F. L. SAINO.

FIRE DOOR OR SHUTTER.

APPLICATION FILED OCT. 6, 1915.

1,195,505. Patented Aug. 22, 1916.

2 SHEETS—SHEET 1.

Fig. 1

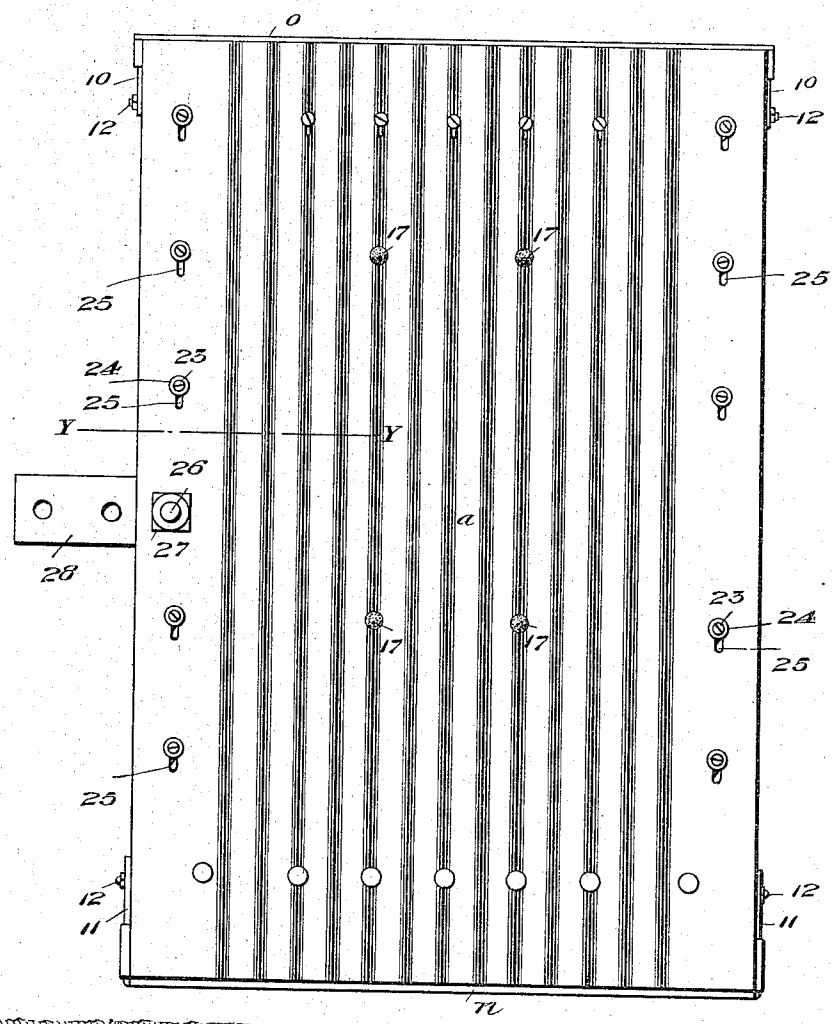


Fig. 4.

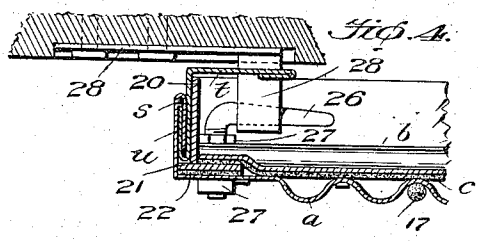
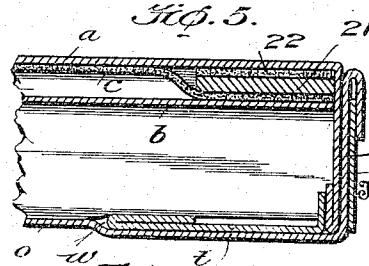


Fig. 5.



Witness

Inventor

Felix L. Saino.

By T. Walter Fowler

Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

F. L. SAINO.

FIRE DOOR OR SHUTTER.

APPLICATION FILED OCT. 6, 1915.

1,195,505.

Patented Aug. 22, 1916.

2 SHEETS—SHEET 2.

Fig. 2.

