R. BRIGGS.

Machine for Beveling the Edges of Metal Plates.

No. 231,146. Patented Aug. 17, 1880.

Fig. 1

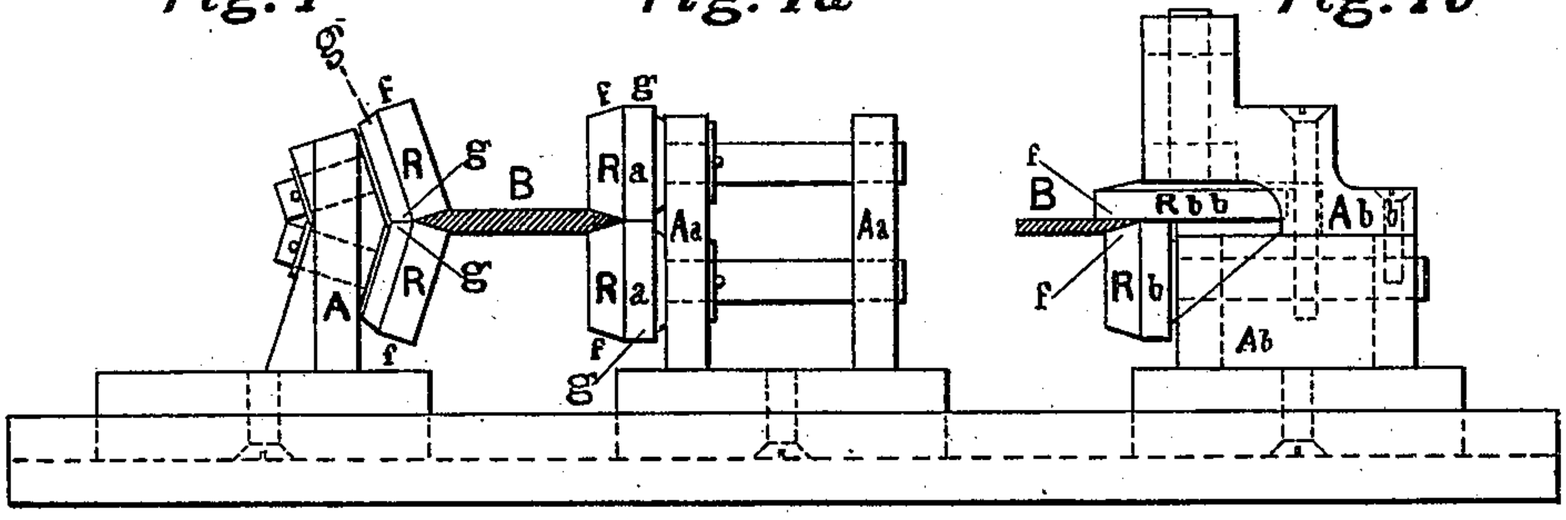


Fig. 1a

Fig. 1b

Fig. 2

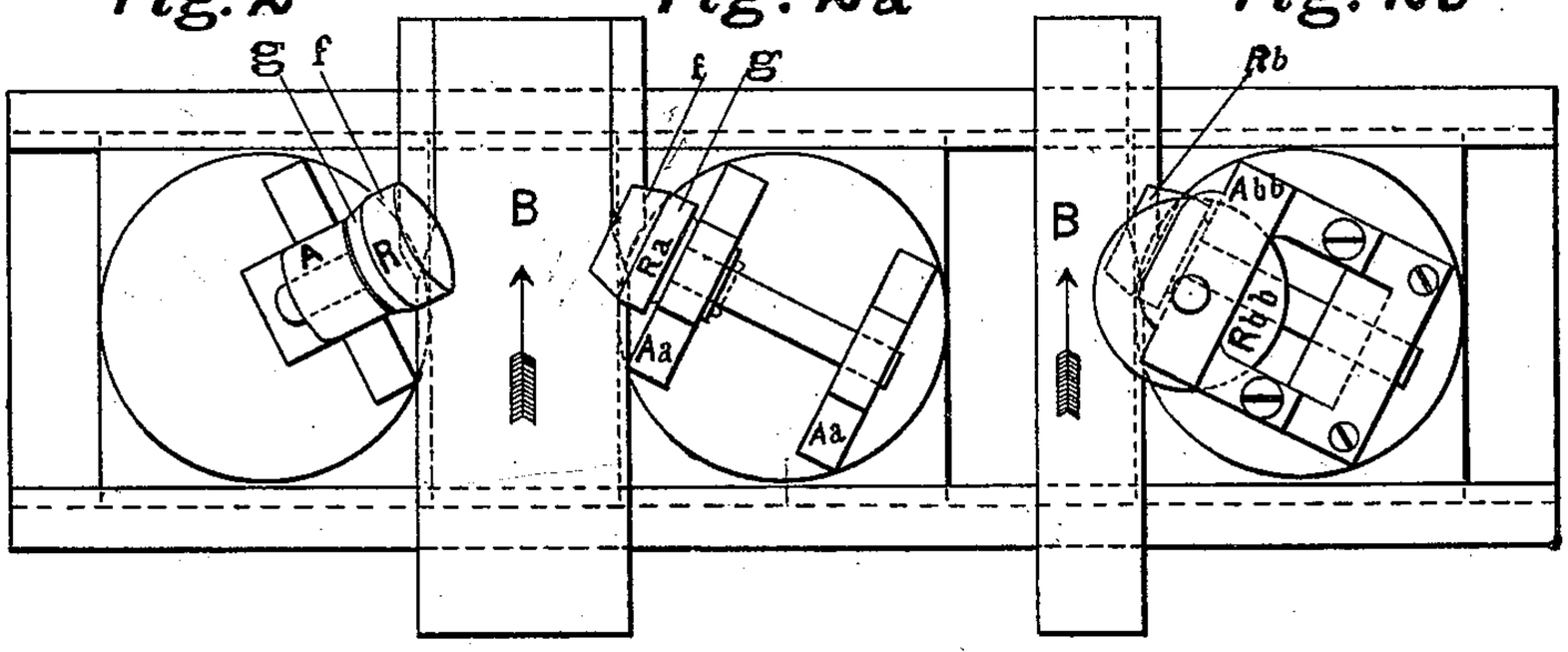


Fig. 2a

Fig. 2b

