No. 662,429.

Patented Nov. 27, 1900.

H. D. HIBBARD.

SAFE.

(Application filed Nov. 14, 1898.)

(No Model.)

2 Sheets—Sheet 1.

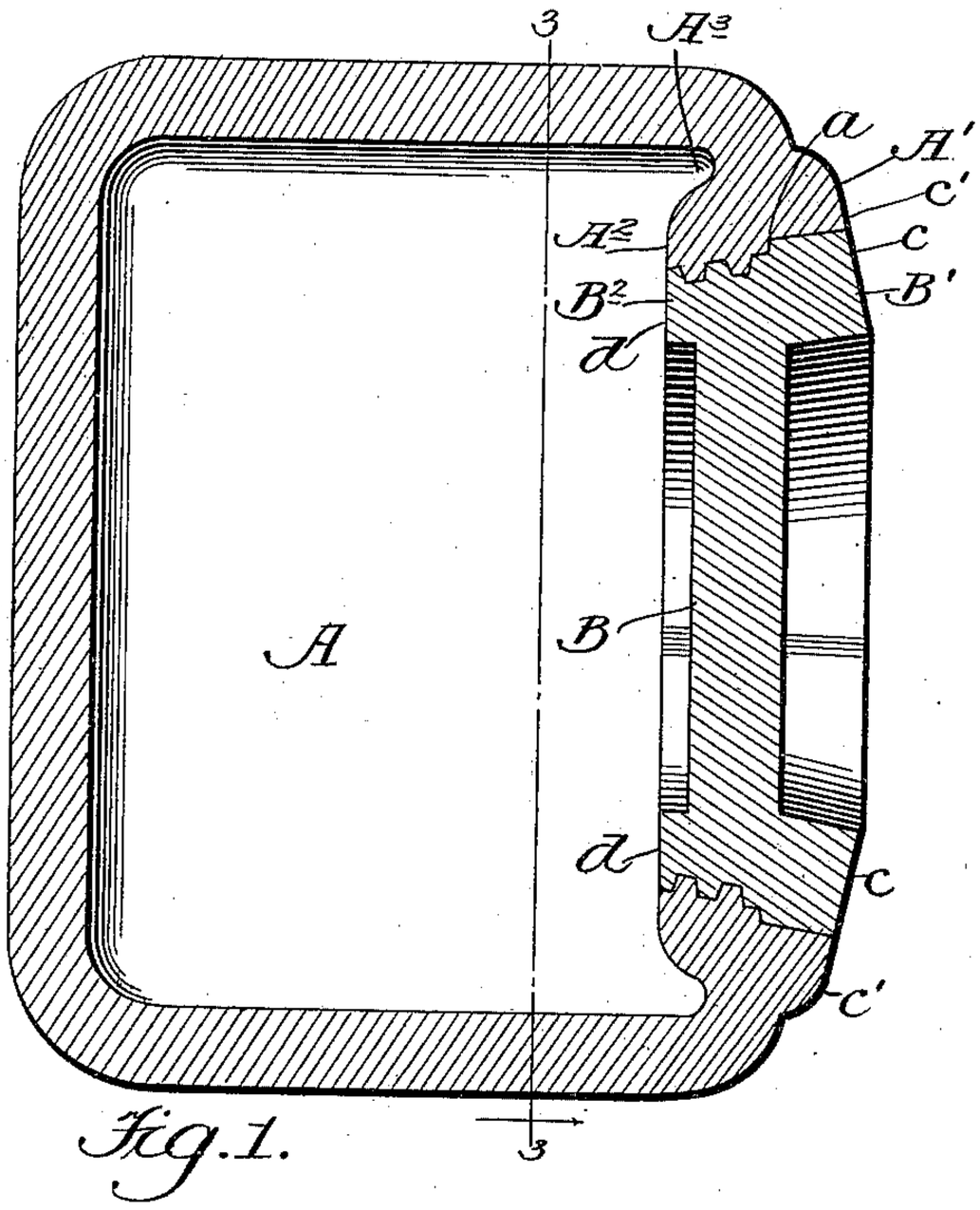

Fig. 1.

