H. G. CARLSON.

SET OF DIES.

APPLICATION FILED DEC. 3, 1914.

1,142,782.

Patented June 8, 1915.

Fig. 1.

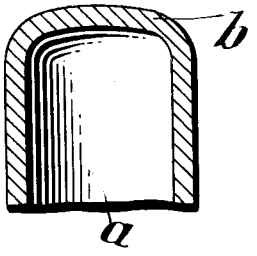


Fig. 2.

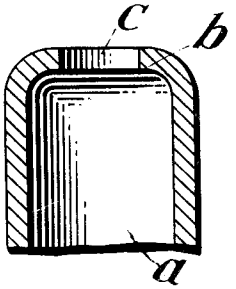


Fig. 3.

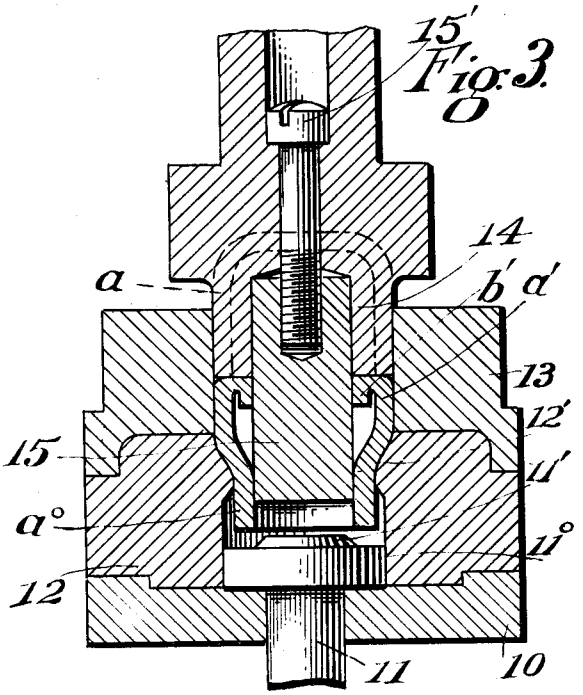


Fig. 4.

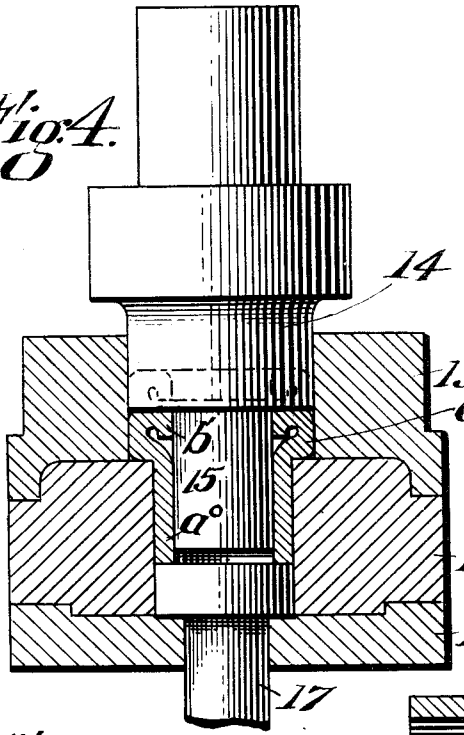


Fig. 5.

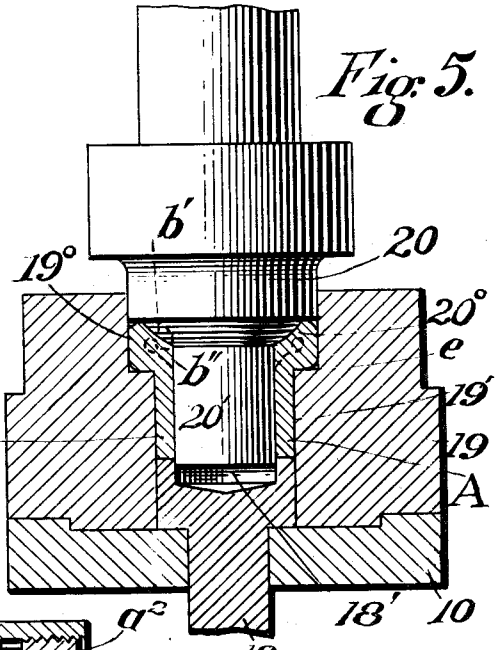
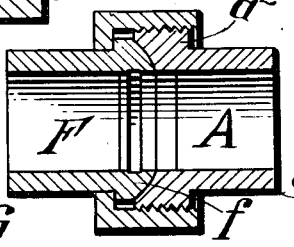


Fig. 6.



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SET OF DIES.

1,142,782. Specification of Letters Patent. Patented June 8, 1915.

Application filed December 3, 1914. Serial No. 875,357.

To all whom it may concern:

Be it known that I, HJALMAR G. CARLSON, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Set of Dies, of which the following is a specification.

