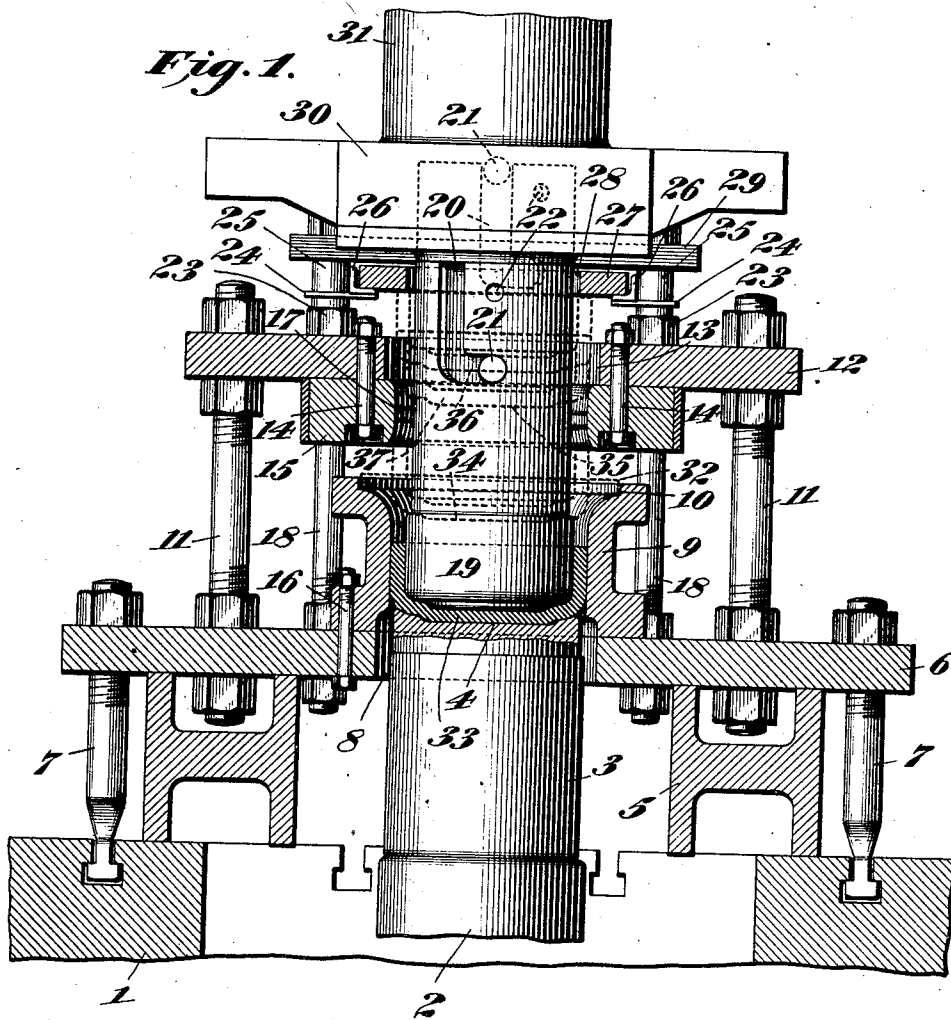
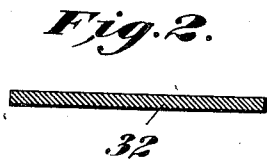
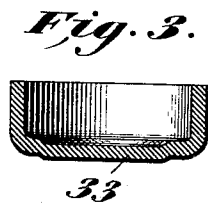
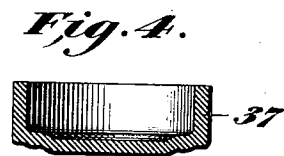


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V. B. ASH ET AL.
METHOD OF AND APPARATUS FOR FORMING METAL.
FILED NOV. 1, 1921.



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UNITED STATES PATENT OFFICE.

VINCENT B. ASH AND ARTHUR E. ALLISON, OF COATESVILLE, PENNSYLVANIA.

METHOD OF AND APPARATUS FOR FORMING METAL.

Application filed November 1, 1921. Serial No. 512,094.

To all whom it may concern:

Be it known that we, VINCENT B. ASH and ARTHUR E. ALLISON, citizens of Coatesville, in the county of Chester and State of Pennsylvania, have invented certain new and useful Improvements in Methods of and Apparatus for Forming Metal; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates generally to a method of and apparatus for forming metal cup-like constructions which may be used for automobile brake drums, which are short hollow cylinders having one closed end, but it may be used for forming any other cup-like shapes desired.

Our invention relates particularly to a method and apparatus for forming these in such a way that there is no reduction in the thickness of the metal at the bend, and in fact if desired we may make the metal thicker at this point, thereby providing a construction of better form or shape for the use intended and at the same time stronger and stiffer.

When cups of this kind are formed in the usual manner the bending of one portion and the drawing of the same produce a thinness of metal at and near the bend, which weakens the structure and produces a shape unfit for the use intended, all of which is obviated by our invention.