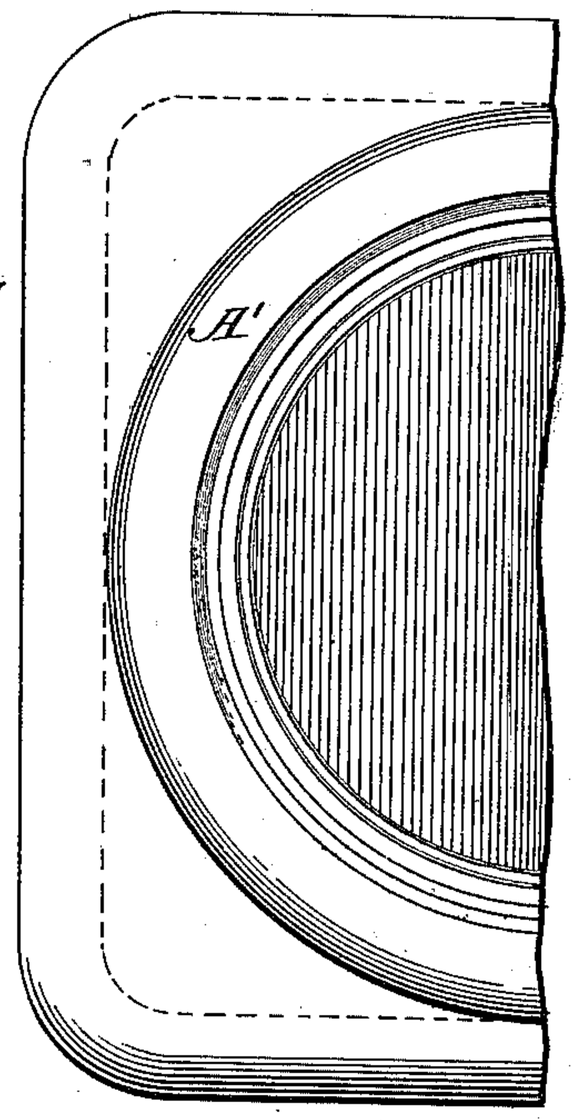

Fig. 2.

