To all whom it may concern:

Be it known that I, LUTHER L. KNOX, a citizen of the United States, residing at Avalon, Allegheny county, Pennsylvania, have invented a new and useful Improvement in Hollow Sheet-Metal Structures, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view, partly broken away, showing one form of structure embodying my invention. Figs. 2 and 3 are sections taken on the lines II—II and III—III, respectively, of Fig. 1. Figs. 4, 5 and 6 are views similar to Figs. 1, 2 and 3, but showing another form of structure. Figs. 7, 8 and 9 are also views similar, respectively, to Figs. 1, 2 and 3, but showing still another form of structure. Figs. 10, 11 and 12 are views similar, respectively, to Figs. 4, 5 and 6, and showing a modification, and Fig. 13 is a detail sectional view showing a preferred method of welding the spacers.

My invention consists in a hollow sheet metal structure in which the sheets forming the body of the structure are spaced and braced with reference to each other by means of internal supports or spacers welded in position in a manner which avoids the necessity for perforating one of the sheets, and which prevents air pockets between the contacting surfaces.

Referring first to that form of my invention shown in Figs 1, 2 and 3, and which illustrate the invention as applied to a hollow water cooled furnace door, the numerals 2 and 3 designate the two sheets of which the structure is composed. These sheets are pressed to shape with the bent edge portions welded or otherwise secured at the edges 4 to form the inwardly projecting marginal hollow flange or offset 5.

The sheets 2 and 3 are spaced and supported relatively to each other by means of the spacers or supports 6 which are arranged at intervals. Each of these comprises a metal strip which may be cut or stamped into the desired shape and which has a plurality of projections 7 at one edge which are welded to the inner sheet 3. At the opposite edge are similar projections 8 which engage small slots or openings 9 formed in the outer sheet 2, and are welded therein. Preferably, the projections 7 are beveled, as shown in Fig. 13, to give a smaller contact area, the spaces formed by these bevels being filled in during the welding, as indicated at 7

The spacers or supports 6 also obviate the use of the stay bolts which are commonly employed for this class of work, or other spacers, which are objectionable by reason of the fact that it is necessary to perforate both the inner and outer sheets of the structure. These perforations form weak spots. The spacers 6 form a secure bracing connection between the plates or sheets and make unnecessary the perforation of but one of the plates or sheets of the structure. The perforations are in the form of narrow slots, which are more or less completely filled by the wedge shaped projections 8, and which can be completely filled by the welding operation. The resulting structure is a very strong and durable one.

Figs. 4, 5 and 6 I have shown my invention as applied to a sheet metal jacket section or unit for furnaces. The construction is substantially the same as that just described, except that the front and rear sheets or plates 11 and 12 are shown as separated to a somewhat greater extent, and the spacers 13 are of correspondingly increased depth. In these figures the spacers are shown as welded to the inner surface of the outer plate 11 and as having projections 14.
which enter and are welded in slots 15 of the inner plate 12. Figs. 4 and 5 also illustrate a convenient way of forming twyer holes in the sections. To form these holes the sheet or plate 11 is punched and the metal forced inwardly to form the hollow internal boss 16. 17 is a short tube or pipe section welded at one end, as indicated at 18, to the edge of said boss; and at its opposite end welded in an opening 19 in the sheet or plate 12. This construction may also be employed to good advantage in other forms of hollow sheet metal structures where it is desired for any reason to form a hole or passage through the structure.

Figs. 7, 8 and 9 illustrate the application of my invention to a hollow sheet metal water cooled door frame. This frame is formed of the shaped sheets or plates 20 and 21. The lintel portion of the structure has a series of short spacers 22 of the character before described; and as many supplemental spacers 23 may be used in the leg and arch portions of the structure as may be necessary. 24 designates a water supply pipe.

Figs. 10, 11 and 12 show a jacket section similar to that shown in Figs. 4, 5 and 6, but with a modified form of spacer. In these figures the spacers are shown as each consisting of a zigzag bar or strip 25, the apices of each bend being flattened off. The flattened apices at one side are welded to the inner surface of the sheet or plate 26, while the projections at the other side engage and are welded in openings 27 in the other sheet or plate 28.

The plates or sheets forming the body of the structure may be united either by welding as shown in Figs. 1, 2, 3, 7, 8 and 9, or by riveting as shown in the other figures, or any other suitable manner.

The invention is applicable to various other forms of hollow sheet metal structures, as well as to the particular forms herein shown and described. It will also be obvious that the form of the spacers may be varied. I prefer to use projections at both edges of the spacers rather than to make a continuous weld at one edge, as this is much cheaper. The use of spaced projections also makes the construction more elastic under expansion and contraction, and this is particularly true where the projections on the two edges of the spacer are staggered with reference to each other. If, however, the structure is to be subjected to a high internal pressure, I may omit the projections 8 and make a continuous weld at this edge.

I claim:

1. A hollow sheet metal structure having an internal spacer, comprising a metal strip secured at its edges to opposite walls of the structure, the securing portion of the strip at least one of its edges being formed by spaced edge portions substantially as described.

2. A hollow sheet metal structure, comprising inner and outer plates, one of said plates having a series of slots or openings therein, and an internal spacer having spaced projections engaging and welded in said slots or openings, the spacer being also secured to the other plate, substantially as described.

3. A hollow sheet metal structure, comprising inner and outer plates, one of said plates having a series of slots or openings therein, and an internal spacer having spaced projections extending in the edge-wise plane of the strip and engaging and welded in said slots or openings, the spacer being also secured to the inner surface of the other plate, substantially as described.

4. A hollow sheet metal structure having a plurality of internal spacers, each of said spacers having a plurality of spaced projections engaging and welded in slots or openings in one wall of the structure, and a plurality of other spaced projections welded to the opposite wall of the structure, substantially as described.

5. A hollow sheet metal structure, having an internal spacer comprising a bar or strip formed with spaced projections at opposite edges thereof, said projections being welded to opposite walls of the structure, substantially as described.

6. A hollow sheet metal structure, having aligned openings formed in opposite sides thereof, one of said openings having an inturned edge, and a hollow tube or thimble welded at one end to said inturned edge and at the other end in the other of said openings, substantially as described.

7. A hollow sheet metal structure having an internal spacer, comprising a metal strip having spaced projections at its opposite edges, the projections at one edge being in alternating relation to those at the opposite edge, and said projections being welded to opposite walls of the structure, substantially as described.

8. A hollow sheet metal structure, having an internal spacing or bracing strip welded at one edge portion to one wall of the structure, and having its other edge portion secured at intervals in slots in the opposite wall of the structure, substantially as described.

In testimony whereof, I have hereunto set my hand.

LUTHER L. KNOX.

Witnesses:

GEORGE B. BLEMING,

W. C. LYON.