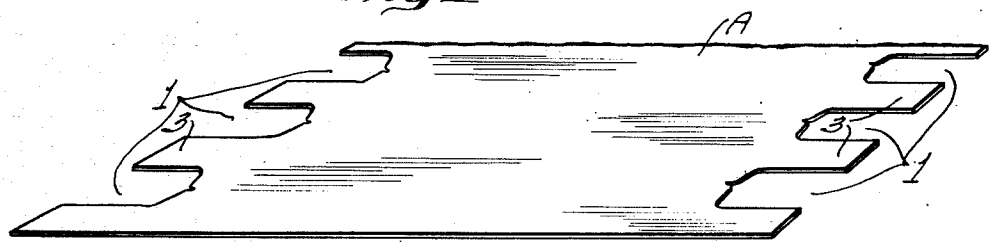
Sept. 11, 1928. 1,683,842

J. J. MULLEN ET AL

METHOD OF FORMING RIBBED OR CORRUGATED SHEET METAL MEMBERS

Filed Jan. 7, 1927

Fig. 1.



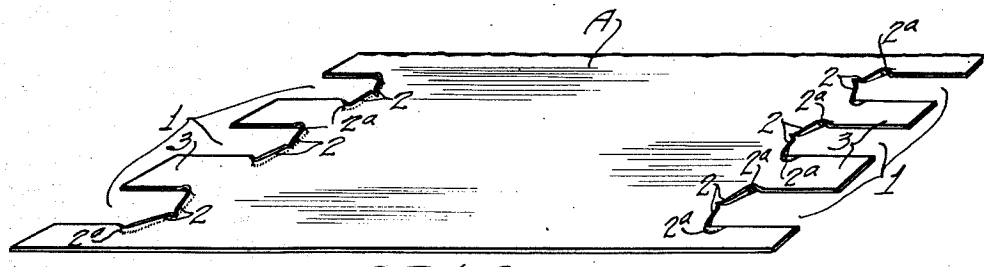


Fig. 2.



Fig. 3.

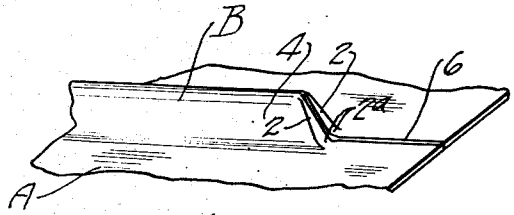


Fig. 4.

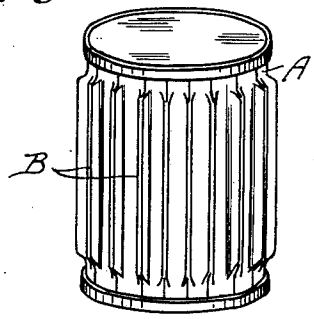


Fig. 6.



Fig. 5.

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UNITED STATES PATENT OFFICE.

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METHOD OF FORMING RIBBED OR CORRUGATED SHEET-METAL MEMBERS.

Application filed January 7, 1927. Serial No. 159,588.

This invention relates to the manufacture of sheet metal members and articles of the kind that are equipped with one or a plurality of laterally-projecting corrugations or hollow ribs produced by bending or folding the plate from which the member is constructed.

One object of our invention is to provide a novel and inexpensive method by which a plate can be deformed so as to produce a corrugation or hollow rib on the plate that has a closed end which terminates some distance inwardly from one edge of the plate.

Another object is to provide a novel method by which a metal plate can be converted, principally by bending operations, into a sheet metal member or article equipped with integral, laterally-projecting corrugations or hollow ribs that have side and end portions which merge into said plate.

And still another object of our invention is to provide a practicable method for producing a sheet metal container having symmetrical end rims or bands of any preferred depth to which end closures can be attached, and also symmetrical, longitudinally-disposed corrugations or hollow ribs of any preferred depth and length, having end closures that merge into said end bands.

Briefly described, our method consists in forming a notch in one edge of a plate, folding or bending the portion of the plate lying in longitudinal alignment with the inner end of said notch in such a way as to produce a corrugation or hollow rib on the plate and also simultaneously cause the side edges of said notch to move into substantially abutting relationship while being retained in their original plane, and closing the end of said corrugation by means of an integral portion or integral portions of said plate. The end sections of the plate lying at opposite sides of said notch, which are brought into substantially abutting relationship during the operation of folding or bending the plate to produce the corrugation, and cooperate with each other to form a plain band or uncorrugated portion beyond the end of the corrugation that is exceptionally strong and rigid, as it is composed of parts of the plate that are not bent or deformed and which are integral with the portions of the plate lying at the sides of the corrugation. The portion or portions of the plate that are used to form the end closure for the corrugation can be shaped or formed in various ways. In the form of my invention herein illustrated said portion or portions are so designed and arranged that they will move into operative position to form an end closure, in the operation of bending or folding the plate to produce the corrugation. Subsequently to the operation of bending or folding the plate to produce the corrugation, the joint in the end closure of the corrugation and the joint between the end sections of the plate lying beyond the end of the corrugation are seamed or closed by a soldering, brazing or welding operation.