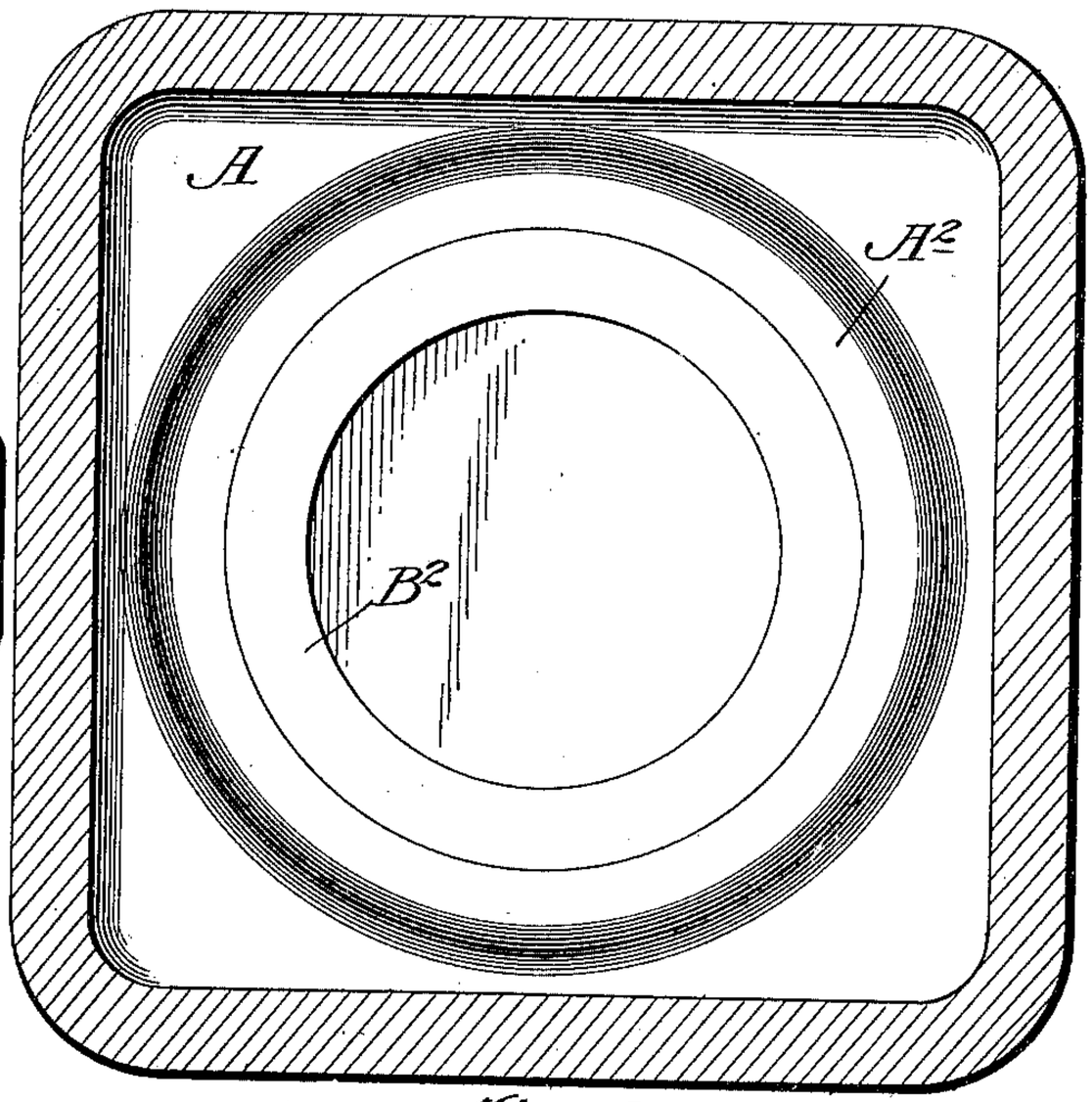

Fig. 3.

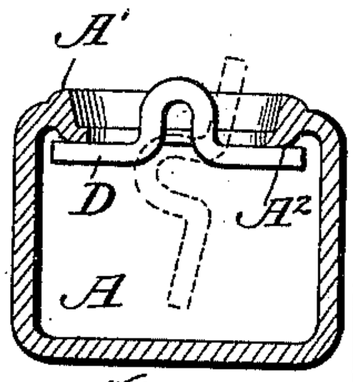

Fig. 8.

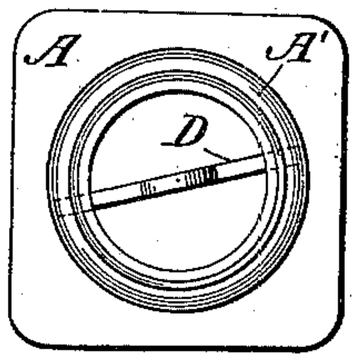

Fig. 9.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 7.

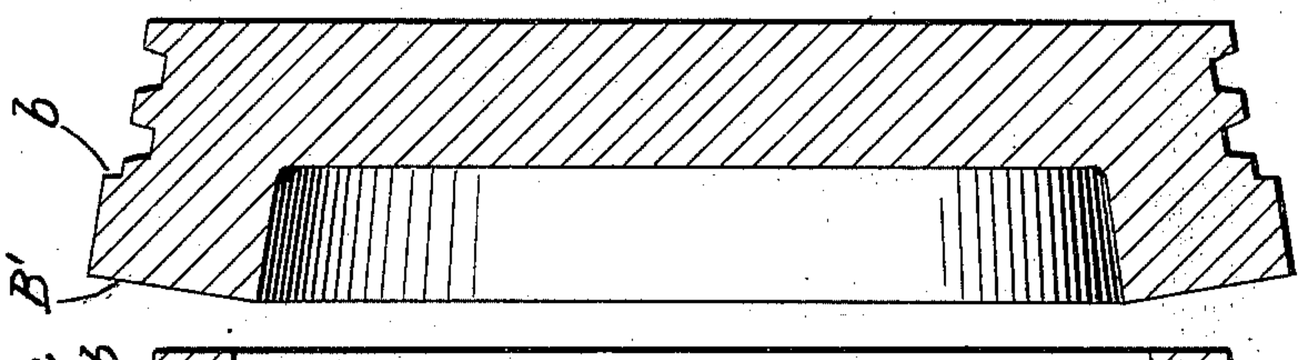

Fig. 6.

