H. G. CARLSON.

APPARATUS FOR DRAWING AND SHAPING SHEET METAL.

APPLICATION FILED APR. 21, 1910.

1,047,167.

Patented Dec. 17, 1912.

2 SHEETS—SHEET 1.

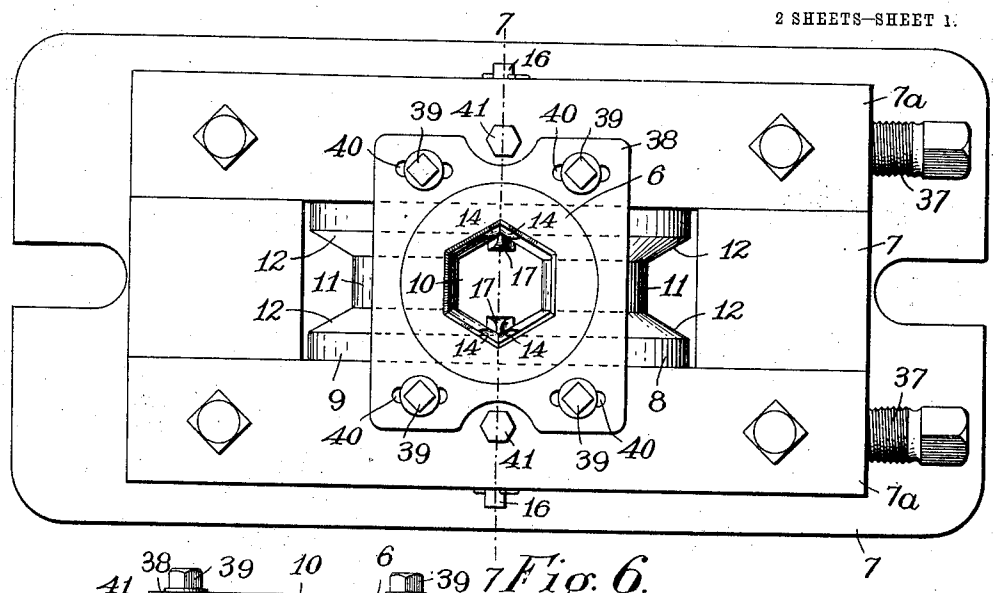

Fig. 6.

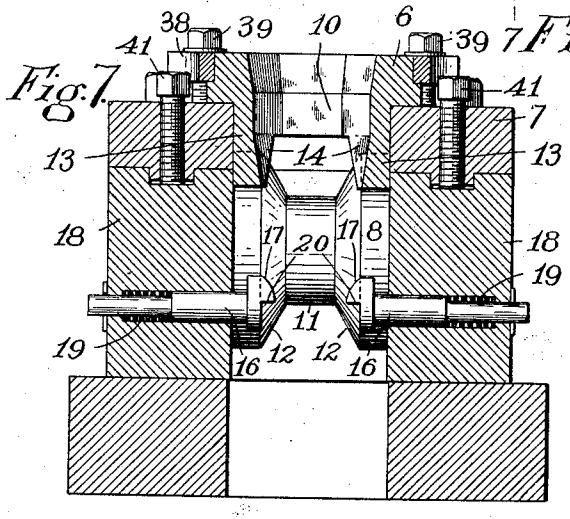

Fig. 7.

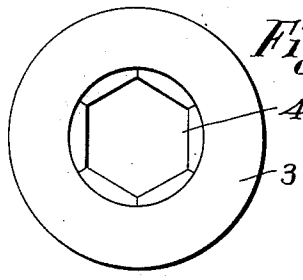

Fig. 3.

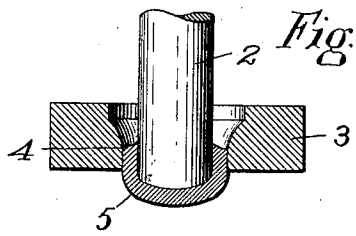

Fig. 4.

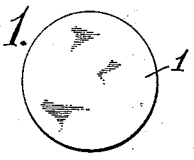

Fig. 1.

