W. B. SMITH.

DIES FOR DRAWING AND UPSETTING METAL FORMS.

APPLICATION FILED DEC. 5, 1918.

1,393,916.

Patented Oct. 18, 1921.

2 SHEETS—SHEET 1.

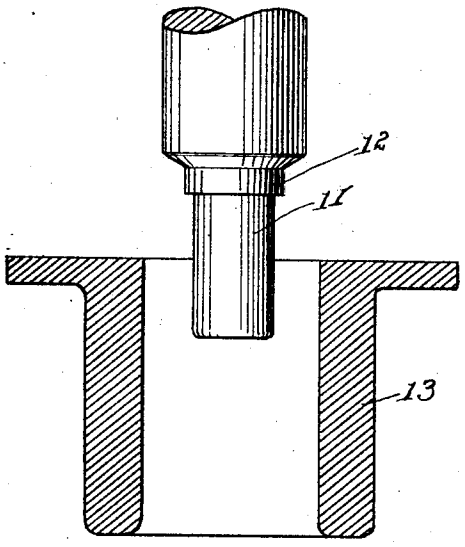


Fig. 1

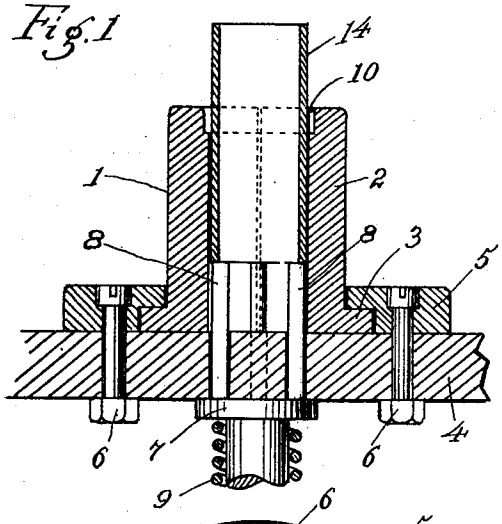


Fig. 2

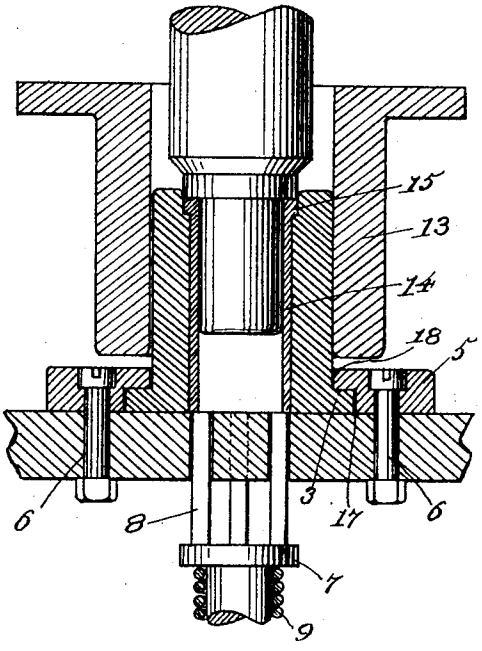
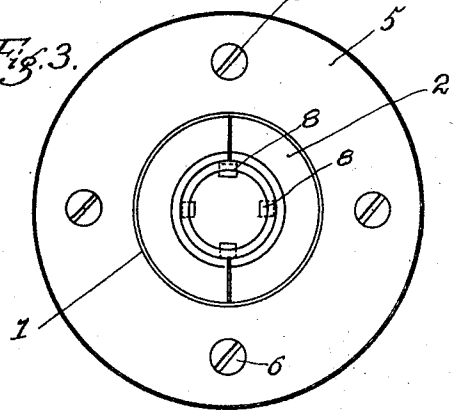


Fig. 3.



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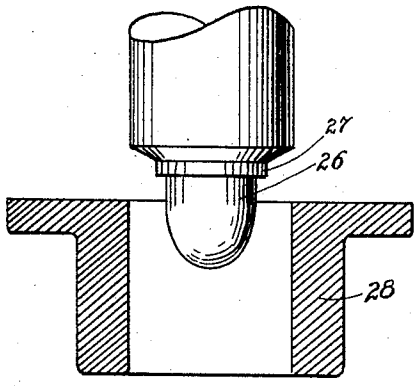


Fig. 4

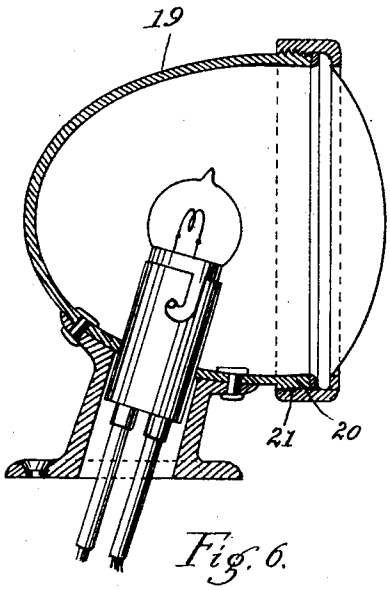
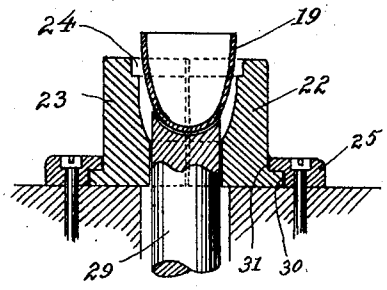


Fig. 6.



