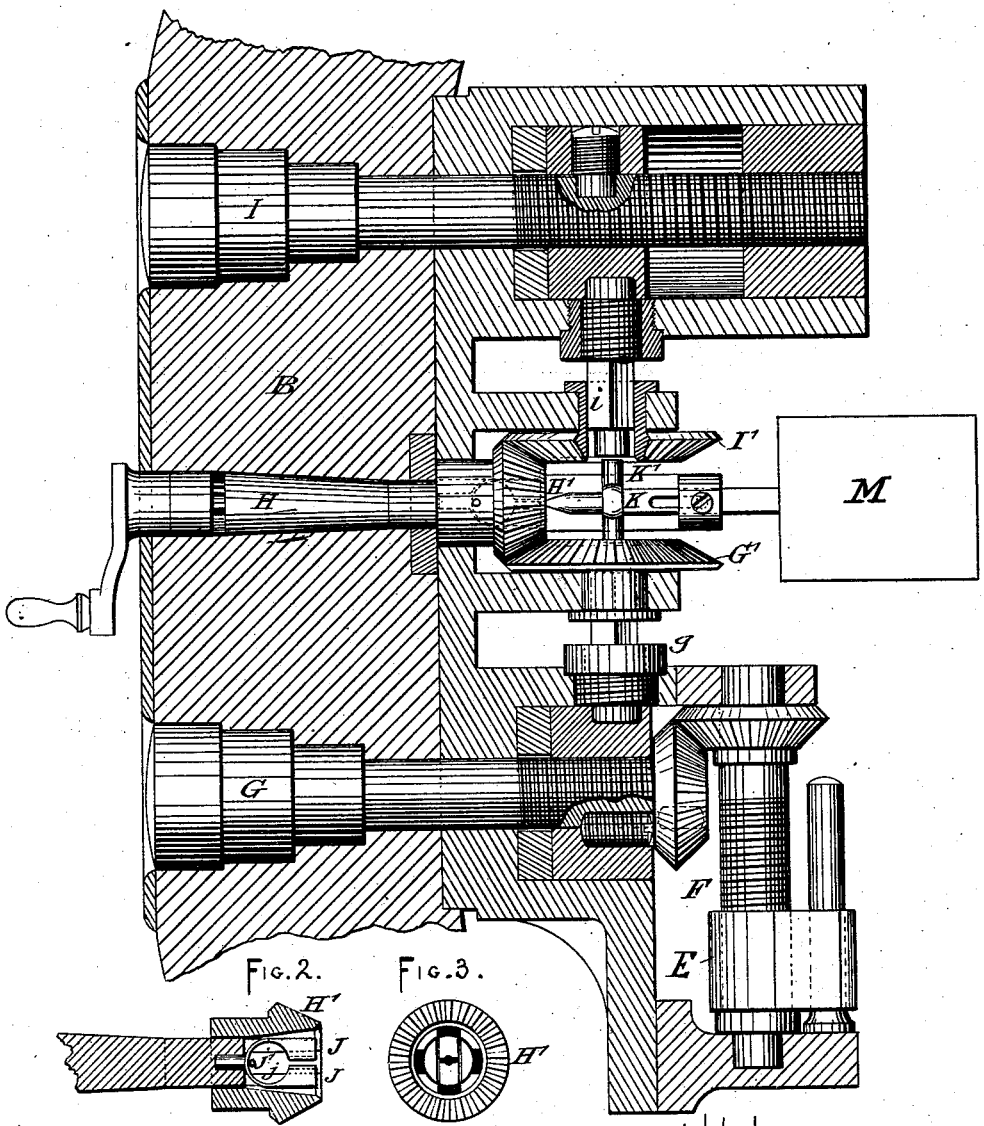

FIG. 2.

FIG. 3.

FIG. 4.

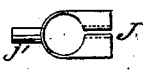

FIG. 5.

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FIG. 7.

