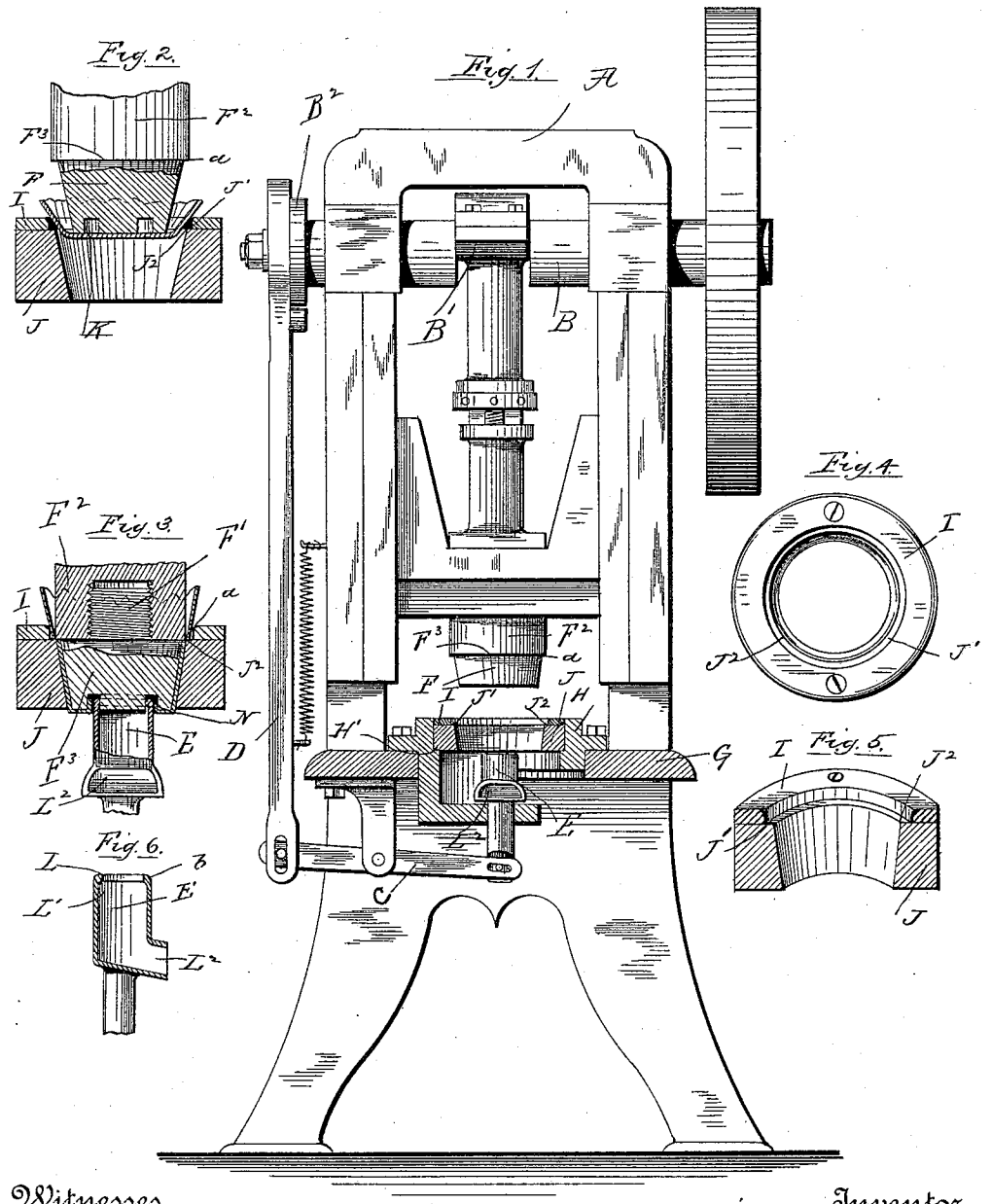
(No Model.)

W. A. TURNER.

DIE FOR SHAPING SHEET METAL.

No. 451,203. Patented Apr. 28, 1891.



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UNITED STATES PATENT OFFICE.

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DIE FOR SHAPING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 451,203, dated April 28, 1891.