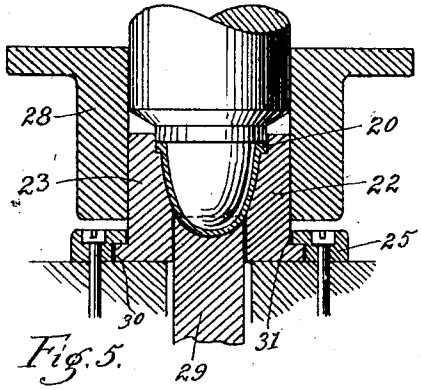


Fig. 5.

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UNITED STATES PATENT OFFICE.

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DIES FOR DRAWING AND UPSETTING METAL FORMS.

1,393,916. Specification of Letters Patent. Patented Oct. 18, 1921.

Application filed December 5, 1918. Serial No. 265,334.

To all whom it may concern:

Be it known that I, WILLIAM B. SMITH, a citizen of the United States, and a resident of Norwood, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Dies for Drawing and Upsetting Metal Forms, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings forming part of this specification.

The special object of my invention is to provide dies for the formation of hollow shells or tubes out of sheet metal in which the sheet metal must be upset or thickened in order to furnish sufficient material for the formation of screw threads or other means of attachment at the thickened portion.

It has been customary in the past to form these hollow shells out of sheet metal by drawing the metal from a flat blank with a series of dies, and the method in use comprises the forcing of the sheet metal by means of a plunger through a series of dies formed in solid blocks of metal, and to form the thickened portion or collar by forcibly upsetting the metal against a shoulder in the die. To accomplish this upsetting of the metal, requires such powerful pressure that the shells or tubes are very apt to adhere to the mold and it becomes exceedingly difficult, when the punch is withdrawn, to loosen the shell or tube from the die to permit its removal.

It is to avoid this difficulty that my invention is directed, by the construction of dies to form the hollow articles so as to permit the ready removal of same when finished.

I have illustrated in the accompanying drawings my improved construction as applied to the formation of a cylindrical tube with one end thickened or formed with a collar, and also for the formation out of a flat blank of a small automobile lamp shell; but it will be understood, of course, that my new construction is applicable to the formation of all sorts of hollow shapes in which it is desired to upset the metal for the reception of screwthreads or otherwise.

In the drawing,

Figure 1—is a central vertical section of a die for forming a shouldered portion of a cylindrical tube showing the plunger and die-retaining sleeve in position for operation.

Fig. 2—is a similar view with the operation completed.

Fig. 3—is a top plan view of the die.

Fig. 4—is a sectional view of the construction, as shown in Fig. 1, for the formation of a small lamp shell.

Fig. 5—is a similar section showing the operation completed.

Fig. 6—is a central section of a lamp structure showing the use to which the sheet metal shell is put.

I have not illustrated in the drawings the preliminary operations for the drawing of the flat sheet metal blank into the tube or shell, as it will be understood that these operations are performed in the usual way, which consists in subjecting a flat blank to one or more punch and die operations to produce the hollow sheet metal form. My improved process relates to the formation of the collar or thickened portion obtained by upsetting the metal.

As I have already indicated, the use of the die formed of a solid block in which the sheet metal is to be upset causes the shell or tube to adhere to the said die so closely that it is extremely difficult and often impossible to loosen the hollow shell for removal. To avoid this difficulty I form a die in two parts: 1 and 2. The die is formed with a bottom flange 3 and is mounted on the die plate 4. A solid ring 5 recessed to fit over the flange 3 and to slip down over the two half dies is secured on the plate 4 by the bolts 6. In order to remove the sheet metal form from the die after the final operation, a knock-out plate 7, with fingers 8, projecting up through the holes in the die plate 4, is provided, and this knock-out block is held against the under surface of the plate 4 by a heavy coiled spring 9. The die is provided with a recessed portion 10 at its upper edge in both halves of the die, and a plunger 11 is formed with a shoulder 12 to upset or compress the sheet metal into this recessed portion. The ring 5 clamps the two half dies 1 and 2 against the plate 4 solidly so as to prevent any movement of the two half dies 1 and 2 in a vertical direction. It will be seen, however, that there is a slight clearance between the ring 5 and the two half dies 1 and 2 at 17 and 18, Fig.

2, which allows a slight movement or separation of the two half dies 1 and 2 in a horizontal direction.