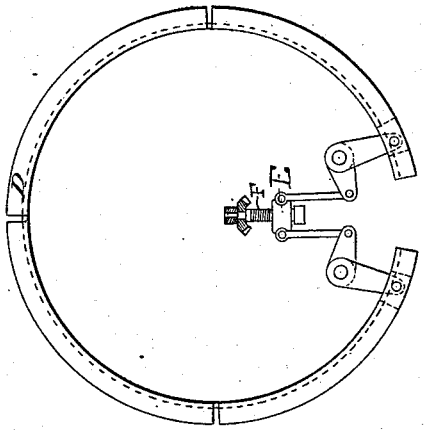
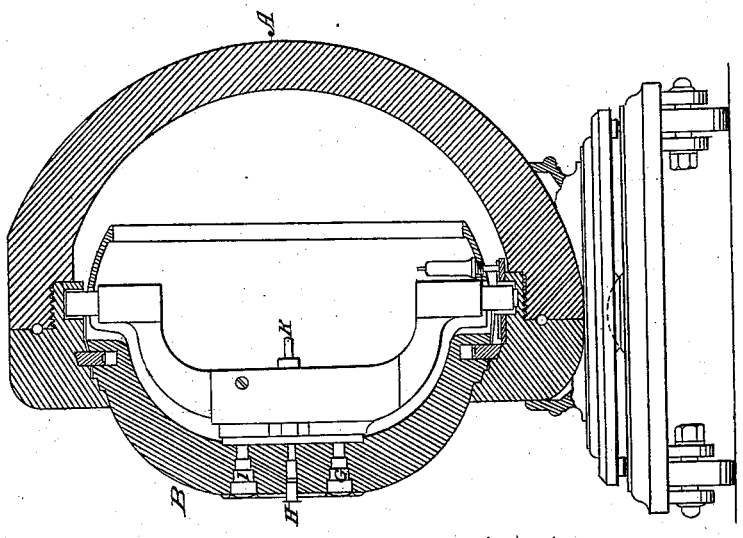


FIG. 6



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UNITED STATES PATENT OFFICE.

WILLIAM CORLISS, OF PROVIDENCE, RHODE ISLAND.

SAFE BOLT-WORK.

SPECIFICATION forming part of Letters Patent No. 261,532, dated July 25, 1882.

Application filed May 7, 1879. Renewed December 30, 1881. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM CORLISS, of the city and county of Providence, in the State of Rhode Island, have invented certain new and useful Improvements relating to Safes; and I do hereby declare that the following is a full and exact description thereof.

I have in my experiments applied the invention successfully to the spherical form of safe and spherical door described in my patent dated March 25, 1873.

The improvement lies in the provisions for securing and liberating the door. I can use any efficient lock operated in any suitable way. The improved mechanism intervenes between the lock and a bolt or stout expanding ring or locking-ring, which, when expanded, engages the door with the body of the safe around nearly its whole periphery. I provide three operating-shafts carefully guarded against being driven in, the holes therefor drilled out or otherwise made an avenue of communication into the safe. One stout shaft operates the expanding ring, which serves as a bolt engaging the door with the body not at a few points, but around nearly the whole of its edge. The other moves the door bodily inward or outward to make and break the contact of the door with the frame or main shell, it being understood that in my form of safe, which I consider preferable, the door is made to move backward and forward for the purpose of engaging and disengaging its exterior edges with the main walls of the safe adjacent to the door, in addition to a movement of rotation within the safe. A third shaft, which may be much smaller, performs the single function of confining and releasing the other shafts by thrusting into them or withdrawing therefrom transverse bolts. This slight shaft lies between the others. Under certain conditions of the lock turning this central shaft in one direction thrusts the transverse bolts into recesses in the main shafts and confines them, while under the same conditions of the lock turning it in the opposite direction withdraws these bolts and sets the main shafts at liberty. The lock M determines whether this (the middle shaft) can or cannot perform these functions. When the safe is locked and the owner has gone away with the key or with the required knowledge of the combination, the central shaft stands disconnected, and may be turned indefinitely in either direction without producing any effect. I prefer, for safety against accident, to use two different locks, each capable of effecting the unlocking. When either lock is properly operated to unlock the safe the movement throws the small shaft into gear. It is only when thus conditioned that the center spindle can produce the effect of withdrawing the cross-bolts, and thus liberating the large shafts.