Fig. 3

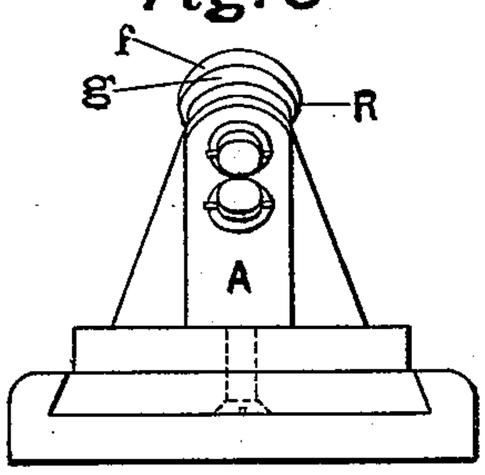


Fig. 3a

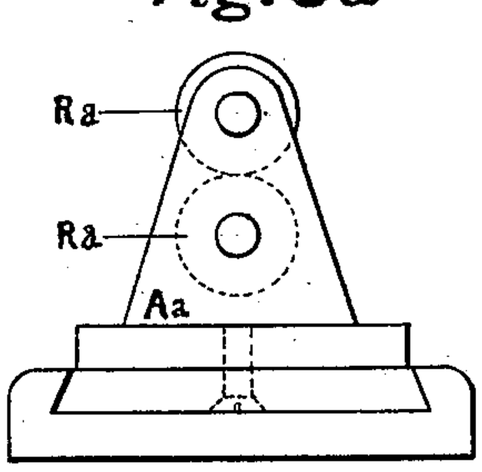
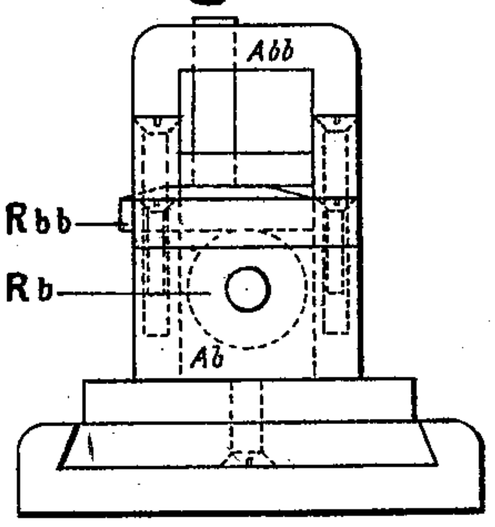


Fig. 3b



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UNITED STATES PATENT OFFICE.

