M. GILMORE.

FIRE DOOR.

APPLICATION FILED MAY 6, 1916.

1,363,774. **Patented Dec. 28, 1920.**

Fig. 1

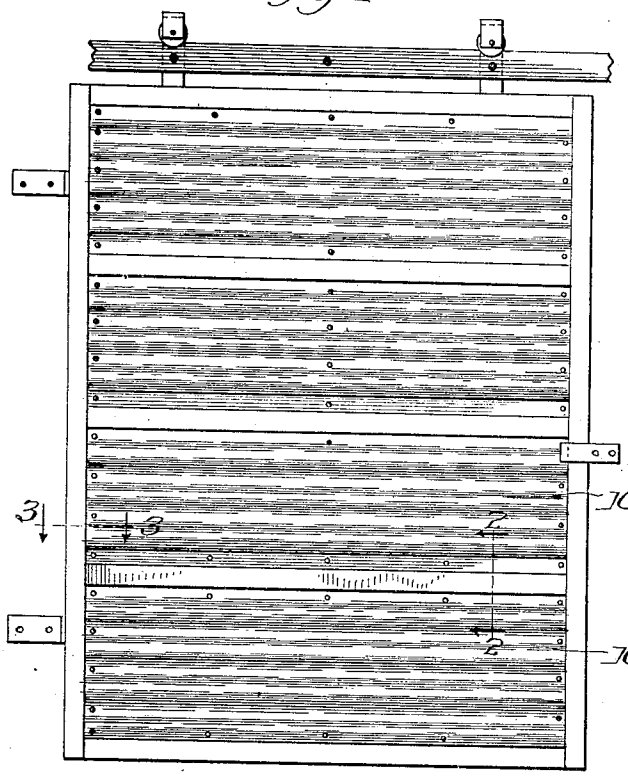


Fig. 2

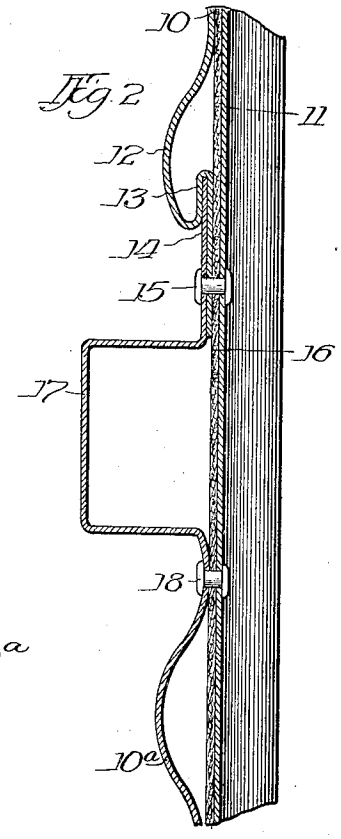
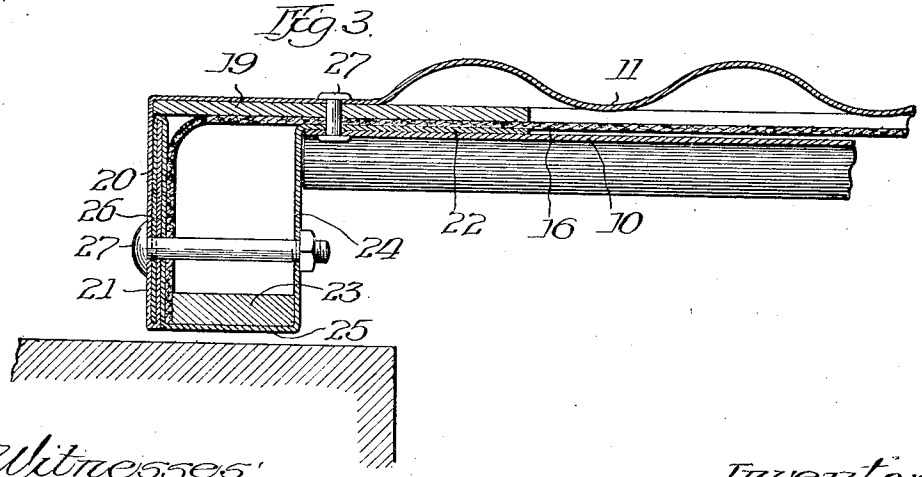


Fig. 3.



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UNITED STATES PATENT OFFICE.

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FIRE-DOOR.

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To all whom it may concern:

Be it known that I, MILLARD GILMORE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Fire-Doors, of which the following is a specification.

My invention pertains to an improved fire door construction in which a construction is employed that renders the doors stiffer and simpler of construction and also cheaper than doors of constructions heretofore made.