When the member or article that is being formed is provided with one or more corrugations or hollow ribs of less length than said member, two longitudinally-aligned notches are formed in the opposite ends of the plate at each point where a corrugation is to be formed. The portions of the plate that are used to form end closures for the corrugations can be shaped in various ways, without departing from the spirit of our invention, but we prefer to bend or flange the metal at the inner end of each of the notches in the plate in such a way as to produce two angularly-disposed, symmetrical portions that increase gradually in depth or height from the center towards the side edges of the notch and which virtually form lateral extensions on the parts of the plate that constitute the side portions of a corrugation. When the intermediate portion of the plate lying in longitudinal alignment with a pair of opposed notches is bent or folded to produce a corrugation and to cause the opposed side edges of each notch to move simultaneously into substantially abutting relationship, the angularly-disposed portions of the plate at the inner end of each notch will also move simultaneously into abutting relationship, and thus co-operate with each other to form an end closure for the corrugation that merges into the portion of the plate lying beyond the end of the corrugation.

Figure 1 of the drawings is a perspective view of the plate from which the member or article is constructed, after the notches have been formed in the opposite ends of said plate.

Figure 2 is a perspective view of said plate, after the portions of the plate in im-

mediate proximity to the inner ends of the notches have been bent or flanged so as to produce the parts that constitute end closures for the corrugations.

Figure 3 is a perspective view of the plate, after the intermediate portions of the plate in longitudinal alignment with the end notches have been bent or folded, so as to produce the corrugations or hollow ribs and also move the end sections of the plate into abutting relationship.

Figure 4 is an enlarged perspective view of a portion of the plate, after the joints in the end closures of the corrugations and in the end portions of the plate have been seamed or closed.

Figure 5 is an enlarged sectional view of a portion of the plate, illustrating how the angularly-disposed portions of the plate that constitute the end closure for a corrugation move into abutting relationship in the operation of bending or folding the plate to produce the corrugation; and

Figure 6 is a perspective view of a sheet metal container provided with a side wall produced by our improved method.

Our method can be used in the construction of various kinds of sheet metal members and articles equipped with closed end corrugations or hollow ribs that are used for ornamental purposes, for producing rigidity or for increasing the surface area of the member or article. It is particularly adapted, however, for use in the manufacture of transformer tanks or cases of the kind described in our pending application for patent.

Referring to the drawings which illustrate the preferred manner of practising or carrying out our method, A designates a plate, usually a sheet metal plate, which is adapted to be converted into a member or article equipped with one or more straight, laterally-projecting corrugations or hollow ribs B having closed ends that merge into plain or uncorrugated portions of the member located beyond the ends of the corrugations. While we have herein illustrated our method as being used to produce a container of the kind shown in Figure 6, which is provided with a sheet metal side wall having plain bands or rims at its ends and a plurality of longitudinally-disposed corrugations or hollow ribs B arranged between said end bands, it will be obvious that our method is applicable to the construction of a sheet metal member equipped with a single corrugation or hollow rib that has only one of its ends closed and terminating within one marginal edge of the plate from which the member is constructed.

In practising our method notches 1 are formed in the opposite ends or opposed edges of the plate A, and the metal at the inner ends of said notches is preferably shaped or bent so as to produce angularly-disposed portions 2 that project laterally from the surface of the plate, as shown in Figure 2. The plate A can either be blanked out or notched by one operation and then bent to produce the angularly-disposed portions 2 at the inner ends of the notches by a separate operation, or the notches 1 and bent portions 2 of the plate can be produced by a single operation, or, at least, by one continuous operation in a combined cutting and bending machine. After the plate has been notched and bent, as above described, the intermediate portions of the plate lying in longitudinal alignment with the two groups of notches in the ends of the plate are bent or folded progressively so as to produce a plurality of spaced, parallel corrugations or hollow ribs B whose ends terminate within the marginal edges of the plate as shown in Figure 3. Various kinds of machines can be used to bend or fold the plate to produce the corrugations, but we prefer to use a machine of the kind described in our pending application for patent.

