A. W. HERBERT.

MACHINE FOR BENDING FLAT METAL STRIPS INTO WASHERS.

APPLICATION FILED MAY 23, 1907. RENEWED SEPT. 9, 1908.

903.976. **Patented Nov. 17, 1908.**

3 SHEETS—SHEET 1.

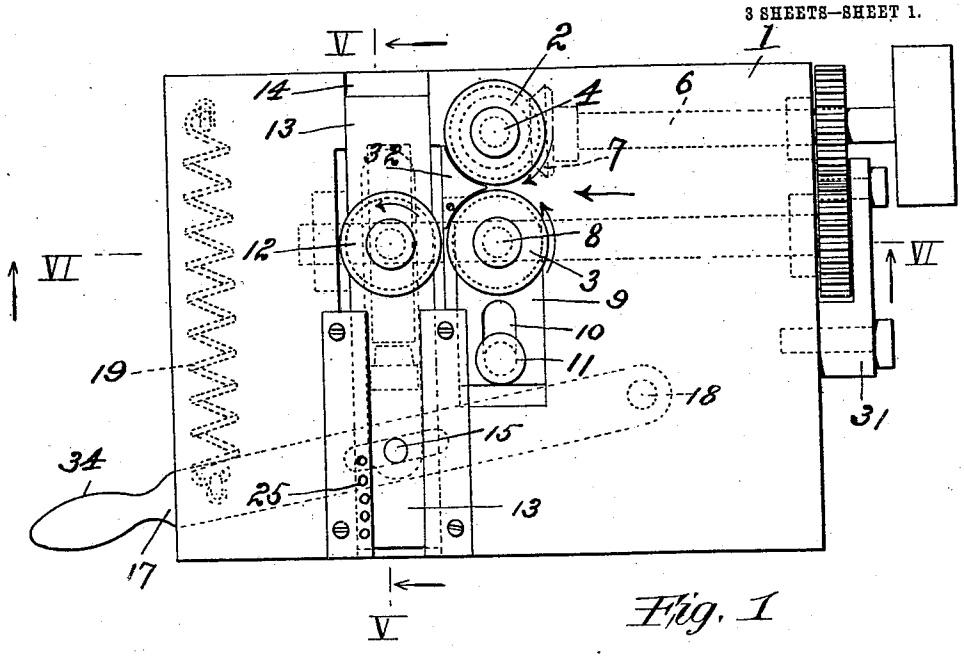


Fig. 1

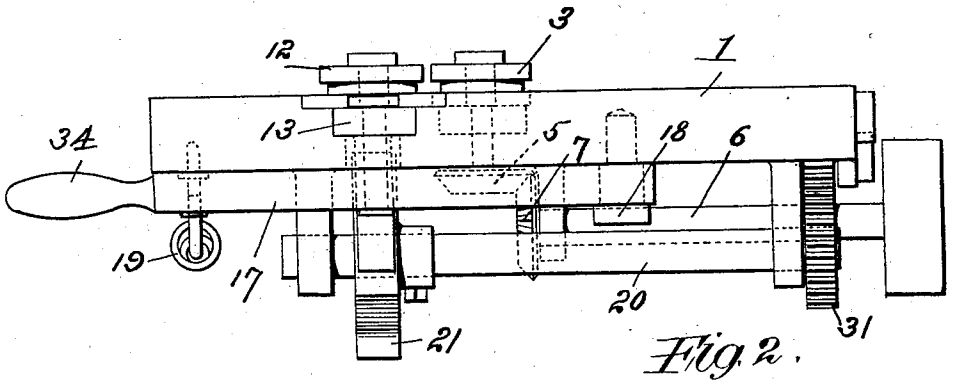


Fig. 2.