I have provided an efficient means for preventing the operating of certain parts except when others are in certain conditions, which will be described farther on.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a vertical section through that part of the door to which the lock and operating mechanism are attached. The remaining figures show certain portions detached. Fig. 2 shows a central longitudinal section through the small shaft and its gear and clutch, which operates what I term the "locking mechanism." Fig. 3 is a face view of the same as seen from the interior of the safe. Figs. 4 and 5 represent the clutch-pieces and their connected spring detached. Fig. 6 is an outline, showing the general arrangement of the mechanism in the safe. Fig. 7 shows what I term the "locking-ring" and its immediate connections detached. This is in a plane at right angles to the section in Fig. 6.

Similar letters of reference indicate like parts in all the figures.

A is the body, and B the door, of my spherical safe. D is my locking-ring, and E F G the mechanism by which the ring D is by one movement contracted or drawn inward to liberate the door and by another movement thrown outward to strongly engage the door with the body. There is a stout revolving frame to efficiently support the door, and allow it, with the shelves and other contents of the safe, to be turned around in the opening and closing movement of the door.

G is a stout shaft, which penetrates the

door. When this shaft G is free and is properly turned it contracts the locking-ring D and allows the door to be thrown back.

I is the other stout shaft, which penetrates the door, and which, when at liberty and properly turned, gives the door the inward movement to set it free from its previous firm contact with the interior of the body, and puts it in condition to be swung around for the opening movement, as set forth in my patent of 1873, above referred to.

A transverse screw-bolt, *g*, having a square head, is arranged to engage by its point in a proper hole formed in the side of the shaft G, and to confine it rigidly when desired. A corresponding transverse screw-bolt, *i*, having a square head, is arranged to engage by its point in a hole in the side of the shaft I and confine it when desired. On the square head of the screw-bolt *g* is loosely fitted a bevel-gear wheel, G′. On the square head of the screw-bolt *i* is loosely fitted a bevel-gear wheel, I′. A third bevel-gear wheel, H′, meshes into both the bevel-gear wheels G′ and I′. It will be observed that the bevel-gear wheel H′ controls the means which confine and liberate both the large shafts G and I.

H is a small shaft standing in the central position between the other two. It is peculiarly equipped. Its exterior is adapted to receive a crank or other means for turning it with sufficient force to operate the slight amount of mechanism which is attached. Its inner end is enlarged and fits loosely in a corresponding large central cavity in the wheel H′. It is slotted transversely. The interior of the wheel H′ is recessed to match the deep slot which extends across the inner end of the shaft H, so that any suitable wings being protruded out from the slot may engage strongly with the wheel H′ and cause it to turn, while a sufficient contraction of the wings within the shaft H will entirely disconnect such shaft from the wheel and render the shaft incapable of imparting any motion to the wheel and its important train of connections.

J J are efficient wings for this purpose. They are formed in one with a spring-connection, *j*, which, when the wings are mounted in the slot, exerts a force tending to contract the wings together. The inner edges of the wings J J are notched, as shown, to aid in holding the tapering pin K in a strictly central position. The wings J J are further held in a central position by means of a pin, *j′*, extending from the center of the spring *j*, which is fitted in a hole in the axial line of the shaft H. The only means of connecting the shaft H with the wheel H′, and thus of affecting the works of the lock, is by separating or expanding the wings J against the gentle force of the spring *j*. This expansion is effected under proper conditions by the insertion of a pointed pin, K, which is thrust outward from the interior of the safe by the working of a lock, M, which may be of any ordinary or suitable character. The pin K corresponds to the bolt of the lock. It stands always in the line of the axis of the shaft H. The pointed end presented toward the shaft H corresponds to the back end of the bolt of the lock. When the lock is unlocked it throws the pin K outward toward the exterior of the safe, and by acting with its point wedgewise between the wings J J throws them out to engage in the recesses in the interior of the wheel H′. This causes the shaft H and the wheel H′ to be engaged. When, on the contrary, the lock is locked, it throws the pin K inward toward the interior of the safe and allows the wings J to be drawn inward. This disengages the wheel H′ from the shaft H and renders it entirely free from its influence, and consequently renders it impossible to affect the mechanism at all until the lock is again restored to the unlocked condition.

