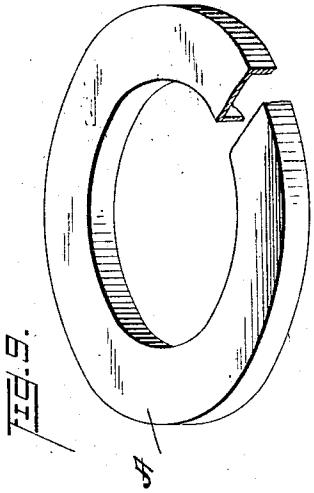
May 6, 1924. 1,493,155

H. H. HUMMEL

UNIVERSAL FLANGING PRESS

Filed Feb. 2 1922 2 Sheets-Sheet 1



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UNITED STATES PATENT OFFICE.

HOWARD H. HUMMEL, OF BETHLEHEM, PENNSYLVANIA, ASSIGNOR TO BETHLEHEM STEEL COMPANY, OF BETHLEHEM, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

UNIVERSAL FLANGING PRESS.

Application filed February 2, 1922. Serial No. 533,665.

To all whom it may concern:

Be it known that I, HOWARD H. HUMMEL, a citizen of the United States, and residing at Bethlehem, Northampton County, State of Pennsylvania, have invented certain new and useful Improvements in Universal Flanging Presses, of which the following is a specification.

This invention relates to a press for flanging and shaping metal plates and particularly annular plates.

It is the object of this invention to provide a universal flanging machine which can be employed for flanging the inside periphery or the outside periphery of an annular plate, or both, the various parts of the mechanism being so arranged that they can be easily and quickly positioned to render the machine capable of operating upon one or the other periphery of the annular plate. More specifically the object is to provide a machine having two press units either of which is adapted to clamp an annular plate while a flange is partially formed on one periphery of such plate by the other unit and also having two other press units one of which is adapted to complete the partially bent flange previously formed on one periphery of the annular plate and the other of which is adapted to similarly operate on the other periphery of said plate. A still further object is to arrange the mechanism for operating one of the last named units so that the plunger head carried thereby will be capable of operating within the opening of an annular plate and at the same time the mechanism will be out of the way and not interfere with the handling of the plates to be flanged.

The foregoing and other useful results are accomplished by the arrangement described in the following specification and illustrated in the accompanying drawings in which:

Figure 1 is a side view of the press certain parts being shown in section;

Fig. 2 is an end view of the same the upper portion being broken away;

Figs. 3, 4 and 5 are diagrammatic views illustrating different positions of the parts of the press when the same is used for forming a flange on the outer periphery of an annular plate;

Fig. 3^a is a plan view of the vertically movable bending die block shown at the right in the upper portion of Figures 3, 4 and 5;

Fig. 3^b is a plan view showing the shape of the vertically movable clamping die block shown at the left in the upper portion of Figures 3, 4 and 5;

Fig. 5^a is a horizontal plan view of the lower portion of Figure 5 illustrating the shape of the horizontally movable die block and also the stationary clamping die block shown in Figures 3, 4 and 5;

Figs. 6, 7 and 8 are diagrammatic views illustrating different positions of the parts of the press when the same is used for forming a flange on the inner periphery of an annular plate;

Fig. 6^a is a plan view of the vertically movable bending die block shown at the left in Figures 6, 7 and 8;

Fig. 8^a is a plan view of the lower portion of Figure 8, this view being similar to Figure 5^a but illustrating the other horizontally movable die block and the stationary die block shown in Figures 6, 7 and 8;

Fig. 9 is a perspective view partly cut away showing the character of product which the machine is adapted to make.

Referring to the drawings in detail, 10 designates the frame of the press which may be supported on any suitable foundation. At the upper end of the frame there are provided two vertically arranged hydraulic press units 11 and 12 to which are respectively secured the plunger heads 13 and 14. These press units are arranged side by side and are operated independently, the plunger heads 13 and 14 being movable in parallel paths toward and from a table 15 suitably secured beneath the press units 11 and 12. A third press unit 16 is also mounted in the frame 10 and arranged in a horizontal position, the axis of the press unit 16 being in the same plane as that of the units 11 and 12. A plunger head 17 is secured to the press unit 16, this plunger head being adapted to move back and forth along the upper surface of the table 15 and towards and from that portion of the table immediately beneath the press units 11 and 12. A fourth press unit 18 is mounted beneath the table 15, this unit being also arranged horizontally and positioned opposite to that of the unit 16. A plunger head 19 is secured to the press unit 18, this plunger extending upwardly through a slot or open-

