Nov. 17, 1931. R. L. WILCOX 1,832,168

MECHANISM FOR MAKING NUTS AND OTHER ARTICLES

Filed July 14, 1930

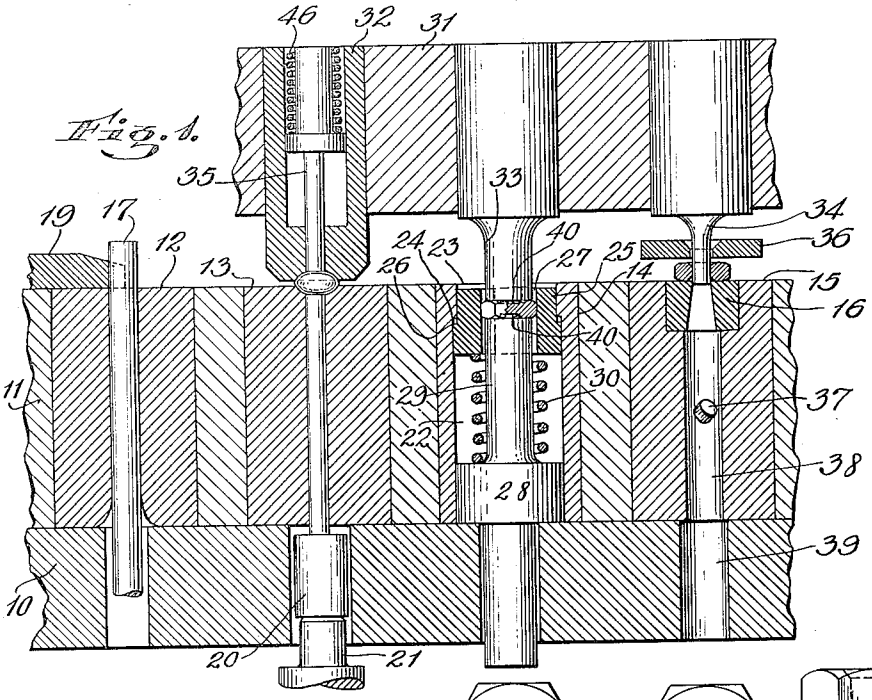


Fig. 1.

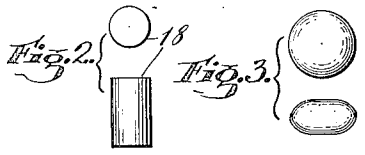


Fig. 2.

Fig. 3.

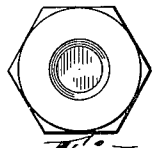


Fig. 4.

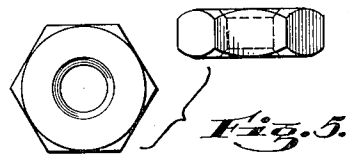


Fig. 5.

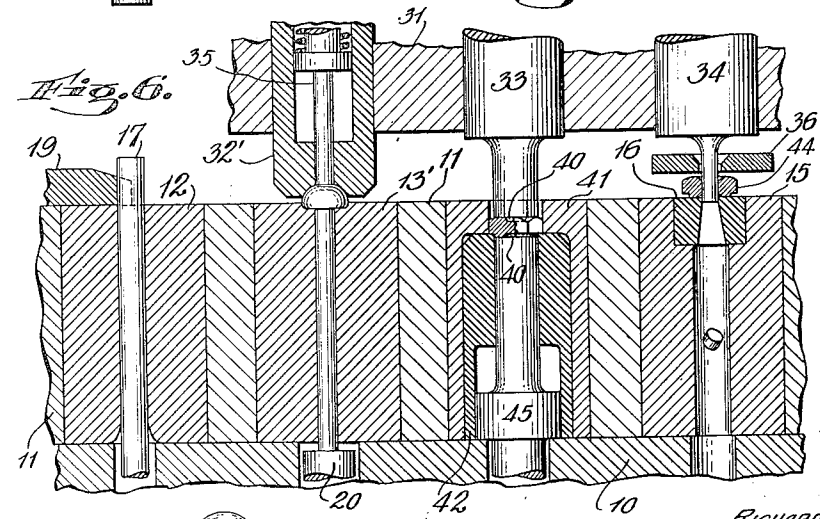


Fig. 6.

