April 20, 1926. 1,581,488

R. S. LEWIS

METHOD OF AND APPARATUS FOR FORMING RADIALLY CORRUGATED DISKS

Filed Dec. 7, 1920

Fig. 3.

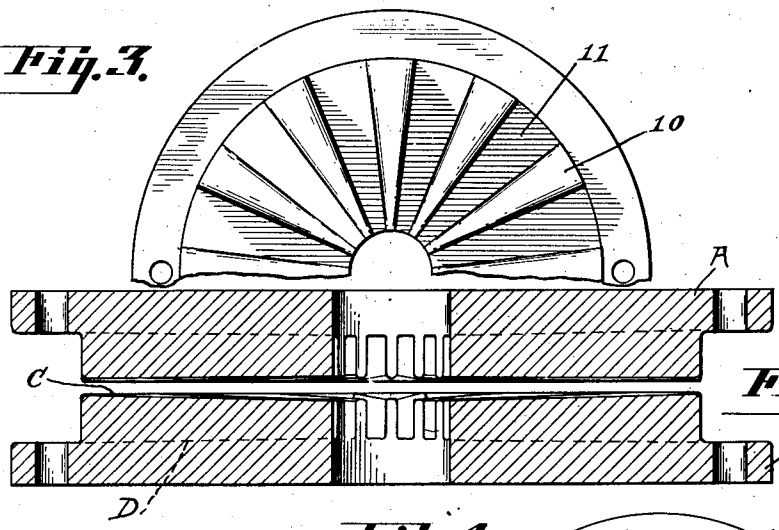



Fig. 1.

Fig. 4.

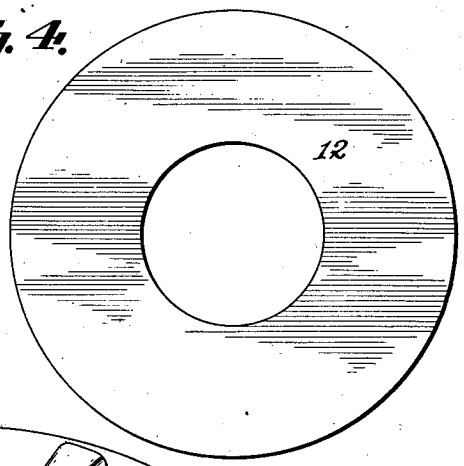



Fig. 5.

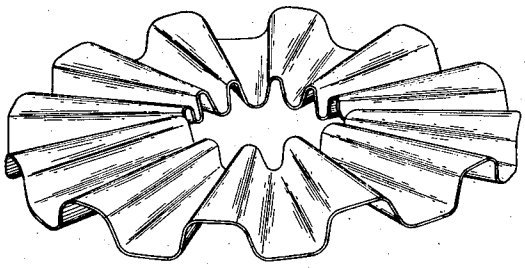
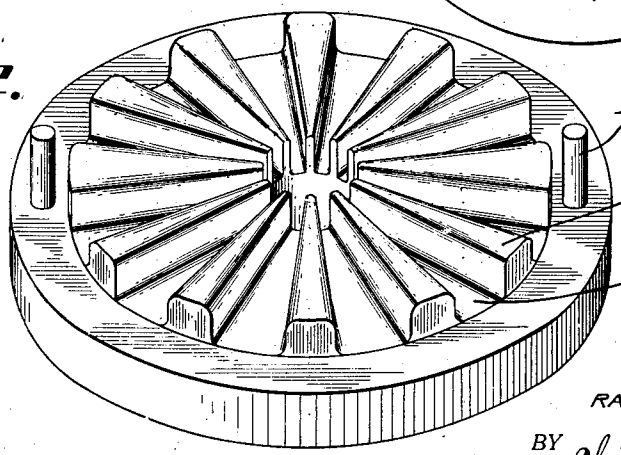


Fig. 2.




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# UNITED STATES PATENT OFFICE.

RALPH S. LEWIS, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO STANDARD STEEL WHEEL & TIRE ARMOR COMPANY, OF OAKLAND, CALIFORNIA, A CORPORATION OF ARIZONA.

## METHOD OF AND APPARATUS FOR FORMING RADIALLY-CORRUGATED DISKS.

Application filed December 7, 1920. Serial No. 428,856.

*To all whom it may concern:*

Be it known that I, RALPH S. LEWIS, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Methods of and Apparatus for Forming Radially-Corrugated Disks, of which the following is a specification.

This invention relates to disk steel wheels and has for its object to facilitate the production thereof.

The particular type of disk wheel involved is that shown and described in Reissue Patent No. 13,822 to Livingston, dated November 3, 1914, which is characterized by the presence of radial corrugations. Heretofore several operations were required to form these corrugations and one patent in particular, namely No. 1,159,322, states that "it is impossible to form all flutes or corrugations in one operation."