Heretofore in the art in the construction of fire doors of this class, which are used principally for closing the openings through brick walls in buildings, it has been considered necessary to provide stiffening members for the door having expansion joints so that the stiffening members may slide upon each other for expansion and contraction of the sheet metal plates forming the front and rear faces of the door so as to prevent buckling of the door when one side is subjected to a much higher temperature than the other as is the case when a fire is on one side of the wall and the door is employed to prevent the fire passing through the opening in the wall. I have found out that by properly constructing the door it is unnecessary to use expansion joints in the stiffening members, but that on the other hand the stiffening members may be formed continuously from one edge of the door to the other, and it is one of the objects of my present invention to provide a construction for securing this result. In carrying out my invention, I find it advisable to use corrugated iron for the front and rear faces of the door, this iron, however, being relatively thin, as for example about one thirty-second of an inch thick. And in connection with this thickness of corrugated metal I employ between them a thickness of fire-prooffing material, such for example as sheet asbestos, which preferably extends into the stiffening members disposed vertically at the edges of the door. These stiffening members are bent from sheet metal preferably somewhat thicker than the metal of the corrugated iron and the sheet of fire-proofing material extends preferably to the rear portion of the stiffening members near their outer walls. The rear edges of the stiffening members are disposed adjacent to the wall through which the opening being protected by the door extends, and I find that with a construction of the kind described the relatively thin sheet metal of the outer side is not of sufficient thickness to buckle the door as a whole when subjected to high temperature, on account of the stiffening members and the remaining portions of the door being relatively cool. The displacement that occurs in the shape of the outer corrugated sheet of metal when subjected to high temperature, may change the corrugations to a certain extent, but this, however, does not place a sufficiently large bending force on the door to buckle the remaining portions thereof.

My invention also provides an improved reinforcing construction for the central portion of the door between the vertical edge stiffening members, and by my invention I also provide an improved connection between the edges of the corrugated sheets forming the door so that the sheets of corrugated metal forming the door are more firmly held together than has heretofore been the case.

My invention will be best understood by reference to the accompanying drawings illustrating one embodiment thereof, in which—

Figure 1 is a rear elevation of my door complete, the wall being removed to more clearly show the door structure,

Fig. 2 shows in enlarged vertical sectional view a portion of the door taken along the line 2—2 in Fig. 1, and

Fig. 3 shows in enlarged horizontal sectional view a part of the door construction shown in Fig. 1, taken along the line 3—3 in said figure.

Similar numerals refer to similar parts throughout the several views.

As shown in drawings, my door construction consists of two thicknesses of corrugated iron 10 and 11, the corrugations of the rear thickness 10 extending horizontally and the corrugations of the front thickness 11 extending vertically. On account of the commercial widths in which the corrugated iron is to be had on the market, it is necessary to make up each face of the door from a plurality of sheets of the corrugated iron and the edges of these sheets are preferably secured together as indicated in Fig. 2 for two of the sheets 10 and 10^a of the rear wall of the door. The lower edge of the sheet

10 is folded under the lowermost corrugation 12 and then back and outwardly upon itself, leaving a channel as indicated at 13. The uppermost edge 14 of the lower sheet 10[a] enters the channel 13, where it is held in place by suitable rivets 15 extending through the edges of the sheets and also through the vertically extending sheets 11 on the front of the door. A sheet of fire-resistant material 16 is disposed between the corrugated sheets 10 and 11, this material being preferably sheet asbestos, and the rivets 15 serve to hold the front and rear walls of the door tightly against the said material 16. Along the upper edge of each of the sheets 10[a] a channel construction 17 is formed extending rearwardly from the door, and this channel serves as a transverse reinforcing member for the portion of the door structure between the edge stiffening members. While these horizontal reinforcing channels may be applied to all of the horizontally extending rear sheets 10 of the corrugated metal as shown in Fig. 1, they may, if preferred, be employed on as few or as many of said sheets as desired. The corrugated sheets forming the front and rear walls of the door are held together immediately below the reinforcing channels 17, preferably by rivets 18 as indicated in Fig. 2.