The principal objects of this invention are to provide a simple, inexpensive and practicable set of dies for making pipe unions and other articles of a similar nature having projections at their ends for receiving nuts or other fastening devices, and end surfaces adapted to abut against each other; to provide for manufacturing such articles from disk-shaped blanks of sheet metal in a minimum number of operations; and more specifically to provide a practicable form of dies for doubling a portion of the sheet metal on itself for the purpose of providing a projecting end, and a surface at the end of the article suitable for abutting against a complementary surface and forming a tight joint therewith.

Reference is to be had to the accompanying drawings in which,

Figure 1 is a central longitudinal sectional view of a cup-shaped blank showing one step of the operation; Fig. 2 is a similar view showing the next step; Fig. 3 is a central vertical sectional view of a set of dies for operating on the blank shown in Fig. 2; Fig. 4 is a similar view of a set of dies showing the next step of the method; Fig. 5 is a similar view of another set of dies showing the final die pressing operation; and Fig. 6 is a longitudinal central sectional view of a complete union formed by this method.

In the manufacture of a member of a pipe union or other similar article according to this invention, a circular disk of sheet metal is the original blank which is employed. This disk is first formed, by ordinary well known die-pressing operations, into the cup shape blank *a* indicated in Fig. 1. In this figure, the sheet metal blank *a* has been shaped in simple dies to form a cylindrical portion having an end *b*. This blank is then operated upon by the ordinary well known type of punch to perforate the end *b* centrally, and in Fig. 2 it is shown as having a central perforation *c* smaller than the end so as to leave a portion of the end in position and rounded over around the outside.

The next step of the preferred method consists in a die-pressing operation for the purpose of reducing the diameter of the open end of the blank shown in Fig. 2, while keeping the external diameter of the perforated end substantially of its original size and at the same time bending in the wall which surrounds the perforation *c* so as to bring that wall into a cylindrical form inside the external wall of the blank and of the same internal diameter as the reduced wall of the open end. For this purpose, the blank is placed in a set of dies as shown in Fig. 3. The dies are shown as working vertically and will be so described, although of course they can be turned if desired, to work horizontally or otherwise. These dies comprise a bottom member 10 having an opening at the center in which is an ejector 11 provided with a central projection 11′ at the top and a flat surface 11° surrounding it. On the top of the member 10 is an intermediate die member 12 having an inwardly curved circumferential surface 12′ at the top of a central perforation therethrough. The top part of this perforation receives the end of the blank which fits within it. On the top of this member 12 is a die member 13 having a central perforation therethrough of a diameter substantially the same as the external diameter of the blank *a* and coinciding with the end of the central opening through the intermediate member 12. Beyond this member 13 is a plunger 14 adapted to enter the perforation in the member 13. This plunger is provided with a smaller central plunger 15 therein projecting beyond the end thereof and held in position by a screw 15′ or the like. The plunger 15 is larger in diameter than the perforation *c*.

In operation, the blank as shown in Fig. 2, is placed in the member 13 with its lower open edge resting on the edge of the surface 12′ of the intermediate die member 12. It is shown in this position in dotted lines in Fig. 3. The plungers 14 and 15 are then brought down upon it and the first effect is the engagement of the end of the plunger 15 with the end *b* of the blank. This plun-

ger is slightly larger than the perforation *c* and consequently it tends to force the metal down in the dies 12 and 13 and at the same time to force the inner edge of the metal surrounding the perforation *c* downwardly and inwardly. The effect of this is to form an inward flange *b'* on the top of the blank as it descends along the surface 12'. It also causes the plunger 15 eventually to enlarge the opening *c* and descend through it. When this happens, the plunger 15 moves down into the body of the blank and then the plunger 14 can come into engagement with the top of the blank, as indicated in Fig. 3. At this time, the plunger 14 has the function of positively forcing the blank down into the die so as to partake of the shape of the top of the surface 12' just below the top of the blank. The plunger 15 continues to perform the function of holding the inner edge of the turned over edge *b'* of the blank to proper internal diameter and it also descends into a position in which it registers with the surface 12' and thus holds the interior of the blank at this point and prevents it from becoming smaller than the plunger 15. As the plunger descends from this point, all the metal that passes below the surface 12' will assume a cylindrical form and will have an internal diameter equal to the internal diameter of the edge *b'* which has been forced inwardly at the top of the blank. At this time the outer wall of the blank has three portions; first, *a'* of the same size as the original blank *a;* second, *a°* of cylindrical form but reduced diameter; and a third portion intermediate of the two and curving gradually from one diameter to the other. The ejector 11 can be forced inwardly at the proper time to hold the end of the blank, prevent its being reduced in diameter, and keep that end substantially in a plane as it comes against the surface 11'', then it is used as an ejector in the usual way. This operation having been completed, the next operation is commenced. In this, the same members 10, 13, 14 and 15 can be used if desired, or duplicates thereof, but a new die 16 and ejector 17 are shown. In this case the ejector 17 is similar to the ejector 11 except that it has a flat top surface. The die 16 is a plane die fitting the die 13, or a correspondingly shaped die, and has a cylindrical passage therethrough fitting the head of the ejector 17 and of the same diameter as the external diameter of the blank at *a°*. The blank being inserted in this set of dies in the position shown in dotted lines in Fig. 4, the plungers 14 and 15 are brought down upon it. The effect of this operation is to bring the upper parts of the blank into a more compact form, and all the parts below into a true cylindrical shape with a square end. This is brought about simply by forcing the parts down into the position shown in full lines in Fig. 4.