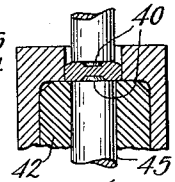


Fig. 9.

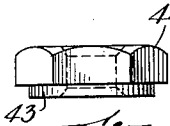


Fig. 8.



Fig. 7.

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Patented Nov. 17, 1931

1,832,168

UNITED STATES PATENT OFFICE

RICHARD LESTER WILCOX, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE WATERBURY FARREL FOUNDRY AND MACHINE COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION OF CONNECTICUT

MECHANISM FOR MAKING NUTS AND OTHER ARTICLES

Application filed July 14, 1930. Serial No. 467,713.

My invention relates to new and useful improvements in means for making nuts and other articles, the latter comprising, among other things, bolt, rivet, screw blanks and the like.

It is an object of this invention, among other things, to provide means whereby such products may be produced in finished form without waste of material, and if desired, provide one or more chamfered faces thereon, without application of pressure at or on such chamfered surfaces.

In carrying out my invention and in attainment of its objects, I provide mechanism whereby wire or a rod from a coil or the like is cut into lengths and these latter presented successively to one or more stations, whereby the length, now referred to as a blank is domed, and at another station the domed blank is formed into an article having a polygonal or other shape with or without a chamfered or beveled face, and thereafter a hole is pierced therethrough, if the article is a nut, and then ejected as a finished complete product.

To these, and other ends, my invention consists in certain novel details of construction and combinations and arrangements of parts, as will be hereinafter described and more particularly pointed out in the claims.

In the accompanying drawings I have adopted for purposes of illustration the mechanism as particularly designed for producing hexagonal nuts of the usual type, as a bolt or screw blank with a hexagonal head. The mechanism is not limited, however, to shapes such as specified, as others may be formed if preferred.

Referring to the drawings, wherein like numerals of reference designate like parts in the several figures;

Figure 1 is a sectional view of such portion of my mechanism as is essential for a complete understanding thereof;

Figure 2 is a view of the blank as cut off from the wire rod or length;

Figure 3 is a view of a double domed blank as shaped in one of the pressure operations;

Figure 4 is a view of the blank after it has assumed its hexagonal form;

Figure 5 is a view of a finished nut;

Figure 6 is a view similar to Figure 1 with mechanism particularly designed to produce a nut of another form;

Figure 7 is a view of a single domed blank;

Figure 8 is a view of a nut having a collar on one face; and

Figure 9 is a fragmentary view of the mechanism designed to produce a nut having one flat face and a chamfered opposite face.

The mechanism shown in Figure 1 is designed to produce a nut substantially as shown in Figure 5, and Figures 2, 3 and 4 show the blank from which it is made in its several forms after successive operations. The mechanism shown in Figure 6 is particularly designed to produce a nut substantially as shown in Figure 8. The blank in this case when first cut off being substantially the same as is shown in Figure 2 but its several successive forms differing slightly.

In practice my improved mechanism may be associated with a power press or the like, although not limited thereto.

The numeral 10 designates the bed of the press or the like, to which is secured by any preferred means a die block 11, within which is mounted a cut-off die 12, pressure die 13, die sleeve 14, and die holder 15, within which is mounted the piercing die 16.

The cut-off die has an opening therethrough of substantially the same shape and size in cross section as the wire rod 17, from which the blanks 18 are produced by a cut-off knife 19.

The outer face of the pressure die 13 is recessed to shape one end of the blank 18 into dome form, and projecting therethrough is a knockout pin 20, which is actuated by a plunger 21.

The die sleeve 14 has a chamber 22 therein of larger diameter than the bore 23 and separated by the shoulder 24.

Within this sleeve is a floating forming die 25 having two outside dimensions that correspond substantially with the same diameter of the chamber 22 and bore 23, with a stop shoulder 26 thereon, which in its extreme outer position engages the shoulder 24. This forming die has an opening 27 of substan-

tially the same shape in cross section as the finished article, shown herein as hexagonal.

Within the die sleeve 14 is a knockout pin 28, which slides within the chamber 22 and the stem 29 of which projects into the opening 27, being shown as having a less cross sectional area.

Between the enlarged portion of the knockout pin and the die 25 is a coil spring 30, the tension of which is exerted to move the die outwardly within the opening 27, such movement being limited by the engagement of the shoulders 26 and 24.

