No. 662,428. Patented Nov. 27, 1900.

H. D. HIBBARD.

SAFE.

(Application filed May 7, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

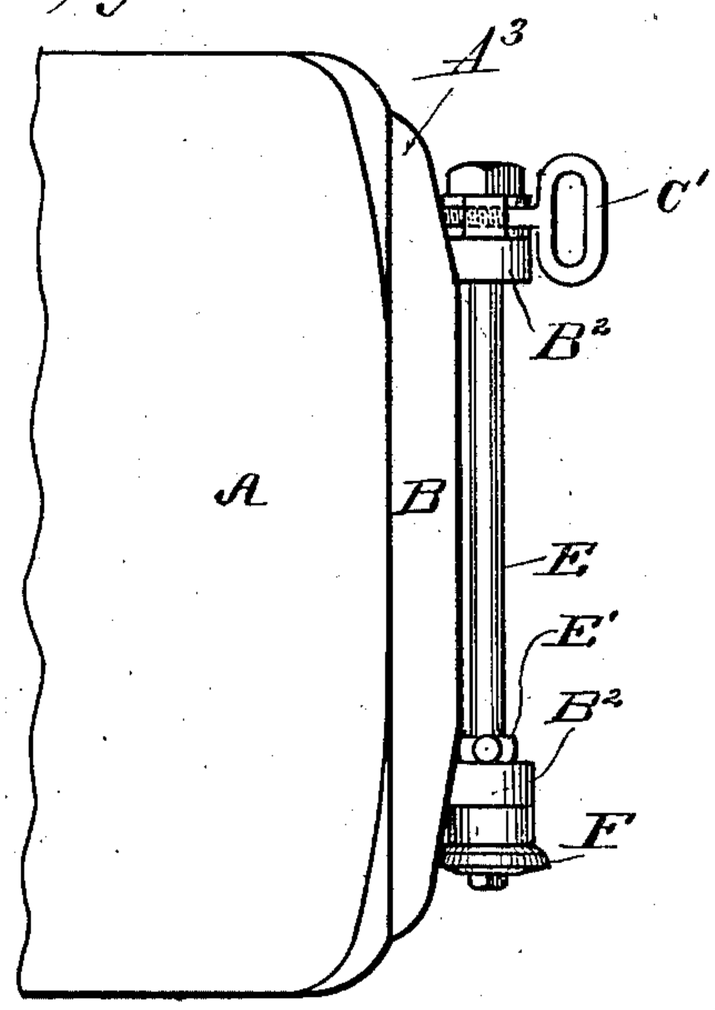


Fig. 3.

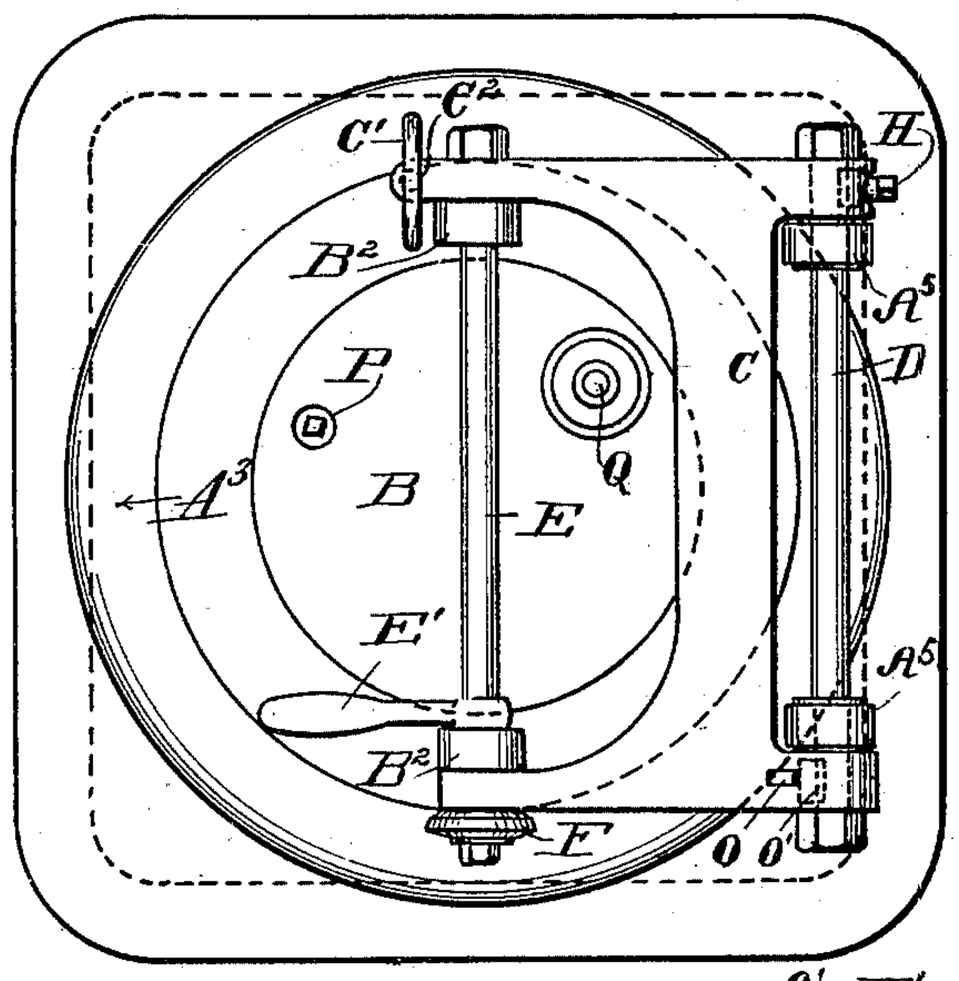


Fig. 8.