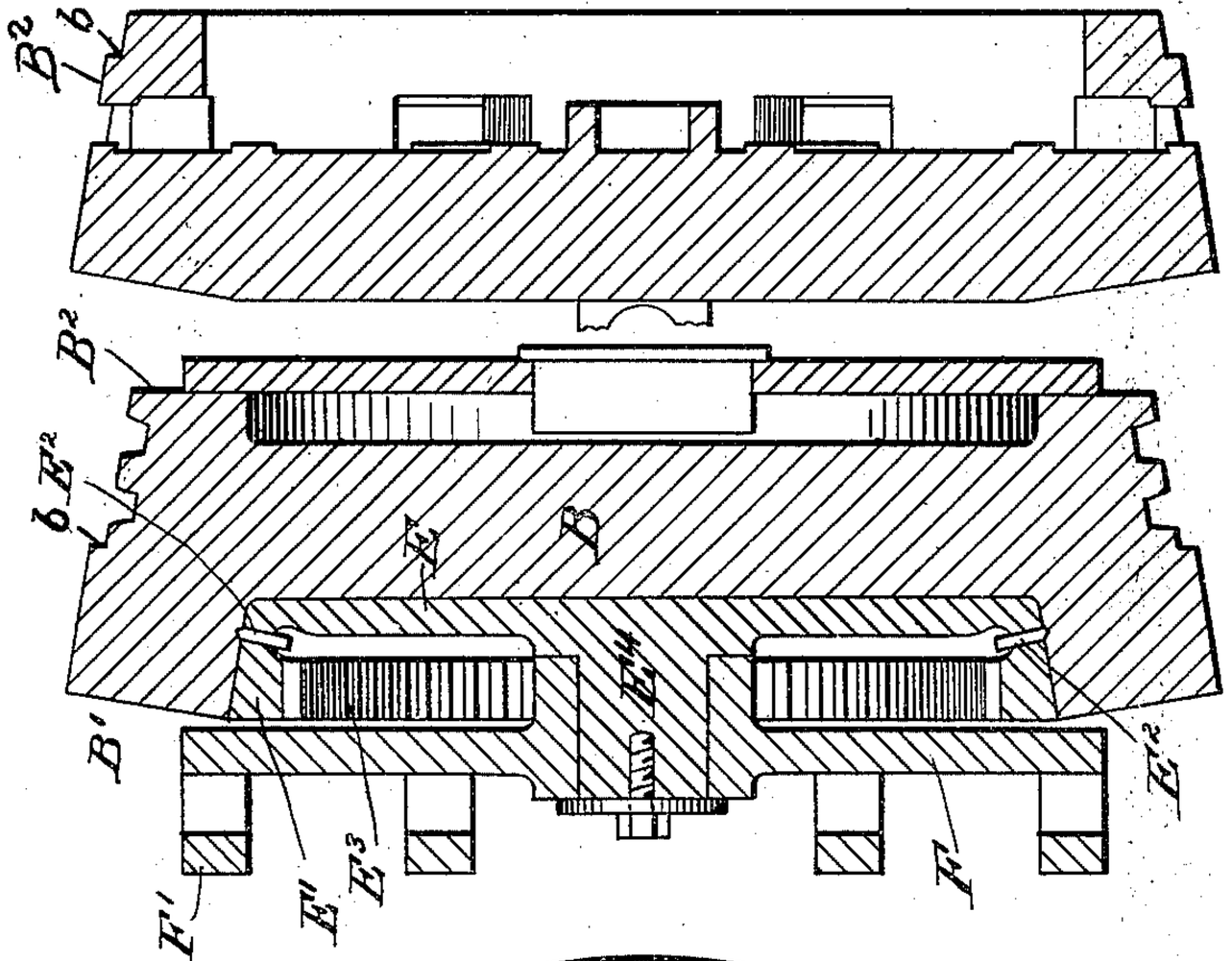

Fig. 5.

Fig. 4.

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SAFE.

SPECIFICATION forming part of Letters Patent No. 662,429, dated November 27, 1900.

Application filed November 14, 1898. Serial No. 696,394. (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 safes, and particularly to that class thereof known as "burglar-proof safes," the object of the invention being to provide an improved structure of this character specially adapted for resisting attack by nitroglycerin or other high explosives.

In the drawings accompanying and forming part of this specification, Figure 1 is a central vertical section through the safe-body and its door. Fig. 2 is a front view of a portion of the safe-body. Fig. 3 is a vertical sectional view taken in the line 3 3, Fig. 1, looking from the rear. Fig. 4 is a front view of the door with the operating mechanism in place for rotating such door into and out of its closed position. Fig. 5 is a vertical sectional view taken in line 5 5, Fig. 4. Figs. 6 and 7 are also vertical sectional views illustrating different forms of said door, Fig. 6 showing the door-body provided with a flange at the inner side thereof, and Fig. 7 showing the door-body provided with a flange at the outer side thereof; and Figs. 8 and 9 illustrate on a small scale a convenient means for manipulating the safe-body during the heat treatment thereof, Fig. 8 being a vertical section, and Fig. 9 a plan view, of such body.