The plunger or gate 31 on the press or the like is actuated in any well known manner toward and away from the die block 11 and mounted therein are a plurality of punches severally designated 32, 33 and 34.

The outer face of the punch 32 is recessed so as to form the blank in dome shape, substantially as shown in Figure 3, and movably mounted therein under the tension of a coil spring 46 is a knockout pin 35.

The diameter of the punch 33 is shown as less than the narrowest dimension of the opening 27, thereby leaving an open space between the outside wall thereof and the inside wall of the opening.

The piercing punch 34 is substantially the same diameter as the opening through the nut.

A stripper plate 36 is positioned relatively to the die 16 so as to strip the nut from the punch as the latter is withdrawn therefrom.

Suitable means, well known in the art, are utilized to transfer the blank from the cut-off station to the succeeding stations until it drops by gravity into a receptacle conveniently arranged to receive it as a finished product.

After the blank 18 has been produced by the cut-off knife 19, it is presented between the faces of the die 13 and punch 32 and during the next movement of the gate it is pressed into a dome shape form, substantially as shown in Figure 3. In this form the blank is domed on each side of the horizontal center of the blank. During this operation the ends of the knockout pins 20 and 35 are in the position substantially as shown in Figure 1. When the gate next moves away from the block 11, the spring 46 actuates the knockout pin 35 and prevents the blank from being retained within the recess of the punch 32 and the knockout pin 20 projects the blank out of the recess in the die 13.

The outside diameter of the blank in its present form (Figure 3) is substantially the same as the distance between the flat faces of the hexagonal opening 27 in the die 25, so that when released by the transfer mechanism it drops therein and rests upon the top of the stem 29, at which time the shoulders 24 and 26 are in contact with each other. At the next movement of the gate toward the die holder, the punch 33 engages the blank and compresses it between the end of the punch and the stem 29, giving the blank its finished cross sectional hexagonal shape.

As pressure is applied to the blank the metal flows outwardly and first engages the inner walls of the opening 27 at about the center of the length thereof. When the pressure on said walls is sufficiently great to hold the blank therein the die 25 then moves with the blank and punch 33 as a unit against the tension of the spring 30. Thus, there is no drag on the outside walls of the blank in the opening 27, which would be the case if the forming die 25 did not float within the sleeve 14. The blank thus formed is removed from the die 25 by the knockout pin 28 and is then carried to the next station where a hole is punched therethrough by the punch 34 and the slug 37 cut therefrom escapes through the openings 38 and 39 in the bed. At the next movement of the gate away from the die holder, the finished nut is stripped from the punch 34 and is carried away from this latter station by the transfer mechanism as a finished product.

The opposing faces of the punch 33 and stem 29 are each provided with a projection 40 which respectively form a depression in each face of the blank, thus materially reducing the thickness and volume of the metal to be removed by the punch 34.

The walls of the projections 40 are flaring so that they leave like walls in the recesses of the blank, hence after the thread is cut in the opening in the nut it is not necessary to countersink the ends of such opening as is the usual practice.

As the pressure applied to the blank in the die 25 is only to a portion of the face thereof the flow of metal is unrestrained so far as relates to such portion of the blank as is not subjected to pressure. This results in the upper and lower edges thereof being chamfered in their completed form, largely due to the fact that the blank is dome shape, and the mechanism shown in Figure 6 is substantially the same as that shown in Figure 1, with the exception that the shape of the blank as produced between the die 13′ and punch 32′ is formed with a dome on only one side of the horizontal center of the blank, the other side being substantially flat.

The operations at the first two stations and the last station are substantially the same as those at similar stations in the mechanism shown in Figure 1, and the structure thereof is substantially the same, with the exception that the recesses in the die 13′ and punch 32′ are shaped so that the dome is formed on only one side of the horizontal center of the blank with the edge of the opposite flat side, however, slightly rounded, substantially as shown in Figure 7. At the third station the die 41 has an opening therethrough of substantially the same shape in cross section as

the finished blank. Within the bore of the die 41 is an abutment block 42 having an opening therethrough of substantially the same diameter as the collar 43 on one side of the finished nut 44 and within which is operable the knockout pin 45.

When the blank is domed upon only one side of the center a rigid die, such as 41, instead of a floating die, may be utilized with efficiency, and the blank is compressed by the punch 33 within the opening in the die 41, and against the upper wall of the block 42 and pin 45, recesses being formed in opposite faces thereof by the projections 40 as before described.

