

J. J. WOOD.
BENDING MACHINE.
APPLICATION FILED AUG. 28, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

FIG. 1.

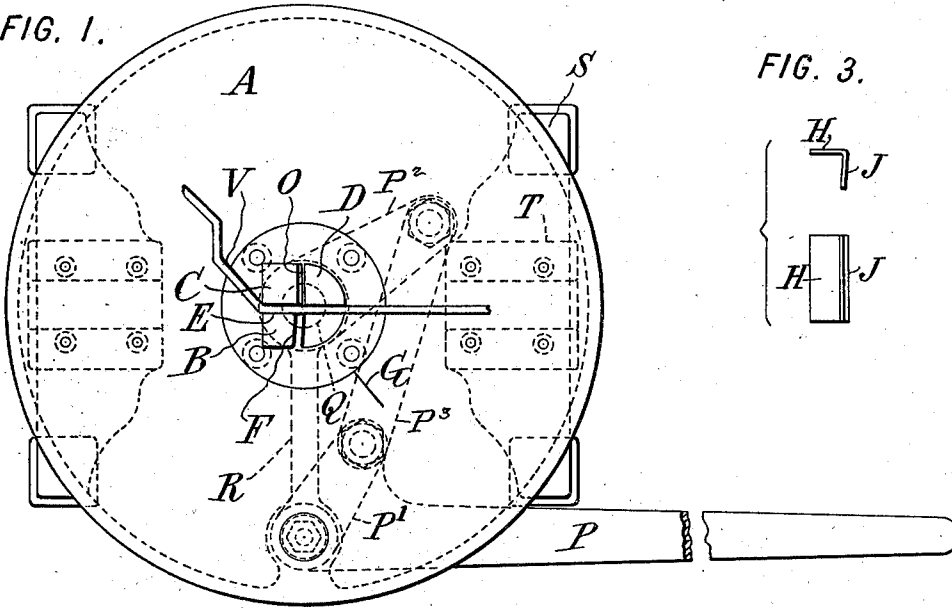


FIG. 3.

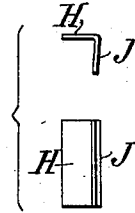


FIG. 2.

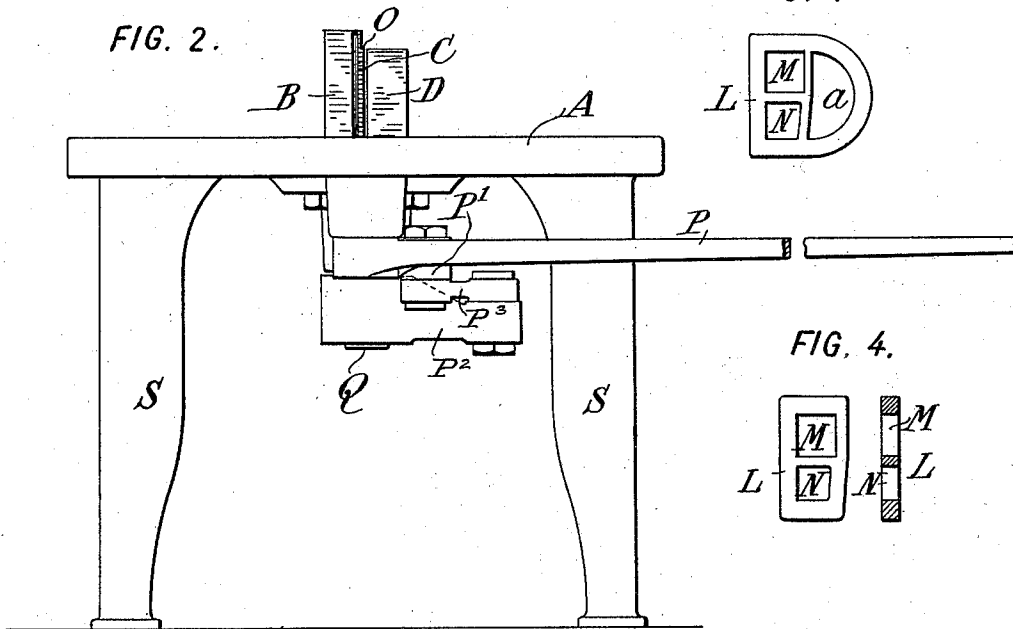


FIG. 4. a

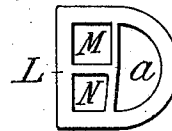
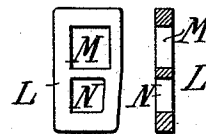