In connection with the plunger, I provide a sleeve 13, the diameter of which will just permit it to pass over the two halves of the die when they are brought in close contact, and this sleeve is brought down simultaneously and but slightly in advance of the travel of the plunger or punch, so that before the metal is upset, the sleeve will fit over and hold the split die closely together, so that for the die surfaces there is practically a closed cylindrical surface without a break. The cylindrical shell 14 is placed in the die resting on the knock-out pins 8, the sleeve 13 descends and locks the halves of the die together and the plunger descends on the metal form, the punch entering the tube with the shoulder 12 bearing on the upper edge of the tube, which is then compressed and the metal upset to form the thickened portion 15.

The fact that the die is in halves, and the two halves being held rigidly together by the sleeve 13 provides in effect a solid die so that there is no expansion or separation of the two die halves 1 and 2. The sleeve and punch are then withdrawn and the fingers on the knock-out plate raise the sheet metal form so that it can be removed from the die. It will be readily seen that as soon as the sleeve 13 is withdrawn from the die halves 1 and 2 that the pressure of the spring 9 against the knock-out plate 7 will tend to force the tube 14 upward. Any tendency of the tube 14 to adhere to the die is prevented because of the freedom to move in a longitudinal direction of the die halves 1 and 2 due to the clearance 17 and 18. In other words, as soon as the sleeve 13 leaves the die halves, said die halves open up, because of clearance provided permitting the easy movement upward and subsequent withdrawal of the tube 14.

For the formation of a lamp shell 19 such as is illustrated in Figs. 4 to 6, with the thickened portion 20 for the screwthreads 21, the die block suitably shaped is also formed in two halves 22, 23 with the recess 24. A similar ring 25 fitting over the flange of the die is employed; also the plunger 26, with shoulder 27 and sleeve 28.

For the removal of the finished blank from the dies, I provide the knock-out plunger 29, spring-pressed as is customary, and the end of this knock-out plunger is formed with the proper recess to receive the inner end of the metal form. In this die also clearances are provided at 30 and 31 allowing the die halves to separate when the sleeve 28 is withdrawn, which makes the operation of raising the shell by the knock-out easy.

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

1. A means for forming a thickened portion on a hollow sheet metal form, which comprises a divided die of the shape of the finished article, and provided with a recess for the reception of the upset metal, the parts thereof having a small normal separability, means for locking the parts of the divided die together firmly, to prevent their expansion or separation, and a plunger shaped to fit the hollow form and to upset the metal into the recess.

2. A means for forming a thickened portion on a hollow sheet metal form, which comprises a divided die of the shape of the finished article, and provided with a recess for the reception of the upset metal, the die being divided into halves on a plane of its longitudinal axis, the parts thereof having a small normal separability, and means for locking the parts of the divided die together to prevent their expansion or separation, and a plunger shaped to fit the hollow form and to upset the metal into the recess.

3. A means for forming a thickened portion on a hollow sheet metal form, which comprises a divided die of the shape of the finished article, and provided with a recess for the reception of the upset metal, a sleeve adapted to inclose and to lock the parts together to prevent their expansion or separation, and a plunger shaped to fit the hollow form and to upset the metal into the recess.

4. A means for drawing sheet metal forms, which comprises a divided die, an integral sleeve surrounding the same, said die having a groove therein into which a metal blank may be forced to increase its thickness, and a plunger formed to fit the blank form, and provided with a shoulder to bear on the end of the metal blank, to force it into said groove.

5. A means for forming a thickened portion on a hollow sheet metal form, which comprises a divided die of the shape of the finished article, the parts of said die having a small normal separability, and provided with a recess for the reception of the upset metal, means for locking the parts of the divided die together firmly, to prevent their expansion or separation, a plunger shaped to fit the hollow form and to upset the metal into the recess, and an ejector in the die adapted to eject the article from the die when the locking means has been removed to permit the slight separation of the divided die for the easy removal of the article.

6. A means for forming a thickened portion on a hollow sheet metal form, which consists in a divided die of the shape of the finished article, the parts thereof having a small normal separability, and provided with a recess for the reception of the upset metal, the die being divided into halves on a

plane of its longitudinal axis, means for locking the parts of the divided die together to prevent their expansion or separation, and a plunger adapted to fit the hollow form and to upset the metal into the recess, said locking means being removable to permit the slight separation of the divided die for the easy removal of the shell or tube.

7. A means for forming a thickened portion on a hollow sheet metal form, which comprises a divided die of the shape of the finished article, and provided with a recess for the reception of the upset metal, the die being divided into halves on a plane of its longitudinal axis, means for holding the divided die against longitudinal movement while permitting a slight lateral play thereof, and means for locking the parts of the divided die together to prevent their expansion or separation when subjected to the pressure, a plunger shaped to fit the hollow form and to upset the metal into the recess, said locking means being removable to permit the slight separation of the divided die for the easy removal of the shell or tube.

8. A means for drawing sheet metal forms which comprises a divided die, an integral ring adapted to hold the die parts against longitudinal, while permitting slight lateral, movement, a removable integral sleeve inclosing the die and preventing separation of the die parts, and a plunger formed to fit the blank form, and provided with a shoulder to bear on the end of the metal blank, an ejector for ejecting the article after removal of the sleeve to allow lateral movement of the die parts.

WM. B. SMITH.