

J. H. GRAVELL.

PROCESS OF MAKING SHEET METAL DOORS, PARTITIONS, AND THE LIKE.

APPLICATION FILED DEC. 16, 1912.

1,156,898.

Patented Oct. 19, 1915.

2 SHEETS—SHEET 1.

Fig. 1,

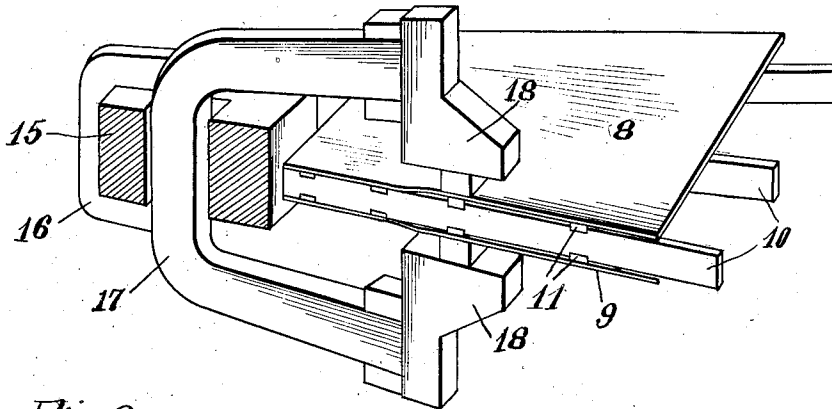


Fig. 2,

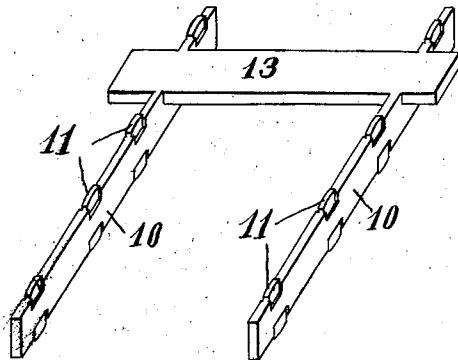
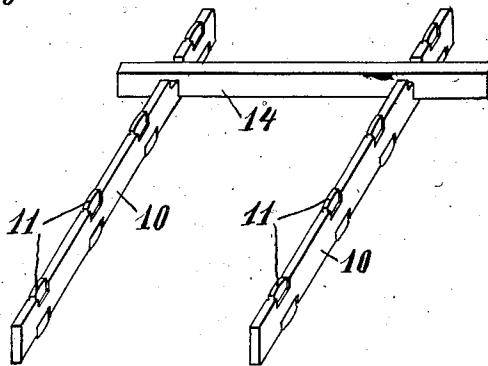


Fig. 3,



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Fig. 4,

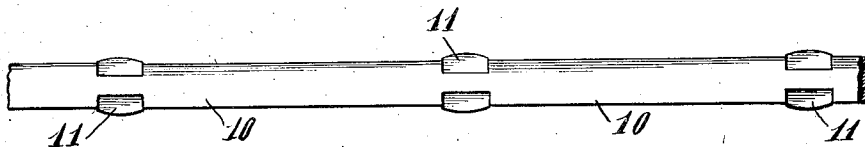


Fig. 6,

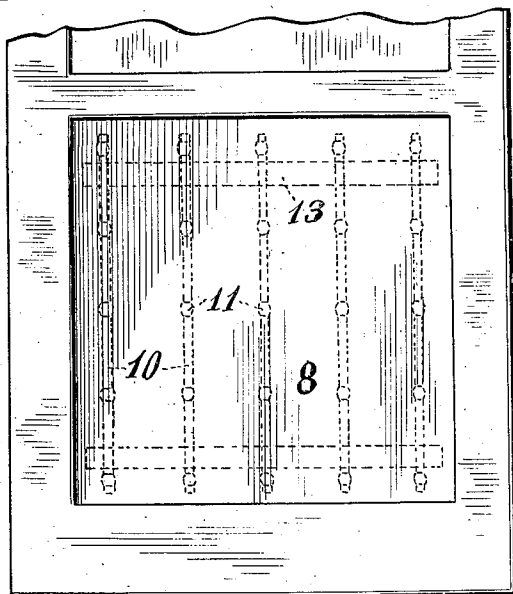


Fig. 5

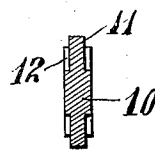
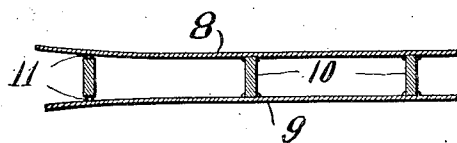


Fig. 7,



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PROCESS OF MAKING SHEET-METAL DOORS, PARTITIONS, AND THE LIKE.

1,156,898.

Specification of Letters Patent.

Patented Oct. 19, 1915.