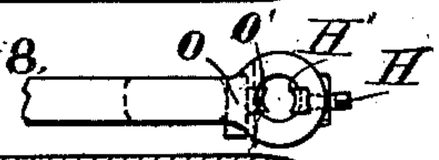


Fig. 2.

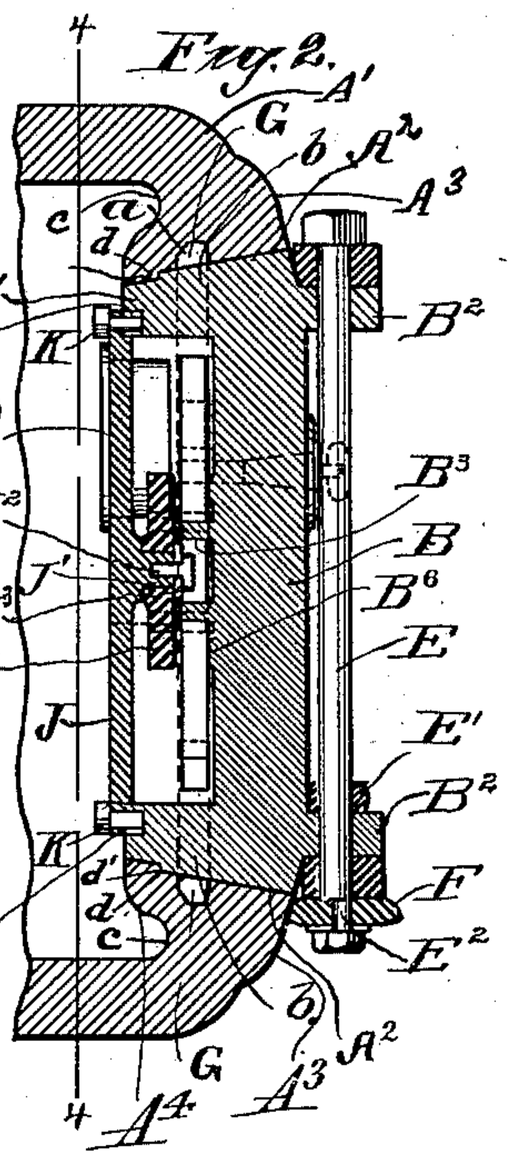
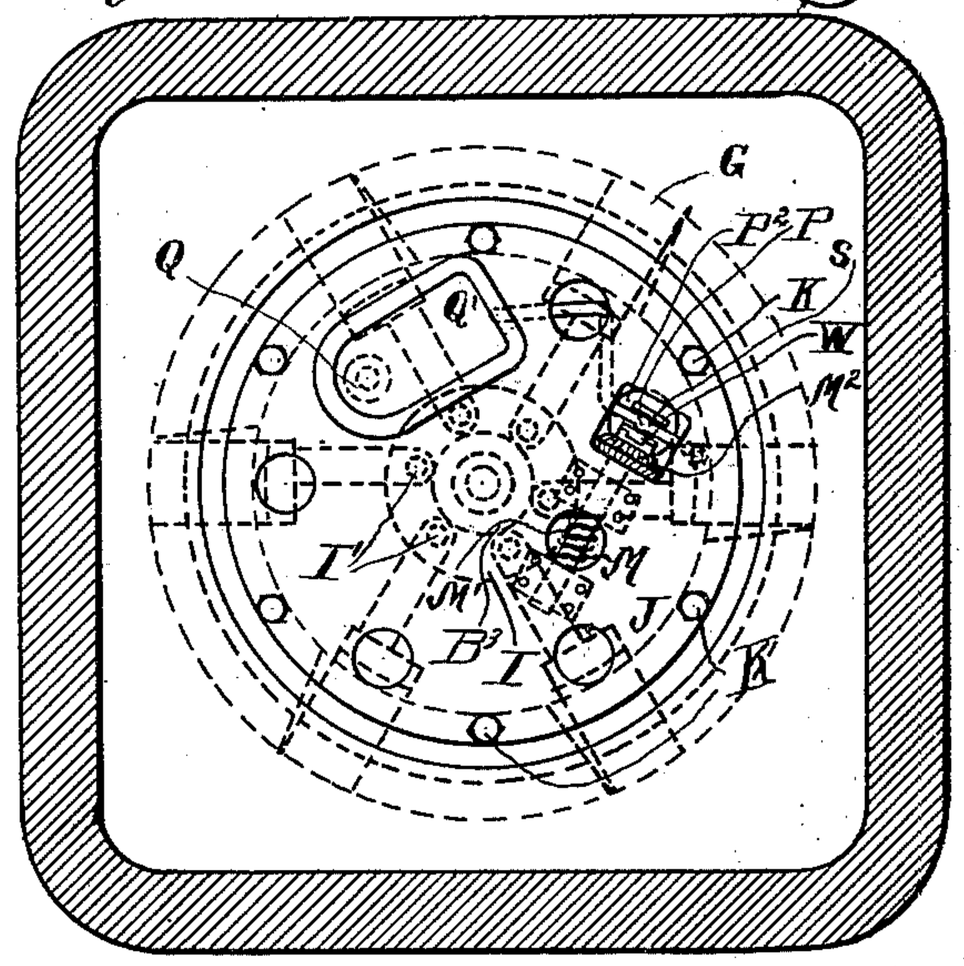


Fig. 7.

Fig. 4.



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No. 662,428. Patented Nov. 27, 1900.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 5.