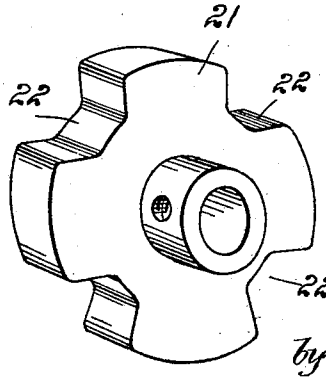


Fig. 7

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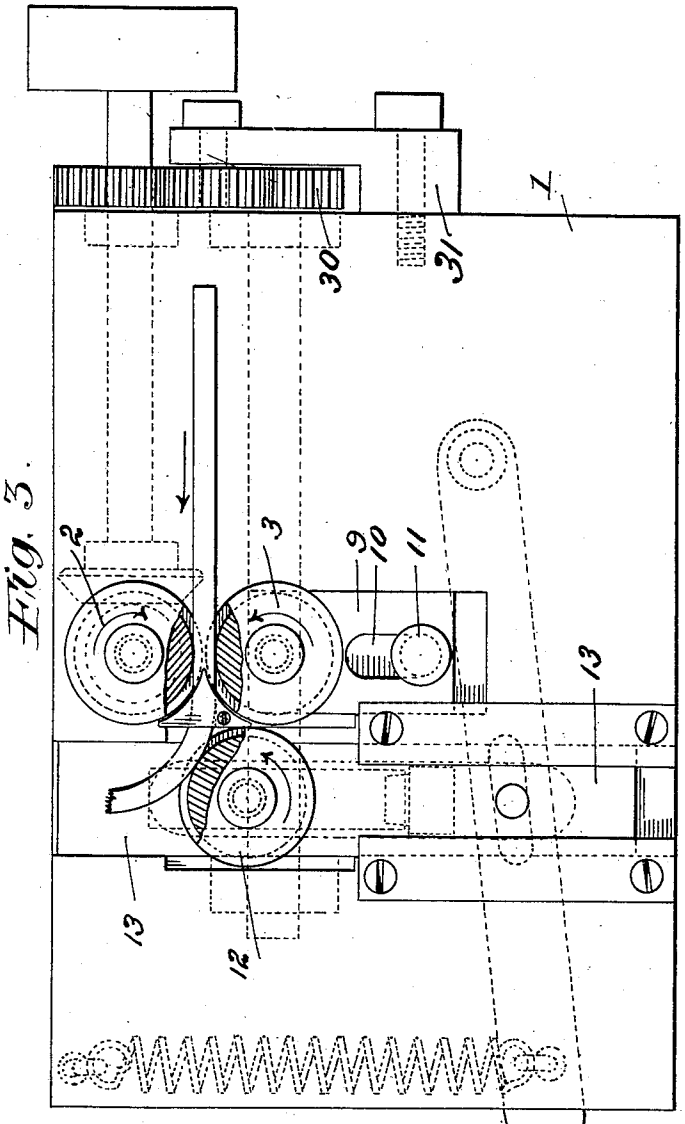


Fig. 5.

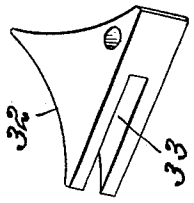


Fig. 9.

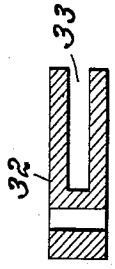


Fig. 11.

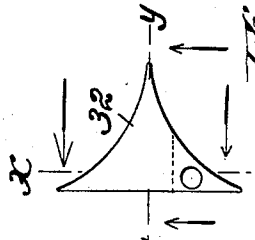


Fig. 10.

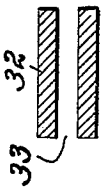


Fig. 12.

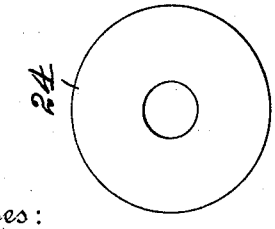


Fig. 8.



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3 SHEETS—SHEET 3.

Fig. 4.