Application filed December 16, 1912. Serial No. 736,903.

To all whom it may concern:

Be it known that I, JAMES H. GRAVELL, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Processes of Making Sheet-Metal Doors, Partitions, and the like, of which the following is a specification.

10 This invention relates to the manufacture of sheet-metal doors, partitions and the like and is directed to a method of making an improved construction for structures of this type, whereby numerous advantages are obtained, including a reduction in the weight of the completed structure and in the cost of manufacture thereof, without a corresponding sacrifice in the strength of the completed structure.

20 In the construction of sheet-metal doors and partitions heretofore, it has been common to provide a pair of parallel sheet-metal pieces, shaped as may be desired, for the surface pieces of the door or partition and various metallic members of one form or another between these sheets and provided with projections or humps at intervals along their length, the said pieces and members being welded together when assembled in the proper relative positions at each of the projections or humps.

30 The present invention relates to a process for making a structure of this type differing from those heretofore provided primarily in the construction of the metallic members which lie between and join the two surface sheets, the method employed in making the door also differing from previous methods largely because of the use of intermediate members of this different and novel form.

40 In accordance with the invention, the door consists of two metallic sheets between which are arranged a plurality of thin, flat, sheet-metal strips, these strips being arranged parallel to each other and in planes transverse to the planes of the surface sheets and having the surface sheets welded to their opposite edges at a plurality of separated points along the strips. In order to facilitate the welding together of the surface sheets and intermediate strips, these strips have projections or humps raised in the

planes of the strips on opposite edges and at separated intervals along the length of the strips. The projections along one of the edges of the strip are directly opposite those on the opposite edge, so that when joining the parts together the welding current may be passed through one surface sheet to a hump on the underlying strip and then through the hump on the opposite edge of the strip and the opposite surface sheet, thus effecting two welds at one operation. The structure manufactured in accordance with this practice possesses the desirable characteristic of being very light in weight and, furthermore, it may be manufactured at a comparatively low cost, but these characteristics may be obtained without reduction in the strength of the completed structure. The strips between the two surface plates being arranged on edge, their resistance to crushing of the door structure is very great.

75 I will describe the construction which I prefer to employ in the practice of my invention, in connection with the accompanying drawings, and will then point out certain advantageous features of this construction over the practice heretofore followed.

80 In these drawings, Figure 1 is a diagrammatic view illustrating the door structure and the method of making the same, Fig. 2 is a perspective view showing a plurality of intermediate strips and one form of support for holding them in their proper relative positions, Fig. 3 is a view similar to Fig. 2 but illustrating a slight modification, Fig. 4 is an elevation of one of the intermediate strips, Fig. 5 is a cross-section of the strip shown in Fig. 4, Fig. 6 is an elevation of a portion of a sheet-metal door, and Fig. 7 is a cross-section through a partially completed door structure.

95 Referring to these drawings, the door structure consists of two sheet-metal plates 8 and 9 arranged parallel to each other and a plurality of sheet-metal strips 10, between the plates 8 and 9, parallel to each other and at right angles to the plates 8 and 9. These strips 10 act as spacers between the surface plates 8 and 9 and serve to connect those plates so as to form a rigid structure of great strength. The plates 8 and 9 may be given any shape desired for the surfaces of

the door structure by pressing them into the desired form.

The strips 10 are thin, flat, sheet-metal strips and they have a plurality of projections or humps raised in the planes of the strips on opposite edges of the strips and at separated points along the length of the strips. The construction preferred for these intermediate strips 10 is that shown in Figs. 4 and 5 which show clearly the method employed in providing the projections or humps. The projection or hump 11 is raised by subjecting the strip 10 to blows on opposite sides thereof at a point adjacent to the edge of the strip. When the strip is subjected to such a blow, a depression is formed in the side of the strip adjacent to its edge, as indicated at 12 in Fig. 5; and the metal at the edge of the strip is caused to flow to an extent sufficient to raise the projection 11 on the edge of the strip and in the plane thereof. Strips of the character shown in Figs. 4 and 5 may be readily constructed at small expense by passing a sheet-metal strip of rectangular cross-section through a punch press and operating the press so as to deliver a blow to opposite sides of the strip adjacent to the edges of the strip at intervals along the length of the strip, thus spreading the metal at the point where the blow is delivered sufficiently to raise the projections 11.

In constructing a door employing strips of this character, a plurality of strips are arranged parallel one to another between two sheet-metal plates 8 and 9, the strips being disposed edgewise between the two plates, that is, in planes transverse to the planes of the plates. In order to facilitate the assemblage of the parts in this manner and to hold the parts in proper relative positions during the welding operation, the several strips 10 employed in the door structure may be provided with one or more supporting devices extending between them and bracing them one on another. In Fig. 2, a plurality of parallel strips 10 are shown having a support 13 extending between them and secured thereto. This support 13 is a thin, flat, sheet-metal strip and extends across and is welded to all of the strips to be employed in the door structure. In Fig. 3, a different form of support is shown. In this case each of the strips 10 is slotted and a sheet-metal strip 14 is provided with slots spaced apart a distance corresponding to the distance between adjacent strips 10, the strips 10 and 14 being assembled as is shown in the drawings, so that the support 14 will hold the strips 10 in their parallel relation and at proper distances apart, even though it is not welded thereto.