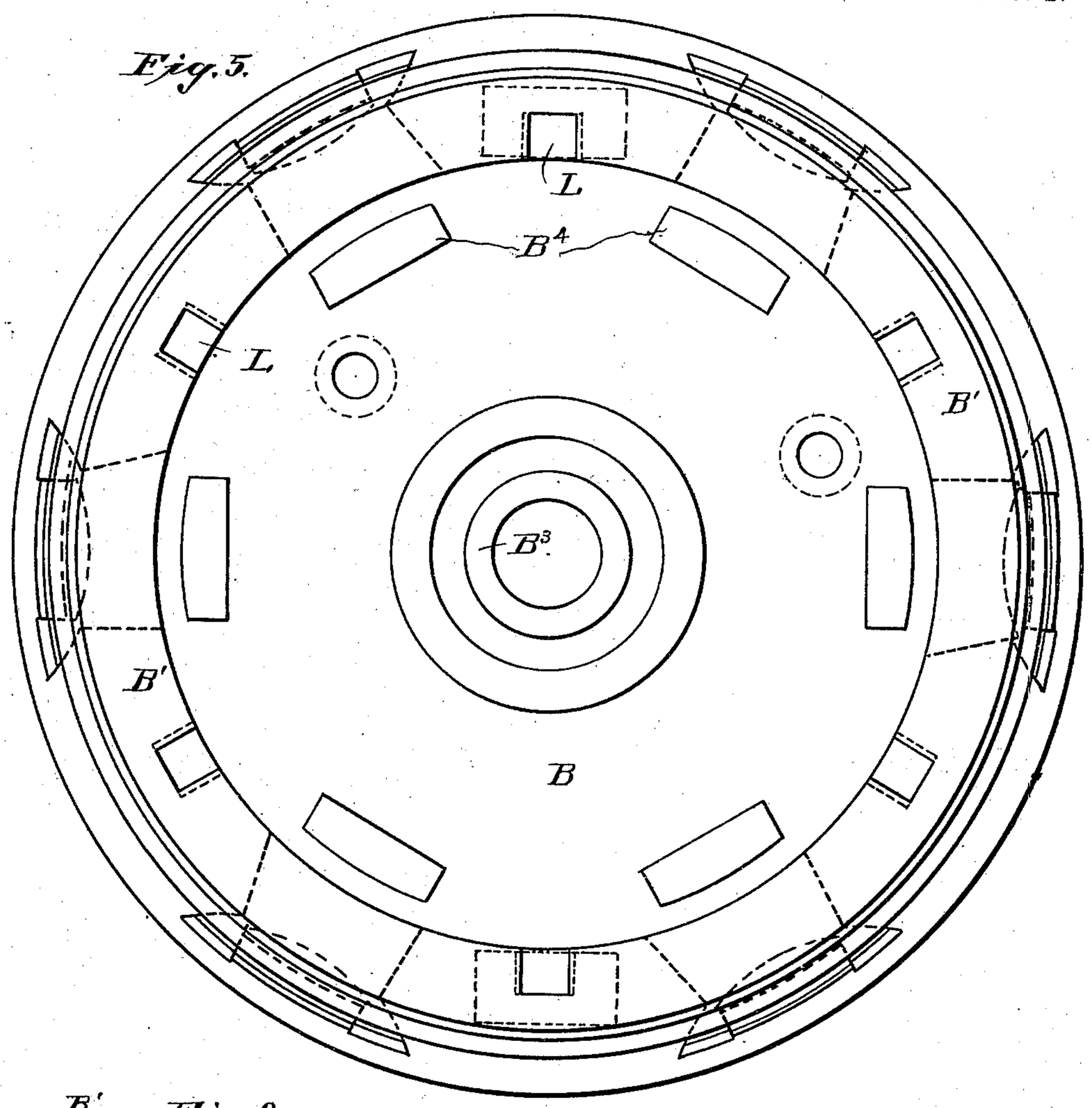
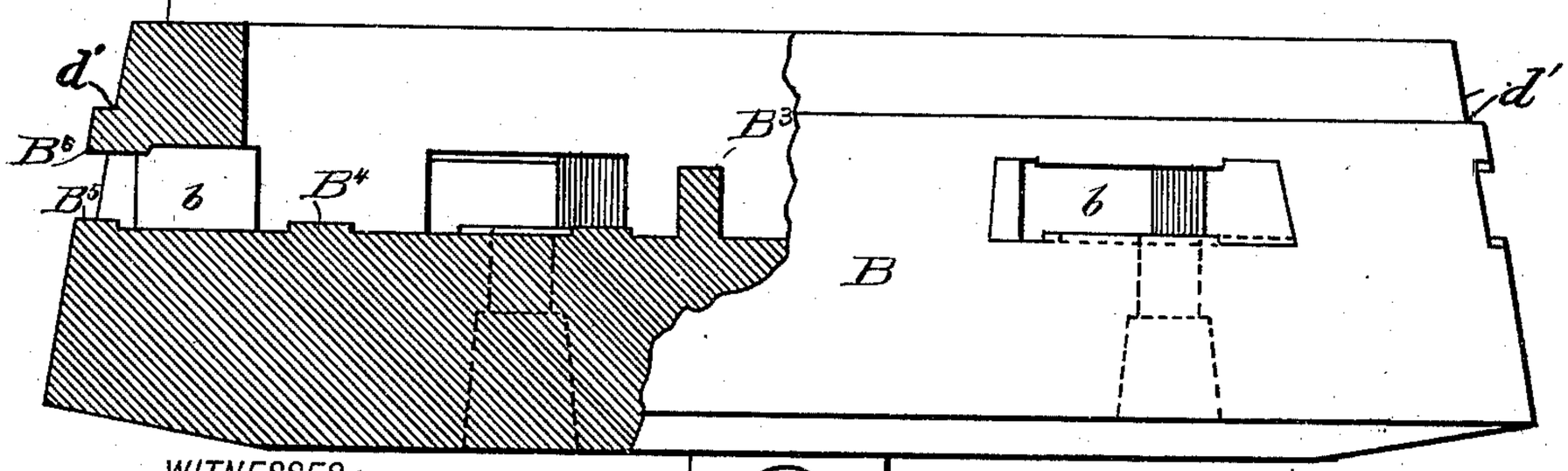


Fig. 6.