The next operation is shown in Fig. 5. Here a die like the plate 10 is provided with an ejector 18 having a head thereon inside and provided with a recess 18'. Above this is a die 19 having a central passage 19' of a diameter the same as the passage in the die 16 and having an enlargement 19° above it of the same diameter as the passage through the die 13. A plunger 20 is brought down upon these parts, said plunger having a main portion of a diameter equal to the diameter of the enlargement 19° and a reduced portion or plunger 20' of the same diameter as the plunger 15. Between these two parts of the plunger is a convex surface 20° for forming the final shape of the seating surface shown in Fig. 5. When the plunger is brought down, it simply compresses the top part of the blank, doubling the metal edge *b'* over on the metal below to form a top layer *b''* of metal and fill up the circular recess therein by compressing the metal into it, leaving only a seam at that point. In the form shown in the drawings, the surface 20° is continuous so as to form a concave surface on the blank suitable for receiving the convex surface of a companion member. This pressing operation also presses out the lower surface of the enlarged part of the blank to form a substantially square shoulder at *e*, and the cylindrical portion of the product is brought to length and thickness and receives its final pressure for shaping it. This blank A can then be screw-threaded, or otherwise fitted up as desired, its ends squared off if necessary, and it is ready for use as a female member of a pipe union or for any other purpose for which its particular shape may be designed. In Fig. 6 I have shown this member A in its complete state set up as a part of a union, said union comprising also a male member F and a nut G. This male member can be made by a similar set of dies.

It is to be observed that the member F, is provided with a slight enlargement and square shoulder *f* for the flange of the nut G, and is provided with a convex end surface suitable for fitting against the concave end surface of the other member. Also, it will be seen that the female member A is provided with a solid head or enlargement for the reception of the screw-thread a^2, of substantially twice the thickness of the original sheet of metal from which the blank is made, and having an adequate length for the screw-thread, and this is accomplished by comparatively simple die-pressing operations without undue complications. The dies by which these operations are performed are simple and complete in them-

selves and they are easily manufactured and operated, some of those in each set being duplicates of some in the other sets.

Although I have illustrated the invention as applied to the manufacture of a pipe union, I am aware of the fact that the principles thereof can be carried out in substantially the same way in the manufacture of other articles of a somewhat similar form, and that the exact sequence of operations can be changed to some extent without departing from the scope of the invention as expressed in the claims. Therefore, I do not wish to be limited to the manufacture of this specific article or to the exact order of steps or shape of dies herein shown and described, but

What I do claim is:—

1. In a set of dies for forming pipe unions and the like, the combination of a die member having a passage therein reduced inwardly from one side, a second member on the outer side of the first named die member having a passage of substantially the same diameter as the diameter of the open end of the passage in the first member, a plunger having an external portion fitting the passage in the second member, and a longer but smaller concentric plunger member adapted to extend into the first member.

2. In a set of dies for forming pipe unions and the like, the combination of a die member having a passage therein reduced inwardly from one side, a second member on the outer side of the first named die member having a passage, and a plunger having an external portion fitting the passage in the second member, and a longer but smaller concentric plunger member adapted to extend into the first member, and means for compressing longitudinally the part of the blank shaped in said second member.

3. In a set of dies for forming pipe unions and the like, the combination of a die member having a passage therein, a second member having a larger passage, and a plunger having an external portion fitting the passage in the second member, and a longer but smaller concentric plunger member adapted to extend into the first member, means for compressing longitudinally the part of the blank shaped in said second member, and means for concaving and compressing the same part of the blank.

4. In a set of dies for forming pipe unions and the like, the combination of means for doubling over the edge of a cup-shaped blank having a perforation in its end, of a die member having a passage therein of two sizes, and a plunger adapted to enter said passage, and having a large portion fitting the larger sized passage, a plunger smaller than the smaller sized passage, the surface between the large portion of the plunger and the smaller plunger having a convex form, and a member adapted to move axially toward said plunger, and having a cavity in its end of concave form and complementary in shape to the said surface on the plunger.

5. In a set of dies for forming pipe unions and the like, the combination of a die member having a passage therethrough reduced inwardly from one side, a plunger adapted to enter the smallest portion of said passage, and of a size to form a space between it and the plunger for receiving the metal to be operated upon, and means for bending over inwardly and forcing longitudinally a blank in said first die member while the plunger is within the same.

6. In a set of dies for forming pipe unions and the like, the combination of a die member having a uniform passage therethrough, a plunger fitting in said passage, an internal plunger of smaller size, another die member having means for receiving the blank from the first named die member, reducing it and bringing it into contact with the last named plunger.

In testimony whereof I have hereunto set my hand, in the presence of two subscribing witnesses.

HJALMAR G. CARLSON.

Witnesses:
DONALD W. ORMSBEE,
GEORGE A. PRATT.