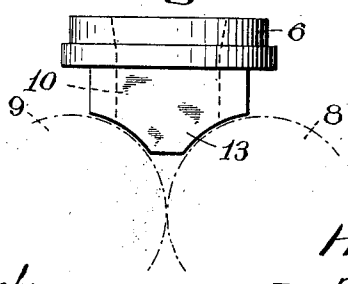

Fig. 15.

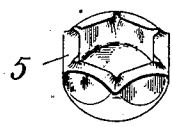

Fig. 5.

Fig. 2.

Witnesses.

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2 SHEETS—SHEET 2.

Fig. 8.

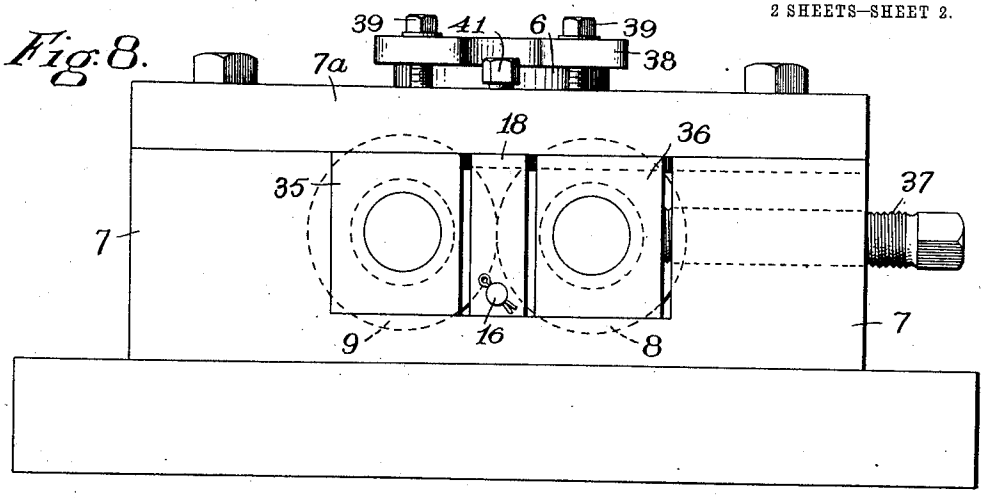


Fig. 9.

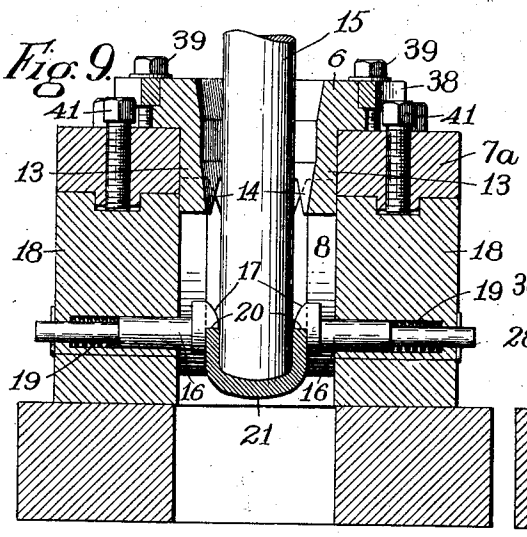


Fig. 13.

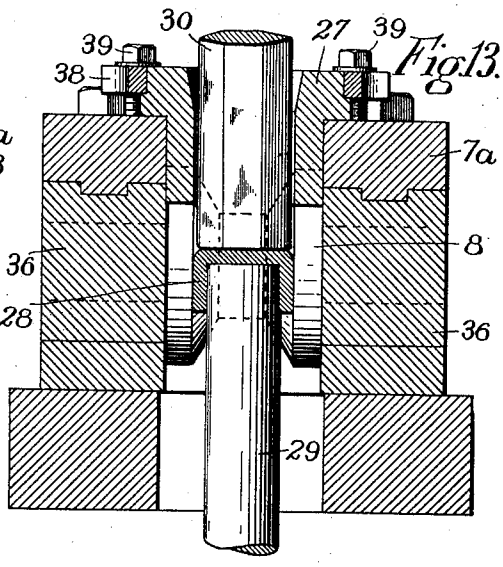


Fig. 10.