Application filed September 18, 1890. Serial No. 365,367. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. TURNER, a citizen of the United States, and a resident of Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Dies for Cutting and Shaping Sheet Metal, of which the following is a specification, reference being had to the accompanying drawings, forming a part of the same, and in which—

Figure 1 represents a front elevation of a die-press with a set of dies contained therein embodying my invention, the table of the press, together with the stationary die and the die-dish supporting the die, being shown in vertical central sectional view. Fig. 2 represents a vertical central sectional view of the stationary die, with a central sectional view of the upper reciprocating die, and representing a blank in sectional view in position to be acted upon by the upper and the stationary dies. Fig. 3 represents similar views of the upper and stationary dies, with a sectional view of the lower reciprocating die, the position of the three dies being that assumed at the completion of the operation upon the sheet-metal blank. Fig. 4 is a top view of the stationary die. Fig. 5 is a vertical central sectional view of the stationary die; and Fig. 6 is a vertical central sectional view of the lower reciprocating die, taken upon a plane at right angles to that shown in Fig. 3.

Similar letters refer to similar parts in the different figures.

The object of my invention is to provide a set of dies which, operated in a die-press of common and well-known construction, will perform several distinct operations upon the sheet-metal blank during a single movement of the dies, which have heretofore required two or more sets of dies and as many separate operations of the die-press, and also to provide means for the renewal of the cutting-edges of the dies by which the edge of the blank is trimmed.

A denotes the frame-work of the die-press; B, the actuating-shaft, provided with a crank B′ and a cam B^2.

C is a pivoted lever actuated by the cam B^2 through the link D. The oscillations of the pivoted lever C impart a reciprocating movement to the lower reciprocating die E, and the crank B′ serves to impart a reciprocating movement to the upper die F in the manner common in machines of this class having what is known as an "upper" and "under" motion.

G denotes the table supporting the die-dish H, which is provided with a shoulder H′, upon which rests a stationary die which acts, in conjunction with the upper reciprocating die F, to shape the sheet-metal blank in the usual manner, the stationary die serving as the female die and the upper die F as the male die, and the sheet-metal blank being pressed into the form determined by the shape of the dies F and J, which in the accompanying drawings is represented as dish-shaped with slightly-flaring sides. The stationary die J consists of a block having a hole with its walls corresponding with the desired shape of the blank, and upon the upper surface of the block is detachably fastened the plate I, concentrically with the hole in the die J, but of slightly-greater internal diameter, leaving the shoulder J′, which has a sharp cutting-corner J^2. The detachable annular plate I receives the impact of the blank as it is being pushed into the die J by the reciprocating die F, thereby protecting the sharp angular cutting-shoulder J^2. The upper or male die F consists of a tapering block fitting the hole in the stationary die after the sheet-metal blank has been forced into it. The tapering block F has a screw-threaded shank F′, by which the die is attached to the spindle F^2. The end of the spindle F^2 is larger in diameter than the end of the die F in contact with it, so as to form a projecting shoulder F^3, forming a sharp cutting-corner at *a*, Fig. 2. The outer diameter of the spindle F^2 at the cutting-corner *a* is equal to the inner diameter of the cutting-corner J^2 upon the shoulder J′, so that as the die F is forced into the stationary die H the cutting-corner *a* is brought into contact with the cutting-corner J^2, causing the edge of the sheet-metal blank, which extends above the cutting-corners *a* and J^2, to be severed from the body of the blank, leaving the edge of the completed blank straight. As the sides of the opening in the die J are flaring, it is impossible to move

the angular cutting-corner J^2 so as to sever the blank by a shearing cut. Therefore the corners *a* and J^2 are made to oppose each other, bringing them into contact, so as to sever the blank by means of compression. The under surface of the upper die F is provided with an annular recess K to receive the lower die E, which consists of a tube provided with the internal shoulders L, the diameter between the sides of the end of the tube being equal to the inner diameter of the annular chamber K, so that as the end of the tube forming the die E is forced into the annular chamber K the inner edge of the tubular die E will serve to cut out a disk from the center of the sheet-metal blank.

The difference between the outer and inner diameters of the annular chamber K is greater than the thickness of the end of the tubular die E, so as to leave a space into which the inner edge of the sheet-metal blank can be forced by the upward movement of the die E.