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

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

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 fired against the safe, while rabbets which might be reached by a liquid explosive after heavy charges have been fired on the exterior of the safe must be done away with. 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. All of the above features must be secured without the safe being unduly heavy or bulky.

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 which have heretofore been made.

This improved safe is of that class which is known as "integral"—that is, the body and door each consist of one piece of metal. In practice the safe is preferably manufactured of the hard and ductile metal known as "manganese steel"—that is, the steel produced in accordance with the patented process of Hadfield—and which in order to possess the best properties for use in the manufacture of safes where it is called upon to resist the drill and wedge and the effect of high explosives must be "heat-treated," by which I mean that the safe after being cast must be heated slowly to a high temperature—such, for instance, as that above redness—and then cooled—as, for instance, rapidly—to give the metal certain desired properties or to increase some of those which it already possesses in some degree.

In the form thereof herein shown and described, and which may be its preferred form, if desired, the safe comprises a body A, of any desired shape, shown herein having side and rear walls provided with a front projecting inwardly from such side walls, such front having a doorway provided with a door seat

or jamb. This body is shown of substantially uniform thickness, the front being provided at its outer and inner faces around the doorway with rings, beads, flanges, or projections A′ and A², respectively, of metal, integral with the body, which rings of metal thereby increase in thickness that part of the front which encircles the doorway, and thus provide an elongated seat or jamb for the door. By the term "seat" is meant that portion of the body door-opening which is in engagement with the door around its edge. By the provision of these rings of metal the safe front in the present instance has substantially 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, 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 body at other parts thereof.

The provision of a rearwardly-extending flange A² around the door-opening forms a recess A³ 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. Located in the seat, preferably remote from the outer side of the front, is an annular offset *a*.

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 internal and external flanges, one diverging outwardly and the other rearwardly from the sides of the safe or from that part of the front which is substantially uniform with the rest of the body.

By the provision of the 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 provision of a mass of metal at this point, the outer flange A² 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 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 which are displaced by the explosion, so that on an explosion or on the hammering at one point this flange will yield outwardly without causing the joint or crack to open each side of the point hammered. In other words, should a charge of explosive material be fired 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 to yield together in the same direction, thereby preventing the opening of the crack or joint of the 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 explosive would act to cause the opening of the joint either by cracking the metal when the charge is sufficient for this purpose or in other ways, thereby to permit the insertion of a charge of nitroglycerin.

The door in the present instance comprises a body or plate B, provided with a flange. In one form this flange extends interiorly of the body. (See Fig. 6.) In another form it extends exteriorly, (see Fig. 7,) and in still another form the flange B′ and B² extends both exteriorly and interiorly, (see Fig. 5,) whereby recesses are provided for the reception of the door actuating and locking mechanisms.

In the form shown in Fig. 6 the recess is adapted to receive suitable bolt mechanism, (not shown,) the bolts of which extend radially through apertures formed in the flange, as set forth in my contemporaneously-pending application, Serial No. 679,976, filed May 7, 1898.

In the form shown in Fig. 5 the body B is located substantially centrally of the depth of the flange, this form of door being especially applicable to that class of safes having so-called "screw-doors." The outer recess is utilized for the reception of suitable mechanism for rotating the door, while the inner recess is utilized for the reception of suitable locking mechanism. In practice when bolt mechanism is used the jamb of the door may be provided with a suitable groove or a series thereof for the reception of the ends of the bolts, this being shown in my application above referred to, but is not necessary in the present instance, since the door is of that class, as above set forth, known as "screw-doors." This groove in the body when provided will reduce the amount of metal at what otherwise would be a too massive part. This same object, however, is accomplished in the present instance by the provision of

the thread-spaces located in the rear of the offset. The threads coact with similar threads formed on the flange of the door in the rear of an offset *b*, likewise formed in such flange to register with the jamb-offset *a*.

In practice the outer marginal face *c* of the door flange or body, as the case may be, is flush with the outer face *c'* of the flange or ring A^2 of the safe-body, this preferably also being the case with the inner face *d* of the door flange or body and the rearwardly-extending flange or ring A' of such body front, and for this purpose the outer marginal face of such door flange or body is preferably coned, whereby it will be substantially square with its peripheral edge, and consequently with the joint of the door. By this construction it will be seen that the body of the door may be substantially of the same thickness as the body of the safe, while the flange of the door constitutes a means of providing an elongated joint-surface or edge coacting with the elongated jamb or joint surface of the body front, thereby forming at the point which is usually subjected to attack a joint of considerable length as compared with other portions of the safe without at the same time interfering with the proper heat treatment of the parts.