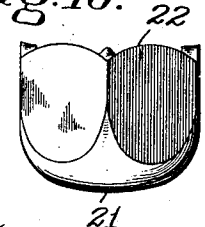


Fig. 11.

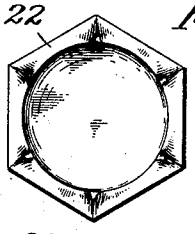


Fig. 12.

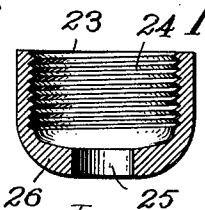
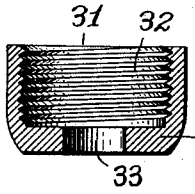


Fig. 14.



Witnesses

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UNITED STATES PATENT OFFICE.

HJALMAR G. CARLSON, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO ROCKWOOD SPRINKLER COMPANY OF MASSACHUSETTS, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

APPARATUS FOR DRAWING AND SHAPING SHEET METAL.

1,047,167. Specification of Letters Patent. **Patented Dec. 17, 1912.**

Application filed April 21, 1910. Serial No. 556,833.

To all whom it may concern:

Be it known that I, HJALMAR G. CARLSON, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Apparatus for Drawing and Shaping Sheet Metal, of which the following is a specification, accompanied by drawings forming a part of the same and illustrating the method of carrying my invention into effect.

My present invention relates to an apparatus for drawing and shaping articles from a sheet metal blank.

While my apparatus is applicable for the production of articles of various shapes in cross section, such as are usually produced by means of punches and dies, I have illustrated it in the accompanying drawings in connection with the manufacture of a hexagonal nut.

The objects of my invention are to facilitate the flow of metal during the operation of the punch and die; to reduce the friction upon the metal and to produce a smooth and homogeneous exterior surface in the article produced; and these objects I accomplish as hereinafter described and illustrated in the accompanying drawings, the novel features of my invention being pointed out in the annexed claims.

Referring to the accompanying drawings, Figure 1 represents a plan view of a circular sheet metal blank which is to be operated upon by the method and apparatus embodying my present invention. Fig. 2 is an edge view of the blank. Fig. 3 is a plan view of a die having, in the present instance, a hexagonal opening in order to impart a hexagonal exterior to the article produced by forcing the blank shown in Fig. 1 through the die by means of a cylindrical punch. Fig. 4 is a vertical central sectional view of the die shown in Fig. 3, with a side view of the punch coöperating therewith, and having the sheet metal blank shown in sectional view as it is delivered from the die. Fig. 5 is a perspective view of the article as it is produced by the punch and die as shown in Fig. 4. Fig. 6 is a plan view of an apparatus employed for the further drawing and shaping of the blank. Fig. 7 is a vertical central sectional view of the apparatus on the plane of the broken line 7—7, Fig. 6. Fig. 8 is a side view of the same. Fig. 9 is a vertical central sectional view similar to that shown in Fig. 7, but representing the blank as being forced through the apparatus by means of a reciprocating punch. Fig. 10 is a side view of the blank as delivered from the apparatus shown in Fig. 9. Fig. 11 is a top view of the same. Fig. 12 represents a finished nut formed from the shaped blank, as shown in Figs. 10 and 11. Fig. 13 represents a central vertical sectional view of an apparatus for performing another step in the process of manufacture, by which the crown of the nut is flattened, and Fig. 14 represents a finished nut formed from the blank as shaped in the apparatus represented in Fig. 13. In the drawings Figs. 10 to 14 inclusive represent the blank and finished nuts upon a scale twice the size of that shown in the accompanying drawings. Fig. 15 is a side view of the gage plate 6 showing its relation to the rolls 8 and 9.

Similar reference characters refer to similar parts in the different figures.