The notches 1 in the plate are of such width that the adjacent end sections 3 of the plate lying between said notches will come together or move into abutting relationship simultaneously with the operation of bending or folding the intermediate portions of the plate to produce the corrugations B, and will thus co-operate with each other to form plain, uncorrugated end portions of single thickness beyond the ends of the corrugations that are exceptionally strong and rigid, as they are formed by flat portions of the plate that are not deformed or bent out of their original plane, and which are integrally connected with the portions of the plate which lie between the corrugations. In this same bending or folding operation the angularly-disposed portions 2 at the inner ends of each pair of opposed notches come together or move into abutting relationship so as to form end closures for the corrugation produced by the part of the plate to which said angularly-disposed portions 2 are integrally attached. In other words, the angularly-disposed portions 2 virtually form lateral extensions on the parts of the plate A that constitute the side portions 4 of the corrugation, and said portions 2 are so disposed that when the plate is being bent or folded to produce the corrugation, as indicated by broken lines in Figure 5, the edges of said portions 2 will simultaneously move into abutting relationship, and will thus co-operate with each other to form an end wall or closure for the corrugation that is made up of two parts which are integrally connected to the side portions of the corrugation and also to the end sections 3 of the plate lying beyond the end of the corrugation.

If the plate A, after being bent and folded in the manner above described, is to be used to form the side wall of a container or receptacle of the kind shown in Figure 6, said plate is bent into oval, oblong or other preferred shape, and the joints 5 in the end closures and between the end sections 3 of the plate lying beyond the ends of the corrugations are closed, either prior to or subsequent to the operation of bending said plate, by seams 6 produced by a soldering, brazing or welding operation, as shown in Figure 4, thereby producing a symmetrical sheet metal container equipped with integral, laterally-projecting corrugations B provided with closed ends that merge into plain or uncorrugated end portions of the container that are located beyond the ends of the corrugations and to which the top and bottom of the container can be easily attached.

The length and spacing of the corrugations may vary, the depth of the corrugations may vary and the distance between the ends of the corrugation and the edges of the plate A may vary. Moreover, as previously stated, the portions of the plate that constitute the end closures for the corrugations can be formed in various ways, but if the metal at the inner ends of each notch 1 is first shaped by a combined bending and drawing operation or in any other manner, so as to produce two symmetrically arranged, angularly-disposed portions 2 that gradually increase in depth or height and which are drawn or stretched slightly at the points 2^a where they merge into the end sections 3 of the plate, the end closures for the corrugations will be exceptionally strong and rigid, and after the joint between the portions 2 has been seamed or closed, the corrugations will present the same appearance and will be just as efficient as a corrugation produced solely by a drawing operation in a die.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A method of forming a ribbed or corrugated member, characterized by forming a notch in one edge of a plate, folding or bending the portion of the plate that is in longitudinal alignment with the inner end of said notch in such a way as to form a corrugation or hollow rib on the plate and also simultaneously cause the side edges of said notch to move into substantially abutting relationship while being retained in their original plane, and closing the end of said corrugation by an integral portion of said plate.

2. A method of constructing a ribbed or corrugated member, characterized by forming a notch in one edge of a plate, bending or folding the portion of the plate that is in longitudinal alignment with the inner end of said notch in such a way as to produce a corrugation or hollow rib on the plate and also simultaneously cause the side edges of said notch to move into substantially abutting relationship while being retained in their original plane, closing the end of said corrugation by an integral portion of said plate, and then seaming said end closure and the joint in the end portion of the plate formed by the abutting side edges of said notch.

3. A method of forming a ribbed or corrugated member, characterized by forming a notch in one edge of a plate, bending the metal at the inner end of said notch at an angle to the surface of the plate, and then folding or bending the portion of the plate that is in longitudinal alignment with the inner end of said notch in such a way as to produce a corrugation or hollow rib, cause the end of said corrugation to be closed by the said angularly bent portion of the metal at the inner end of the notch, and also simultaneously cause the side edges of said notch to move into substantially abutting relationship while being retained in their original plane.

4. A method of producing a ribbed or corrugated member, characterized by forming a notch in one end of a plate, bending or folding the portion of the plate that is in longitudinal alignment with the inner end portion of the notch so as to form a corrugation or hollow rib on the plate and simultaneously cause the side edges of said notch to move into substantially abutting relationship while being retained in their original plane, closing the end of said rib by integral angularly-disposed extensions on the side portions of said corrugation, and then seaming or closing the joint between said extensions.