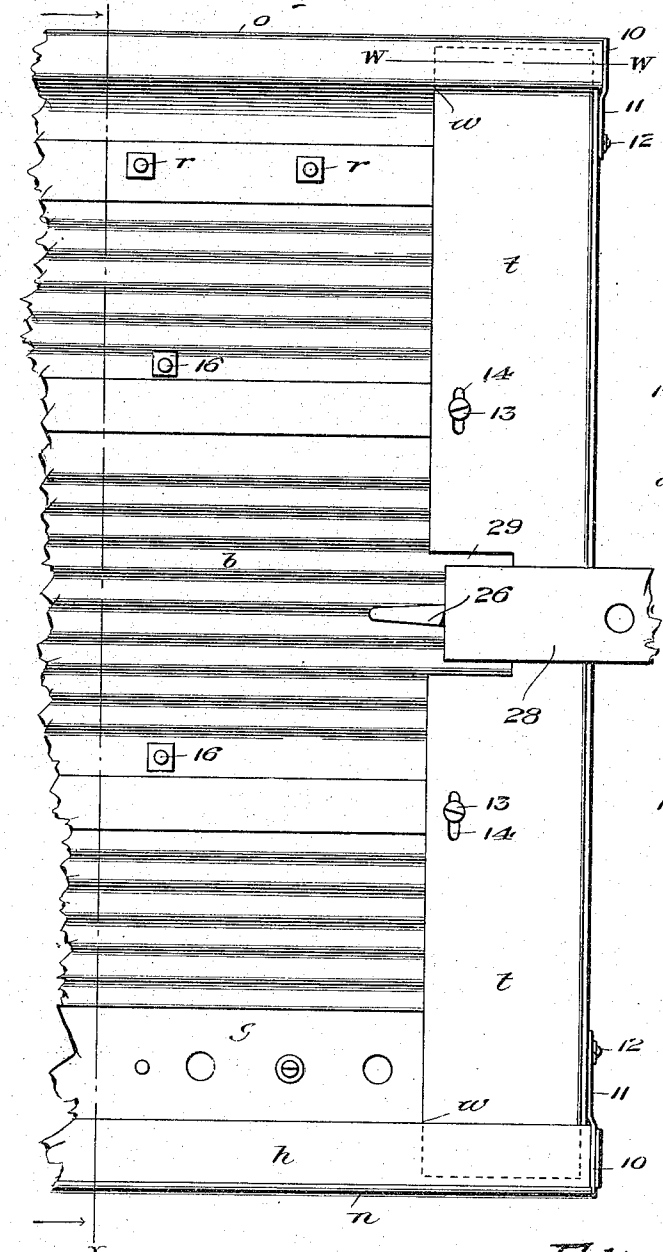
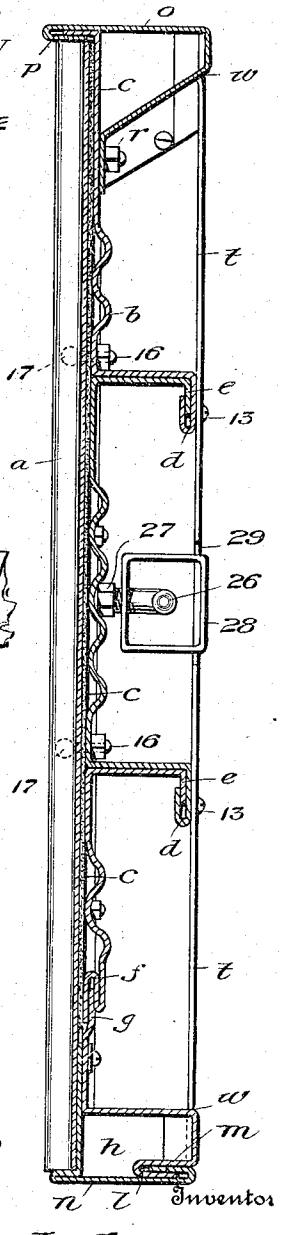


Fig. 3.



Witness

Inventor

Félix L. Saino.

By T. Walter Fowler

Attorney

THE NORRIS PETERS CO., PHOTO LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FELIX LAWARNCE SAINO, OF MEMPHIS, TENNESSEE.

FIRE DOOR OR SHUTTER.

1,195,505. Specification of Letters Patent. Patented Aug. 22, 1916.

Application filed October 6, 1915. Serial No. 54,387.