By my improved apparatus for shaping and drawing sheet metal I proceed with a circular blank 1 of sheet metal, such as that shown in Figs. 1 and 2, and I impart a cup shaped form to the blank corresponding in cross section approximately to that of the desired article by means of a punch 2 and die 3 adapted to coöperate together, as is customary in devices of this class. In the present instance the die 3 is provided with a hexagonal hole 4, while the punch 2 is cylindrical, and when the blank has been forced through the die 3 by the punch 2 a cup shaped blank 5 is produced, such as is shown in perspective view in Fig. 5.

The above described apparatus constitutes the first step in my improved method. It will be understood, however, that I do not confine myself to the use of a hexagonal die as in cases where the article to be produced is circular in cross section circular dies would be used. The blank as shown in Fig. 5 is next forced through a gage plate 6 mounted upon the top of a framework 7, in which is journaled a pair of rolls 8 and 9.

The gage plate 6 is provided with a hexagonal hole 10 corresponding to the size and

shape in cross section of the blank 5, Fig. 5, and serves to guide the blank between the rolls. The rolls 8 and 9 are mounted in the framework with their peripheries in contact. Each of the rolls 8 and 9 is provided with a central groove, with the groove in the roll 8 in exact alinement with the groove in the roll 9. The grooves are duplicates of each other and the bottom of each groove is formed by a cylindrical surface 11 of the roll whose length equals the desired width of one of the hexagonal sides of the blank. The side walls 12, 12, of the grooves are beveled to form an angle of 60° with the cylindrical surface 11, and their width equals the length of the cylindrical surface 11. When the peripheries of the rolls are brought into contact therefore, the opening between the rolls will be hexagonal but slightly smaller than the hexagonal opening 10 through the gage plate 6. Extending downward from the under side of the gage plate 6 are the lugs 13, 13, with their opposing interior walls 14, 14, fitting the opposing corners of the blank and converging, in order to compress the blank as it is forced downward between the lugs 13 into the opening between the rolls 8 and 9, the compression of the blank being sufficient on the plane of the line 7—7, Fig. 6, to allow it to enter between the beveled sides of the rolls and thereby prevent the formation of fins between the peripheries of the rolls which would tend to crowd the rolls apart.

The blank 5, after having passed through the die 3 by which it is given the hexagonal form shown in Fig. 5 is dropped into the opening 10 in the gage plate 6, and a cylindrical punch 15 of the same size as the punch 2 is caused by a reciprocating motion to force the blank through the gage plate 6 and between the rolls 8 and 9. As the blank passes downward between the rolls 8 and 9 the latter are caused to rotate by their contact with the blank, causing a compression of the blank to the size of the opening between the rolls, and as the contact between the rolls and the blank is a rolling contact, scratching or abrasion of the surface of the blank is obviated. Beneath and in the angle formed by the rolls 8 and 9 are a pair of strippers 16, 16, having beveled surfaces 17 and capable of sliding in blocks 18. The beveled heads of the strippers normally project into the path of the blank as it is forced down by the punch 15 and the contact of the blank with the beveled surfaces 17 causes the strippers to be forced outward against the tension of spiral springs 19, thereby allowing the blank to pass the strippers which are then forced inward by the tension of the spring 19 to carry the shoulders 20 of the strippers over the upper edge of the blank, which has then been forced into the position shown at 21, Fig. 9. The movement of the punch 15 is then reversed and as it moves upward the blank will be stripped from the end of the punch by means of the shoulders 20.

The compression and consequent elongation of the blank as it passes between the rolls 8 and 9 gives it the form shown in Figs. 10 and 11, which are represented on a scale twice the size of that shown in the preceding figures. In the form shown in Figs. 10 and 11 the nut may be completed if desired by trimming the edge 22, as shown at 23, Fig. 12, cutting an interior screwthread 24, and if desired, forming a hole in the crown as at 25, thereby forming what is known as a cap or gland nut, having a rounded crown 26.