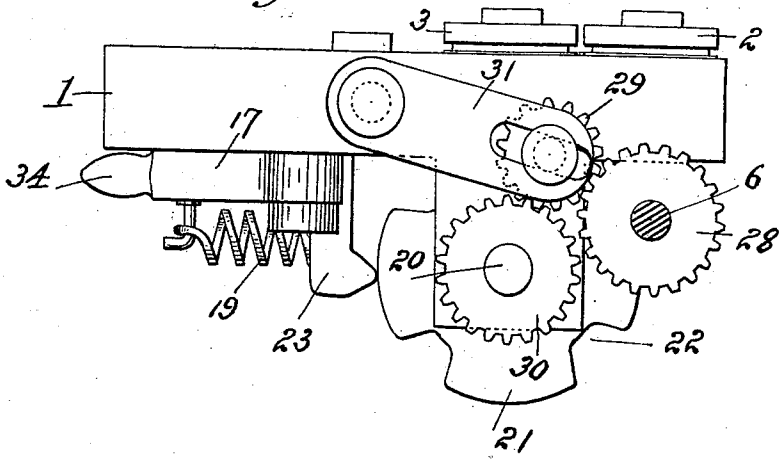


Fig. 5.

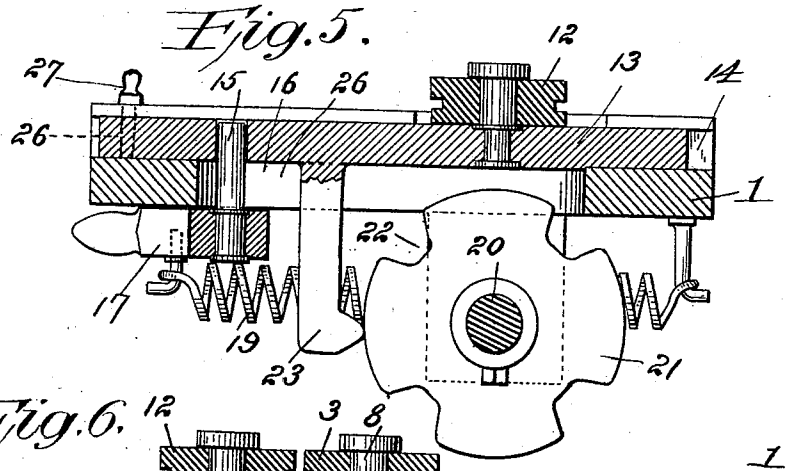
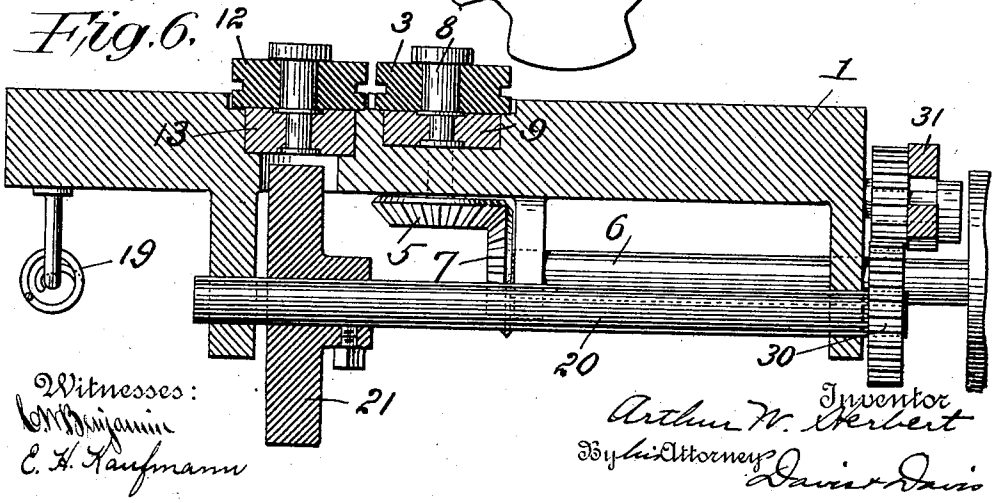


Fig. 6.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR BENDING FLAT METAL STRIPS INTO WASHERS.

No. 903,976. Specification of Letters Patent. Patented Nov. 17, 1908.