To all whom it may concern:

Be it known that I, FELIX L. SAINO, a citizen of the United States, residing at Memphis, in the county of Shelby and State of Tennessee, have invented certain new and useful Improvements in Fire Doors or Shutters, of which the following is a specification.

My invention relates to certain new and useful improvements in fire-doors and shutters, and particularly those made with front and rear metallic sheets and an interposed sheet of refractory material, such for instance as disclosed in the prior patent No. 982,303, issued to myself and others on January 24, 1911.

One of the leading objects of the present invention is to provide a construction whereby increased expansion and flexibility of the components of the door are provided without in any manner detracting from the fire-resisting properties of the door, and to reduce to a minimum the number of parts entering into the door construction.

With the above and other objects in view, the present invention consists of the parts, and the constructions, arrangements and combinations of parts which I will hereinafter describe and claim.

In the accompanying drawings forming part of this specification and in which similar reference characters indicate like parts in the several views;—Figure 1 is a front elevation of a fire-door or shutter embodying the salient features of my invention and showing a portion of the door broken away. Fig. 2 is an enlarged rear view of a side portion of the door. Fig. 3 is a vertical section on the line X—X of Fig. 2. Fig. 4 is an enlarged horizontal section on the line Y—Y of Fig. 2. Fig. 5 is an enlarged cross-section on the line W—W of Fig. 2.

In the said drawings, as in the before-mentioned patented construction, the door or shutter comprises fundamentally a front, *a*, of sheet-metal and a back, *b*, of similar material, preferably corrugated and formed of sections of suitable width according to the size of the door or shutter. The corrugations of the front extend vertically while those of the rear sheet extend horizontally or crosswise of the first mentioned corrugations and which latter corrugations, namely, those vertically disposed are open at the bottom to allow for the free entrance of air from the rear or cooler side of the door in much the same manner as disclosed in the aforesaid prior patented construction, it being understood that when a high temperature is maintained outside of the front sheet, heating said sheet, say to a red color, the air in the channels formed by the corrugations becomes heated by intimate contact with the walls thereof and, since the air in the room to be protected is at a much lower temperature than that of the interior of the door, a "flue action" or draft will be caused by the continuous displacement of the lighter heated air by the cooler. This fresh supply of cooler air, by absorbing the heat from the front sheet during its ascent, allows an increase in the duration and temperature of the exposure to which the door may be subjected without melting the metal.

As in the prior patented construction, I place between the front and rear sections of the door, a sheet, *c*, of suitable non-heat-conducting material, say, asbestos, or the like, one surface of which forms the walls of the flues formed by the vertical corrugations before mentioned.

When corrugated metal, horizontally disposed, is used in the construction of the sectional rear sheet, a series of dead-air pockets or channels are formed between the corrugations of said sections and the sheet of refractory material, *c*, thus reducing to a minimum the radiation of heat through the door. This also provides a transverse stiffness throughout the rear surface of the door.

The rear of the door is further reinforced and stiffened by one or more transverse beams which may be formed in any suitable manner, as by bending the adjacent edges of the sections into substantially L-shape. In other words, one section, *b*, has its edge first bent outwardly at right-angles to the rear surface of the door and thence is bent in a plane substantially parallel to said face and has its terminal edge bent back upon the last-named bent portion to form a groove or channel, *d*; the contiguous edge of the adjacent section is first bent at right-angles to conform substantially to the corresponding bent portion of the described companion section and has its terminal portion or outer edge adapted as a tongue, *e*, to enter the channel or groove, *d*, formed

by the bending back of the terminal edge of the section first described, which construction provides not only a rigid reinforcing bar on the back of the door between adjacent sections and extending horizontally across the same, but it further provides a slidable joint between the edges of said sections which will enable the sections to freely expand horizontally and vertically under the influence of heat to which the door may be exposed.

In practice, the depth of the groove, *d*, is about one-fourth (¼) of an inch greater than the length of the tongue *e*, or about equal to the length of the portion of the slot, 14, which is below the head of the bolt, 13. This provides space for ample expansion of the joint formed.