Having thus given a general description of our invention, we will now, in order to make the matter more clear, refer to the annexed sheet of drawings, which forms part of this specification, and in which like characters refer to like parts.

Figure 1 is a vertical sectional elevation of our improved apparatus showing in full lines the first step in forming the brake drum and in dotted lines the position it assumes until it is stripped from the die plug; Figure 2 is a transverse section of the brake drum disk-shaped blank from which the brake drum is formed; Figure 3 is a transverse sectional elevation illustrating the form of the brake drum after the first step in the operation, and Figure 4 is a transverse sectional elevation illustrating the brake drum after it has been stripped from the die plug.

Referring now to the characters of refer-

ence on the drawings: 1 indicates the base of our machine in general; 2 is the bottom plunger which is adapted to be moved upwardly and downwardly as desired by hydraulic or other means (not shown), the upper end of the plunger being 3, which we call the bottom die plug and which may be separate or integral with the bottom plunger. We provide a bottom die 4 adapted to correspond with the shape desired for the bottom of the finished product, either as part of the bottom plunger or separate as previously stated. We also provide spacing blocks 5 between the plate 6 and the base of the machine, which is secured thereto by T-bolts 7 as illustrated. The plate 6 has an opening 8 therein. We also provide another die 9, which we call a ring or forming die, which is secured to the plate 6 by means of the bolts 16. The upper portion of the forming die 9 is counterbored and tapers outwardly and of the shape indicated as 10, thereby providing a flaring entrance for the blank which causes the material thereof when pressed into the die to enter properly and uniformly to make the desired shape. We also provide a plate 12, which is secured to the plate 6 by the bolts 11 as illustrated, this plate 12 being provided with a central opening 13 therein. We also provide a top drawing die 15, which is secured to the plate 12 by the bolts 14, the opening in said die being provided with rounded edges as illustrated, the main drawing face of the same being 17. We also provide cross bars 29, which limit the upper movement of the stripper 27, which cross bars rest on the tubular washers 25 and are secured by the bolts 18 to the plate 6 as illustrated. The die plug is 19, the upper portion of which is hollow and provided with a bayonet slot 20, and in the upper portion of the slot is the pin 21, secured to and projecting from the lower cylindrical portion of the upper plunger 31 to secure it in place as desired, and this die plug is further provided with a hole 22, in which a bar may be inserted for partially rotating the same. The bolts 18 are provided with nuts 23 to retain the plate 12 in position, and above this we supply rests 24 which support the angles 26, on which the stripper plate may be slid in or out of position as desired. The stripper plate is provided with a hole 28 therethrough. The tip plunger of the ram is provided with a head and die chuck 30, the lower portion

of which is cylindrical and fits within the die plug 19 and is provided with the pin 21 secured thereto and projecting into said bayonet slot. 32 indicates in general the blank from which the brake drum is formed; 33 is the form thereof after the first operation; 34 indicates, as shown in dotted lines, the position of the brake drum at the end of the second operation, just after it has been forced out of the ring die and the die plug rotated; 35 is the third position of the brake drum just after passing through the drawing die; 36 is the fourth position of the brake drum just before being stripped from the die plug, and 37 is the final form of the brake drum.

It will be noticed that the finished brake drum has full corners at its bend portion and the cylindrical surfaces are complete and the corners of the same are not thin or rounded, thus being best adapted to the use intended.

The operation of our apparatus is as follows: A hot or cold blank 32 is introduced into the upper portion of the counterbore of the forming or ring die 9, as shown, when the die plug 19 is above the upper portion of the forming die 9. When the bottom die and die plug are in the position illustrated in Figure 1, the upper die plug 19 is forced downwardly upon the blank and draws it through the flared opening 10 of the forming die 9 until the cup assumes the form 33 shown in full lines in Figures 1 and 3. The partially formed brake drum is then forced upwardly out of the forming die 9 by moving the bottom plunger 2 and the bottom die plug 3 and the superimposed bottom die 4 in an upward direction until the bottom of the cup or drum is in the position indicated by the dotted lines, marked 34 in Figure 1, and the plunger 31 is withdrawn upwardly. The pressure is then released on the bottom plunger 2 sufficiently to allow the die plug 19 to be partially rotated by means of a bar inserted in the hole 22 until the pin 21 is in line with the vertical portion of the slot 20. The head 30, the top plunger 31 and the cylindrical portion extending into the die plug 19 are then raised upwardly until the pin 21 is in about the position indicated by dotted lines in Figure 1. The bottom plunger 2 and attached portions are then forced upwardly, and the drum which is on the end of the die plug 19 is forced through the rounded opening 17 in the top drawing die 15, which action draws and forces the sides of the cup downwardly until they fill the space within the die, so that the corners are now full as illustrated by the finished pressed cup 37 of Figure 4. The top plunger 31 is now lowered until the pin 21 is opposite the horizontal portion of the slot 20, whereupon the die plug 19 is

rotated in reverse direction and is locked upon the pin 21 in the position illustrated by Figure 1. The bottom die is then again lowered to the position illustrated in Figure 1 and the top plunger 31 is raised until the edge of the cup contacts with the stripper plate 27, whereupon a continuance of this movement will strip the cup from the lower end of the die plug. The stripper plate 27 is then moved outwardly in a horizontal manner, sliding on the angles 26, while the upper end of the die plug 19 is above it and the drum removed. The stripper plate 27 is then returned to its operative position and the die plug 19 is then lowered through it to a point above the upper surface of the ring die 9, and the apparatus is now ready for another operation.