ROBERT BRIGGS, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR BEVELING THE EDGES OF METAL PLATES.

SPECIFICATION forming part of Letters Patent No. 231,146, dated August 17, 1880.

Application filed January 30, 1880.

To all whom it may concern:

Be it known that I, ROBERT BRIGGS, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Beveling the Edges of Strips, Plates, or Sheets of Metal, of which improvements the following is a specification.

The forming of beveled edges upon strips, plates, or sheets has heretofore generally been effected by the removal of a portion of the material by grinding, shearing, or cutting away by means of planing or turning tools, leaving the edge or bevel as may be desired, any of which methods are slow in operation and wasteful in material and power.

Beveled edges have also been formed upon strips, plates, or sheets by passing the same between rolls, which rolls have either been conical in shape or have possessed conical collars, and have been made to act upon the edges of the strips, plates, or sheets. Such methods of beveling have long been known and in public use, and examples of mechanism therefor will be found in the United States Patents of James McCarty, No. 10,478, January 31, 1854, and of W. H. Singer, No. 97,450, November 30, 1869, and No. 109,953, December 6, 1870.

In such application of rolls for beveling edges it has been usual and customary at all times to mount the pair of rolls forming the edge, and which have their axes in the same vertical plane, (the words "vertical" or "horizontal" in the specification refer to the general plane of the strip, plate, or sheet operated upon, which is considered the horizontal plane, but may actually be at any angle with the actual horizon,) and to enter, lead, guide, or direct the strip, plate, or sheet so that it or the edge of it will pass between the rolls in the direction of traverse at right angles to the plane of the axes of the rolls.

When the strip, plate, or sheet is firmly held by compression of those portions not affected by the beveling process the material at or near the edge will have been displaced by the compression of the rolls, and while some portion of the displaced material may have been spread out to form the desired sharpened edge or bevel, other portions thereof will have been disposed in elongation of the edge, which thus becomes stretched in corrugations, or what is known as "buckled." In fact, the action of the rolls, as described, upon the edge is mainly one of elongation, the extent of which elongation becomes greater in proportion as the work done by the roll-surfaces increases toward the sharp edge of the bevel, and the spreading of the material is principally incident to the resistance offered to elongation by such portion of the strip, plate, or sheet as is not acted upon under pressure of the rolls.

In these processes of rolling bevels upon the edges of strips, plates, or sheets it is found needful that the entire surface, or nearly the entire surface, of the strips, plates, or sheets shall be firmly held or confined, even when not acted upon; otherwise the beveling collars or surfaces will fail to be brought into contact with the edges, and the strip, plate, or sheet will become corrugated in direction of its width or radius, or will thicken in its cross-section more or less unevenly, and the beveling will have been imperfectly accomplished without the desired uniform sharpness of the edge.

The object of my invention is to effect the beveling of the edges of strips, plates, or sheets without the buckling of the same which attends the ordinary processes of rolling; and to this end my improvements consist in a novel method of displacing and forcing the material of the strip, plate, or sheet in a sidewise direction and spreading out the edge thereof by application of pressure to the same during its traverse between rolls longitudinally at an angle other than a right angle, or, in other words, by the application of pressure in a direction inclined relatively to the line of traverse, such application being effected by means of a roll or of rolls having its or their axial line or lines inclined to said line of traverse, as hereinafter set forth.

To enable those skilled in the art to practice my invention, I will proceed to describe it with reference to the accompanying drawings, in which—

Figure 1, Fig. 1^a, Fig. 1^b are elevations, Fig. 2, Fig. 2^a, Fig. 2^b are top views or plans, and Fig. 3, Fig. 3^a, Fig. 3^b are end views, of rolls arranged and disposed for beveling strips of

metal according to my invention, together with housings and bed-plates for supporting such rolls.

The rolls R R R^a R^a R^b R^{bb} (supported by the housings A, A^a, A^b and A^{bb}) have their axes placed and are themselves made or turned off in such form or shape as may be demanded to give the required bevel to the edge of the strip, as hereinafter set forth.