The top edge of the uppermost rear section, *b*, of the door is bent at right-angles toward and over the front, *a*, of the door and over the intermediate sheet, *c*, of refractory material, while the lower edge of the bottom rear section, *b*, is folded to form a groove or channel, *f*, in which is slidably fitted the upper bent edge or tongue of a plate, *g*, whose lower portion is bent into substantially rectangular form to form a part of a hollow section, *h*, or lower rail of the door, the terminal lower edge of this section being bent back upon itself to form a groove or channel, *l*, in which is slidably fitted the corresponding tongue, *m*, formed by bending back upon itself the rear edge of a plate, *n*, which forms the bottom of the hollow lower rail of the door, said plate, *n*, being slitted at the ends and again bent under the lower end of the front section of the door and thence extending up back of the front section of the door and over the plate, *g*, for a considerable distance and being riveted or otherwise secured to the latter, the rivets passing thus through the front and rear sections of the door and firmly securing these parts together.

The top rail of the door is formed by a plate, *o*, whose upper front edge is folded rearwardly to form a groove, *p*, into which slidably fits the forwardly extending bent edge of the uppermost rear section, *b*, of the door, the said plate, *o*, being slitted at the ends and bent into substantially rectangular shape to form a hollow rail of proper dimensions at the upper end of the door; the rear or lower edge of this bent plate, *o*, being bolted, riveted or otherwise secured to the front and rear sections of the door, as shown at *r*, thereby securing this upper hollow section or rail rigidly to the other components of the door while allowing for expansive movement in the joints formed by the overlaps when the door is subjected to high temperatures.

The stiles of the door are formed by extending the side edges of the front sheets, *a*, over the side edges of the door and bending back the free edges of these sheets to form grooves, *s*, the said front sheets thus forming a binding along and over the side edges of the door.

On the rear side of the door and extending vertically and continuously from top to bottom are the plates, *t*, of suitable width and each of which is bent so that one portion extends over a side edge of the door, this bent portion having its marginal edge folded to form a tongue, *u*, which slidably interlocks with the groove, *v*, formed by folding the outer edge of that portion of the said front sheet, *a*, which is bent over the side edge of the door to form the continuous interlocking side edge binding therefor, as before explained, and wherein expansion is taken care of by the interlock of the parts, and the slats, 25, in the front wall, *a*.

At the rear corner portions, the bent plates, *g* and *o*, which form the top and bottom rails of the door are slotted, as at *w*, and the upper and lower ends of the vertical plates, *t*, pass through these slotted portions and into the rails, thereby housing the ends of the vertical plates and making an attractive finish therefor.

In slitting the rear portions of the plates, *g* and *o*, which form the top and bottom rails of the door, to admit the upper and lower ends of the vertical plates, *t*, suitable tongues, 10 and 11, are formed, one of which, 10, is bent over the upper ends of the sides of the door and the other, 11, is bent vertically over the side edge for a suitable distance and is then secured by a rivet, bolt or other suitable fastening, 12. The outer or free end of the tongue, 10, is bent back over the tongue, 11, as shown.

The intermediate portions of the vertical plates, *t*, are secured to the transverse reinforcing bars formed by bending and interlocking the edges of the adjacent rear sheets, *b*, of the door, by bolts or equivalent fastenings, 13, passing through slots, 14, in said vertical plates and engaging said reinforcing bars, and which construction permits expansion of the connected parts when the door is subjected to fire conditions.

As in the prior patented construction, suitable bolts or equivalent fastenings, 14, extend through the front and rear faces of the door and through the intermediate sheet of refractory material and serve to unite these parts normally in rigid condition. In this connection I prefer that the bolts, 16, which are the only means which penetrate and unite the central portions of the front and rear faces of the door, shall be formed with fusible heads, 17, which while normally holding the front and back of the door rigidly together or with the front face under restraint, will melt when subjected to a prede-

termined temperature and thus render the front plate, or plates, unrestrained transversely relatively to the back plates and to allow the now unrestrained front plate to bulge outwardly, as more fully disclosed in my prior application filed September 21, 1914, Serial Number 862,722.

In order to stiffen the stiles of the door I place within each of the same a continuous flat bar, 20, whose width will depend upon the size and thickness of the door or shutter with which it is employed as a stiffening frame.