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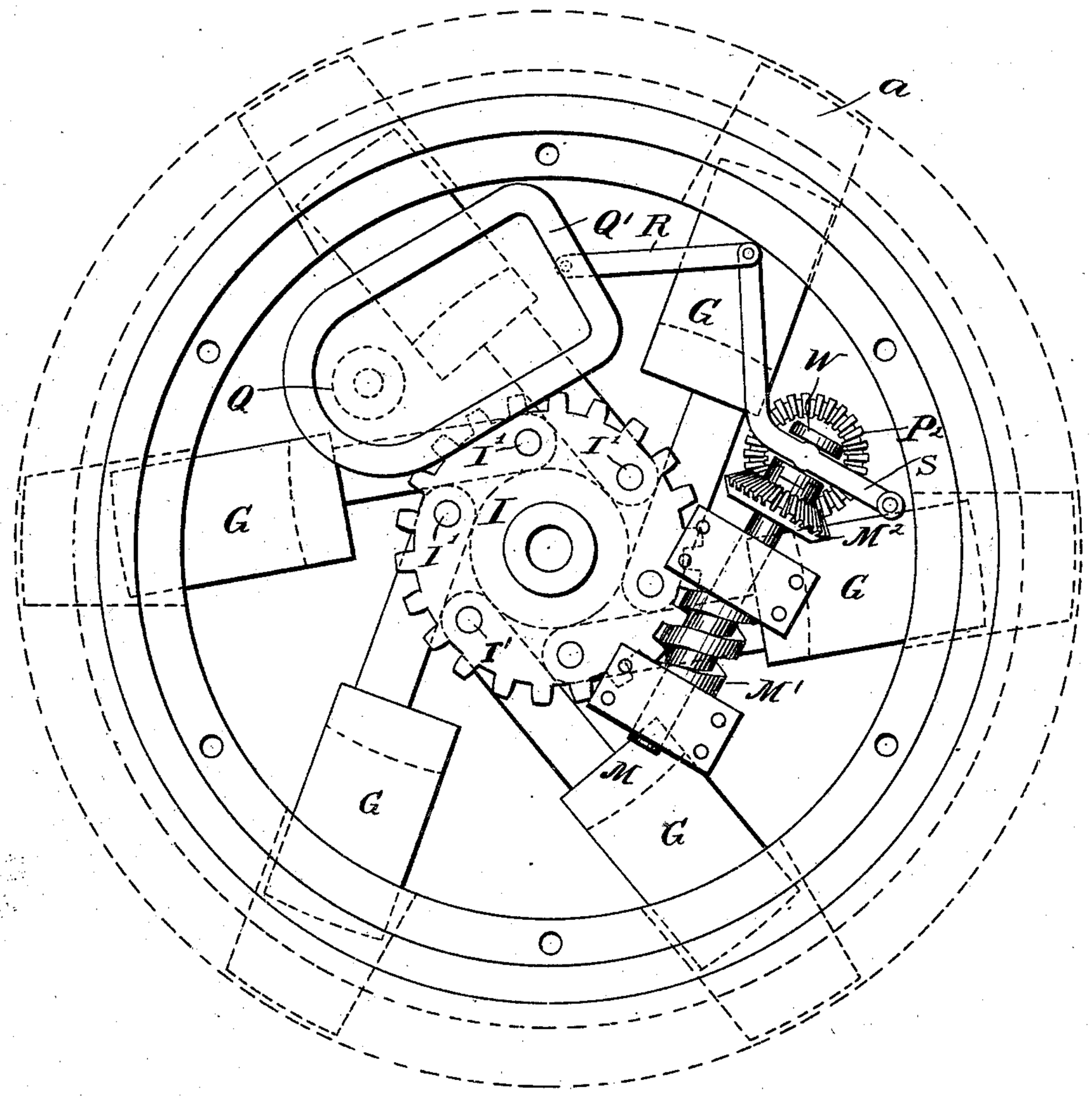
(No Model.) 3 Sheets—Sheet 3.

Fig. 9.



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UNITED STATES PATENT OFFICE.

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SAFE.

SPECIFICATION forming part of Letters Patent No. 662,428, dated November 27, 1900.

Application filed May 7, 1898. Serial No. 679,976. (No model.)

To all whom it may concern:

Be it known that I, HENRY D. HIBBARD, a citizen of the United States, residing at North Plainfield, Somerset county, in the State of New Jersey, have invented a certain new and useful Improvement in Burglar-Proof Safes, of which the following is a specification.

This invention relates to burglar-proof safes, vaults, or analogous structures comprising a body and a door, each of which is shown in its preferred form as an integral structure, one object of the invention being to furnish an improved safe so constructed that the metal at all parts thereof will be substantially uniform, whereby it may be successfully subjected to heat treatment, while providing an increased thickness of metal and a relatively long bearing or joint around the door.