The outer edge of the die E is slightly rounded at *b*, so as not to abrade the surface of the blank as it is forced upward into the chamber K, forming the flange N, Fig. 3. The internal diameter of the tubular die E is enlarged at L′ to allow the disk cut from the blank to fall and be delivered through the side opening L^2.

In case the blank has previously had an opening cut in the bottom, a circular recess may be used in place of the annular chamber K, and the tubular die E can then be made solid, as its only office in such cases would be to form the flange N.

The inner edge of the annular plate I is made flaring to correspond with the flaring sides of the die J, and as the lower end of the reciprocating die F is of less diameter than the upper end of the tapering opening in the die J the sheet-metal blank resting upon the annular plate I will be forced from its center downward by the action of the die F pushing the blank into the tapering opening in the die J and drawing its outer edges over the upper corners of the annular plate I, as shown in Fig. 2, and preventing the contact of the sheet-metal blank with the sharp angular corner J^2 until the die F has nearly reached the limit of its downward movement. This use of the annular plate I serves to protect in a great measure the sharp cutting-angle J^2. The plate I also serves to furnish a bearing-surface for the sheet-metal blank by means of its upper corners, of relatively greater diameter, securing an increase in the space between the upper corner of the annular plate I and the lower end of the reciprocating die F, thereby rendering the action of the dies much easier. By making the annular plate I detachable from the die J it can be readily removed, allowing the upper surface of the die J to be ground and the angular corner J^2 to be sharpened.

The operation of the dies is as follows: The sheet-metal blank, which in the present instance has been partially shaped by previous operations, is placed in position to be forced into the stationary die, as represented in Fig. 2. The downward movement of the upper die into the stationary die carries the blank down over the edge of the annular plate I into the position shown in Fig. 3, drawing the same and completing the shaping operation, as shown in Fig. 3. The completion of the downward movement of the upper die will bring the corner *a* into contact with the corner J^2, severing the upper edge of the blank, as shown in Fig. 3, sufficient space being left between the inner edge of the plate I and the outer surface of the spindle F^2 for the severed edge. The lower die E is then forced upward into the annular chamber K, cutting out a disk from the sheet-metal blank and at the same time turning up the edge, as at N, Fig. 3. The motions of the dies E and F are then reversed and brought into the positions shown in Fig. 1, ready for the repetition of the operation. As the cutting-corners *a* and J^2 become worn and dulled by use, they can be readily sharpened by removing the plate I and grinding the upper surface of the die J, and also by removing the upper die F from the spindle F^2 and grinding across the end of the spindle.

It will be seen that by a single operation of the machine the blank is brought into the desired shape by the action of the dies F and J. The upper edge of the blank is trimmed by the action of the cutting-edges *a* and J^2. The disk is cut from the center of the blank, and the edge around the hole so formed in the blank is turned upward, forming the flange N.

The mechanism shown by which the reciprocating movement is imparted to the upper and lower dies F and E, is that of the well-known die-press; but other means can be employed for that purpose, the actuating mechanism by which the reciprocating dies are moved forming no part of my present invention.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a die-press, the combination of a die J, provided with a tapered opening and having an upper surface at an angle with the sides of said tapered opening and forming an angular cutting-corner, and a reciprocating die with tapered sides, whose diameter is less than the diameter of the tapered opening in die J to allow for the compressed blank, said reciprocating die having an angular cutting-corner arranged to oppose the cutting-corner in said die J, whereby the blank is severed by its compression between said cutting-corners, substantially as described.

2. The combination of a reciprocating spindle F^2, a die F, removably attached to said

spindle, said spindle overhanging said die the thickness of the completed blank and forming an angular cutting-corner a, and a die J, provided with a tapered opening and having an upper surface at an angle with the sides of said tapered opening and forming an angular cutting-corner J^2, said cutting-corners being so disposed as to be brought into contact by the action of the dies, and thereby sever the blank compressed between them, substantially as described.

3. In a die-press, the combination, with a die provided with an annular recess, of a tubular die entering said recess, as described, the inner edge of said tubular die serving to cut a hole in a blank brought between said dies, and the outer edge of said tubular die acting to carry the edge of said blank into said recess, substantially as described.

Dated at Worcester, in the county of Worcester and State of Massachusetts, this 16th day of September, 1890.

WILLIAM A. TURNER.

Witnesses:
RUFUS B. FOWLER,
E. CONVERSE.