Another continuous rigid vertical bar, 21, extends along each side of the door just back of the front plate, *a*, and materially stiffens the front corners of the door. Between these vertical bars, 20, 21, and the back of the front sheet, *a*, of the door is placed a sheet, 22, of paper or other destructible material, the said bars and destructible sheets being normally rigidly united by bolts, 23, or equivalent fastenings and the said sheets being capable of destruction under high temperature to thereby render the front sheet more or less unrestrained when the door is subjected to fire conditions and when increased flexibility to allow for more free expansion of the door is desired. This result is further provided for by placing fusible washers, 24, under the heads of the bolts, 23, which secure the front sheet, *a*, to the vertical bars, 21, said bolts or certain of them passing through slots, 25, in the front of the door to allow for relative vertical expansion between the bars and front of the door.

In order to hold the door when shut firmly against the wall, I employ a hook-bolt, 26, secured by nuts, 27, and passing through the front and back plates, *a*—*b*, of the door, the intermediate sheet, *c*, of refractory material and the vertical stiffening bar, 21, the hook-portion of this bolt extending transversely of and being spaced from the rear face of the door and lying between the same and the inner surface of the vertical side plate and adapted to engage a suitable hanger, 28, secured in the wall of the building, said vertical plate, *t*, being recessed at 29, to allow the same to pass over or receive the hanger, 28.

It is also noted that the bolts, 17, with fusible heads are the only fastenings which penetrate the door and normally hold the front and back sheets thereof in restraint. When the fire which strikes the outside or front of the door reaches a certain temperature, the heads of the bolts fuse and thereby release the bolts which in turn allow the front plate, *a*, to become unrestrained and to bulge outwardly as before described.

The door or shutter may be mounted in any well known manner, and the construction of the parts is such that while they are normally rigid, when fire hits the door, the paper sheets, the fusible washers, and the fusible heads of the bolts will render the door more or less unrestrained, thus permitting it to expand in all directions but without danger of separation or destruction of any of its leading components.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. A fire-door or shutter having front and rear walls of sheet metal and an intermediate sheet of refractory material, said rear wall composed of sections whose adjacent edges are normally spaced apart and slidable one relatively to the other, said edges being bent at an angle to the face of the door to form a transverse outstanding reinforcing girder on the rear of the door.

2. A fire-door or shutter having front and rear walls of sheet metal and an intermediate sheet of refractory material, said rear wall composed of sections having adjacent horizontal edges normally spaced apart and slidable one relatively to the other, said edges being bent substantially at right-angles to the plane of the rear face of the door to form a transverse reinforcing girder on the rear of the door, said edges of the sections being slidably interlocked to provide for relative expansion of the sections.

3. A fire-door or shutter having front and rear walls of sheet metal and an intermediate sheet of refractory material, said rear wall composed of sections having adjacent horizontal edges bent substantially at right-angles to the plane of the rear face of the door to form a transverse reinforcing girder of angular cross-section on the rear of the door, said edges of the sections being normally spaced apart and slidable one relatively to the other and being slidably interlocked to provide for relative expansion of the sections.

4. A fire-door or shutter having front and rear walls of sheet metal and an intermediate sheet of refractory material, said rear wall composed of sections having adjacent horizontal edges bent substantially at right-angles to the plane of the rear face of the door to form a transverse reinforcing girder on the rear of the door, said edges being normally spaced apart and slidable one relatively to the other, said edges of the sections being slidably interlocked to provide for relative expansion of the sections, a plate extending across the upper rear portion of the door and secured to the uppermost of the rear sections thereof and bent to form a hollow top rail, said plate and the upper edge of the upper rear section having their outer edges slidably interlocked, and plates extending along the sides of the rear of the door and over said reinforcing girders and having intermediate

portions secured to said girders, said girders and plates having registering openings, and fastenings engaging said openings.

5. A fire-door or shutter having front and rear walls of sheet metal and an intermediate sheet of refractory material, said rear wall composed of sections having adjacent horizontal edges bent substantially at right-angles to the plane of the rear face of the door to form a transverse reinforcing girder on the rear of the door, said edges of the sections being slidably interlocked to provide for relative expansion of the sections, a plate extending across the upper rear portion of the door and secured to the uppermost of the rear sections thereof and bent to form a hollow top rail, said plate and the upper edge of the upper rear section having their outer edges slidably interlocked, plates extending along the sides of the rear of the door and over the reinforcing girders, and means for securing the plates to the girders and allowing expansion of one part thereof relatively to the other part, said means comprising slots formed in one part and fastenings passing through said slots and into the other part.