A further object of the invention is to provide an improved integral safe-body having around the doorway thereof increased thickness of metal obtained by the provision of an external and an internal flange, the metal around such doorway being maintained substantially uniform with that of the major part of the body by the provision of means which also acts to receive the locking-bolts carried by the door.

A further object of the invention is to provide an improved integral safe-door comprising a body and a flange, said flange having an offset and bolt-openings intermediate said offset and said body.

In the drawings accompanying and forming part of this specification, Figure 1 is a side view of the front portion of a safe constructed in accordance with the present invention. Fig. 2 is a vertical section thereof. Fig. 3 is front view of such safe. Fig. 4 is a vertical sectional view taken in line 4 4, Fig. 2, looking from the rear thereof. Figs. 5 and 6 represent the door on a larger scale, Fig. 5 being a rear view and Fig. 6 an edge view, partly in section. Fig. 7 illustrates a modification of the pintle connecting the door with the crane-hinge. Fig. 8 is a plan view showing part of the crane-hinge and the door-adjusting means; and Fig. 9 is a view corresponding with Fig. 4 with a portion removed, the parts being shown on an enlarged scale.

Similar characters of reference indicate corresponding parts in all the figures of the drawings.

As a preface to a further description of the present improvement it is understood that the structure may be either stationary or portable and may, if desired, be inclosed in another safe or casing of heat-resisting qualities to make the construction fireproof. In the present instance the improvement is shown embodied in a safe of moderate size, which may be carried on an ordinary cradle and placed in an office with or without such adjunct.

The present improvement comprises in a general way a body having a door way or opening provided with an improved construction of seat or jamb for the reception of a door, an improved door adapted to be seated in said opening, and means for securing the door to its seat.

The advance in the burglar's art, due chiefly to the introduction of nitroglycerin as an aid in safe-breaking, demands that the highest properties obtainable in metals should be utilized in the manufacture of safes to secure treasure from the attacks of the modern burglar. Not only is the highest quality of metal required, but also large bearing-surfaces are necessary at the joints to distribute the effect of charges of high explosives, such as nitroglycerin, fired against the safe, while offsets or steps against which the effect of a liquid explosive would be serious must be so located that it is practicably impossible to reach them. Moreover, in order to secure the highest properties in the metal used for the manufacture of safes it must be heat-treated. This necessitates that all parts thereof must be substantially uniform, or otherwise it will not be properly affected by the heat treatment and is in danger of being ruptured by internal strains set up within its mass. The metal which I preferably use is the peculiarly difficult and ordinarily impracticable material known as "manganese steel"—that is, steel produced and treated under the Hadfield patented processes. To accomplish the heat treatment of this material, however, with any reasonable degree of practicability, the structure formed

therefrom must have, as above stated, substantially uniform thickness and not be too massive, since if it is too thick in any part it will not be properly affected by the heat treatment and is in danger of being ruptured by the internal strains set up within its mass. It has also been found in working with manganese steel by casting and subsequent heat treatment that an imperfect condition of the interior exists if any of the parts are too thick. This imperfect condition results in invisible internal cavities when the metal is sectioned. It is not necessary to determine whether these are due to imperfect filling or strains in the shrinkage during the casting process or are due mainly and entirely to slow conduction and strains involved in the slow heating or rapid cooling during the heat treatment. It is sufficient that they are present unless the parts are formed in such manner that they can be readily subjected to heat treatment, and this necessitates that the parts be not too massive, while at the same time they must be sufficiently thick to withstand the attack of the burglar. This is obtained in the present improvement by the use of a moderate thickness of metal throughout, even at the flange portions of the body around the door, whereby the metal is homogeneous and maintained in its highest integrity at all parts thereof.

To secure the above advantages in a practicable manner is the object of the present invention, and that this object has been successfully accomplished is demonstrated by practicable tests heretofore made.

In the form thereof herein shown and described, and which may be its preferred form, if desired, this improved safe comprises a body A, formed of a single casting and of any desired or suitable shape, it being shown herein substantially rectangular in shape, whereby it is provided with side and rear walls, having a front wall A′ projecting inwardly from such side walls, such front wall having a doorway provided with an elongated door seat or jamb A^2. This body is of substantially uniform thickness and is provided around the doorway with rings, beads, flanges, or projections, one, as A^3, on the exterior and the other, as A^4, on the interior, both integral with such body, thereby increasing the thickness of that part of the body which encircles the doorway. The provision of the rearwardly-extending flange A^4 around the door-opening forms a recess *c* intermediate said flange and the inner face of the side walls adjacent thereto, whereby the mass of metal around the door-opening is maintained substantially uniform with the thickness of the other portions of the body. The absence of this recess or an equivalent provision would result in the parts around the opening being too massive, and so interfere with the proper heat treatment of the body. The door-seat is shown as circular and conical or tapering from its outer to its inner face, so that the door may be freely inserted, the outer face of the flange A^3 being shown in the present instance as substantially square with the jamb or joint surface of the body. By the provision of these rings of metal the safe-front in the present instance has ogee outer and inner faces, so that such front thus comprises a part of substantially uniform thickness with the major portion of the body and a part diverging from such part of uniform thickness to form an elongated jamb or seat, the metal around such jamb thus projecting or being swelled outwardly beyond the face of such uniform part or the normal face of the front and rearwardly beyond the face of such uniform part and into the interior of the body.

By constructing the body in the manner specified all parts thereof are substantially uniform, since while the front is so constructed as to provide an elongated joint-surface or jamb, yet the thickness of the metal transversely of such jamb is substantially no greater than the thickness of the metal at other parts thereof. The thickness of the jamb is also materially reduced in the direction of its length by the provision of an opening for the reception of each bolt, and which opening is shown herein as an annular groove *a*, cored in the casting. This groove thus acts not only to reduce the thickness of the metal at this point, thereby to facilitate the heat treatment of the body at such point, but it also acts to receive the bolts which lock the door in its seat. In the form shown this annular recess is located relatively remote to the outer face of the body-front.