In practice the doorway or opening of the body is made conical or tapering, being larger at the front, so that the door may be freely inserted, while the door is made tapering and circular, thereby to facilitate the required precisionizing of the seat-surfaces of the safe body and door. The long joint thus formed by the flange of the door and the flanges of the body front present large surfaces of metal which favor the transmission of shocks from the door to the body, or vice versa, without damaging the metal, while it also greatly aids to prevent the door being forced in on one side by the effect of a charge of explosive fired near the edge. The offsets *a* and *b* coact to prevent the door from being forced inwardly at any point, while such offsets being located relatively remote to the front of the door very much reduce the chances of a burglar working nitroglycerin so far into the joint as to reach them.

In the form shown the door is provided with suitable mechanism for rotating the same and which is shown located in the outer recess thereof. Into this recess is fitted a suitable casting E, having a forwardly-extending flange E', secured to the flange of the door by bolts or pins E^2, which project sufficiently into the hard metal of such door-flange to maintain the casting E firmly in position. The flange E' is formed as an internal gear and is therefore provided with an annular series of gear-teeth E^3, loosely mounted on a boss or hub E^4. Integral with the casting is a face-plate F, retained in position by a suitable screw and washer. This plate is provided with ears F' for the reception of a pintle of a crane-hinge. (Not shown.) Projecting through this plate is a stub-shaft F^2, carrying at its inner end a pinion F^3 in engagement with the internal gear E^3, whereby on the rotation of the shaft F^2 by a suitable crank the rotation of the door, thereby to engage and disengage the same from the body, is effected.

The form of heat treatment which is used in practice for the metal from which the present structure is manufactured consists in slowly heating the article after it is cast in a furnace to the desired temperature and then withdrawing it and immersing it in water or some other fluid which will cool it faster than if allowed to cool in the open air in the usual way. To accomplish this, however, with any reasonable degree of practicability, the safe must have, as hereinbefore specified, 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 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 in 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 safe 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 in its highest integrity at all parts thereof.

The heat treatment hereinbefore mentioned can be readily carried out by placing the safe-body and the door each separately in a furnace while such furnace is cold and then igniting the fuel and regulating the further supply thereof and the access of air to attain a gradual heating up to a fairly bright red. This usually takes several hours, after which the parts are removed from the fire and immersed in water. The handling of the door will involve little difficulty. The safe-body can be suspended by a chain and crane, the chain being attached to a narrow cross-bar D, which may be introduced in a vertical position, as shown in dotted lines, Fig. 8, and then turned into a horizontal position on the interior, whereupon it will engage the walls of the front, and so permit the safe to be swung into position to be lowered over a body of water either fresh or brine or any preferable cooling liquid, or if this is not

practicable in all instances, owing to the possibility of the bar bending the hot metal, other means may be used.

It is to be understood that the term "safe" as used herein and in the claims includes a vault, strong room, or analogous structure and that the term "ring" as used herein and in the claims is not limited to a circular flange or projection, but includes within its scope whatever form of means will accomplish the object set forth herein, since around an oval or a square doorway this ring will conform to the shape of such doorway.

By the term "unmachinable" as used herein is meant that the metal of which the safe is built is of such a character that cutting or boring tools are of no practicable use in connection therewith and that the only operations that are practicable are grinding ones.

I claim as my invention—

1. An integral safe or vault door having a recess extending over the major part thereof to form an annular flange and a body, the latter of reduced thickness as compared with the thickness of the door at the outer edge thereof, said door having its edge provided with an offset, and at one side of said offset with an elongated smooth joint-surface extending in an unbroken condition from said offset to the face of the door.

2. An integral safe or vault door having a recess extending over the major part thereof to form an annular flange and a body, the latter of reduced thickness as compared with the thickness of the door at the outer edge thereof, said door having its edge provided with an offset, and at one side of said offset with an elongated smooth joint-surface extending in an unbroken condition from said offset to the face of the door, the outer marginal face of said door being substantially square with said smooth joint-surface.