FIG. 4.



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No. 757,078.

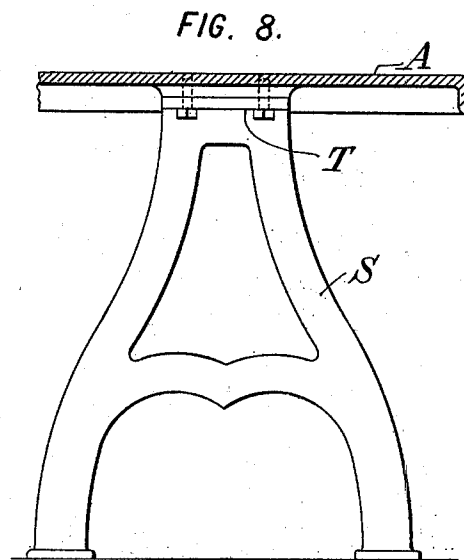
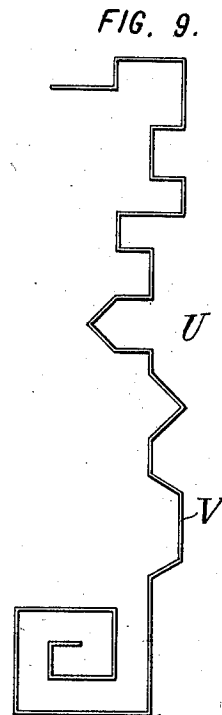
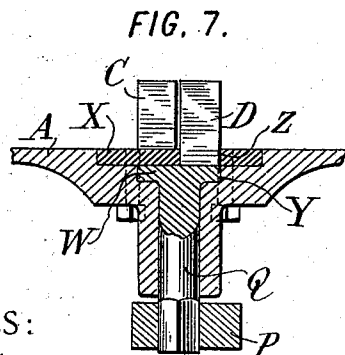
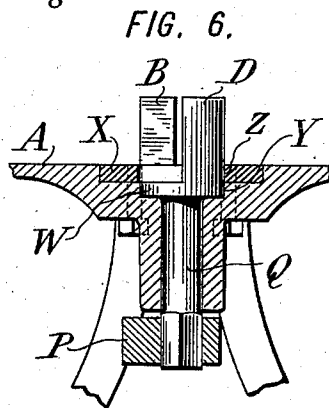
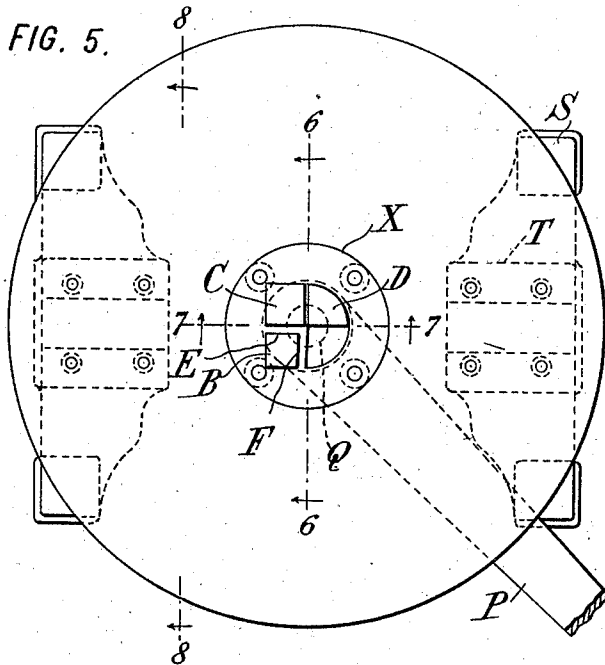
PATENTED APR. 12, 1904.