In Figs. 2, 2^a, and 2^b, which are top views or plans, or, more correctly, views in the plane of the strip, (which strip is indicated by B in the several views,) it will be seen that the vertical plane passing through the axes of the rolls, Figs. 2 and 2^a, and through the axes of the lower roll, R^b, Fig. 2^b, is placed at an angle more or less acute than ninety degrees with the direction of traverse of the strip B, as indicated by the arrows; or, in other words, the axis of each of the pair of rolls, or of the single roll which forms or produces the bevel on the strip, plate, or sheet, is placed at such an angle with the direction of traverse of the strip, &c., that the surface of the roll, which surface is in contact with the edge of the strip, shall rotate outwardly across the face of the strip in a diagonal path, in lieu of in the proper direction of traverse of the said strip.

The effect of this disposition of the axes or axis can be best appreciated by considering the particular case exhibited in Figs. 1, 2, and 3. A pair of rolls, R R, the working-faces *f f* of which are parallel to their axes, or are cylindrical, are mounted in a housing, A, with their axes in the vertical plane, but divergent, instead of being parallel to each other, so as to give the desired angle for a beveled edge between the working-faces. Behind the working-faces *f f* narrow surfaces of contact *g g* are formed. These cylindrical roll-surfaces, having uniform surface velocities, are diverted from any grinding action upon the material, such as appertains to conical roll-surfaces—for instance, as at *f f* on rolls R^a or R^b; or to plate-wheel surfaces —for instance, as at *f* on roll R^{bb}; and it follows that this arrangement of rolls in Figs. 1, 2, and 3 is the best possible to avoid friction and loss of power between the rolls and the edge acted upon. If, now, a strip, B, Fig. 1, of uniform thickness and with an unbeveled edge, be presented to the rolls R R, Fig. 1, it becomes evident that the perfect beveling of the edge can or will be effected only by the displacement of a portion of the material of the unbeveled corners sidewise, and not by extension lengthwise, unaccompanied by spreading, and that this displacement should be effected progressively upon the edge of the strip, spreading out the same as the strip advances between the rolls.

If the bevel has a triangular section to a sharp point or edge, the spread must be equal to one-half the height of the triangle made by the outline of the beveled edge, or, what is the same thing, equal to one-half the width of the beveled edge measured on the flat of the strip.

If a strip in process of being beveled to a triangular section be removed from the rolls when partially beveled, the line of the unbeveled edge will be found to pass along the middle of the beveled surface of the beveled edge. The spreading of the edge must have been effected progressively in that small portion of the length of the strip which was at any instant of time in absolute contact with and undergoing the beveling action of the rolls. Hence the path of the material which is to be squeezed out to form the sharp edge while in contact with the rolls producing the squeezing action must have been oblique or diagonal to the direction of movement of traverse of the strip. The extent of obliquity of this path can be readily ascertained. The diameters of the rolls give the exact distance from their contact (where they will first act) upon the edge of a strip of any given thickness to their vertical plane of axes, which last point is where the rolls themselves come into contact, and where the sharp edge of the strip must certainly be produced. In this distance longitudinally the edge of the strip must have been spread out to the extent of one-half the width of the bevel sidewise. The path of the material displaced must consequently have been in close approximation to the oblique line formed by the hypotenuse of a right-angled triangle with its base where the length of the hypotenuse is that of the contact between the rolls and the edge of the strip at any instant, and where the perpendicular to the base has a length equal to one-half the width of the bevel, the base-line being longitudinal (or tangential in case of a curve) to the direction of traverse of the strip, plate, or sheet. When the surfaces of rolls in contact with the edge undergoing the operation of beveling move in the same direction as the path of the material, and the axes of the rolls are so placed that the plane of rotation of the rolls (which plane is taken where the point of the bevel is formed or produced) passes along the oblique line heretofore described, and thus coincides with that path, the object and purpose of my invention will have been accomplished.

