W. E. BASSETT.

Machine for Flanging Metal-Plates.

No. 221,438. Patented Nov. 11, 1879.

Fig. 1

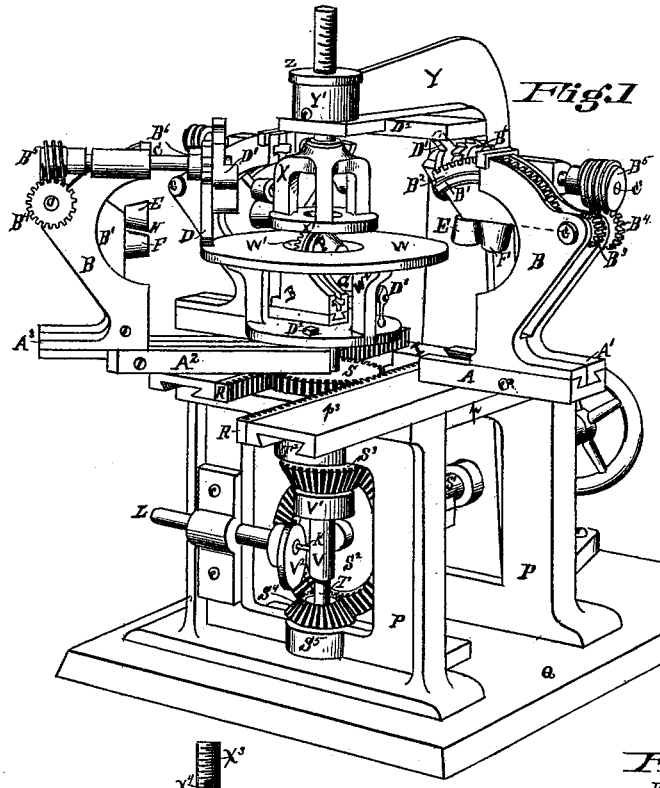


Fig. 2

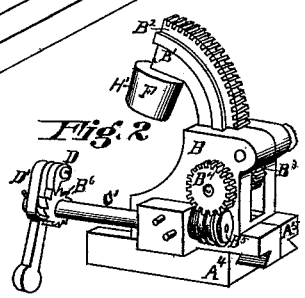


Fig. 3

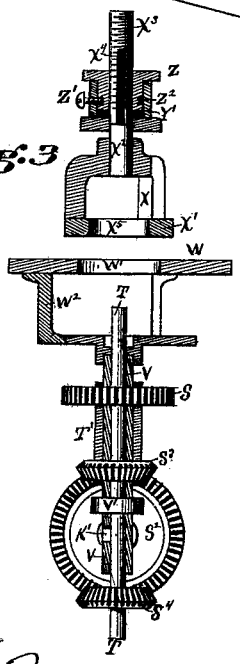
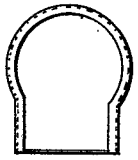


Fig. 4.



Attest.

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WALTER E. BASSETT, OF CINCINNATI, OHIO, ASSIGNOR OF ONE-HALF OF HIS RIGHT TO PHILIP LOHR, OF SAME PLACE.

## IMPROVEMENT IN MACHINES FOR FLANGING METAL PLATES.

Specification forming part of Letters Patent No. **221,438**, dated November 11, 1879; application filed March 12, 1879.

*To all whom it may concern:*

Be it known that I, WALTER E. BASSETT, of the city of Cincinnati, county of Hamilton, and State of Ohio, have invented certain new and useful Improvements in Machines for Forming Flanges on Metal Plates, of which the following is a specification.

My invention consists in the provision of means whereby the edges of metal plates or of orifices in such plates may be bent into a flange or flanges rapidly, easily, accurately, and cheaply.

In the accompanying drawings, forming a part of this specification, and to which reference is hereby made, Figure 1 is a perspective view of my flanging-machine. Fig. 2 is a view of that portion of my machine shown at G, Fig. 1, and which is immediately instrumental in nozzling or flanging holes in metal plates. Fig. 3 is a view of the central upright portion of my machine, showing the table for supporting and the devices for clamping and holding said plate in position while being flanged, and also shows the former used in connection with the nozzler in flanging the flue-holes. Fig. 4 represents a fire-box boiler-head, having a circular end and parallel sides, the distance between the sides being less than the diameter of the circle of the end.

The frame of the machine may be clamped or screwed to a foundation or to a bed-plate, Q.

To the vertical supports P are attached the horizontal top pieces, *p*. Two dovetailed slideways are fixed upon the latter, or otherwise properly supported. Upon these ways move two slides, $p^3$, each having a dovetailed groove fitting over the dovetailed way, provided with racks R R. These racks are operated through the horizontal pinion-wheel S.