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APPLICATION FILED AUG. 28, 1903.

NO MODEL.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

JAMES J. WOOD, OF FORT WAYNE, INDIANA.

BENDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 757,078, dated April 12, 1904.

Application filed August 28, 1903. Serial No. 171,109. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. WOOD, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Bending-Machines, of which the following is a specification.

My improvements relate to machines for bending bars or the like. A common application of such machines is in the bending of bus-bars into suitable shape for passing around obstructions or for otherwise conducting the current from one point to another of a switchboard or other electric mechanism. Prior machines for this purpose or for analogous purposes have generally been slow in use and have been limited to the making of right-angle bends.

It has generally been necessary in prior machines to lay the bar flat upon a table with one end, sometimes ten or fifteen feet long, projecting over the edge without any support, to clamp it down near the edge of the table by means of a bolted clamp, and to then bend up the long overhanging end. In my present machine there are no such difficulties, the bar being merely placed edgewise between a pair of lateral supports and being automatically held against longitudinal movement by the first bending of the metal. Preferably the width of the space between the lateral supports can be varied to suit the thickness of the bar. My present machine can be operated quickly and can bend a bar through any desired angle and into a great variety of shapes. It is of very simple and very strong construction.

Further advantages will appear in detail hereinafter.

The accompanying drawings illustrate machines embodying the invention.

Figures 1 and 2 are respectively a plan and side elevation of a machine for bending heavy bars. Fig. 3 illustrates in plan and side elevation an angle-piece which is used to adapt the machine for bars of different thickness. Fig. 4 illustrates in plan and longitudinal section a clip which is used in bending extra heavy bars. Fig. 4^a shows a modification of Fig. 4. Fig. 5 is a plan of a machine for

lighter work. Figs. 6, 7, and 8 are sections taken, respectively, on the line 6 6, 7 7, and 8 8 of Fig. 5. Fig. 9 is an edge view of a bus-bar bent in several different ways by my improved machine.

Referring now to the drawings, A is a table carrying at its central portion a pair of lateral supports in the form of upright posts B and C, between which the bar is placed edgewise. The table also carries a movable bending means, such as the quadrant-shaped post D. The portion of the bar which projects beyond the post B is bent by the turning of the post D around its center. The two bearing-faces E and F of the post B are at an angle slightly less than a right angle, so that the free portion of the bar may be bent slightly beyond a right angle, then when released it springs back to exactly a right angle. The bending-post D, it will be noted, bears against the bar at a distance beyond the edge of the post B substantially equal to the thickness of the bar, and therefore the post C, preventing lateral movement of the bar away from the post B. As soon as the bending-post D commences to turn the bar is caught against the forward edge of the post B and cannot move longitudinally. By this simple arrangement, therefore, I eliminate the necessity for any clamps or other devices for preventing movement of the bar. The point at which the bar is to be bent will be located coincidently with the forward edge of the post B, the bend occurring exactly at this point. Where any special angle is to be formed, it can be marked on the table and the post D can be turned until the bar bends to coincide with the marked line (or to go slightly beyond it to allow for the spring of the metal)—for example, as indicated at G, a line laying off about half a right angle. The bar can be bent with very small offsets, the size being limited only by the size of the posts B and C, as is obvious. The post B is always within the bend being formed, while previous bends may be placed around the rear faces of either of the posts B or C. The post D is so small that it does not project beyond the rear face of the post C, and therefore also offers no obstruction to the arranging of a previously-bent portion of the

bar at that part of the table. In fact the three parts which project above the table—that is to say, the three posts B, C, and D—are so arranged and of such dimensions as to permit the further bending of bars bent into any conceivable shape, the offsets of which are not smaller than the post C. The operation is as simple as it could possibly be, consisting merely in standing the bar on edge in the right position and then giving the operating-handle a turn.