I consider this mechanism desirable and reliable without further safeguards. Persons gaining access to the exterior of the safe may turn the shaft H indefinitely, but with no effect on anything in the interior of the safe until the lock is unlocked. When the unlocking is effected by a proper key—combination, electrical connection, time-lock, or whatever may be its mode of operating—then, and not till then, the pin K is thrown forward and the shaft H assumes control through the wheel H′. When thus conditioned, by turning the shaft H in one direction the transverse bolts *g* and *i* may be withdrawn from the shafts G and I, after which (the shafts G I being operated in the proper direction and order) the door is set free and may be turned by the hand. It will be understood that on closing the door these parts should be operated again into the proper position before the lock is locked, and that then, after the shafts G and I are again strongly secured by their respective transverse screw-bolts *g* and *i*, the lock is again locked, which movement again withdraws the pin K toward the center of the safe, allows the wings J J to be drawn inward by the spring *j*, and the shaft H is forever after inoperative until the lock is again thrown into the unlocked position. But I have provided further safeguards. The two transverse bolts *g* and *i* are in line with each other. The pin K traverses the space between their ends. These parts are so proportioned that when the bolts *g* and *i* are withdrawn from their respective engagements with the large shafts G I their ends will lie in close contact with the pin K. It is only when these bolts are thus fully withdrawn that the shafts G I can be set at liberty. I provide a cross-bar, K′, firmly fixed. Its moderate length allows it to be received between the ends of the shafts *g i*, but only when the latter are moved apart to their full extent, and therefore are both fully engaged with their respective shafts G I. This is the condition which obtains when the safe is locked. The movement of the pin K by the lock in assuming the locked position carries the cross-bar K′ into the position just described between the ends of the transverse shafts *g i* and leaves it there. In this condi-

tion, even if some chance force—as, for example, a considerable friction between the shaft H and the wheel H′—should tend to turn the wheel H′, and consequently the wheels G′ I′, and thus withdraw the transverse bolts *g i*, the presence of the cross-bar K′ between the ends of the shafts avoids the possibility of this motion proceeding beyond a very small extent. So soon as the shafts *g i* shall by such slight force be withdrawn sufficiently to press their ends upon the cross-bar K′ their further motion is effectually arrested until the pin K and its attachments are moved by the proper locking motion of the lock. The same cross-bar, K′, performs another function. When the pin K and its attachments are by the unlocking motion thrown outward, causing the point of the pin K to properly separate the wings J, and thus engage the shaft H with the gear-wheel H′ and its connections, the movement brings the cross-bar K′ entirely out of the line of the transverse shafts *g* and *i*. Thus conditioned, the working of the gearing draws the shafts *g* and *i* together until their ends strike the pin K. This movement, which liberates the respective main shafts G and I, is not in any manner impeded by the presence of the cross-bar K′ because it has moved out of line; but if while the parts are in this unlocked condition any attempt is made to lock the lock the cross-bar K′ prevents such movement by striking against the shafts *g i* and preventing the movement of the pin K until all the parts have been brought to the proper condition for such locking—that is to say, the cross-bar K′ will strike against the shafts *g i* and prevent the locking movement of the pin K until, first, the door of the safe has been turned into the proper position; next, the shaft I has been turned to bring the door forward into tight contact with the interior of the safe, care being taken, either by a mark or preferably by a positive stop, (not shown,) to arrest the turning of this shaft I in such position that the hole in its side is presented to receive the transverse shaft *i;* next, the shaft G is turned to expand the locking-ring D, (care being taken to arrest the turning of this shaft G in the proper position to allow the engagement therewith of its transverse shaft *g;*) then, finally, the shaft H is turned, and by its engagement with the wheel H′ and its connections the transverse shafts *g i* are moved outward into full engagement with their respective shafts G I. When all these movements have been properly effected, and not before, the cross-bar K′ is free to be moved backward toward the interior of the safe. Now the lock (not represented) can be operated and the pin K be thrown into the locked position. This cross-bar K′ therefore performs the double functions of, first, insuring that the parts are in the proper position before the lock can be locked, and, second, and more important, of insuring that the cross-bolts cannot by any frictional or other contact be drawn toward each other until the lock is unlocked.

Modifications may be made without sacrificing all the advantages of the invention. I propose, when desired, to employ two or more locks, which shall require to be both operated before the bar-pin K can be moved outward and the safe opened. With a very strong construction of safe, in which I propose mainly to use this mechanism, I esteem it more important to guard against the mischief which may result from an accidental loss of memory of the proper number or a derangement of a lock by employing two locks which shall be combined, not so as to require both to be unlocked, but, on the contrary, to allow the safe to be opened when either one is unlocked.