The height of the collar 43 may be changed by varying the relative position of the end of the pin 45 and the adjacent face of the abutment block 42.

After the blank has been formed within the die 41 the knockout pin 45 projects the blank through the opening therein and the same is transferred to the next station where it is pierced to form an opening therethrough as before described.

In Figure 9 I have illustrated the tools as arranged to produce a nut blank which is chamfered upon only one face and without a collar 43. These tools are the same as those shown in Figure 6 at the third station but positioned so that the end of the knockout pin 45 is flush with the adjacent face of the block 42.

The cross sectional area of the punch 33 and stem 29 may be substantially the same as that of the opening 27 if desired.

There are minor changes and alterations that may be made within my invention, aside from those herein suggested, and I would therefore have it understood that I do not limit myself to the exact construction herein shown and described, but claim all that falls fairly within the spirit and scope of the appended claims.

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

1. In mechanism of the character described, the combination with, a reciprocating pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of, means for releasing the blank from the pressure means; a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; and means for applying pressure to one face of such dome shaped blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, with that portion of the face outside of the pressure area shaping itself into a chamfered face.

2. In mechanism of the character described for forming an article or the like, with a chamfered face, the combination with, reciprocating pressure means for shaping the blank into dome form; of, means for releasing the blank from the pressure means; a die or the like having an opening therethrough of substantially the same shape in cross section as that of the finished article; means for applying pressure to such domed shape blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, the area of the surface of the last mentioned pressure being substantially the same as the unchamfered portion of said face.

3. In mechanism of the character described, the combination with, reciprocating pressure means applied to the end of a blank for shaping the same so that one side of the largest diameter thereof is dome shape; of, means for releasing the blank from the pressure means; a die or the like having an opening therein substantially the same shape in cross section as that of the finished article; and a punch, the area of the pressure face thereof being less than the largest dimension of said blank that applies pressure to the blank while within said opening, which pressure reduces the height of the blank and shapes the exterior thereof to substantially the finished form with that portion of the face outside of the punch pressure area shaping itself into a chamfered face.

4. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; means for applying pressure to such domed shape blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, with that portion of the face outside of the pressure area shaping itself into a chamfered face; and means for mounting said die whereby it will move with the blank while under pressure.

5. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; and means for applying pressure to such domed shape blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished

form, with that portion of the face outside of the pressure area shaping itself into a chamfered face, said die being movably mounted and in one direction travelling with the blank when pressure is applied thereby to the walls of the opening therein.

6. In mechanism of the character described, the combination with a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; reciprocating pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article, the outside dimension of which is the same or slightly less than that of the shortest cross dimension of said opening; and means for applying pressure to one face of such dome shaped blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, with that portion of the face outside of the pressure area shaping itself into a chamfered face.

7. In mechanism of the character described, the combination with, reciprocating pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of, means for releasing the blank from the pressure means; a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; and pressure means applied to opposite ends of the dome blank, while within said opening and over an area less than the diameter thereof, to shape the exterior of the blank into its substantially finished form, with that portion of the said ends, outside of the pressure area, shaping itself into a chamfered face.

8. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; and pressure means applied to opposite ends of the dome blank, while within said opening and over an area less than the diameter thereof, to shape the exterior of the blank into its substantially finished form, with that portion of the said ends, outside of the pressure area, shaping itself into a chamfered face, one of said pressure means forming a platform upon which the blank rests when it first enters said opening.

9. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; means for applying pressure to such domed shape blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, with that portion of the face outside of the pressure area shaping itself into a chamfered face; and means for mounting said die whereby the same may have movement substantially parallel to the said opening therein.

10. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; means for applying pressure to such domed shape blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, with that portion of the face outside of the pressure area shaping itself into a chamfered face; means for mounting said die whereby the same may have movement substantially parallel to the said opening therein; and stop means for limiting the movement of the die in one direction.

11. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; means for applying pressure to such domed shape blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, with that portion of the face outside of the pressure area shaping itself into a chamfered face; means for mounting said die whereby it will move with the blank while under pressure; and yielding means for moving the die in one direction.

12. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; means for applying pressure to such domed shape blank while within said

opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, with that portion of the face outside of the pressure area shaping itself into a chamfered face; and a holder for said die within which the die is movably mounted, having stop shoulders therein that co-operate with similar shoulders on the die to limit the movement thereof in one direction.

13. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; means for applying pressure to such domed shape blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, with that portion of the face outside of the pressure area shaping itself into a chamfered face; a holder for said die within which the die is movably mounted, having stop shoulders therein that co-operate with similar shoulders on the die to limit the movement thereof in one direction; and yielding means which applies pressure against said die to hold it against said shoulder.

14. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; pressure means applied to opposite ends of the dome blank, while within said opening and over an area less than the diameter thereof, to shape the exterior of the blank into its substantially finished form, with that portion of the said ends, outside of the pressure area, shaping itself into a chamfered face; and means for actuating one of said pressure means whereby to eject the blank from the die.

15. In a mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; an abutment member to limit the movement of the blank within the die in one direction, having an opening therethrough; and a combined pressure resisting member and knockout mechanism within the opening in said abutment member.

16. In mechanism of the character described for forming an article with an integral collar on one face, the combination with pressure means for shaping a blank into dome form; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; an abutment member to limit the movement of the blank within the die in one direction, having an opening therethrough; a combined pressure resisting member and knockout mechanism within the opening in said abutment member; and means for holding said member and knockout mechanism with the face thereof at a distance from the face of the abutment member, corresponding with the height of the collar.

17. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; and means for applying pressure to such domed shape blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, with that portion of the said ends, outside of the pressure area, shaping itself into a chamfered face, said pressure means having a projection upon its pressure face to form a depression in the article.

18. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face of the finished article; of a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; means for applying pressure to such domed shape blank while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, with that portion of the said ends, outside of the pressure area, shaping itself into a chamfered face, said pressure means having a projection upon its pressure face to form a depression in the article; and a punch for forming an opening through the article concentric with said depression after the same has been subjected to the action of the pressure means.

19. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face on the finished article, of positive means for ejecting the blank from one portion of the pressure means, yielding means for ejecting the blank from another portion of the pressure means; a die or the like having an open-

ing therein of substantially the same shape in cross section as that of the finished article; and means for applying pressure to one face of such domed shape blank, while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form.

20. In mechanism of the character described, the combination with pressure means for shaping a blank into dome form whereby under subsequent pressures the wall of the dome will flow unrestrained and form a face on the finished article, of positive means for ejecting the blank from one portion of the pressure means, yielding means for ejecting the blank from another portion of the pressure means; a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article; and means for applying pressure to one face of such domed shape blank, while within said opening and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form, said pressure means being disposed to operate substantially parallel with each other.

21. In mechanism of the character described for forming an article or the like from a rod length; means for cutting off a portion of the rod; opposed pressure means between which said cut-off portion is presented to shape such cut-off portion into dome form; a die or the like, having an opening therein of substantially the same shape in cross section as that of the finished article; and means for applying pressure to one face of the domed shape blank, while within said opening, and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form.

22. In mechanism of the character described for forming an article or the like from a rod length; means for cutting off a portion of the rod; opposed pressure means between which said cut-off portion is presented to shape the latter into dome form; a die or the like, having an opening therein of substantially the same shape in cross section as that of the finished article; means for applying pressure to one face of the domed shape blank, while within said opening, and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form; knockout mechanism in a portion of the first mentioned pressure means and a yielding knockout mechanism in another portion of said pressure means which yields during the forming of the blank, but exerts its pressure and ejects the blank thereafter.

23. In mechanism of the character described the combination of pressure means comprising a punch and die for shaping a blank into dome form whereby under subsequent pressures a wall of the dome will flow unrestrained and form a face on the finished article, a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article, a punch for applying pressure to one face of such domed shape blank while within said die and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form; a block with which said punches are associated; and a block with which said dies are associated, one of said blocks being movable toward and away from the other.

24. In mechanism of the character described the combination of pressure means comprising a punch and die for shaping a blank into dome form whereby under subsequent pressures a wall of the dome will flow unrestrained and form a face on the finished article, a die or the like having an opening therein of substantially the same shape in cross section as that of the finished article, a punch for applying pressure to one face of such domed shape blank while within said die and over an area less than the diameter thereof to shape the exterior of the blank into its substantially finished form; means for holding the dies in a fixed relation to each other; and means for holding the punches in a fixed relation to each other.

In testimony whereof, I have hereunto affixed my signature.

RICHARD LESTER WILCOX.