A slideway, A, is attached to each of the slides $p^3$, and in each slideway A moves a slide, A′, supporting the circular slideways B. Each of these slides A′, as also the slide $A^3$, attached to pinion S, and the slide $A^5$ of the nozzling device, may be provided with a suitable device for setting each one at any desired position in its respective slideway.

Power is communicated to the machine through shaft S′, journaled in bearings properly supported. One extremity of this shaft is provided with a beveled toothed wheel, $S^2$, which engages two smaller beveled-gear wheels, $S^3$ and $S^4$. The gear-wheel $S^4$ is provided with a hub or journal extending down and rotating in a bearing, $S^5$, located at or near the foot of the frame. A vertical shaft, T, is fixed in this gear-wheel $S^4$ by either a permanent connection or one capable of connecting or disconnecting said shaft and wheel at pleasure. The upper extremity of shaft T is adapted to receive my improved forming-tool for nozzling holes for flues, &c.

A sleeve or hollow journal, T′, encircles a hollow shaft, V, and to it is attached at bottom the gear-wheel $S^3$, and at top the gear-wheel S. This journal T′ rotates in a bearing, $T^2$, properly supported by the frame or other means.

The table W is provided with orifice W′, and is supported by a frame-work or web, $W^2$, attached to the upper end of the hollow stationary shaft V. The shaft V and table are elevated and lowered by means of the cam or eccentric $V^2$ and the collar or stud V′, the latter being attached to the shaft V. This table W is stationary, so far as ability to rotate is concerned, and is prevented from rotating by the pin K, preferably located at the end of shaft L, and inserted into slot K′ in the shaft V, thus allowing vertical motion of the shaft V and table W.

The clamp consists of an annular plate, X′, connected to a frame-work or cage, X, the latter, in turn, being rigidly attached to $X^2$, provided with a screw-thread, $X^3$, and with a longitudinal slot, $X^4$, in which is a pin or feather secured to the upper portion, Y′, of the frame. A hand-wheel, Z, is provided with a hub rotating within a bearing in frame Y, and having a female screw, which engages the male screw $X^3$ of shaft $X^2$. This hand-wheel and hub is retained in position in its bearing by means of a pin or set-screw, Z′, which is screwed through the bearing and enters a groove, $Z^2$, in the periphery of the hub.

The opening $X^5$ in the plate X′, and the opening W′ in the table W, and the shaft T, and the mechanism for rotating it, are provisions made to enable the nozzling or flanging of holes for flues, &c., to be done.

Whenever it is not expected or desired to flange holes, as well as the outside edges of plates, these openings and the shaft T may be dispensed with, in which event the hollow shaft V may be solid and the gear-wheel $S^4$ omitted.

To the upper side of pinion S is attached slideway $A^2$, on which moves the slide $A^3$, which latter supports circular slideways B, in which moves the circular slide B′, provided with the curved rack $B^2$, which engages a spur-wheel, $B^3$, secured to the shaft C, which rotates in bearings connected to the circular slideways B. On one of the outer ends of the shaft C is a pinion, $B^4$, into the teeth of which meshes the screw $B^5$, operated by shaft C′, which rotates in a bearing connected to the circular slideways B, and is in turn operated by ratchet-wheel $B^6$, which is intermittingly operated by the pawl D, pivoted to the head of lever D′, swung upon shaft C′, and extending above or below said shaft such a distance as that it will engage with the stud or flange $D^2$, supported by the machine, or otherwise, as desired, as the circular slide moves as far as said stud or flange $D^2$.

The slides B′, except in cases where they are employed for nozzling, are each provided with two rollers, E and F, for flanging the plate. Each of these rollers rotates on a pin fixed in the slide B′; or, when preferred, the roller may be provided with an extension, which extends into the slide B′ and rotates therein. These rollers are conical, and roller F is preferably a little longer than the other, for the reason that this increased length of roller F enables it to better work around the outside corner, which is gradually forming as the metal of the plate is being bent up to form the flange.

The roller E, when its outer edge is angular instead of round, is so placed in relation to the slide that the lower corner farthest from the circular slide shall be the center of the circle or circular path in which the slide revolves. This corner H is therefore always stationary, so far as the movements of the circular slide in its slideway are concerned.

When the outer edge of roller E is round instead of angular, the center of the circle forming the round edge at the place of its contact with the plate to be flanged should be the center of the circle or circular path in which the slide revolves; and it is obvious from this position of the rollers that the use of the circular slide is more practical in flanging straight edges than the trunnions which have heretofore been most generally used in flanging circular plates.