3. An integral safe or vault door comprising a body having an annular flange extending forwardly of said body and forming with such body an elongated joint-surface; a step or offset located at the periphery of the door; and threads located at one side of said offset, said door having a smooth elongated joint-surface extending in an unbroken condition from the outer face of said door to said threads or offset.

4. A safe-body made integral of metal of substantially uniform thickness and provided with an outwardly-extending flange and a rearwardly-extending flange, both around the door-opening and presenting an elongated joint-surface, the rearwardly-extending flange forming at its rear a recess whereby the thickness of the mass of metal around said opening will be substantially uniform with the other portions of the body, substantially as described.

5. A safe or vault body having a doorway, a door adapted to fit therein, said body having around said doorway and in contact with the edge of the door a projection integral with a part of such body and in position and adapted to yield with the metal of the door at the edge thereof when such door metal is, under high-explosive charges, moved laterally or radially, thereby to continuously preserve a tight metal-to-metal joint or contact between said projection and the door edge, the organization being such that said projection has a distinct line of demarcation at its juncture-point with the body.

6. A safe or vault body having a doorway, a projection located around said doorway and having its inner face forming a door-seat, such projection terminating with the outer edge of such door-seat whereby such projection does not extend beyond the door-seat, said projection having a distinct line of demarcation at its juncture-point with the safe-body, and a door adapted to fit into said seat in such manner that the metal of the projection will yield with the metal of the door at the edge thereof when the joint is subjected to the effect of high-explosive charges.

7. A safe or vault comprising a body having a doorway and provided around such doorway with a projection integral with a part of said body, and a door having, when in its closed position, its outer marginal face substantially flush with the contiguous outer face of such projection.

8. A safe or vault body having a doorway and provided around such doorway on the interior of the safe with a rearwardly-extending integral projection or flange prolonging the door-seat to form an elongated joint-surface, the innermost face of said flange being free of juncture with the sides of said body.

9. A safe or vault body having a doorway, the jamb thereof having relatively great depth obtained by providing such body with an integral rearwardly-extending projection located around such doorway on the interior of such body with a space formed between such projection and the walls of said body, whereby the thickness of the mass of metal around said doorway will be substantially uniform with the other portions of the body.

10. A safe or vault body having a doorway and provided around said doorway with an integral projection or flange extending beyond the body proper, the face of such flange being substantially square with the jamb-surface.

11. A safe or vault body having a front provided with a doorway, such front having a ring or projection of metal integral therewith and located around said doorway and projecting beyond the normal surface of said front and increasing the normal thickness of the front around the doorway thereby to provide such doorway with an elongated jamb-surface, the outer surface of said ring being substantially square with said jamb-surface, and an offset or step located in said jamb-surface.

12. A safe-body having a doorway, and provided around such doorway with a ring or projection of metal integral with a part of the

body and projecting forwardly beyond the normal face of said body and with a ring or projection of metal also integral with a part of the body and projecting rearwardly into the interior of said body, said rings forming an elongated jamb.

13. A safe comprising an integral heat-treated body of metal approximately uniform in thickness and having inner and outer beads or flanges contiguous to the doorway, and forming an elongated jamb, and a door having its edge of increased thickness and corresponding with the thickness of such jamb, thereby providing an elongated joint-surface around the door, said door having its outer marginal surface flush with the outer face of the exterior flange of the body, substantially as described.

14. In a safe, the combination of an integral body of substantially uniform thickness having a doorway and provided around said doorway with a forwardly-extending increased portion or flange; and a door having, when in its closed position, its outer marginal face substantially flush with the outer face of such flange.

15. A safe-body having a doorway, and provided around such doorway with a ring or projection of metal integral with the body, and projecting forwardly beyond the normal face of said body, and with a ring or projection of metal also integral with the body, and projecting rearwardly into the interior of said body, said rings forming an elongated jamb, the outer surface of the outer ring or projection being substantially square with the jamb-surface, and the inner ring or projection forming a space located between said ring and the side walls of the body, whereby the thickness of the mass of metal around the doorway will be decreased, while an elongated jamb-surface is obtained.

16. An integral safe-door comprising a body having a pair of annular flanges, one extending forwardly of said body and the other rearwardly thereof, and forming with said body at the periphery thereof an elongated joint-surface; a step or offset located at said periphery, and threads located at one side of such offset, said door having a smooth elongated joint-surface extending in an unbroken condition from the outer face of the door inwardly to said offset or threads.

