W. E. WILLIAMS.

METHOD OF MAKING CORRUGATED DISKS FOR WHEELS.

APPLICATION FILED JUNE 12, 1915.

Patented Jan. 23, 1917.

1,213,564.

Fig. 1.

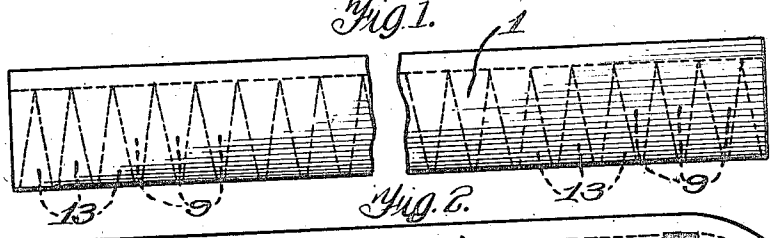


Fig. 2.

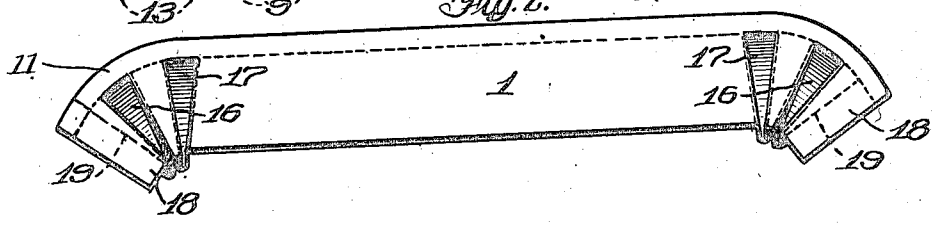


Fig. 5.

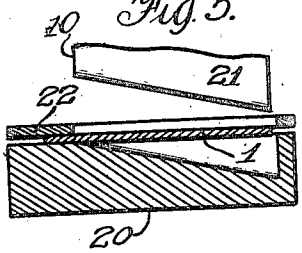


Fig. 3.

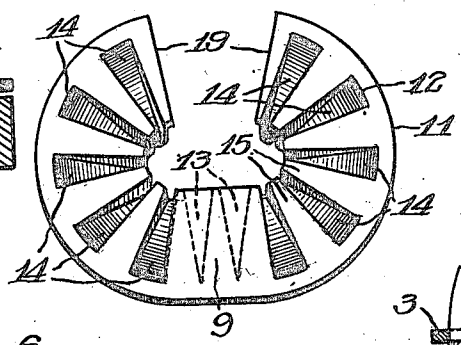


Fig. 6.

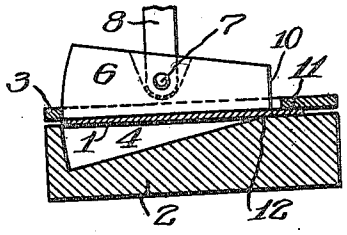


Fig. 8.

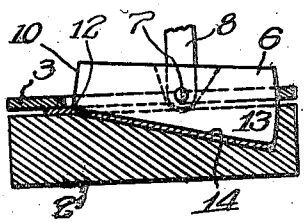


Fig. 7.

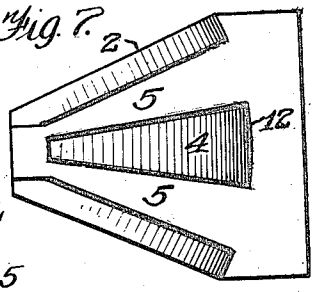


Fig. 4.

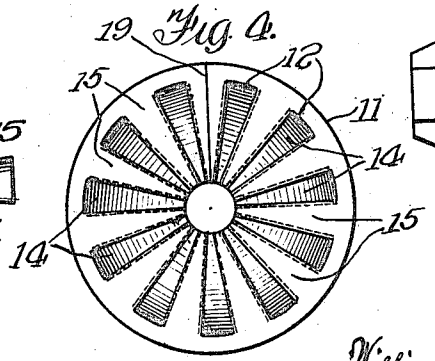
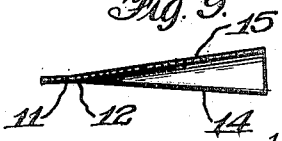


Fig. 9.



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METHOD OF MAKING CORRUGATED DISKS FOR WHEELS.

1,213,564. Specification of Letters Patent. Patented Jan. 23, 1917.

Application filed June 12, 1915. Serial No. 33,698.