In the device for nozzling flue-holes, &c., Fig. 2, the roller F is so placed that a point on the side H′ of the roller shall be the center of the circle or circular path in which the slide revolves. Where both rollers E and F are employed with the slide, the lower roller, F, is preferably provided (in connection with the slide) with suitable mechanism for rendering roller F so adjustable that the space between the faces of the rollers E and F can be increased or diminished at pleasure.

Should no device be provided for moving roller F, as above described, the same result could be obtained by means of different sizes of roller F, which may be substituted.

The rollers E and F may be of the same size, and of uniform shape. They may be rectilinear cylinders; but, preferably, the shape and proportions of the rollers are as follows: The smaller end of roller E is next the slide, and the larger end of roller F is next the slide. The object of thus placing the rollers in relation to each other and the slide is to enable them to produce a flange which shall make an acute angle with that face of the plate on which the flange is, or, in other words, lean toward the center on that face of the plate.

Such a position of the flange enables that portion of the shell of the boiler or vessel which is to be connected thereto to be driven over said flange, and at the same time to keep a tight joint between said flange and shell.

Usually the table W will be sufficient to fully support the metal plate while the latter is being flanged; but when desired an additional support may be attached to portion I of the frame, and be provided with a clamp to hold the metal to said additional support, and also to serve as a gage to adjust or set the plates in proper position to be flanged.

When found desirable the intermediate gear-wheel, $B^3$, or it and the worm-wheel $B^4$, may be dispensed with. In case both are dispensed with the screw $B^5$ may be made to directly engage with the rack $B^2$. In case the gear-wheel $B^3$ is dispensed with the worm-wheel $B^4$ would gear with the rack and also with the screw $B^5$.

While I prefer to employ the rack and the desired attendant mechanism for operating the slide B′, I do not wish to be understood as limiting myself to this particular means of operating the slide, but claim, as an important feature of my invention, the combination of the roller F or rollers E and F and the slideways B and slide B′, irrespective of the particular means employed to operate the slide B′.

The manner in which my invention operates is as follows, viz: And, first, when the plate to be operated on is semicircular at one end and has parallel sides, the distance between the sides being the diameter of the circle of the end, the roller F, which may be adjustable, is so located with reference to roller E as that the space between them shall be sufficient not only to receive the edge of the plate to be flanged, but allow the edge of the plate which is to be turned to be thickened as the flange is being formed. I next adjust the circular slides B′, with their rollers, by means of the slides A′ and $A^3$ and slideways A and $A^2$, and the mechanism for setting them, so that rollers E shall be equidistant from the center of the table, and so far apart from each other that when the plate is placed on the table and inserted between the rollers E and F, the corner H of the

roller E shall be as far from the outer edge of the plate as the width of the flange to be formed.

The great advantages of having the table stationary and the flanging-rollers to move while the plate is undergoing the operation of flanging are as follows: First, the table is saved the intense strain and friction to which it must be subjected when it moves and carries the plate through the rollers, particularly when the movement it makes is rotary; secondly, it is not necessary to bring the rollers in close contact with the metal, sufficient space being allowed between the rollers to work (in circular flanges) into the flange the superfluous metal which is necessarily crowded into the flange as the latter is being formed; thirdly, I avoid any necessity of putting a hole into the head whose outer edge is to be flanged.

The slides A′ and $A^3$, if not already secured in position in the slideways A and $A^2$, are now secured by the set-screws, or other device employed for adjusting and securing them.

The table is raised and the rollers lowered until the circular face of the lower roller is on a line with the top of the table and the axes of all the rollers point to the center of the circular table. The boiler-plate is placed on the table with its edges between the rollers, back from the flat face of the top roller a distance equal to the depth of the flange to be turned. The clamp is then lowered by turning the hand-wheel Z, thereby clamping the plate firmly against the table.

To provide against any possible slip or move, the supplemental support for the plate attached to portion I of the frame is used, and said support is furnished with a straight sliding flange or clamp, against which the bottom edge of the head may rest and be clamped. Having the plate thus secured and in position, the machine is put in motion. The pair of rollers whose slideway $A^2$ is attached to pinion S is carried from right to left and from left to right in a semicircle, so as to travel over the entire semicircular portion of the edge of the head, while the two pairs of side rolls are carried up and down the sides of the head to and from the point of intersection of the semicircle of the end of the head or sheet with the straight line of the side, while at the same time the levers D′, by striking against the projections or studs $D^2$, cause the screws $B^5$ to revolve, they giving motion to the worm-wheels $B^4$, which transmit their motion by the pinions $B^3$, causing the quadrants or slides B′ to move in their slideways B, and thus bringing the rollers to a perpendicular, which carry with them the edge of the plate, and so flanging the two sides and the circular end of a fire-box boiler-head. By turning the eccentric $V^2$ the table is lowered, dropping the flanged head clear of the rollers, leaving it free to be drawn from the machine.