ing 20 in the table and being also movable back and forth toward the portion of the table directly beneath the press units 11 and 12. The press unit 18 is in line with the unit 16 and has its axis arranged in the same vertical plane as that of the units 11, 12 and 16. A vertically movable stripper mechanism 21 is mounted in the frame 10, such stripper mechanism being adapted to engage floating plungers (not shown) in the die blocks hereinafter described to strip the plates from the dies after the flange operation. Such stripping mechanism forms no part of the present invention and further reference to the same is deemed unnecessary. The various press units and the stripper mechanism are preferably operated by any suitable hydraulic means and a plurality of levers 22 are shown arranged on the frame 10 which levers are adapted to control the movements of the various units.

The various plungers heretofore referred to are provided with means by which suitable die blocks may be secured thereto for performing the various flanging operations desired and the table 15 is also provided with means by which a suitable die block or die blocks may be secured in position beneath the vertically movable plunger heads 13, 14.

When it is desired to flange the outer periphery of an annular plate a stationary clamping die block 24 is fastened to the table 15 beneath the plunger head 13 as diagrammatically illustrated in Figure 3, the plunger head having a clamping die block 25 secured thereto. The press unit 11 is then operated to bring the clamping die block 25 against the plate A to be flanged, this plate being arranged on the die block 24 so that a portion of the same overhangs the edge of such die block. The press unit 12 is then operated to force down the plunger head 14 to which is secured the bending die block 26. When this die block 26 comes in contact with the overhanging portion of the blank A, the same is bent downwardly as shown in Figure 4. The die block 26 is then withdrawn by operation of the press unit 12 and the press unit 16 is operated to advance the plunger head 17, this plunger head carrying a bending die block 27. When the die block 27 comes in contact with the partially formed flange on the plate A, it will serve to complete the operation of bending such flange, that is, the die block 27 cooperating with the stationary die block 24 completes the formation of the flange the bending of which was partially done by the die block 26.

It will be understood that the vertical face 28 of the stationary die block 24 against which the outer flange of the plate is formed, is convexly curved as shown in Figures 5[a] and 8[a] to suit the curvature of the particular plate which is being flanged. The opposite vertical face 29 of this block is concavely curved for use when a flange is to be formed on the inner periphery of the plate as later described. The vertical face 30 of the horizontally movable die block 27 is also curved to correspond with the curvature of the convex face 28 of the die block 24 as will also clearly appear from Figure 5[a] of the drawing. The face of the vertically movable die block 26 adjacent the clamping die block 25 is preferably cut away on an incline as illustrated at 31 and such inclined face is preferably curved to correspond with the curvature of the vertical face 28 of the stationary die block 24. In flanging plates of different sizes, it is of course apparent that die blocks with different radii of curvature must necessarily be employed.

When it is desired to flange the inner periphery of an annular plate the stationary clamping die block 24 is arranged beneath the plunger head 14 of the unit 12 and the clamping die block 25 is secured to such head, the die blocks 24 and 25 being so arranged that their concave face is on that side adjacent the plunger head 13. The plate A to be flanged is placed upon the stationary die block 24 with a portion overhanging the same and the clamping die block 25 is brought into contact therewith by operation of the press unit 12 (see Fig. 6). A die block 26[a], secured to the plunger head 13 of the unit 11, is then moved down into engagement with the overhanging portion of the plate A which portion is bent to the position shown in Figure 7 of the drawing. The die block 26[a] is then raised by operation of the unit 11 and the horizontally arranged press unit 18 operated to advance the head 19 this head carrying a bending die block 32. As the die block 32 is moved toward the stationary die block 24 the operation of bending a portion of the flange on the plate A is completed.

As heretofore stated, the vertically arranged face 29 of the stationary die block 24 is concavely curved and the corresponding face 33 of the horizontally movable die block 32 is convexly curved, the curvature of said faces corresponding to the curvature of the particular piece of work to be produced. Where the annular plates have different sized openings, it is of course necessary to have the die blocks provided with different degrees of curvature. As shown in Figure 6 of the drawing, the face 26[b] of the die block 26[a] is inclined; and is shown in Figure 6[a] such inclined face is preferably convexly curved to correspond with the curvature of the face 29 of the die block 24.