The bars should fit as closely as possible between the posts B and C to insure the obtaining of the exact angle desired and also to prevent the bar from curving instead of lying flat in the space between the posts B and C, and in order to make a good fit for bars of different thicknesses the machine is designed for the maximum thickness to be used, and means are provided for reducing the width of the space between the posts. For the best work the fit should be so close that the bar cannot drop into place, but must be forced down by lightly tapping it. Likewise the longitudinal distance between the rotation-axis of the bending-post D and the bending-post B should be equal to the thickness of the bar to be bent. These requirements are provided for by means of one or more angle-plates, Fig. 3, each having a portion H to extend along the face E and a portion J to extend along the face F of the post B, the thicknesses of these angle-plates being such as to reduce the space between the posts B and C and between the face F and the operating-face K of the bending-post to distances equal to the thicknesses of the bars to be bent.

In bending the very heaviest bars there is danger that the post B may be slightly bent. In order to avoid this and at the same time to retain as small a post as possible, (so as to make small bends,) I provide a device for uniting the two posts B and C at their upper ends—for example, these two posts may extend somewhat higher than the width required to accommodate the bus-bar, and after the bus-bar is introduced I may arrange a clip L, Fig. 4, over the upper ends of the two posts. This clip has openings M and N, fitting closely the posts C and B, respectively. It is made of heavy steel and provides abundant resistance against the bending effort necessary to bend the bar. The close fit on the posts also prevents the clip from turning. Preferably the post C is formed with a shoulder O to limit the downward movement of the clip L.

Any suitable operating mechanism may be provided in connection with the parts described. The operating-lever P of Fig. 1 is connected by a toggle connection with the shaft Q, which carries the bending-post and multiplies the power, this machine being designed for heavy work. The handle P describes nearly a half-circle in making a right-angle bend and its toggle-arm P' is near its

dead-center, and therefore most effective at the beginning and end of a bending movement. The arm P², which is connected directly to the shaft Q, makes only a quarter-revolution, while the handle P makes a half-revolution, and the arm P² is nearly at right angles to link P³ and the direction of pull at the end of the movement, so that with the arm P' nearly on its dead-center the multiplication of power is enormous. Where the machine is to be employed for bending smaller bars, the shaft Q may be keyed directly to the operating-lever P, Figs. 5, 6, and 7. With the heavy machine of Fig. 1 a strengthening-rib R may be provided, connecting the bearings of the shaft Q and the operating-lever P.

The table A is supported by a pair of bifurcated standards S, provided with wide-spread legs and a long upper bearing-head T, bolted to the under side of the table, Fig. 8. This arrangement leaves a wide space immediately below the table where the lever swings and gives a long bearing in the principal direction of pull of the lever.

Fig. 9 shows a bus-bar U, having bends of various styles in its length, all of which may be easily and quickly made on my improved machine. In Fig. 1 the bar is shown in position in the machine for making the final bend to complete the offset V, Fig. 9.

A point of great value in my machine is the fixing of the lateral supports or posts at one end only and the use of a one-end bearing for the bending tool or post. This arrangement and the table for supporting the bar make it possible to use the machine almost as fast as the bar can be handled and to handle the bar very readily. The bending of the bar horizontally also economizes space and work and facilitates access to and handling of the same, the old machines requiring an extremely high and comparatively inaccessible table to give room for the vertical movements of the bar. In a comparison of my machine with the old type of bus-bar-bending machines referred to I have succeeded in making in ten minutes a bar which required six hours on the old machine. The single end-supports and bearing, however, necessitate the strongest material and construction if the machine is to be adapted for small bends. The construction illustrated in Figs. 6 and 7 is valuable as securing great strength and being at the same time very simple. In this construction the bending-post D is mounted eccentrically on the shaft Q, or rather on the rotatable disk W, which forms the head of said shaft, the latter being carried in a suitable bearing-socket in the table A. The disk W is held down by the overlying plate X, which carries the fixed posts B and C and which has a substantially semicircular opening permitting the movement of the bending-post D. The disk W and plate X, with the posts which they carry, are preferably made each from a single steel forging. The

upward lift on the portion of the disk W opposite the bending-post D is sustained by the overlying plate X, and the direct rearward reaction against the bending-post D is sustained by the edge Y of the socket in the table and the edge Z of the opening in the plate X.

