Nov. 1, 1932. R. A. MITCHELL 1,886,210

METHOD OF MAKING CUPPED FORGINGS

Filed May 5, 1931

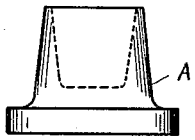


Fig. I

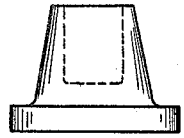


Fig. II

Fig. IV

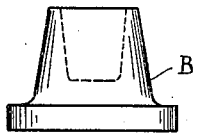
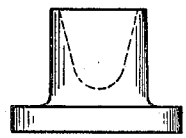


Fig. V



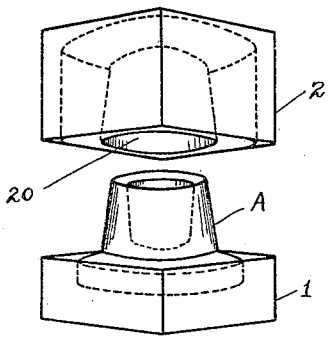


Fig. III

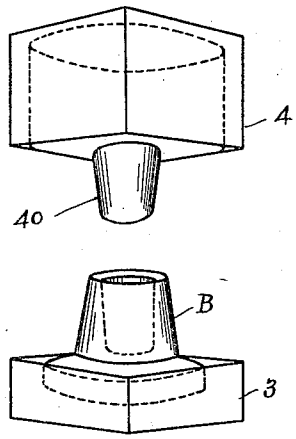


Fig. VI

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UNITED STATES PATENT OFFICE

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METHOD OF MAKING CUPPED FORGINGS

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This invention relates to improvements in the forming of cupped forgings, and the object in view is economy both in fabricating operations and in material.

The invention is illustrated in the accompanying drawing. Figs. I and II are views in side elevation of an article produced in the practice of my invention. As seen in Fig. I, the article is in intermediate state; as seen in Fig. II, it is fully forged. Fig. III is a diagrammatic view, showing in perspective the dies employed in shaping the intermediate article of Fig. I, to the fully forged state of Fig. II. Figs. IV, V, and VI are views corresponding to Figs. I, II, and III, and illustrating a variation in detail.

The object in view is to produce a deeply cupped forging, such as those illustrated in Figs. II and V. The forging of Fig. II is shaped interiorly to true cylindrical form; that of Fig. V is shaped to such form exteriorly. Forgings of this general sort are shaped between dies which move axially with respect to the cylindrical recess, and the walls of the cup must taper, both internally and externally, to afford clearance and to allow the forging to come freely away from the dies by and between which it is formed. The cupped forging, as it is necessarily formed, is illustrated in Figs. I and IV. Heretofore, in the formation of such articles, the practice has been to produce the forging of the shape particularly shown in Figs. I and IV; that is to say, with walls which taper both internally and externally from base to rim, and then, by machining, to bring the desired surface (whether the interior surface or the exterior) to true cylindrical form,—such forms as are indicated in Figs. II and V.

In the practice of this invention an additional pair of dies is provided, which shall engage the otherwise finished forging of Fig. I or Fig. IV; and shall, while the forging is still hot and in forgeable condition, bring it to the desired shape of a true cylinder. Ordinarily an ultimate machining of the cylindrical surface will be necessary, to give to it minute precision of dimension and desired smoothness, but the amount of machining necessary to achieve this upon the article produced in the practice of this invention is relatively slight, and relatively little material need be cut away.

Beginning with the blank of Fig. I, the desire being that the tapered-walled cup be brought to true cylindrical form internally, as seen in Fig. II, a pair of dies such as that shown in Fig. III is provided. The die 1 is a stool, to engage the base of the cup-shaped forging A and to sustain it in truly aligned position with respect to the companion die. The companion die 2 is recessed with a conical recess 20, of such dimensions and proportions that, as the dies come together upon the hot piece A introduced between them, the walls of the cup are shifted radially inward, so as to bring the recess within the cup-shaped forging from the conical shape indicated in Fig. I to the cylindrical shape indicated in Fig. II.

If the initial forging B, Fig. IV, is to be brought to the shape shown in Fig. V, with exterior surface cylindrical, a pair of dies such as that shown in Fig. VI is provided. The die 3 is substantially identical with the die 1 of Fig. III, and serves substantially the same purposes, positioning and sustaining the forging B when placed within it. The die 4 is provided with a conical extension 40, so proportioned and such in size, that, when the dies come together, the extension 40, entering the cup of forging B, will expand its walls and bring it to the shape shown in Fig. V, with the exterior surface, previously conical, now truly cylindrical.

It will be observed of both of the alternate operations described that there is no appreciable change in the overall length of the forging of Figs. I and IV; that the change in shape is effected in lateral or radial displacement of the hot metal; that in both cases the descending die 2 (4) with conical shaping surface first engages the forging at the rim of the cup, and that the engagement of the die with the forging progresses from the rim over a widening area which in the end extends all the way to the base. It will be observed that the effect of the operation of the dies of Fig. III is to compress the metal of the cup wall, and to thicken the wall some-

what; and that the effect of the operation of the dies of Fig. VI is to expand the metal of the cup walls, and to reduce somewhat the wall thickness. It is with this difference in detail in mind that the forging of Fig. I, otherwise of equal dimensions, is shown to be somewhat thinner at the rim of the cup than the forging of Fig. IV.

I claim as my invention:

The method herein described of forming a cupped forging having a cylindrical surface which consists in forging a body of metal to cupped shape with walls tapering both interiorly and exteriorly from a relatively thick base to a relatively thin rim, with the taper requisite to afford clearance and to allow the forging to come freely away from the dies, and then, beginning at the rim and progressing to the base exerting pressure radially upon one surface of the wall while leaving it free and unconfined upon the opposite surface, until that opposite surface is brought to cylindrical shape.

In testimony whereof I have hereunto set my hand.

RALPH ANSON MITCHELL.