Intersecting the seat in the rear of the bolt-receiving groove *a* is an annular offset or step *d*. By forming the groove in advance of such step it will be seen that any nitroglycerin which might by any possibility be worked into the joint would flow into this groove, and so be prevented from reaching the offset, it being a difficult matter to fire the same while in such groove. This groove thus not only acts to maintain a uniformity of metal around the doorway and to receive the locking-bolts, but it also acts as a protective medium to the offset, the provision of which is essential in order to prevent any part of the door being forced inwardly independently of the body.

From the foregoing it will be seen that the jamb or seat for the door is given relatively great length, which is an essential feature, and since the length of this jamb should be greater than the thickness of the metal in the rest of the body or in the body or main plate of the door this is obtained in a practicable manner by providing the internal and external flanges, one diverging outwardly and the other rearwardly from the side of the safe or from that part of the front which is substantially uniform with the rest of the body. By the provision of these flanges not only is the seat or jamb of the door elongated, but the body adjacent to such door is reinforced in a practicable manner other than by the mere

provision of a mass of metal at this point, the outer flange A^3 particularly reinforcing the safe-body in such manner that the opening of the joint between the body and the door is prevented by hammering or by the explosion of heavy charges adjacent thereto, since this flange acts under such attacks to permit the metal thereof to yield radially, the radial line being that of least resistance to the reluctant motion of the particles of metal which are displaced bv the explosion, so that on an explosion or on continued hammering at one point this flange will yield outwardly, together with a portion of the metal of the door adjacent to the jamb, without causing such joint to open each side of the point hammered. In other words, should a charge of explosive material be fired, for instance, on the door adjacent to the joint, the result would be to cause a portion of the metal of the door and a portion of the metal of the body-flange A^3 to yield together in the same direction, thereby preventing the opening of the joint around such door, since a metal-to-metal joint or contact throughout this yielding action will be preserved. This would not be the case, however, if such flange or bead were not provided, since the mass of metal in the body proper around the door would be such that there could be no yielding thereof in any direction, so that the force of the explosion would act in such manner as to open the joint either by cracking the metal when the charge is sufficient or in other ways, thereby to permit the insertion of a charge of nitroglycerin.

The door in the present instance comprises a circular body or plate B, of substantially uniform thickness with the walls of the body A, and an internal flange B′, such flange forming, with the body, at the periphery of the door an elongated tapered joint-surface, shown herein corresponding to the joint-surface or seat of the body. The outer marginal face of the door is coned to be flush with the outer face of the external flange A^3 and also substantially square with the edge of the door, and consequently with the joint formed around the same. The door-flange B′ is provided with an offset *d′*, registering with the offset *d* in the jamb of the body, and is also provided intermediate such offset and its body B with bolt apertures or openings *b* for the passage of the locking-bolts. By this construction it will be seen that these bolt apertures or openings protect the offset in the door, since should nitroglycerin be forced into the joint it would flow through these bolt-apertures into the interior of the safe, where it would be impossible in any practicable manner to explode it, so that these apertures *b*, together with the groove *a* in the body, not only constitute a means to permit the proper working of the bolts, but also a means of preventing nitroglycerin from reaching the steps *d d′*, where its effect would be serious.

By providing the door with an internal flange a recess is provided on the interior of the door for the reception of suitable bolt mechanism hereinafter described, while at the same time a substantially uniform thickness of metal in the door is maintained, while furnishing a relatively long joint-surface, which is an essential feature in safe construction, since this joint-surface coöperating with the elongated jamb furnishes large surfaces of metal, which favor the transmission of shocks from the door to the body, or vice versa, without damaging the metal, while also greatly aiding to prevent the door being forced inwardly on one side by the effect of a charge of explosive fired near the edge, the offsets or steps also coacting, as hereinbefore set forth, to prevent the door from being forced inwardly. By the provision of long joint-surfaces it is also possible to have the offsets located such a relatively great distance away from the front of the door as to materially reduce the chances of a burglar working nitroglycerin so far into the joint as to reach them.

Since the particular construction of locking mechanism shown herein constitutes the subject-matter of a separate application, Serial No. 16,402, filed May 12, 1900, and since also the particular construction of the hinge mechanism shown constitutes the subject-matter of a separate application, Serial No. 16,250, filed May 11, 1900, it is deemed necessary herein only to give a general description thereof, reference being had to such applications for more particular descriptions thereof.

Formed on the outer side of the front are a pair of ears A^5 in position to support the door by means of a pin or pintle D, extending through such ears and a pair of ears of a suitable crane-hinge C, which is connected with the door by a suitable pin or pintle E, extending through the forwardly-extending ends of said hinge C and a pair of ears B^2 of the door. This hinge may be of ordinary steel. Secured to the pin or pintle E is a handle E′, by which the door may be partially rotated. The pin E is provided at its lower end with an extension E^2, slightly eccentric to the axis of said pin, and which extension carries a wheel F, which when the door is closed lies nearly in contact with the adjacent surface of the body A. Its function is to aid in overcoming friction and inertia in opening the door after it has been unlocked. To accomplish this, the pin E is partially rotated by the handle E′, thereby bringing the wheel into slightly-rolling contact with the body of the safe, and consequently drawing the door outwardly to the extent of a fraction of an inch, which door may then be pulled outwardly by the handle C′, provided for the purpose. In the modification shown in Fig. 7 the pintle E may also have a similar construction at its upper end, whereby the same effect will be obtained at the upper and lower ends of the door simultaneously.