One of the great advantages of my invention is the difficulty it imposes to the opening of the safe by violence. So long as the cross-shafts *g* and *i* are strongly engaged with their main shafts G and I it is impossible to open the safe. The only possible means of removing those bolts *g* and *i* is through the gear-wheel H′. Nothing but the proper movement of the pin K can give this control. Only the proper operation of the lock or locks can give the proper movement to that pin K. Supposing all the obstacles to be passed, and that violence could be applied to the lock and displace it, this act, instead of making the safe more easily opened, removes the only means of access. The screw-threads on the transverse bolts *g i* hold them strongly against any but the proper mode of removal. The movement of the pin K, with its cross-piece K′, to the proper extent and in the right direction is essential either to the liberation of the cross-bolts *g* and *i* to allow them to be withdrawn or to the connection of the mechanism to cause them to be unscrewed.

It is not essential that the cross-piece K′ be firmly bolted upon and made a part of the pin K. It may serve if attached through any reliable mechanism. It can perform all the functions of the cross-bar K′ if it be a substantial piece capable of exerting a proper mechanical resistance, and shall on the one hand meet the sides of the bolts *g i* to prevent the pin from being disengaged from the parts unless the bolts *g i* are fully engaged in the shafts G I, and on the other hand shall meet the end of the shafts *g i* to prevent them from being withdrawn by any force except when the lock is unlocked.

I do not confine the invention to its application to my spherical safe.

I do not confine myself to the position of the lock M shown in Fig. 1. The lock may be in practice placed close to the door wherever room is available, and be made to operate the pin by a lever; or two locks may be used connecting with the pin by a cross-bar.

I claim as my improvement in safes—

1. In a safe for valuables, an operating-shaft controlled in position by a revolving threaded counter-bolt, in combination with the locking and door-opening mechanisms, substantially as herein set forth.

2. In combination with the locking and the

door-opening mechanism of a safe, the two bolts *g* and *i*, each formed with screw-threads and mounted in a correspondingly-threaded support, and the two operating-shafts G and I, arranged substantially as and for the purposes herein specified.

3. In combination with the operating-shaft G and the transverse locking-bolt *g*, the shaft H, loose gear-wheel H′, movable wings J, and a lock or locks controlling the operation of said wings, as herein specified.

4. The shaft H, gear-wheel H′, wings J, and a lock or locks controlling the latter, in combination with two transverse locking-bolts, *g i*, and the two operating shafts G I, as herein specified.

5. In combination with the locking mechanism of a safe for valuables, the shaft H, gear-wheel H′, and single spring *j*, connecting the wings J J, and having a centering-pin, *j*, all adapted to serve as herein specified.

6. The combination of the shaft H, gear-wheel H′, wings J J, and means *j*, for drawing them inward with the pointed pin K and one or more locks operating said pin, as herein specified.

7. In combination with the operating-shaft G I, cross-bolts *g i*, and pin K, the stop K′, arranged to perform the double functions of preventing the withdrawal of the cross-bolts *g i* until the pin K is properly thrown and of preventing the disengagement of the mechanism from the shaft H until the cross-bolts *g i* are fully inserted, as herein specified.

8. In combination with the operating-shaft G, the pin K, and cross-bar K′, wings J J, shaft H, gear H′ G′ I′, and cross-shaft *g*, combined and arranged as and for the purposes herein specified.

9. The combination, with a principal operating-shaft, of a transverse bolt worked by an independent mechanism, and suitable devices operated by a lock for connecting and disconnecting the latter and the transverse bolt, substantially as herein specified.

10. The combination of means for engaging the door strongly with the casing, mechanism for operating the same, a connecting and disconnecting piece, K, and a lock or locks controlling such disconnecting-piece, substantially as herein specified.

11. In a safe for valuables, the combination of an independent spindle, mechanism operated thereby to liberate the locking-bolt, and a lock or locks applied within the safe, controlling the engagement of the spindle with the aforesaid mechanism, substantially as herein specified.

In testimony whereof I have hereunto set my hand this 23d day of April, 1879, in the presence of two subscribing witnesses.

WILLIAM CORLISS.

Witnesses:
JAMES W. CLARKE,
CHARLES B. HAWKINS.