Application filed May 23, 1907, Serial No. 375,191. Renewed September 9, 1908. Serial No. 452,197.

To all whom it may concern:

Be it known that I, ARTHUR W. HERBERT, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Machines for Automatically Bending Flat Metal Strips into Flat Washers of Circular or other Form, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 is a plan view of the machine; Fig. 2 a front elevation; Fig. 3 a plan view showing the shaping roller in its inner position; Fig. 4 a side elevation; Fig. 5 a transverse vertical sectional view on the line V—V of Fig. 1; Fig. 6 a longitudinal sectional view on the line VI—VI of Fig. 1; Fig. 7 a detail perspective view of the form-governing cam; Fig. 8 a detail view of the form-governing disk used when producing circular washers; Fig. 9 a detail perspective view of the means for guiding the material from the feed rolls to the shaping roller; Fig. 10 a plan view thereof; Fig. 11 a sectional view on the line X—X of Fig. 10; and Fig. 12 a similar view on the line *y—y* of Fig. 10.

One of the main objects of this invention is to provide a machine which will operate automatically to bend flat strips of metal into flat washers of any desired form either circular, or of angular form having rounded corners.

Another object of the invention is to provide such a machine having a shaping roller mounted upon a yielding slide or support, and to provide means whereby said roller may be moved to permit the stock or material to be fed a certain distance, the shaping roller being then released and permitted to preliminarily shape the projecting end of the stock so that when the feed rolls operate the stock will move freely in contact with the shaping roller.

Referring to the various parts by numerals, 1 designates a table which constitutes the top of the machine, and which may be suitably supported. No supporting means is shown in the drawing, but it is obvious that any suitable form may be supplied. On the upper side of the table of the machine two feed rolls 2 and 3 are mounted. One of these rolls, 2, is secured to the upper end of a short vertical shaft 4 which passes through the table and carries at its lower end a beveled gear 5. Power is applied to this feed roll through the power shaft 6 and bevel gear 7, this latter gear meshing with the gear 5. The feed roll 3 is journaled on the upper end of a stub-shaft 8, whose lower end is secured to a horizontal slide 9 mounted in a recess in the upper surface of the table. This slide is adapted to be adjusted toward and from the feed roll 2 to adapt the machine for flat stock of different widths, said adjustment being secured by means of the slot 10 in the slide, and the set screw 11 passing through said slot into the table. The feed rolls are each formed with an annular groove in its periphery and said rolls are counter-sunk in the table to bring the lower walls of said grooves flush with the upper surface of the table. The material to be operated upon is fed between the feed rolls in the direction indicated by the arrow in Fig. 1, and as shown in Fig. 3, the edges of said material being received in the grooves of said feed rolls. The feed roll 3 is an idle roll, power being applied only to the feed roll 2.

The shaping roller 12 is mounted on a slide 13 and this slide is adapted to move backward and forward in a guide-way 14 in the upper surface of the table, said guide-way being parallel with a line drawn through the centers of the feed rolls 2 and 3, so that said slide is adapted to be moved perpendicularly to the line of travel of the material between the feed rolls. This shaping roller is an idle roller and rotates only when the moving strip of material is in contact therewith. Depending from the slide 13 is a pin 15, said pin extending down through a slot 16 formed in the table. The lower end of this pin is secured to a lever 17 which is pivoted to the bottom of the table, at 18. Connected to the lever, and normally forcing it toward the feed rolls, is a strong coil spring 19, so that said spring tends to force the slide 13 rearward on the table and to bring the shaping roller into the line of movement of the material when said material is being fed forward by the feed rolls.