5. A method of producing a ribbed or corrugated member, characterized by forming a notch in one edge of a plate, bending the metal at the inner end of said notch so as to produce two angularly-disposed, opposed portions, then folding or bending the portions of the plate that is in longitudinal alignment with the inner end of said notch so as to produce a corrugation or hollow rib on the plate and cause said angularly-disposed portions to move into position to form an end closure for the corrugation, and thereafter seaming or closing the joint between said angularly-disposed portions and the joint between the end sections of the plate constituting the side edges of said notch.

6. A method of producing a ribbed or corrugated member, characterized by forming a notch in one edge of a plate, bending or folding the portion of the plate that is in longitudinal alignment with the inner end of said notch so as to produce a corruga-

tion or hollow rib on the plate, thereby causing the side edges of said notch to simultaneously move into substantially abutting relationship while being retained in their original plane, closing the end of said corrugation by integral portions on the side walls of said corrugation, and thereafter seaming or closing the joint between said integral portions and the joint between the abutting end sections of the plate.

7. A method of constructing a ribbed or corrugated member, characterized by forming a notch in one edge of a plate, bending the metal at the inner edge of said notch so as to produce two angularly-disposed integral portions on the plate which increase gradually in depth or height from the center towards the side edges of said notch, then folding or bending the portion of the plate that is in longitudinal alignment with the inner end of said notch so as to produce a corrugation or hollow rib, thereby causing said angularly-disposed portions to move simultaneously into a position to form an end closure for the corrugation and also causing the side edges of said notch to move into substantially abutting relationship while being retained in their original plane, and subsequently closing the joint between the said angularly-disposed portions and the joint between the abutting end sections of the plate lying beyond the end of the corrugation.

8. A method of producing a ribbed or corrugated metal member, characterized by forming a notch in one end of a plate, shaping the metal at the inner edge of said notch by a combined bending and drawing operation so as to produce two opposed angularly-disposed portions which increase gradually in depth or height from the center towards the side edges of the notch, folding or bending the portion of the plate in longitudinal alignment with the inner end of the notch in such a way as to produce a corrugation or hollow rib on the plate and cause said angularly-disposed portions to co-operate with each other to form an end closure for the corrugation, and subsequently seaming the joint between said angularly-disposed portions and the joint between the abutting end portions of the plate at opposite sides of said notch.

9. A method of producing a corrugated or ribbed member which consists in forming longitudinally aligned notches in opposed edges of a plate, bending or folding the intermediate portion of the plate lying in longitudinal alignment with said notches so as to form a corrugation or hollow rib on the plate and also cause the opposed side edges of each of said notches to move simultaneously into substantially abutting relationship while being retained in their original plane, closing the ends or said corrugation by integral portions of the plate and seaming the joints in the end closures of the corrugation and the joints in the end sections of the plate located beyond the ends of the corrugation.

10. A method of producing a ribbed or corrugated sheet metal member, characterized by forming longitudinally-aligned notches in the opposite ends of a plate, shaping the metal at the inner ends of said notches by a combined bending and drawing operation so as to produce a pair of opposed, angularly-disposed portions at the inner end of each of said notches, bending or folding the intermediate portion of the plate lying in longitudinal alignment with said notches so as to produce a corrugation or hollow rib on the plate and also to cause each of said pairs of angularly-disposed portions to move into a position to form an end closure for the corrugation and subsequently seaming or closing the joints in said end closures and the joints in the end sections of the plate lying beyond the ends of the corrugation.

11. A method of producing a container, characterized by forming longitudinally-aligned notches in the opposite ends of a metal plate, progressively bending or folding the intermediate portions of the plate lying in longitudinal alignment with opposed notches so as to form corrugations on the plate and cause the end sections of the plate between the side edges of said notches to move into substantially abutting relationship while said end sections are retained in their original plane, closing the ends of said corrugations by integral portions of the plate, between the side edges of said notches to move into substantially abutting relationship, closing the ends of said corrugations by integral portions of the plate, bending the plate into the form desired for the side wall of the container, and seaming the end closures of the corrugations and the joints between the end sections of the plate.

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FRANCIS M. STAMBAUGH.

CERTIFICATE OF CORRECTION.

Patent No. 1,683,842. Granted September 11, 1928, to

JAMES J. MULLEN ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 114, claim 5, for the word "portions" read "portion"; page 4, line 65, claim 9, for the word "or" read "of"; same page, claim 11, line 104, beginning with the word "between" strike out all to and including the word "plate" in line 107; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of October, A. D. 1928.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.