To all whom it may concern:

Be it known that I, WILLIAM ERASTUS WILLIAMS, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented a new and useful Method of Making Corrugated Disks for Wheels, of which the following is a specification.

My invention relates to forming disks from plane sheet metal strips by providing one side of the strip with transverse corrugations which taper toward the opposite side.

The invention is set forth in the claims.

Reference will be had to the accompanying drawings in which—

Figure 1 is a plan view of a flat sheet out of which the disk is made. Fig. 2 shows the strip after the first corrugating steps have been taken. Fig. 3 shows a nearly finished disk. Fig. 4 shows a completely formed disk. Fig. 5 is an outline sectional elevation of a form of dies. Fig. 6 is a sectional elevation of the dies that I use in forming my disk. Fig. 7 is a plan view of the bottom die shown in Fig. 6. Fig. 8 is a sectional elevation of the devices shown in Fig. 6 after the punch has descended and formed a corrugation in the disk. Fig. 9 is a radial section through the formed disk.

In the drawings 1 indicates a flat strip of metal a little longer than the circumference of the disk to be formed. I place one end of the sheet 1 upon the die 2 and hold the same down flat by the pressure pad 3, the latter being of ordinary construction. The die 2 is provided with the cavity 4 and side sections 5 and the cavity and side sections are approximately the shape of a portion of the finished disk.

A punch 6 of peculiar shape is hinged at 7 to a link 8 hinged to the punch cross head, not shown, or to any suitable press or forming means. Pressure is then applied on the punch and the tapering panel 9 of the sheet which corresponds to the shape of the bottom of punch 6 is pushed down into the cavity 4 of the die. The end 10 of the punch resting heavily on the outer margin or flange 11 of the sheet. The punch as it goes down rocks on the pin 7 and the metal of the sheet is drawn in rapidly on the inside or the center side and the corrugation so formed tapers out to nothing at 12 where the corrugations terminate and the smooth flange remains. By this method there is no distortion of the sheet but simply the drawing in of the triangular panels of metal 13 shown in dotted lines in Figs. 1 and 3. This leaves the bottom faces 14 and top webs 15 with the metal almost in its normal condition but the triangular webs 13 are subjected to the bending, incident to being drawn down into the die.

In service as a wheel the top and bottom webs 14 and 15 take most of the strain of the work and webs 13 serve chiefly to tie the front and back webs together. As the corrugations bring the sheet around into circular form there is a stretching action on the margin of the sheet at 11 and this margin forms a suitable flange to which the rim of the wheel is made fast. I first punch the end corrugations 16 (see Fig. 2) and then punch one or two more adjacent thereto as indicated by 17, Fig. 2. Having done this the end corrugations of the sheet are not distorted further by punching the other corrugations. It is necessary that the corrugations be formed in regularly spaced transverse lines and desirable that the metal should draw equally from each side. So at the ends of the sheet there must be left a little surplus, as shown by 18 Fig. 2, to remain under the pressure pad and equalize the draw on each side. This surplus 18 I cut off to the joint line shown by dots 19 directly after the sheet reaches the form of Fig. 2 or before it reaches a stage of formation shown in Fig. 3. Then when the final punch is given the sheet forming the last corrugation the two ends on the lines 19 come together forming the full disk. The seam 19 is then welded or otherwise suitably connected and the whole disk is then given a final finishing pressing in a die the full size of the disk sizing up all alike the several corrugations that may vary slightly from different hardness of spots in the metal sheet.

The strain of drawing in the triangular panels 13 into the die stretches the metal at these panels more or less irregularly owing to the varying degree of hardness of different sheets and hence the trim line 19 cannot be exactly known before the first corrugations at each end of the sheet are made. Further, if the end is trimmed before the corrugations are made leaving no surplus 18 to be cut off, then when the punch 6 goes

down the metal will draw in more from the end side than it will from the body side and produce a corrugation out of line with the other corrugations to be formed in the sheet.