Mounted in suitable bearings on the bottom of the table is a horizontal cam-shaft 20 on which is secured a form-governing cam 21. As shown in the drawings, this form-governing cam is provided with four diametrically opposite depressions 22. De-

pending from the slide 13 is a lug 23 which is adapted to bear against the periphery of the form-governing cam, as shown clearly in Figs. 4 and 5. This lug governs the position of the shaping roller. As shown in the drawings, when this lug is bearing against the periphery of the form-governing cam 21, the shaping roller is out of the line of travel of the material being fed by the feed rolls and said roller will not contact with said material, the result being that the material will be fed in a straight line. When, however, the depressions 22 are brought into register with the said dog, the slide 13, under the influence of the spring 19, will be moved rearward on the table and the shaping roller will be brought into the path of the material being worked upon and will force it from a straight line and cause it to be curved. The degree of the curve and the length of the curve will be dependent upon the depth of the recesses 22 and the length thereof around the cam 21. As shown in the drawings this cam is arranged for producing substantially square washers having rounded corners. It will, of course, be understood that by providing the proper form of governing-cam any desired shape of washer may be produced.

When it is desired to produce circular washers a disk, such as shown at 24 in Fig. 8, of the proper diameter, is secured to the shaft 20. This, as will be readily understood, will permit the shaping roller 12 to be brought into a certain position with relation to the two feed rolls and held there during the operation of the machine. It will, of course, be understood that the slide 13 may be locked in any suitable position to hold the roller 12 in fixed relation with the feed rolls 2 and 3 by means of a series of openings 25, and an opening 26 in the slide 13, a pin 27, shown in Fig. 5, being passed through one of the openings 25 and into the opening 26 in the slide. It will be readily understood that by placing said pin in the desired opening 25 and in the opening 26 in the slide the shaping roll 12 may be secured in any desired position with relation to the feed rolls. This means of securing the shaping roll 12 in a fixed position may be used instead of the form-governing disk 24, if desired. It will, of course, be understood that the pin 27 is to be removed when the washer to be formed is of some angular form and a form-governing cam, such as the cam 21, is used.

The shaft 20 is driven from the power shaft by means of gears 28, 29 and 30. Gear 28 is secured to the power shaft and engages the gear 29 which is an idle gear, and this latter gear engages the gear 30 secured to the shaft 20. To vary the speed of the cam shaft 20 the gear 19 is movably mounted in an arm 31 so that any desired size of gear may be secured to the cam shaft. By this means the proper speed of the cam shaft 20 may be obtained. It will, of course, be understood that the speed of the form-governing cam must be so regulated with respect to the speed of the power shaft and of the feed rolls as to produce the desired shape of washer. This is more particularly so where the washer to be produced is to have one or more straight sides. It will, of course, be understood that if the feed rolls travel at a high speed and the form-governing cam at a slow speed the washer will be large and the straight portions thereof will be long. The necessity, therefore, of providing means for governing the relative speeds of these two parts is manifest.

To hold the strip of material in its flat position between the feed rolls and the shaping roller a guide 32, which is horizontally slotted as at 33 to receive the strip of material, is provided. To permit the shaping roller to be withdrawn from the material at any time against the tension of the spring 19 the lever 17 is prolonged beyond the table and is formed into a handle 34.

From the foregoing it will be readily seen that when the proper form-governing cam is secured to the cam shaft 20, the operation of the machine will be entirely automatic, it being simply necessary to feed the stock between the feed rolls either in short pieces or from a reel. It will also be readily understood that if it is desired to form circular washers the slide carrying the shaping roller may be held in a fixed position by means of the pin 27 and the registering perforations 25 and 26, or by means of the form-controlling disk 24.

By means of the lever 17 the shaping roll may be withdrawn from the path of the material to permit said material to be fed forward, and may then be released and permitted to engage the projecting end of the material to preliminarily bend it, so that it will move freely through the machine under the action of the feed rolls.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A machine of the class described comprising a pair of grooved feed rolls adapted to receive a strip of flat material between them, means for applying power to one of said rolls, a grooved shaping roller, a slide carrying said roller, a tension means connected to said slide and normally tending to move it in one direction, a rotatable form-governing device adapted to control the movement of the slide in the opposite direction and to thereby control the operation of the shaping roller on the material fed by the feed roll, and means for rotating said form-governing device.