By means of a novel form of die I have succeeded in producing the corrugations in a single operation, without either tearing or stretching the metal. This die in its preferred form is disclosed in the following specification and illustrated in the accompanying drawing in which:

Fig. 1 shows a central cross-sectional view of the cooperating and die members in separated position,

Fig. 2 shows a perspective view of the lower die member,

Fig. 3 shows a partial plan view of the lower die member,

Fig. 4 shows a plan view of the blank from which the corrugated disk is formed,

Fig. 5 shows a perspective view of the corrugated disk which enters into the construction of a vehicle wheel.

The die herein shown comprises an upper member A and a lower member B, the adjacent faces of which are provided with radial ribs 10 and channels 11. The ribs of one die member co-operate with the channels of the other member and are so constructed and proportioned that when closed there is a considerable clearance between the side walls of cooperating ribs and sufficient clearance between the top and bottom faces as to allow the sheet metal of the desired gauge to lie between. The faces C and D of the ribs and channels are inclined axially, being of less depth at their inner ends than at their outer ends. This inclination is a gradual one and amounts to approximately 21 1000ths of an inch per inch of length for corrugations of 1 inch depth.

In operation a flat steel annular disk 12 such as shown in Fig. 4 is laid upon the bottom die member and the upper die member is pressed down upon the same, said dies being held in registering position by guides or pins 13. Owing to the axial inclination of the opposite faces of the ribs and channels the pressure applied by the die members will act first upon the outer portion of the disk and will extend gradually in towards the center as the corrugations start to form. This pressure will be exerted both radially and axially on account of the inclination of the ribs and channels and will thus cause the disk to be drawn inwardly towards the center as the corrugations are formed. The draw of the metal being greater than the resistance caused by meshing the die during the first half of its engagement allows the metal to creep inwardly and therefore to radially corrugate as the dies move towards each other. When the dies have completely engaged the metal is ironed smooth and forms a perfect corrugation without stretching the metal or in any way varying its thickness. When closed the horizontal faces of the ribs and channels are in contact with the metal but the vertical or side walls of the ribs do not touch the metal. This clearance between the side walls of the ribs reduces friction and lessens the likelihood of straining or stretching the metal.

The blank or disk shown herein has a diameter of 24½ inches whereas the corrugated disk has a diameter of but 19¾ inches. This difference represents the quantity of metal necessary to form the corrugations.

While I show ribs or corrugations of rectangular cross-section it is obvious that the shape of these corrugation may be varied. The degree of axial inclination of the cooperating faces of the die members specified herein varies with the depth of the corrugation, being less for shallow corrugations and more for deep corrugations. The important thing to be considered in con-

nection with the present dies is to so incline the working faces of the ribs and channels as to cause the metal to move inwardly in a radial direction simultaneously with the formation of the corrugations.

I find it advisable to carry out the forming operation by tripping the press two or three times. That is to say, instead of allowing the dies to be pressed tightly together in one movement of the press I release the press momentarily once or twice during the operation of forming a disk in order to reduce the possibility of rupturing the metal.

Having thus described my invention what I claim and desire to secure by Letters Patent is:—

1. The process of forming in a single operation a radially corrugated disk wheel for vehicles which consists in pressing a plane sheet metal disk between co-operating die members having radially extending ribs and channels whose opposed faces are inclined so as to cause the metal to be drawn inwardly towards the center simultaneously with the forming of the corrugations.

2. A die for forming in a single operation a radially corrugated disk wheel for vehicles comprising co-operating members, each formed with radially extending ribs and channels, the faces of the ribs being inclined so as to be of less height at their inner ends than at their outer ends and co-operating channels being oppositely inclined so that the ribs of one die member will bottom on channels of the other die member.

3. A die for forming in a single operation a radially corrugated disk wheel for vehicles comprising co-operating die members, each formed with a central aperture and having radially extending ribs and channels, the ribs of one member entering the channels of the other member, the opposed faces of said ribs and channels being so inclined as to be of less height at their inner ends than at their outer ends.

4. A die for forming in a single operation a radially corrugated article from metal, comprising co-operating members, each having radially extending ribs and channels, the ribs of one member entering the channels of the other, and the opposed faces of said ribs and channels being inclined to each other so as to cause the metal to be drawn inwardly toward the center simultaneously with the formation of the corrugations.

5. A die for forming in a single operation a radially corrugated article from sheet metal, comprising co-operating members, each having radially extending ribs and channels, the ribs of one entering the channels of the other, said ribs and channels being inclined so as to be of less height at their inner ends than at their outer ends, whereby the sheet metal will be drawn inwardly toward the center simultaneously with the formation of the corrugations.

RALPH S. LEWIS.