It is apparent that a single stationary clamping die block may be employed beneath the plunger heads 13, 14 one end of which is convexly curved and the other end

concavely curved, it being only necessary to change the position of this block on the table 15 to adapt the machine to flange either the inner or outer periphery of an annular plate. Similarly, a single movable clamping die block 25 may be used having one end convexly curved and the other concavely curved, such block being fastened to the head 14 or the head 13 depending upon whether the outer or inner edge of the annular plate is to be flanged. However, if desired, separate blocks 24, 25 may be employed on the inner and outer periphery of the plate. The horizontally movable die block 27 must of course always be concave since this die block is employed in operating only upon the flange on the outer periphery of the plate. On the other hand, the horizontally movable die block 32 must always be convexly curved, since it is so positioned as to always operate upon the flange on the inner periphery of the plate.

It should be understood that the die blocks herein described are comparatively narrow in width so that only the section of the plate within the arc of the die block is flanged at one setting. In order to flange the entire periphery of the plate it is, therefore, necessary to repeatedly change the position of the plate to expose different portions thereof to the action of the die blocks.

The foregoing construction provides a universal press which can be employed for flanging the inner or outer periphery of an annular plate or both which renders it unnecessary to provide two or more machines for performing these different operations. The arrangement is also such that annular plates of practically any size may be flanged both internally and externally, it being necessary only to provide die blocks which have curvatures to suit the curvatures of the work to be produced.

It may be further noted that when a flange is being formed on the outer periphery of an annular plate by means of the die blocks 24, 26 and 27, the die block 32 may be moved against the die block 24, thus serving to support the same and rigidly hold it in position. Likewise when a flange is being formed on the inner periphery of an annular plate by the die blocks 24, 26[a] and 32 the die block 27 may be brought into contact with the die block 24 to support and hold the same rigidly in position. If the width of the plate is such as to interfere with the lateral supporting of the fixed die block 24 in the manner suggested, then distance pieces (not shown) having heights less than that of the die block 24 may be interposed between said block and the supporting block.

Various changes may of course be made in the details of the foregoing construction without departing from the spirit of the invention as defined in the appended claims.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In a machine of the kind described, in combination, a table, two independent plungers arranged side by side above said table and movable toward and from the same, two other independent plungers movable toward and from the portion of the table beneath said first named plungers and in a direction transverse to the direction of movement of said first named plungers, and means for operating each of said plungers independently.

2. In a machine of the kind described, in combination, a table, two independent plungers arranged above said table and movable toward and from the same in parallel paths, two other independent plungers movable toward and from the portion of the table beneath said first named plungers and in a direction at right angles to the line of travel of said first named plungers, the two plungers last mentioned being arranged on opposite sides of the path of travel of said first named plungers, and means for operating each of said plungers independently.

3. In a machine of the kind described, in combination, a table, a plunger movable parallel with the surface of the table and toward and from an intermediate portion of the table, a second plunger also movable parallel to the surface of said table and toward and from said intermediate portion thereof, a pair of plungers arranged side by side above said intermediate portion of said table and movable toward and from the surface of the same, and means for operating said plungers independently.

4. In a machine of the kind described, in combination, a table, a pair of independent plungers arranged side by side and movable in parallel paths toward and from said table, a third plunger positioned on one side of the path of movement of said first named plungers and movable toward and from such path, a fourth plunger positioned on the other side of the path of movement of said first named plungers and also movable toward and from said path, and means for independently moving said plungers.

5. In a machine of the kind described, in combination, means for supporting a piece of work to be operated upon, a pair of independent plungers arranged side by side and movable in parallel paths toward and from said work supporting means, a third plunger movable toward and from said work supporting means and in a path at right angles to the path of movement of said first named plungers, a fourth plunger movable

toward and from said work supporting means and at right angles to the path of movement of said first named plungers, and means for operating said plungers independently.

6. In a flanging machine, in combination, a table, a pair of plungers arranged above said table and movable toward and from the same, a third plunger arranged above said table and movable parallel with the upper surface thereof and toward and from the line of travel of said first named plungers, said table having a slot therein, a fourth plunger projecting upwardly through the slot in said table and movable toward and from the line of travel of said first named plungers, means on said table and each of said plungers for supporting a die block and means for operating said plungers.

7. In a flanging machine, in combination, a frame, two parallel vertically arranged press units mounted side by side on said frame, plunger heads operated by said units, a third press unit arranged horizontally on one side of said first named units, a fourth press unit arranged horizontally on the other side of said first named units, plunger heads carried by said horizontally arranged units, and means for supporting work beneath said vertically arranged units and in the line of movement of said horizontally arranged units.

8. In a flanging machine, in combination, a frame, two parallel vertically arranged press units mounted side by side on said frame, plunger heads operated by said units, a third press unit arranged horizontally on one side of said first named units, a fourth press unit arranged horizontally on the other side of said first named units, plunger heads carried by said horizontally arranged units, the axes of said units being arranged in substantially the same vertical plane, and means for supporting work beneath said vertically arranged units and in the line of movement of said horizontally arranged units.