In flanging fire-box heads having parallel sides, and the distance between them less than the diameter of the circle of the end, (see Fig. 4,) making it necessary to revolve the center rolls beyond a semicircle, throw the racks on the slides $p^3$, carrying the rollers out of gear with their driving-pinion S, and move these slides toward the front of the machine sufficiently to allow their driving-gear to be turned the necessary distance beyond the semicircle without carrying the rolls beyond the point of intersection of the straight line they generate and the curved line generated by the center rolls, and the slide $A^3$, which moves in a circular path, is set at such distance from the center of rotation as shall enable the rollers it carries to flange the circular portion of the head.

Should the sides of the head be inclined toward each other at the bottom of the head, the slideways, upon which slide the slides $p^3$, should be drawn toward each other on the front end of the machine. I am enabled to thus set these slideways by providing both ends of each with transverse slots and set-screws passing through the said slots into the frame.

In forming a concave flange, such as is used on the back-plates of fire-boxes, it is necessary to reverse the position of the slide $A^3$ in the slideway $A^2$ upon pinion S, and turn it around to the front of the machine, and clamp the plate to be flanged on the supplemental support.

In making round heads, the rollers whose supports are attached to pinion S only are used, making a continuous revolution around the head, the other operations being as before described.

In nozzling or flanging flue-holes, it is first necessary to adjust the roller the proper distance from the center of the hole in the boiler-plate, which is done by raising the roller to a perpendicular and moving it out or in on the slideway $A^4$ until the distance between its circular face and the inside of the annular plate or former X′ is equal to the thickness of the metal to be flanged, making allowance for slightly stretching or thinning of the metal in turning the flange. The roller F and slide B′ are then returned until the circular face of the roller F shall be on a line with the upper face of table W. The head then being put in position, the center of the hole to be flanged being coincident with the center of the former or clamp, the latter is lowered onto the head, holding it in position, and at the same time serving as a former for the outside of the flange. The machine being then put in motion, the action upon the pawl and the movement of the circular slide is as before, and the roller F is moved with the slide B′, and, pressing against that side of the plate opposite where the former X′ presses, operates in connection with the latter to form the flange.

Where the straight sides only of a metal plate are to be flanged, the device for forming flanges on curved edges may, of course, be dispensed with. After the operation of forming the flange has been completed and the

flanged plate removed, the slides B′ are returned to their first position, either by temporarily disengaging the screw $B^5$ from its action on pinion $B^3$, or in any other of the many ways in which such disengagements are commonly effected. After the slide B′ has been returned to its first position the screw $B^5$ will be caused to again engage in action with $B^3$.

What I claim as new and of my invention is—

1. The combination of the rollers E and F, adjustable circular slideways B, and the circular slide B′, substantially as and for the purposes specified.

2. The combination of the roller F, adjustable circular slideways B, circular slide B′, and former or clamp X′, substantially as and for the purposes specified.

3. The combination of adjustable circular slideways B, slide B′, rollers E and F and rack $B^2$, pinion $B^3$, worm-wheel $B^4$, and screw $B^5$, substantially as and for the purposes specified.

4. The combination of adjustable circular slideways B, slide B′, rollers E and F and rack $B^2$, pinion $B^3$, shaft C, worm-wheel $B^4$, screw $B^5$, shaft C′, ratchet-wheel $B^6$, pawl D and lever D′, and stud $D^2$, substantially as described, and for the purposes specified.

5. The combination of the slides $p^3$, provided with racks R, and slides A′, connected to said slides $p^3$, circular slides B′, provided with flanging-rollers, and driving-pinion S, and slideway $A^2$, attached thereto, and its slide $A^3$, and circular slide B′, provided with flanging-rollers.

6. The stationary table W and clamp X′, in combination with the linear-moving flanging-rollers, substantially as and for the purposes specified.

7. The stationary table W and clamp X′, in combination with the linear-moving flanging-rollers, and also the flanging-rollers moving in the path of a circle, substantially as and for the purposes set forth.

8. The combination of the shaft T, pinion $S^4$, slide $A^2$, circular slide B′, roller F and table W, and clamp and former X′, substantially as and for the purposes set forth.

9. The combination of the conical rollers E and F, the smaller end of roller E and the larger end of roller F being next the slide B′, for the purposes specified.

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Attest:
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