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METHOD OF FORMING ANGULAR CORRUGATIONS IN SHEET MATERIAL.

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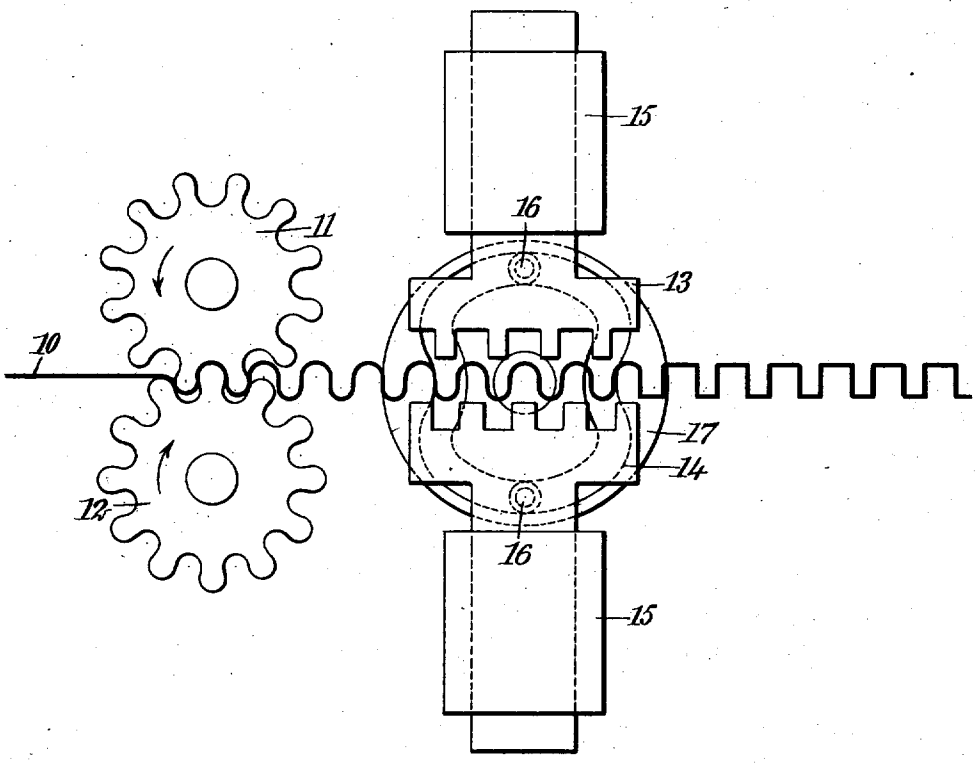
1,018,399. Patented Feb. 20, 1912.



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METHOD OF FORMING ANGULAR CORRUGATIONS IN SHEET MATERIAL.

1,018,399. Specification of Letters Patent. Patented Feb. 20, 1912.

Application filed April 29, 1907, Serial No. 370,832. Renewed January 18, 1909. Serial No. 472,954.

To all whom it may concern:

Be it known that I, D McRa Livingston, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Method of Forming Angular Corrugations in Sheet Material, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in the corrugating of sheet material, and more particularly to a method of bending sheet metal into a series of angular corrugations, each corrugation of which comprises three sides of a square or rectangle.

The object of the invention is to provide an improved method, whereby sheet material may be bent to the desired configuration with speed and accuracy, and without any liability of cutting, breaking, or otherwise injuring the sheet operated upon.

The invention is adapted for use in the corrugating of sheet metal or other sheet material for any purpose whatsoever, but is particularly adapted for employment in the forming of partition walls for coolers or condensers of the type illustrated in my United States Patent, No. 767,905, granted August 16, 1904.

In the construction of coolers or condensers, it is very essential that the corrugations of the dividing walls be formed with the greatest accuracy, and that the length of the sides of the several corrugations and the angles at which said sides intersect, be so formed that when two similar partition walls are brought adjacent to each other, the space between said wall may be of uniform width throughout its length, and the corrugations of the wall going to make up one conduit may be so arranged in respect to the wall of the adjacent conduit, that the grooves between the two adjacent ridges of one plate will be bridged by the bases of the grooves of the next adjacent plate. This necessitates the bending of the plates to present corrugations rectangular in form, and necessitates that these corrugations be of an exact and predetermined width. Furthermore, in order to make the completed structure symmetrical, the grooves in each plate must be of uniform width and of a width different than that of the ridges intermediate said grooves. In order to make the sides of the corrugations parallel and the tops of said corrugations flat, complicated apparatus and a method involving a large number of separate steps have heretofore been found necessary, but by means of the improved method hereinafter described, I am able to form the corrugations with absolute accuracy and great rapidity. The first of these steps comprises the preliminary bending of the sheet into corrugations of substantially the proper width but of slightly greater height and having rounded ends, which step may be readily accomplished by the use of intermeshing rollers presenting corrugated surfaces. The corrugations so formed are then subjected to pressure in forming or shaping mechanism which flattens the sides and top of each corrugation, which step may be readily accomplished by the use of suitable dies.

