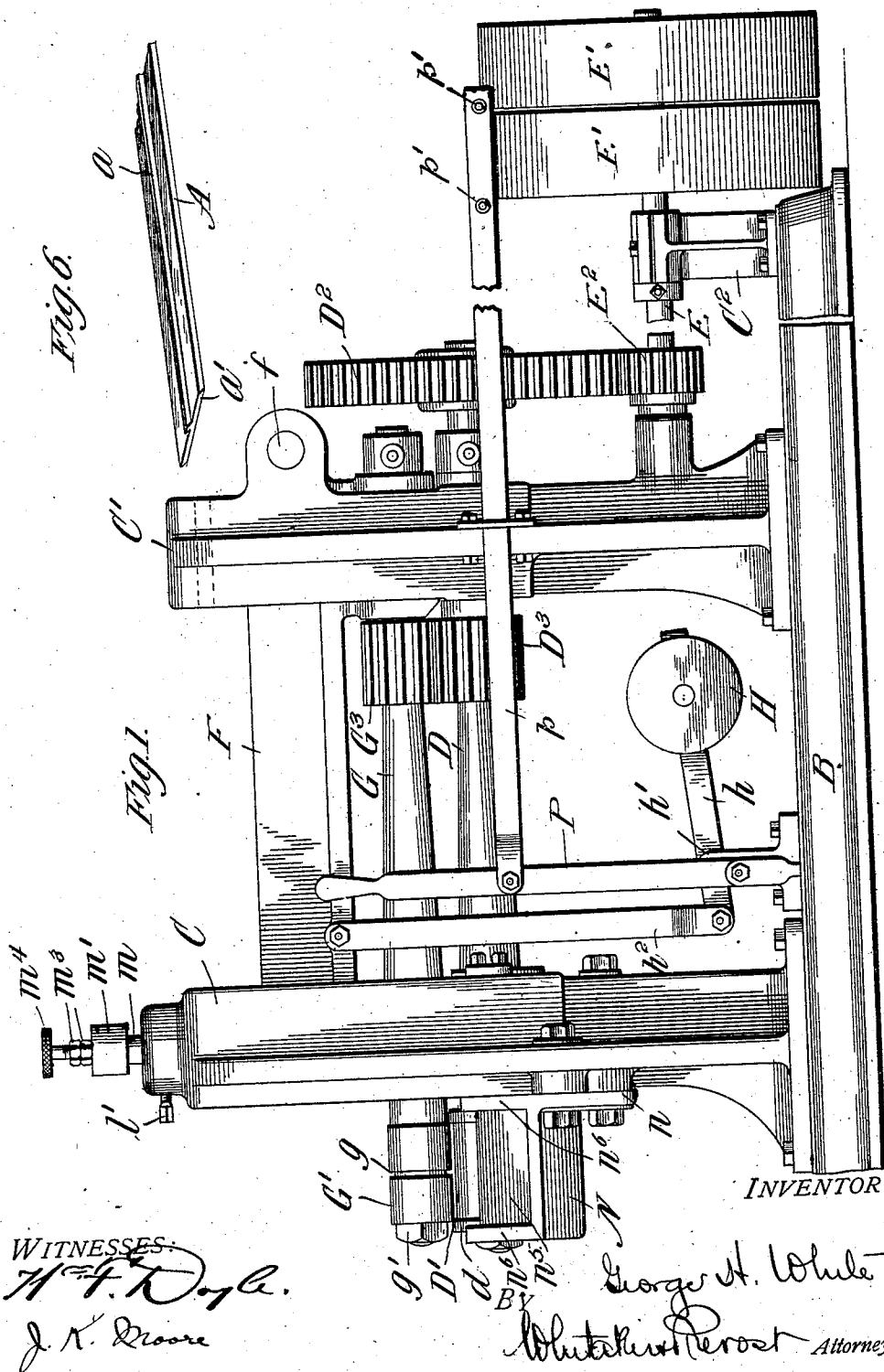


No. 849,764.

PATENTED APR. 9, 1907.