9. In a flanging machine, in combination, a work supporting die block, two vertically movable die blocks arranged side by side, means for independently moving said last named die blocks toward and from said first named die block, two horizontally movable die blocks arranged on opposite sides of said work supporting die block, and means for independently moving said last named die blocks toward and from said work supporting die block.

10. In a flanging machine, in combination, two vertically movable die blocks arranged side by side, means for operating the same, a stationary die block adapted to be positioned beneath either of said first named die blocks, said vertically movable die blocks being so arranged that material may be clamped between either of them and said stationary block and held in the path of movement of the other, whereby the material so held by one of said movable blocks will be bent by the other, a horizontally movable die block arranged on one side of said stationary block and adapted to cooperate with one side of said stationary die block to further bend the material previously bent by one of the vertically movable die blocks, a horizontally movable die block arranged on the other side of said stationary die block and adapted to cooperate with the other side of said stationary die block to further bend the material previously bent by the other of said vertically movable die blocks, and means for operating said horizontally movable die blocks.

11. In a flanging machine in combination, two vertically movable plungers arranged side by side, means for operating the same independently, each of said plungers being adapted to receive a clamping block or a die block, a sationary die block adapted to be positioned beneath either of said plungers and to cooperate with the clamping block carried by one of said plungers to clamp material and hold the same in position to be bent by the die block carried by the other plunger, a horizontally movable plunger arranged on each side of said stationary die block, each of said last named plungers carrying a die block adapted to cooperate with one side of said stationary die block, and means for independently moving said last named plungers toward and from said stationary die block.

12. In a flanging machine, in combination, a stationary die block having a flat upper face and having a convex vertical face on one end and a concave vertical face on the other end, a horizontally movable die block arranged on one side of said stationary block and having a concave face adapted to cooperate with the convex face of said stationary block, a second horizontally movable die block arranged on the other side of said stationary die block and having a convex face adapted to cooperate with the concave face of said stationary block, means for clamping a blank on the upper face of said stationary die block, a vertically movable die block adapted to partially bend the blank on one side of said stationary die block, each of said horizontally movable die blocks serving to complete the operation of bending the blank on one side of said stationary die block, and means for independently moving said horizontally movable die blocks toward and from said stationary die block.

13. In a flanging machine, in combination, a table, a horizontally movable plunger projecting upwardly from the surface of said table, a die block carried by said plunger, the portion of said table adjacent said

plunger being unobstructed whereby an annular blank may be placed in a position surrounding said plunger and die block, means for clamping the blank in such position, a vertically movable plunger carrying a die block adapted to contact with and bend a portion of the inner edge of the annular blank, means for operating said vertically movable plunger and die block, and means for operating said horizontally movable plunger and die block to further bend the portion of the blank bent by said vertically movable plunger and die block.

14. In a flanging machine, in combination, a table having an opening therein, a horizontally movable plunger projecting upwardly through said opening in the table, a die block carried by said plunger, the portion of said table adjacent said plunger being unobstructed, whereby an annular blank may be placed in position surrounding said plunger and die block, means for clamping the blank in such position, a vertically movable plunger carrying a die block adapted to contact with and bend a portion of the inner edge of the annular blank, means for operating said vertically movable plunger and die block and means arranged beneath said table for operating said horizontally movable plunger and die block to further bend the portion of the blank bent by said vertically movable plunger and die block.

15. In a flanging machine, in combination, a stationary die block, two parallel press units arranged side by side above said die block, each of said press units carrying a die block adapted to cooperate with said stationary die block, two other press units arranged at right angles to said first named units and carrying die blocks adapted to cooperate with opposite sides of said stationary die block.

16. In a flanging machine, in combination, a stationary die block, two parallel press units arranged side by side above said die block, each of said press units carrying a die block adapted to cooperate with said stationary die block, two other press units arranged at right angles to said first named units and carrying die blocks adapted to cooperate with opposite sides of said stationary die block, the axes of said press units being arranged in the same plane.

17. In a flanging machine, in combination, a stationary die block having a convex face on one end and a concave face on the other, means for clamping a blank on said stationary block, a plunger movable toward and from said convex face of said die block and carrying a die block for cooperating with such face, a second plunger movable toward and from said concave face of said block and carrying a die block for cooperating with such face, and means for independently moving said plungers.

In testimony whereof I hereunto affix my signature.

HOWARD H. HUMMEL.