By forming the end corrugations first and then trimming the sheet for the joint ends, the sheet may be readily put into an ordinary shear and the end trimmed but should the work proceed without the ends being trimmed until the disk nears final form the trimming then can only be accomplished with difficulty. It is impracticable to form these tapering corrugations in metal of the quality and thickness necessarily used for vehicle wheels by rigidly set punches, as is the custom with most punch press work. Such an arrangement is indicated by Fig. 5 wherein 20 indicates the die and 21 the punch and 22 the pressure pad or stripper. In this case the punch descends in a parallel arrangement with the bottom of the die and strikes the sheet 1 at an angle at the inside or narrowest point of the cavity in the die where narrowest and deepest part of the corrugation is to be formed and the greatest strain on the metal is occasioned in the work. As this punch descends the metal at the point must draw together the larger portion of the sheet farther back where the punch has not yet made contact and there is not enough of it at any time in contact with the punch and in action simultaneously to overcome the resistance of the larger areas farther back that must follow it, so the metal at the point shears and once started in shearing the whole panel shears out nearly the shape of the bottom of the punch.

With my method of forming the tapering corrugations the forming means moves at all times in parallel relation to the face of the panel that is being formed and the bending takes place on the whole length of the line of the bend simultaneously. By my method no wrinkling or buckling of the sheet, takes place, but with other die methods wrinkles or tears in the metal occur. The sheet or disk when it comes out of my dies as is indicated by Figs. 6 and 8 has the flange 11 in line with one face of the disk. Should other position be required the flange is bent as is indicated by Fig. 9 wherein the flange 11 is in a central plane.

What I claim is:

1. The method of forming a disk with tapering corrugations from a sheet of metal, which consists in forming by dies a corrugation at each end of the sheet and then trimming the ends and then forming the balance of the corrugations.

2. The method of forming a sheet of metal into a disk by bringing it by dies to the desired form in which it has tapering corrugations and by forming the end corrugations before those on the body are formed.

3. The method of forming a disk from a plane strip which consists in giving it tapering corrugations by applying die pressure to opposite faces of the strip from end to end of transverse lines beginning at one margin and extending nearly to the opposite margin, the lines of application swinging as the strip changes its form.

4. The method of forming a disk from a flat strip which consists in pressing into divergent planes spaced transverse tapering segments by pressure simultaneously applied over approximately the whole of each segment, whereby the parts between said segments integrally connect segments in the two planes.

5. The method of forming a disk from a plane metal strip which consists in pressing into two divergent planes, alternately, a series of spaced segments all tapering from the same margin of the strip, the forming pressure being simultaneously applied from end to end of each segment.

6. The method of forming a disk from a plane metal strip which consists in maintaining one marginal portion of the strip plane while pressing from the rest of the strip alternately into two planes diverging from the portion so held, spaced, tapered segments, by pressure simultaneously applied to substantially the whole of each segment.

7. The method of forming a plane edged disk from a metal strip which consists in maintaining one margin of the strip in a plane, pressing tapering transverse corrugations into the rest of the strip to give the strip as a whole curvature approximately in its own plane, and finally bending the portion so held in a plane other than its initial plane.

8. The method of forming a disk from a plane metal strip which consists in pressing regularly spaced triangular segments extending inward from one margin of the strip into position approximately perpendicular to the plane of the strip by pressure acting simultaneously from end to end of the segments.

9. The method of forming from a plane sheet metal strip a corrugated disk having radial corrugations gradually tapering, as the distance from the center increases, in the plane of the disk and in planes approximately perpendicular thereto, which consists in forming such corrugations in each end portion of the strip, trimming the ends of the strip to form, forming intermediate corrugations, thus bringing the trimmed ends together, and securing said ends to each other.

10. The method of forming a sheet into a disk by tapering corrugations, by bending triangular sections of the sheet into positions approximately perpendicular to the plane of the disk, by dies moving at all

times approximately perpendicularly to the segments which they displace between said sections.

11. The method of making a disk by bringing a sheet to disk shape by pressing therein tapering corrugations, said pressing means engaging contact along the entire length of the corrugation being formed during the entire act of forming.

12. The method of forming a corrugated sheet metal disk having deeper corrugations on its central portions than on the outer edge, which consists first in forming in each end of a sheet of metal tapering corrugations, then trimming each end to form, then forming the balance of the tapering corrugations thus bringing the trimmed ends together, then securing said ends to each other.

13. The method of forming a corrugated sheet metal disk having deeper corrugations on its central portions than on the outer edge, which consists first in forming in each end of a sheet of metal tapering corrugations, then trimming each end to form, then forming the balance of the tapering corrugations thus bringing the trimmed ends together, then securing said ends to each other, then pressing the whole disk to exact size.

Signed in Chicago, in the State of Illinois, and county of Cook this 5th day of June 1915.

WILLIAM ERASTUS WILLIAMS.

Witnesses:

ROBERT BAUERLE,

ALBERT J. SAUSER.