The handle C′ has a threaded shank and is turned into a projecting lug C^2 of the crane-

hinge, the inner end thereof engaging the face of the door and acting as a set-gage to determine the amount of oscillation to be allowed the door upon the pin E, which amount of oscillation should be only sufficient to permit the door to be opened and shut and can be easily regulated by screwing the handle in or out. To adjust the bearings of the crane-hinge, so as to carry the door farther to the right or left or to carry it higher or lower or to effect this in both directions, as required, suitable means is provided. Even when the measurements are carefully made and the parts are lined up with accuracy there is still a chance that the door through slight springing of the crane-hinge or through other causes may not when brought toward its closed position coincide exactly with the seat in the doorway. A screw H is tapped into the crane-hinge at its upper bearing with the pin D and acts upon a suitable bearing-block H′, (see Figs. 3 and 8,) by which the position of the hinge-bearing at the top may be adjusted at will. A key O is driven transversely through said crane-hinge at its lower bearing with said pin D and acts upon a similar bearing-block O′, whereby the lower bearing may be adjusted. By turning the screw H inwardly, so as to lift the door and also move it to the right and moving the key O to adjust its bearing in the opposite direction—that is, inwardly—so as to lift the door and also move it to the left, the door will be raised without affecting its position laterally. By shifting both of these adjusting devices in the same direction the door may be shifted bodily to the right or left.

The locking mechanism embodies a series of radially-shiftable swinging bolts G, the inner ends of which abut when in their locking position against a suitable boss B^3, integral with the door-body B. The flange B′ has a series of bolt-apertures *b* formed therein, as hereinbefore set forth, such apertures being shown as tapered to provide for the swinging or lateral movement of the bolts. The inner end of each of these bolts, which is shown somewhat reduced in diameter, is secured by a headless pin I′ to a rocking plate I, formed on its periphery as a worm-wheel and which rocking plate is mounted on a stud J′, projecting from a plate J, forming the back plate of the door, a suitable screw H^2 and washer H^3 maintaining such worm-wheel in position. This back plate is maintained in position by suitable bolts K entering soft-metal or wrought-iron inserts L, located in the flange B′ of the door. In engagement with this worm-wheel I is a worm M′, the shaft M of which is supported in suitable bearings. One end of this worm-shaft carries a loosely-mounted bevel-gear M^2, the hub of which forms one member of a clutch. Splined to this worm-shaft for rotation therewith and longitudinal movement relatively thereto is the other member W of this clutch, it being shifted by suitable connections, such as a pair of levers R and S, one in connection with suitable lock mechanism (not shown) inclosed in a suitable casing Q′ and which locking mechanism is provided with a spindle Q for operating the same. Projecting through the door is a spindle P, the outer end of which is adapted to be turned by a suitable crank, while the inner end carries a bevel-gear P^2, in mesh with the bevel-gear M^2, mounted on the worm-shaft. When the clutch member W has been shifted by the combination-lock into position to engage the worm-shaft bevel-gear M^2, such gear will thereupon turn with the worm-shaft, so that on the rotation of the spindle P the bevel-gear P^2 will be turned thereby to rotate the worm-shaft and the worm-wheel, and thus withdraw or force outwardly the bolts.

The amount of grinding required in forming the door is reduced by providing a relatively narrow raised surface B^6 on one as the inner face of each bolt-aperture *b* and a pair of correspondingly-raised surfaces B^4 and B^5 on the opposite or outer faces of such aperture. Sufficient bearing is afforded by these raised surfaces to give and maintain the required close fit under all the strains to which the parts can be subjected by any ordinary violence, while the amount of manganese steel to be removed by the grinding is materially less than would be required if the bearing were over the whole adjacent surface. By this construction also the necessity of further finishing the walls of the bolt-openings is avoided and which finishing is not practicable with the means necessary to be used to work this material.

From the foregoing it will be seen that the construction of the door is such that if the back plate J be forced inwardly toward the center of the safe by any explosive within the door or by violence it will carry with it the small screw and washer and the rocking plate I and the several pins, thereby leaving the bolts in their locking position, owing to the provision of the headless pins I′.

The term "safe" as used herein and in the claims is to be construed as including a vault, strong box, or other analogous structure, while the term "ring" as used herein and in the claims is not to be limited to a circular flange, bead, or projection, but includes within its scope whatever form of means will accomplish the object set forth herein, since in oval or square doors this ring will conform to the shape of the door.

I claim as my invention—

1. A safe comprising an integral safe-body having a circular door-opening and made of hard, tough, unmachinable metal of increased thickness around such door-opening, said door-opening having an elongated joint-surface provided with a continuous groove adapted to perform the double function of inducing a uniformity of thickness of metal around said door-opening in the production of the casting and serving to receive the lock-

ing-bolts; and an integral door of channel-shaped cross-section also made of hard, tough, unmachinable metal and having a corresponding long joint-surface, substantially as described.

2. A safe comprising an integral safe-body made of hard, tough, unmachinable metal, and having a doorway and an abruptly-presented external bead or flange and an internal flange around such doorway, the two providing a long joint-surface at the jamb, the bearing-surface of said jamb containing a continuous groove contributing to restrict the body of metal at the jamb and aid in securing toughness thereof corresponding with the thickness and conditions at the other parts of the body, the bearing-face of the jamb being continuously tapered in front of said groove and having an offset in the rear thereof, and a door of a thickness approximating that of the body and having an internal flange, substantially as described.