The construction of the vertical edge stiffening members of the door is best shown in connection with Fig. 3. As indicated in this figure, there is interposed between the front and rear walls of the door at the edge a vertical bar 19, around which the edge sheet 11 of the front wall is bent and extends rearwardly as shown at 20, after which it is bent upon itself to extend forwardly to form a channel 21. Between the vertical edge of the rear sheets 10 and the sheet of asbestos 16 a vertically extending strip of sheet metal 22 is disposed which is bent rearwardly along the edge of the rear sheets of the door and at a sufficient distance from the wall 20 of the stiffening member to receive the vertical bar 23 between the rearwardly extending wall 24 of the strip 22 and the channel 21. The strip 22 is bent around the bar 23 as shown at 25 substantially parallel with the plane of the door and adjacent to the inner surface of the channel 21 said strip is bent forwardly and then in the reverse direction rearwardly to form a channel 26 opening toward the rear of the door, whereas the channel 21 opens toward the front of the door. When in assembled condition, the edge members of these channels interlock with each other as indicated and are held in place by bolts 27 which may be disposed vertically as required to properly hold the parts together. The sheet of asbestos 16 is extended inside of the channel 26 to the extreme rear edge of the stiffening member so that its rear edge rests between the edge of the bar 23 and the channel 26. Rivets 27′ are shown in Fig. 3 for securing the front and rear sheets of the door to the vertical bar 19 and to the stiffening strip 22, although equivalent fastening devices may be employed if desired. For small doors, the reinforcing bar 23 may, if desired, be omitted.

The top and bottom edges of the door are provided with hollow reinforcing members preferably of a construction similar to that shown for the vertical edges of the door. Rivets or other fastening devices may be employed throughout the body portion of the door where necessary to secure the front and rear walls together.

As a result of the construction described it will appear that no provision is made in the vertical edge stiffening members of the door for the sliding of a part of one of the members upon the remaining portion of said member, which sliding construction has commonly been employed in the art heretofore. This results in greatly simplifying the construction without, however, introducing any disadvantage, for I find by means of my construction, where the outer wall of the door is made of relatively thin iron as referred to, the expansion of the outer wall of the door under high temperature does not buckle the door construction as a whole and therefore does not separate the edges of the door from the adjoining brick work, but on the other hand the door serves its purpose as a protection equally as well at very high temperature as does the construction of door previously used in the art having sliding joints in its vertical stiffening members. The lateral stiffening members 17 in connection with the construction shown in Fig. 2 for securing the edges of the sheets together results in a door construction having a high degree of lateral stiffness, and in addition accidental separation of the edges of the horizontal sheets of corrugated iron from each other is prevented. This construction for joining the edges of the corrugated sheets may also be employed on the vertically extending front sheets if desired.

To provide for the tendency of the portions 21 and 26 to move relatively to each other in a vertical direction when the front of the door is subjected to high temperature, it is desirable that the holes through these portions for receiving the bolts 27 should be elongated somewhat into vertical slots. The action referred to above, when the front of the door is subjected to very high temperature, to wit, that the door as a whole does not buckle, may be due to a number of contributing reasons. In the first place, the portion of the stiffeners at the rear of the door and near the wal lis maintained

in relatively cool condition, while the outer portion of the door is in many cases heated to a very high degree. I have found that highly heated iron has a much lower strength than cold iron and, this being the case, the portions 24 and 25 of the stiffener really constitute the dominating factor controlling the form of the stiffener. Furthermore, the bar 23, being free from positive fastening devices, may slip somewhat against its inclosing walls and so free the stiffener from any buckling action that it might otherwise introduce. The thin sheet metal constituting the outer surface of the door has so little expansive force when highly heated that it readily is deformed in shape, buckling somewhat along its surface without, however, producing a sufficient buckling force to bend the stiffener as a whole. Heretofore, as far as I am aware, it has been invariably considered necessary to provide stiffeners of the kind under consideration with expansion joints to prevent buckling of said stiffeners, and I believe I am the first to discover that by forming the wall of the door of thin sheet metal and providing the rear walls of the stiffener with relatively high resistant strength, continuous stiffeners will not buckle under the application of very high temperature to the front of the door.

What I claim is:

1. In a fire door, the combination of two sheets of corrugated metal having their edges adjacent to each other, a support for said sheets, the edge portion of one of said sheets being outwardly distended from said support a greater distance than said corrugations to form a reinforcing member having a projecting edge adjacent said support, the edge portion of the other of said sheets being folded to extend first along the outer surface of said projecting edge portion and then around said projecting edge and along the back surface of said projecting edge portion between it and said support, and fastening devices extending through said overlapped edge portions and said support.

2. In a fire door, the combination of two sheets of corrugated metal having their edges adjacent to each other, a support for said sheets, the edge portion of one of said sheets constituting a projecting edge adjacent said support, the edge portion of the other of said sheets being folded to extend first along the outer surface of said projecting edge portion and then around said projecting edge and along the back surface of said projecting edge portion between it and said support, and fastening devices extending through said overlapped edge portions and said support.

In witness whereof I hereunto subscribe my name this 21st day of April, A. D. 1916.

MILLARD GILMORE.