2. A machine of the class described com-

prising a support, a pair of grooved feed rolls counter-sunk in said support to bring the lower walls of the grooves flush with the surface of said support, a slide movable on said support, a grooved shaping roller carried by said slide, a lever connected with said slide, a spring connected to said lever, a form-governing cam, a lug on said slide adapted to engage the form-governing cam, and means for rotating the form-governing cam.

3. A machine of the class described comprising a support, a pair of grooved feed rolls counter-sunk in said support to bring the lower walls of the grooves flush with the surface of said support, a slide movable on said support, a grooved shaping roller carried by said slide, a lever connected with said slide, a spring connected to said lever, a form-governing cam, a lug on said slide adapted to engage the form-governing cam, means for rotating the form-governing cam, a slotted guide to receive the material from the feed rolls and hold it in its flat position until it is engaged by the shaping roller.

4. A machine of the class described comprising a pair of opposed grooved feed rolls adapted to receive edgewise between them a flat strip of metal, a correspondingly grooved shaping roller adapted to engage the edge of said strip beyond the feed rolls, means for normally forcing said shaping roller into the path of the material operated upon by the feed rolls, and a governing cam controlling the position of the shaping roller, and means for rotating said governing cam at the proper speed with respect to the speed of the feed rolls.

5. A machine of the class described comprising a table or support, a pair of opposed grooved feed rolls counter-sunk in said support to bring the lower walls of the grooves flush with the surface of said support, said feed rolls being adapted to receive a flat strip of metal edge-wise between them, a shaping roller movable on said support and correspondingly grooved and adapted to engage the edge of the strip beyond the feed rolls, and means for normally forcing said shaping roller into the path of the feed rolls.

6. A machine of the class described comprising a pair of feed rolls, a shaping roller, a slide carrying said roller, means connected to said slide to normally force the shaping roller into the path of the material acted upon by the feed rolls, means for moving the shaping roller out of the path of said material and against the tension means, whereby the material will have a free movement and when the shaping roller is released it will engage and initially bend the material beyond the feed rolls.

7. A machine of the class described comprising a support, a pair of grooved feed rolls counter-sunk in said support to bring the lower walls of the grooves flush with the surface of said support, a slide movable on said support, a correspondingly grooved shaping roller carried by the slide, a form governing cam controlling the movement of said slide in one direction, a tension means controlling the movement of said slide in the other direction, whereby the shaping roller will be moved into and out of the path of the material operated upon by the feed rolls, a guide between the feed rolls and adapted to receive the material from said rolls and to prevent it from twisting when operated upon by the shaping roller, and means for rotating one of the feed rolls and the form-governing cam.

8. A machine of the class described comprising a pair of opposed grooved feed rolls adapted to receive edgewise between them a flat strip of metal, a correspondingly grooved shaping roller adapted to engage the edge of said strip beyond the feed rolls, a slide carrying said shaping roller, a lever connected to said slide, whereby said slide and shaping roller may be moved outward and away from the path of the material advanced by the feed rolls, and a spring normally forcing the shaping roller toward the path of the material fed by the feed rolls.

9. A machine of the class described comprising a pair of opposed grooved feed rolls adapted to receive edgewise between them a flat strip of metal, a correspondingly grooved shaping roller adapted to engage the edge of said strip beyond the feed rolls, a slotted guide between the feed rolls and the shaping roller to hold the strip in its flat or edgewise position, and means for moving the shaping roller to engage the edge of the strip beyond the guide and a cam to govern the movement of the shaping roller.

10. A machine of the class described comprising a pair of opposed grooved feed rolls adapted to receive edgewise between them, a flat strip of metal, a correspondingly grooved shaping roller adapted to engage the edge of said strip beyond the feed rolls, a slide carrying said shaping roller, means connected to said slide whereby said slide and shaping roller may be moved outward and away from the path of the material advanced by the feed rolls, and a spring normally pressing the shaping roller toward the path of the material fed by the feed rolls.

In testimony whereof I hereunto affix my signature in the presence of two witnesses this 18th day of May 1907.

ARTHUR W. HERBERT.

Witnesses:

WM. R. DAVIS,

EMMA H. H. KAUFMANN.