Reference is to be had to the accompanying drawing forming a part of this specification, in which the figure illustrates the elements of a mechanism for carrying out my improved process.

The sheet 10 of metal or other material to be corrugated is fed through any suitable guides to the two corrugating rollers 11 and 12. These rollers are so disposed as to intermesh and sufficient space is left between the teeth for the passage of the sheet of material. The sides of the teeth upon one of the rollers, as, for instance, the roller 12, are disposed radially and form the surface against which the other roller 11 presses the metal. The teeth of the roller 11 are preferably of greater thickness adjacent their ends than at their intermediate portions, said teeth being undercut so that only the curved ends of the teeth engage with the metal. These teeth serve as fingers to force the metal into the conformity of the surface of the roller 12. Either one or both of the rollers may be rotated by any suitable mechanism, not shown. The metal in passing between the rollers 11 and 12 is bent to form corrugations, the opposite sides of which are substantially parallel and the ends of the corrugations and the bases of the grooves therebetween are curved into substantially semi-circular form. The distance between the opposite parallel sides of the corrugations is substantially the same as the desired width of the finished article, but the corrugations are of slightly greater height. The material going to make up the rounded corrugations is the exact equivalent of the material required for the rectangular

corrugations, whereby all liability of stretching or crowding of the sheet is avoided. The teeth upon one of the rollers, as, for instance, the roller 12, may be of greater width than the teeth upon the other roller, whereby the resulting corrugations will be of greater width than the distance between the adjacent corrugations.

The sheet after having been corrugated by the rollers, is fed to mechanism which serves to flatten the tops of the ridges and the bases of the grooves forming the corrugations, so that while the opposite sides of each corrugation remains the same in width, the top and bottom thereof are bent to lie at right angles to said sides. This mechanism preferably comprises oppositely disposed dies 13 and 14, either one or both of which are movable to press a sheet between said dies. The teeth upon both dies are of the exact width and height of the desired product, and the teeth of one plate are enough narrower than the space between the teeth of the adjacent plate to permit the sides of the corrugations to lie therebetween. As shown, the two die plates are mounted to reciprocate within suitable supporting guides 15, and are caused to operate simultaneously by the engagement of rollers mounted on pins 16 entering a cam groove in a rotating member 17. As this member rotates the dies are held in the position indicated in the drawing until the metal having the preliminary corrugations is fed between the die plates to the proper position, at which time the die plates are brought together to transform these corrugations into the desired shape. The teeth of one of the die plates 14 are somewhat wider than the teeth of the opposite die plate 13, whereby the corrugations of the resulting product are of greater width than the grooves between said corrugations.

If desired, the rollers may be arranged to operate intermittently, so as to remain stationary while the metal is being pressed between the die plates 13 and 14, and start in operation as soon as the die plates are a sufficient distance apart to permit of the removal of the sheet from between the same. The rollers would thus automatically draw in the sheet and automatically feed the sheet with the preliminary corrugations therein to the dies for finishing and perfecting the corrugations.

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

1. The method of forming rectangular corrugations in sheet material, consisting of two steps; first, forming therein a series of preliminary corrugations having semi-cylindrical portions, and, second, converting each corrugation from curved to rectangular form by a single stamping action without stretching or compressing the material, the amount of material going to make up the corrugations of the first form being the exact equivalent of that required for the corrugations of the second form, and the number of corrugations per unit length remaining constant.

2. The method of bending sheet metal to form corrugations having oppositely disposed substantially parallel sides, consisting of first forming in said sheet a series of preliminary corrugations of curved form, and, second, straightening the sides of each corrugation to form substantially rectangular portions by a single stamping action without stretching or compressing the material the amount of material going to make up the corrugations of the first form being the exact equivalent of that required for the corrugations of the second form, and the number of corrugations per unit length of both being the same.

3. The method of forming rectangular corrugations in sheet metal, consisting of two steps: first, forming therein a series of preliminary corrugations of curved form, the series including alternately-disposed semi-cylindrical portions, and, second, converting each corrugation from curved to rectangular form, each of the rectangular corrugations having straight parallel sides, and each side formed of curved portions of adjacent semi-cylindrical portions of the preliminary corrugations.

4. The method of forming rectangular corrugations in sheet metal, consisting of two steps: first, forming therein a series of preliminary corrugations of curved form, the series including alternately-disposed, semi-cylindrical portions, and, second, converting each corrugation from curved to rectangular form, each of the rectangular corrugations having straight parallel sides, and each side formed of curved portions of adjacent semi-cylindrical portions of the preliminary corrugations, the preliminary corrugations being formed by a rolling action, and the final corrugations being formed by pressure applied in a direction at right angles to the general plane of the material.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

D McRA LIVINGSTON.

Witnesses:
CLAIR W. FAIRBANK,
EVERARD B. MARSHALL.