When a plurality of the strips 10 have been assembled edgewise between the two plates 8 and 9, these parts are secured together by welding the plates 8 and 9 to

each of the strips 10 at each of the projections or humps 11 on the strips 10. For this purpose a welding machine is employed adapted to pass the welding current through the plate 8 to a projection 11 on the underlying strip 10, then through the strip 10 to the opposite projection 11 and to the plate 9. Such a machine is indicated diagrammatically in Fig. 1, wherein 15 is the core of a transformer, 16 the primary coil thereof and 17 the secondary coil. The secondary is provided with terminals 18 between which the parts to be welded are inserted. Suitable means are provided for forcing the terminals 18 together against the parts to be welded, but this is not shown in the drawings, as it is a provision common to all welding machines. When the parts of the door are in proper position between the terminals of the welding machine, these terminals are forced against the plates 8 and 9 and the circuit of the welding current is closed. The humps or projections on the strips 10 confine the current to a relatively small area in its passage through the strips 10 and the projections 11 are rapidly reduced so that a weld is made between the strip 10 and each of the outside plates. As the projection 11 is reduced, the plates 8 and 9 are forced together so that at the end of the welding operation these plates lie in contact with the edges of the strips 10 between the welds.

In the manufacture of structures of the character herein shown, it has been common heretofore to employ sheet-metal strips bent to a channel form between the two outside plates, these channel strips being provided with projections or humps at separated points along their length adapted to contact with the adjacent surfaces of the outside plates. The structure shown in the drawings and above described is superior to those employing such channel strips, in that it is of lighter weight, and also in that it may be manufactured at lower cost, the latter being due in part to the fact that the channel strips require a greater number of operations in their production than do the straight strips shown in the drawings. No sacrifice in the strength of the structure is made by the employment of the flat strips rather than channel-shaped strips, as the flat strip possesses ample strength in resisting crushing strains. When intermediate strips of channel shape are employed, the sides of the channel strips are apt to yield toward each other during the welding operation, unless means are provided for guarding against this, and if such yielding took place the welds might be imperfect. For this reason, it has been proposed to employ a mandrel in connection with such a channel-shaped strip by inserting this mandrel within the strip to sustain the opposite sides of the strip during the welding operation

and withdrawing the mandrel after the welds have been effected. Employing a mandrel in this way adds to the cost of production of the structure and is objectionable for this reason, but in addition to this it frequently happens that the use of a mandrel in this manner is impossible. In some cases, the plates for the sheet-metal structure are so shaped that the distance between them is greater at an intermediate point than it is at points adjacent to the edges of the plates. For instance, a sheet-metal door might have the side plates therefor pressed to such form that a panel extending over a large area near the center line of the door would be of greater thickness than a portion extending around the panel. In the manufacture of such a structure, it would be impossible to use a mandrel which is to be withdrawn after the completion of the welding operation. In many cases, a sheet-metal structure is such that the edges thereof must be closed before the welds over the surface thereof have been made, and in such cases it is impossible to employ within the door a part which must be removed after the welding operation. Here, again, a mandrel for supporting opposite sides of a sheet-metal channel lying between the side plates could not be employed. In all instances of this character the construction shown in the drawings and above described may be employed, and the value of this construction is increased by the wide range of its utility.

Having described my invention, what I claim as new therein and desire to secure by Letters Patent of the United States is:

1. The process of making a sheet-metal

door, partition or the like, consisting in arranging a plurality of thin flat metal strips in definite relation to each other on edge, said strips having raised projections at spaced intervals along their edges, supporting said strips in such relation by a supporting member transverse thereto, placing the strips thus arranged between two parallel sheet-metal plates with each strip disposed in a plane transverse to the planes of said plates, and then welding each of said plates to each of said strips through said raised projections, substantially as set forth.

2. The process of making a sheet-metal door, partition or the like, consisting in arranging a plurality of thin flat metal strips in definite relation to each other on edge, said strips having raised projections at spaced intervals along their edges, supporting said strips in such relation by a supporting member transverse thereto, said strips being secured together by a mortised connection with said member, so arranged that no surface of said member projects beyond an edge plane of said strips, placing the strips thus arranged between two parallel sheet-metal plates with each strip disposed in a plane transverse to the planes of said plates, and then welding each of said plates to each of said strips through said raised projections, substantially as set forth.

This specification signed and witnessed this 11th day of December, 1912.

JAMES H. GRAVELL.

Witnesses:

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