My improved machine is adapted for bending not only bus-bars, but also bars, rods, or plates of almost any cross-section and material. For example, I have found it useful in bending iron transformer-hooks, (softened by heating,) and the range of application of a machine embodying the invention is obviously very wide. The reinforcing device shown in Fig. 4 may be modified in various ways. For example, as shown in Fig. 4^a, the clip may be adapted to extend over the upper ends of the three posts B, C, and D, the last being extended in height to correspond with B and C, and may have a third approximately semicircular opening *a* with its edge forming a rear support for the upper end of the post D in all positions of the latter.

Though I have described with great particularity of detail certain embodiments of the invention, yet it is to be understood that the invention is not limited to the specific embodiments disclosed. Various modifications thereof in detail and in the arrangement and combination of the parts are possible to those skilled in the art without departure from the invention.

What I claim is—

1. A bending-machine for bars or the like including in combination a horizontal table for supporting the weight of the bar, and holding and bending means for the bar projecting above said table and supported at their lower ends, said table being entirely free of other projections above so as to leave room for the bar to lie in any direction from the holding and bending means.

2. A bending-machine for bars or the like including in combination a horizontal table for supporting the bar, a pair of posts B and C having a space between them, and a bending-tool D, said posts B and C and tool D being supported at their lower ends and said table being entirely free of other projections above it so as to leave room for the bar to lie in any direction from the posts and bending-tool.

3. A bending-machine for bars or the like including in combination a horizontal table, a pair of fixed vertical posts thereon between which the bar may be placed, a bending-tool projecting above said table and having a bearing-face in line with the bearing-face of the outer one of said posts and movable horizontally to bend the free portion of the bar, and

an angle-plate adapted to rest on said table and overlie the two bearing-faces of the inner one of said posts to adapt the machine for bending thinner bars.

4. A bending-machine for bars or the like including in combination a pair of lateral supports B and C having a space between them with one open end through which a bar may be introduced, means for bending the portion of the bar outside of said space, and a clip L for bracing said supports at the open end having openings M and N fitting closely over said posts.

5. A bending-machine for bars or the like including in combination a pair of lateral supports B and C having a space between them with one open end through which a bar may be introduced, a bending-tool D, and a clip L for bracing said posts and tool having openings M and N fitting closely over said posts, and an opening *a* with its edge forming a rear support for the tool D.

6. A bending-machine for bars or the like including in combination a horizontal table A, a pair of posts B and C having a space between them, a movable bending-tool D cooperating therewith having a bearing only at its lower end, a central rotatable disk W carrying and fixedly connected with said bending-tool and carried in a socket in the table A, and a plate X carrying said lateral supports and overlying and holding down said disk and having an opening through which the tool D projects.

7. A bending-machine for bus-bars or the like including in combination a horizontal table, a bending-tool rotating horizontally over said table, a hand operating member therefor, and power-multiplying connecting mechanism between said operating member and the pivot of said bending-tool, whereby the hand operating member moves through a greater arc than the bending-tool.

8. A bending-machine for bus-bars or the like including in combination a horizontal table, a bending-tool rotating horizontally over said table, an arm P² of said tool, an arm P' carried by said table, a link connecting said arms, said parts being arranged to bring said arm P² near its dead-center and said arm P' approximately at right angles to the link at the end of an operation, and hand-operated means for turning said arm P².

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JAMES J. WOOD.

Witnesses:

ARTHUR N. EDROP,
DOMINGO A. USINA.