In some cases the rounded form of the crown 26 is undesirable and it is flattened by forcing the blank a second time between the rolls 8 and 9, by providing a second gage plate 27, similar to the gage plate 6, but having a slightly smaller opening to fit the reduced size of the blank after it has been once passed between the rolls 8 and 9.

In the operation of flattening the crown of the nut it is forced the second time between the rolls 8 and 9 in a reverse position, with the crown uppermost, as shown at 28, Fig. 13, and during its passage between the rolls the interior of the blank is supported by a cylindrical arbor 29 of the same diameter as the punch 15, and the downward pressure by which the blank is forced between the rolls is applied by means of a hexagonal follower 30. The opposing ends of the arbor 29 and follower 30 are at right angles to their line of movement, so that the pressure applied by the follower 30 upon the top of the crown causes the latter to be forced downward and flattened against the upper end of the arbor 29, as shown in Fig. 13. The nut is then finished as before, by trimming its edge 31, forming an interior screwthread 32 and boring a hole 33 through the center of the flattened crown 34.

The rolls 8 and 9 are journaled in boxes 35 and 36, Fig. 8, held in the framework 7 and capable of a sliding movement therein. The frame 7 is provided with set screws 37 which bear against the boxes 36 in order to allow the roll 8 to be crowded closely into contact with the roll 9.

The gage plates 6 and 27 are held in position by means of an overlapping plate 38, which is attached to the cap pieces 7^a of the framework by means of bolts 39 which pass through slots 40 in the plate 38, in order to allow the latter to be adjusted with reference to the rolls 8 and 9. The blocks 18 which hold the sliding strippers 16 are secured in proper position between the boxes 35 and 36 by means of set screws 41. During the final passage of the blank between the rolls in a reverse position, as shown in Fig. 13, the

blocks 18 can be removed as the strippers 16 are not required in the final operation.

I do not herein confine myself to the use of a die 3 having a hexagonal opening as my improved method may be employed in shaping articles which are circular in cross section instead of hexagonal. I believe it to be broadly new, however, to employ reducing rolls having grooves or passes corresponding to the article to be shaped in cross section and actuated by the movement of the article itself as it is pushed between them by means of a reciprocating punch.

I claim,

1. In an apparatus for shaping sheet metal, a gage plate having an opening to receive a cup shaped blank, a pair of rolls with their peripheries in contact and provided with alined grooves forming a passage between said rolls in alinement with the opening in said gage plate and corresponding in shape with the shape of said opening in cross section but of less diameter.

2. In an apparatus for shaping sheet metal, a gage plate having an opening to receive a cup shaped blank and deliver the same to a pair of grooved rolls, with the delivery end of said opening having converging sides, and a pair of grooved rolls having their grooves in alinement with the opening in said gage plate.

3. In an apparatus for shaping sheet metal, the combination of a die for receiving a previously shaped blank, comprising a pair of grooved rolls, a punch for forcing said blank between said rolls, and means for engaging said blank after its passage between said rolls and stripping it from said punch when the movement of said punch is reversed.

4. In an apparatus for shaping sheet metal, the combination of a die for receiving a previously shaped blank, a punch for forcing said blank through said die, and means for engaging said blank after its passage through said die and preventing the blank from following the punch when the movement of the punch is reversed.

5. The combination with a pair of rolls journaled with their peripheries in contact and having grooves forming a passage for a cup-shaped sheet metal blank, of a gage plate in alinement with said passage and a punch fitting the interior of the cup-shaped blank.

6. The combination with a pair of rolls journaled with their peripheries in contact and provided with grooves forming a passage for a cup-shaped blank, of a gage plate having an opening in alinement with said passage and having lugs entering the angle between said rolls with their opposing walls converging.

7. The combination with a pair of rolls journaled with their peripheries in contact and having grooves forming a passage for a cup-shaped blank polygonal in transverse section, a gage plate having a corresponding polygonal opening in alinement with said rolls, and a punch cylindrical in transverse section.

Dated this sixteenth day of April 1910.

HJALMAR G. CARLSON.

Witnesses:

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