17. A safe-body made integral of metal of uniform thickness and provided with an outer flange and an inwardly-extending flange, both around the door-opening, and presenting an elongated joint-surface, the inner flange forming at its rear a recess A^3, whereby the thickness or mass of metal around said opening will be substantially uniform with the other portions of the body, in combination with a door having its outer marginal portion flush with the outer flange, substantially as described.

18. In a safe, an integral heat-treated door of metal, approximately uniform in thickness and having a recess extending over the major portion thereof, in combination with a body also integral of heat-treated metal, the bearing-surfaces matching with a long and tapered joint, and both door and body being slightly coned externally to be square with the joint and flush with each other, substantially as described.

19. An integral safe-door comprising a body having an annular flange projecting forwardly thereof and forming with such body an elongated joint-surface; a step or offset located at the periphery of the door, and threads located at one side of said offset, said door having a smooth elongated tapered surface at the other side of said offset and extending in an unbroken condition from said offset to the outer face of the door.

20. An integral safe-door comprising a body having an annular flange projecting forwardly thereof and forming with such body an elongated joint-surface, a step or offset located at the periphery of said door, threads located at one side of such offset; and means comprising gear mechanism located within the recess formed by said forwardly-extending flange for rotating said door.

21. An integral safe-door comprising a body having an annular flange projecting forwardly thereof and forming with the door an elongated joint-surface, a step or offset located at the periphery of said door, threads located at one side of said offset, said door having a smooth elongated tapered surface at the other side of said offset and extending in an unbroken condition from said offset to the outer face of the door; and means located in the recess formed by said flange, and comprising an internal gear and a pinion meshing therewith for rotating said door.

22. An integral safe-door comprising a body having a pair of annular flanges, one extending forwardly of said body and the other rearwardly thereof, and forming with such body at the periphery thereof an elongated joint-surface, a step or offset located at said periphery, and threads located at one side of such offset, said door having a smooth elongated tapered surface at the other side of such offset and extending in an unbroken condition from said offset to the outer face of the door.

23. An integral safe-door comprising a body having a pair of annular flanges, one extending forwardly of said body and the other rearwardly thereof, and forming with such body at the periphery thereof an elongated joint-surface, a step or offset located at said periphery, threads located at one side of such offset, said door having a smooth elongated tapered surface at the other side of such offset and extending in an unbroken condition from said offset to the outer face of the door; and means located in the recess formed by said forwardly-extending flange for rotating said door.

24. An integral safe-door comprising a body having a pair of annular flanges, one extend-

ing forwardly of said body and the other rearwardly thereof, and forming with a part of such body at the periphery thereof an elongated joint-surface, a step or offset located at said periphery, threads located at one side of such offset, said door having a smooth elongated tapered surface at the other side of such offset and extending in an unbroken condition from said offset to the outer face of the door; and means comprising an internal gear and a pinion located in the recess formed by said forwardly-extending flange for rotating said door.

25. A safe or vault cast of the manganese steel herein specified and heat-treated substantially as herein set forth subsequent to said casting, thereby to render such metal tough, and comprising an integral body having a doorway and provided with an increased portion of metal around such doorway forming a jamb of greater length in the direction of its depth than the thickness of the walls of the body thereby forming an elongated jamb, the organization of the body being such, however, that while an increased portion of the metal is obtained around the doorway the metal of such body is nevertheless substantially uniform throughout thereby to facilitate such heat treatment; and an integral door channel-shaped in cross-section and having a joint-surface of greater depth than the thickness of the body of such door or of the walls of the safe-body, the organization being such, however, that while the door has an elongated joint-surface the thickness of such door is nevertheless substantially uniform throughout and with that of the safe-body thereby to facilitate the heat treatment of said door.

26. An integral safe-body cast of steel and heat-treated subsequent to such casting by heating such cast safe-body up to a predetermined temperature and then cooling the same, substantially as herein set forth.

27. An integral safe-body cast of the manganese steel herein specified and heat-treated subsequent to such casting by heating such cast safe-body up to a predetermined temperature and then cooling the same, substantially as herein set forth.

28. An integral safe-door cast of steel and heat-treated subsequent to such casting by heating such cast door up to a predetermined temperature and then cooling the same, substantially as herein set forth.

29. An integral safe-door cast of the manganese steel herein specified and heat-treated subsequent to such casting by heating such cast door up to a predetermined temperature and then cooling the same, substantially as herein set forth.

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

HENRY D. HIBBARD.

Witnesses:
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M. F. BOYLE.