It can be demonstrated, by computation or through models, that with any given diameter of rolls and with a given thickness of strip there is one particular angle between the line of direction or traverse of the strip and a vertical plane through the axes of the rolls suited for any accepted or desired bevel which shall most nearly cause the surface of the rolls producing such bevel to move in the direction of the path of the material to be displaced. In the same method of inquiry, the most suitable angle between the axes of the rolls and the line of traverse of the strip demanded for bevels in the form of a truncated triangle, or having curved outlines, can be ascertained. Similarly to this inquiry into the action of rolls, as shown, Figs. 1, 2, and 3, the action of rolls shown by Figs. 1^a, 2^a, and 3^a can be followed. Here the rolls R^a R^a are represented as having conical working-faces *f f*, (in lieu of cylin-

drical ones,) and as having parallel axes. A slight grinding action upon the edge being beveled proceeds from the conical faces, and a slight stretching of the sharp edge follows; but the extent of this stretching, or the loss of power attendant upon the grinding action, is not important in practice. The method of ascertaining the proper angle for placing the plane of axes of the rolls with regard to the line of traverse of the strip is similar to that set forth for arrangement, Figs. 1, 2, and 3.

Similarly, again, on Figs. 1^b, 2^b, and 3^b the bevel is obtained by the pair of rolls R^b R^{bb}. In this case the bevel is rolled and formed by the single roll R^b, which corresponds in all respects of action and position to either one of the pairs R R, Figs. 1, 2, and 3, or R^a R^a, Figs. 1^a, 2^a, and 3^a, the upper roll, R^{bb}, being merely a supporting-roll to sustain the strip while undergoing the action of a single roll, R^b, with its axis inclined to the line of traverse of the strip, the said inclination being such as will bring the planes of rotation of the surface of contact of the roll R^b with the edge undergoing beveling in coincidence with the path of material displaced in the act of correct beveling, as before described.

The supporting-roll R^{bb} (which may be either a flat disk, as drawn, or a conical disk, if the shape of bevel desired requires) can have its axis so located with regard to the vertical plane through the axis of R^b as to give, when the proper diameter of the roll or disk R^{bb} is provided, a practical equivalent of motion to that portion of the working-face *f* of the roll (or disk) R^{bb} outwardly in a sidewise direction with regard to the line of traverse of the strip, similar to the direction of motion of the working-faces *f f* of the upper rolls, R or R^a, Figs. 1, 2, or 3, or Figs. 1^a, 2^a, or 3^a.

Thus, upon Fig. 2^b it will be seen that the axis of R^{bb} is placed in front (front being held to mean the side of the rolls at which the strip is entered) of the vertical plane of the axis of the roll R^b, and that by the rotation of R^{bb} on its axis, as here shown, that part of the face (indicated by *f* on the roll R^{bb}, Fig. 1^b) where the edge of the strip B is sustained against the compression proceeding from the roll R^b moves outwardly, as regards the proper line of traverse of the strip, in close approximation to the path of the material, as hereinbefore set forth as such path.

In operating this my invention it will be found necessary to provide the usual mechanisms of bed-plates, housings, &c., with adequate guards, guides, or supports, to secure the proper entry or delivery of strips, plates, or sheets for the rolls. Such guards, guides, or supports may be rolls, pins, fingers, or plates, and must be adequately secured to or adjusted upon cramp-bars or otherwise to the housings or bed-plates in any usual manner.

In practice, for beveling the edges of strips I prefer the arrangement shown in Figs. 1^a, 2^a, and 3^a, where the strips may be either drawn between the rolls by means of the ordinary draw-bench and its appliances, or may be rolled by motion imparted to the axes through gearing.

When it is desirable to change the bevels at times it will be best to have the housings carrying the rolls adjustable on vertical and swiveling axes.

When both edges of a strip are to be beveled at once two pairs of rolls will be required to effect the beveling at a single pass, and when strips of various widths are to be beveled the rolls should be made adjustable sidewise, preferably by movement of the housings supporting the rolls upon a common bed-plate.

The use of any specific mechanism for effecting the operation of my invention is not claimed at this time; but,

As an improvement in beveling the edges of metal plates and strips, I claim—

1. A roll or rolls for beveling one or both sides of one or both edges of a plate or strip of metal, arranged to rotate in a plane or planes oblique to the edge of the plate or strip and in a direction that shall, while it tends to feed the plate forward, draw outwardly and extend the margin of the plate laterally as well as longitudinally, substantially as set forth.

2. The improved method described of beveling the edges of plates or strips of metal—to wit, the application and use of a pressure-roll traversing the margin of a plate obliquely to its edge, thereby drawing outward and extending the margin of the plate or strip laterally as well as longitudinally.

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