3. A safe-door of channel-shaped cross-section made integral of hard, tough, unmachinable metal having flaring apertures through the flange for the passage of locking-bolts, and also having raised bearing-surfaces for said bolts, substantially as described.

4. A safe comprising a body having solid walls and made in one piece of hard, tough, unmachinable metal with a doorway and with an increased thickness of metal adjacent to such doorway, forming an elongated, tapering jamb-surface; and a door, channel-shaped in cross-section and made in one piece of similar material, the joint between said door and body being without steps in front of the bolts, and having a step in the rear of the bolts, substantially as described.

5. A burglar-proof safe comprising a body having a doorway with an elongated jamb-surface; a door having a flange provided with bolt-apertures, each of said parts made of a single piece of hard, tough, unmachinable material, ground to a tightly-matching condition; a hinge supporting said door on said body; and a series of locking-bolts located to be projected through said apertures in different directions from the door into the jamb, said door having surfaces of small area in position to support and guide the bolts, substantially as described.

6. A door comprising a body and a flange, said flange having bolt-apertures and said body having a series of raised bearing-surfaces located inside of said flange and in position to support the bolts in their working positions.

7. A safe-body having a doorway and a pair of flanges located around said doorway, and projecting in opposite directions whereby one projects forwardly of the body and the other projects rearwardly into the interior of such body thereby to form an elongated jamb, said jamb having bolt-receiving means therein.

8. A door comprising a body and a flange said flange having bolt-apertures and said body having a series of raised bearing-surfaces located inside of said flange and in position to support the bolts in their working position, and each of said apertures also having one or more raised bearing-surfaces coöperating with the bearing-surfaces of the body to support the bolts.

9. A safe-body having a doorway and a forwardly and a rearwardly extending flange located around said doorway and forming an elongated jamb, said jamb having a groove therein, the outer contiguous face of said forwardly-extending flange being substantially square with the jamb-surface.

10. An integral safe-body having a doorway and an external and an internal flange located around said doorway, said flanges projecting in opposite directions and forming an elongated jamb provided with a groove therein and with an offset at one side of said groove.

11. An integral safe-body having a doorway and an external and an internal flange located around said doorway and forming an elongated jamb provided with a groove located therein, and an offset located in the rear of said groove.

12. A safe-body provided with a doorway and having located around said doorway a flange or projection integral with a part of said body, with its outer face, contiguous to the jamb of such doorway, substantially square therewith, said projection having a distinct line of demarcation at its juncture-point with the body, and said jamb having a groove located therein.

13. A safe comprising a body having a doorway, and an external flange integral with a part of said body and located around said doorway and forming an elongated jamb, said jamb having a groove therein, and a door having an elongated joint-surface corresponding with that of said jamb and adapted to fit into said doorway, the outer marginal face of said door being substantially flush with the outer contiguous face of said flange.

14. A safe comprising an integral body having a doorway and an external and an internal flange located around said doorway and forming an elongated jamb provided with a groove therein and with an offset at one side of said groove; and a door channel-shaped in cross-section adapted to fit into said doorway and having an elongated joint-surface, and an offset adapted to register with said jamb-offset.

15. An integral safe-body formed in one piece and having a doorway, and provided around such doorway with an interiorly-located flange projecting rearwardly into the interior of said body and forming an elongated jamb having a bolt-receiving groove therein, the innermost face of said flange being free of juncture with the sides of said body.

16. An integral safe-door comprising a body and a flange, said flange having flaring bolt-apertures for the passage of locking-bolts,

and said body having a centrally-located boss in position to coöperate with the inner ends of said bolts.

17. An integral safe-door comprising a body, and a flange forming with said body an elongated joint-surface having an offset, said flange having a series of bolt-receiving apertures located intermediate said offset and the body of said door.

18. A safe comprising a body provided with a doorway and having increased thickness around such doorway, the jamb of such doorway having therein an opening for the reception of a bolt and an offset in the rear of said opening; and an integral door adapted to fit into said doorway and comprising a body and a flange, said flange having an offset registering with the offset of the doorway-jamb, and also having a bolt-aperture intermediate its offset and body.

19. A safe comprising a body provided with a doorway and with an external and an internal bead or flange located around said doorway, the jamb of said doorway having therein an opening for the reception of a bolt and an offset in the rear of said opening; and an integral door adapted to fit into said doorway and comprising a body and a flange, said flange having an offset registering with the offset of the doorway-jamb and also having a bolt-aperture intermediate its offset and body.

20. A safe comprising a body provided with a doorway and with an external and an internal bead or flange located around said doorway, the jamb of said doorway having therein an annular groove for the reception of bolts and an offset in the rear of said groove; an integral door adapted to fit into said doorway and comprising a body and a flange, said flange having an offset registering with the offset of the doorway-jamb and also having a series of bolt-apertures intermediate its offset and body; and bolt mechanism in position to lock said door in its seat.

21. An integral door comprising a body and a flange, said flange having a series of rectangular flaring apertures for the passage of locking-bolts, and an offset in the rear of said apertures, and said door having a centrally-located boss coöperating with the inner ends of the bolts, and a plurality of raised bearing-faces in engagement with each of said bolts.

22. A safe comprising an integral body having a doorway and having increased thickness around such doorway, the outer marginal face of such body around the doorway being substantially square with the joint-surface of the doorway, said joint-surface having a groove located therein for the reception of bolts, and an integral door comprising a body and a flange, said flange having bolt-apertures for the passage of bolts, the outer marginal surface of said door being substantially square with the periphery thereof and flush with the outer marginal face of said body.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

HENRY D. HIBBARD.

Witnesses:
M. F. BOYLE,
J. B. CLAUTICE.