Although we could force the brake drum upwardly through the top drawing die 15, while the die plug is in the position shown by full lines in Figure 1 by moving the bottom plunger 2 upwardly, this action would cause a high compression in the metal of the lower portion of the brake drum 33, and would tend to produce a fin or extrusion near the lower rounded corner by reason of such intense pressure, which would be caused by the resistance of the top plunger 31. We therefore prefer to draw the top plunger 31 upwardly in the manner previously indicated before forcing the brake drum through the top drawing die 15, as we have found from actual experience that this produces the best results, and this is one of the reasons for the special construction of the die plug 19 and the part of the plunger 31 which fits therein and the arrangement of the pin 21 and the bayonet slot 20.

Although we have shown and described our invention in considerable detail, we do not wish to be limited to the exact and specific details thereof as shown and described, but may use such modifications in, substitutions for, or equivalents thereof as are embraced within the scope of our invention, or as pointed out in the claims.

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

1. The method of drawing a cup-shaped article, which consists in forcing a disk-shaped blank into a forming die by means of a die plug projected against the same, then relieving the pressure on said die plug and forcing the blank in the opposite direction through a drawing die, thereby filling and thickening the bend portion of the same.

2. The method of forming a cup, consisting of placing a disk-shaped plate upon a forming die, forcing it inwardly into said die with a plug of smaller diameter than said die, then relieving the pressure on said plug, then forcing the blank outwardly from

the forming die and through a drawing die, then withdrawing the plug and removing the cup from the apparatus.

3. The method of forming an automobile 5 brake drum, which consists in forcing a disk-shaped metal blank into a hollow cylindrical forming die having a flaring mouth, by projecting a cylindrical die plug against the same, then relieving the pressure on said die 10 plug and forcing the primarily cup-shaped blank in a reverse direction through a drawing die; whereby the metal of the side portions flows plastically into and fills out the bend portions, thereby producing a cup with 15 the bend portions of thickness equal to or greater than the other portions.

4. A cupping apparatus, comprising a bottom die of conformation corresponding to the bottom of the cup, a movable plunger on 20 which said bottom die is supported, a cylindrical forming die mounted over the bottom die, a plug of less diameter than the drawing die and adapted to be reciprocated therein, a drawing die mounted adjacent said 25 forming die, and means for forming cup-shaped blanks in the forming die and for forcing the same in opposite direction through the drawing die, whereby the bends are filled.

30 5. A cupping apparatus, comprising a forming die, a bottom plunger adapted to operate therein, an upper plunger having a die plug of less diameter than said forming die, reciprocably and rotatably mounted 35 therein, means for operating said plungers, and a drawing die adjacent the forming die.

6. A cupping apparatus, comprising a forming die having a flaring upper portion, a bottom plunger the upper end of which is 40 formed to correspond to the bottom of the

cup and adapted to fit neatly within said forming die, a die plug of less diameter than said forming die, the upper portion of which is a hollow cylindrical sleeve provided with a bayonet slot therein, a plunger reciprocably mounted within said sleeve and provided with a pin projecting within said bayonet slot, a drawing die mounted adjacent said forming die, and means for actuating said plungers and for turning said die plug 50 to permit the partial withdrawal of the upper plunger therefrom to relieve the pressure prior to forcing the cup through the drawing die.

7. A cupping apparatus, comprising a bottom die, a reciprocable plunger on which 55 said bottom die is mounted, a hollow cylindrical forming die in alignment with said bottom plunger and provided with a flaring opening, an upper plunger carrying a cylindrical die plug with rounded corners, the 60 end portion being of conformation to correspond with the inner portion of the drum bottom, the upper portion of said die plug being hollow and provided with a bayonet 65 slot and reciprocably mounted on an extension of said upper plunger, a drawing die mounted adjacent to and in alignment with said forming die, and means for operating said plungers whereby the cup is primarily 70 formed in the forming die, the pressure on the die plug then relieved and the primary cup-shaped form forced in a reverse direction through the drawing die, whereby the bend is filled and made as thick as or thicker 75 than the other portions of the drum.

In witness whereof we hereunto affix our signatures.

VINCENT B. ASH.
ARTHUR E. ALLISON.