6. A fire-door or shutter having front and rear walls of sheet metal and an intermediate sheet of refractory material, said rear wall composed of sections having adjacent horizontal edges bent substantially at right-angles to the plane of the rear face of the door to form a transverse reinforcing girder on the rear of the door, said edges of the sections being slidably interlocked to provide for relative expansion of the sections, a plate extending across the upper rear portion of the door and secured to the uppermost of the rear sections thereof and bent to form a hollow top rail, said plate and the upper edge of the upper rear section having their outer edges slidably interlocked, and plates extending along the sides of the rear of the door and over said reinforcing girders and having intermediate portions secured to said girders, said plates being of angular form in cross-section to provide portions which extend over the side edges of the door, and said front wall being extended over the side edges of the door, and overlapping the corresponding portions of the plates to form edge bindings for the door, the overlapping portions of the plates and the extended front wall of the door forming hollow stiles and having their edges folded to form a slidable interlock therebetween.

7. A fire-door or shutter having front and rear walls of sheet metal and an intermediate sheet of refractory material, and means forming hollow top and bottom rails for said door, vertical plates extending along the sides of the rear wall and of angular form in cross section to provide portions which extend over the side edges of the door, said front wall being extended over the side edges of the door and overlapping the corresponding portions of the vertical plates to form therewith edge bindings for the door, the plates and the extended portions of the front wall of the door forming hollow stiles and having their edges folded to form a slidable interlock therebetween, and continuous rigid bars extending through the hollow stiles beneath the overlapping portions of the front wall and vertical plates.

8. A fire-door or shutter having front and rear walls of sheet metal and an intermediate sheet of refractory material, and means forming hollow top and bottom rails for said door, vertical plates extending along the sides of the rear wall and of angular form in cross section to provide portions which extend over the side edges of the door, said front wall being extended over the side edges of the door and overlapping the corresponding portions of the vertical plates to form therewith edge bindings for the door, the plates and the extended portions of the front wall of the door forming hollow stiles therebetween, and continuous rigid bars extending through the hollow stiles beneath the overlapping portions of the front wall and vertical plates, the top and bottom rails of the door being slotted on the rear side and the ends of the vertical plates being extended into said slots.

9. A fire-door or shutter having front and rear walls of sheet metal, and an intermediate sheet of refractory material, said rear wall being composed of sections the adjacent edges of which are slidably interlocked, plates extending across the top and bottom of the rear wall and having one portion secured to the sections of the rear wall and having another portion bent to form rearwardly extending hollow top and bottom rails, said plates being slitted at the ends, vertical plates extending along the rear side edges of the door and made angular in cross section to provide portions which extend over the side edges of the door, the front wall of the door being extended over the side edges and overlapping the corresponding portions of the plates to form edge bindings for the door and the overlapping portions of the plates and the extended front wall of the door forming hollow stiles having their edges folded to form a slidable interlock therebetween, the upper and lower ends of said vertical plates being extended into the slitted portions of the top and bottom rails, and said rails having tongues which are bent transversely across the side edges of the door and having other tongues bent vertically over the side edges, and the first-named tongues having portions which are bent back over the second-named tongues, and means for securing the second-named tongues to

the overlapping portions of the vertical bars and the extended front wall of the door.

10. A fire-door or shutter having front and rear walls of sheet metal and an intermediate sheet of refractory material, said rear wall composed of sections whose adjacent edges are slidably interlocked and said front wall being extended over the side edges of the door and having folded edges, vertical plates at the rear edges of the door having portions extending over the edges of said door and folded to overlap and slidably interlock with the folded edges of the extended front, said door having slotted top and bottom rails in which the upper and lower ends of the vertical plates are extended, and said rails being formed of bent plates secured to the rear sections of the door and having opposite edges slidably interlocked with contiguous edges of the rear sections.

11. A fire-door or shutter having front and rear walls of sheet metal and an intermediate sheet of refractory material; means forming hollow stiles and top and bottom rails for the door; vertical plates extending beneath the front wall of the door along the side edges thereof; a sheet of destructible material between said plates and the inner surface of the front wall of the door; and securing devices normally rigidly uniting the front and read walls of the door to said plates; said sheet adapted to be destroyed under the influence of high temperatures to give flexibility to the front wall of the door.

In testimony whereof I affix my signature.

FELIX LAWARNCE SAINO.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."