G. H. WHITE.
METAL BENDING MACHINE.
APPLICATION FILED FEB. 20, 1906.

3 SHEETS—SHEET 1.

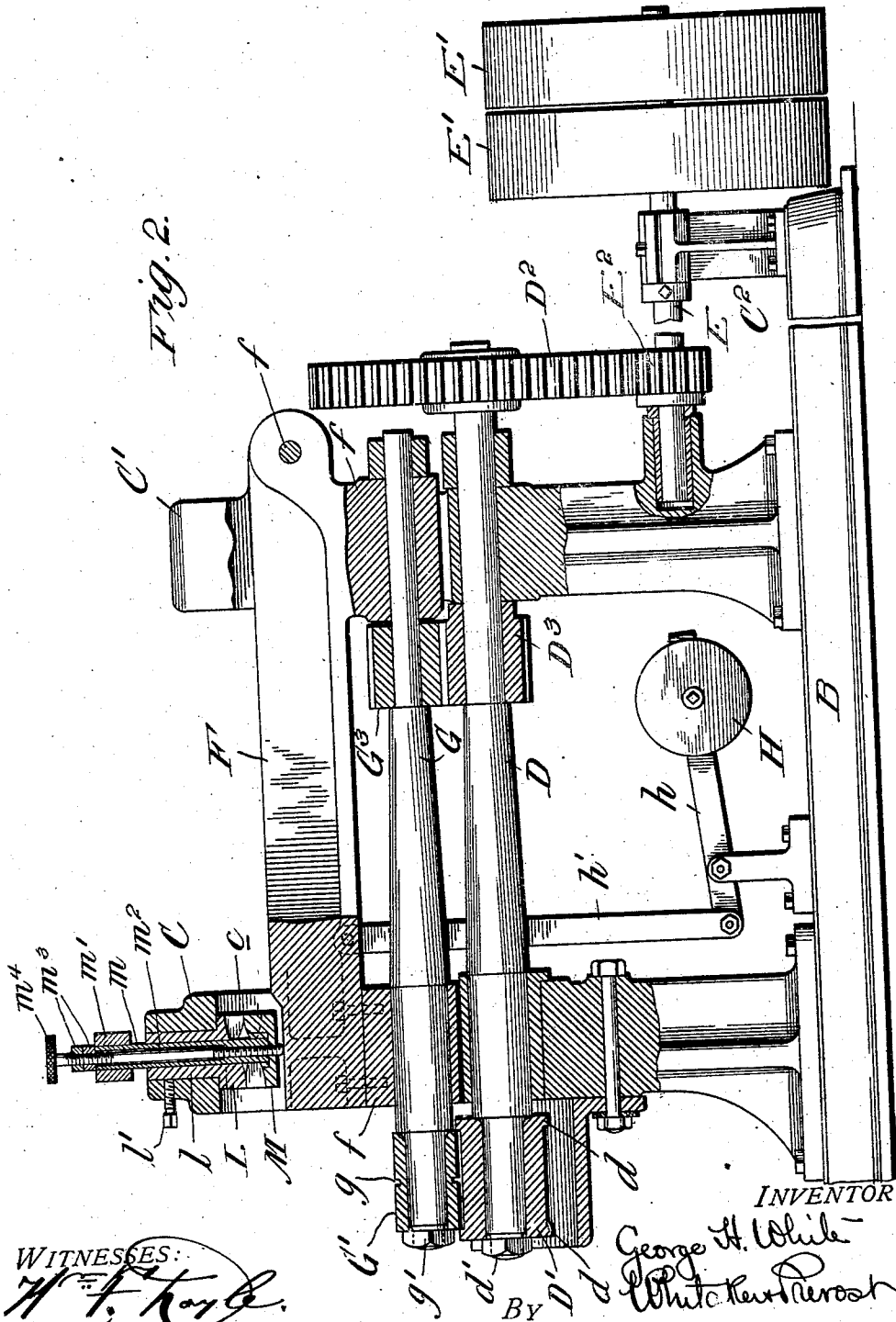


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3 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

GEORGE HENRY WHITE, OF OIL CITY, PENNSYLVANIA, ASSIGNOR TO S. R. DRESSER MANUFACTURING COMPANY, OF BRADFORD, PENNSYLVANIA.

METAL-BENDING MACHINE.

No. 849,764.

Specification of Letters Patent.

Patented April 9, 1907.

Application filed February 20, 1906. Serial No. 302,055.

To all whom it may concern:

Be it known that I, GEORGE HENRY WHITE, a citizen of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Metal-Bending Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists in the novel features hereinafter described, reference being had to the accompanying drawings, which illustrate one form in which I have contemplated embodying my invention, and the said invention is fully disclosed in the following description and claims.

Referring to the said drawings, Figure 1 represents a side elevation of a metal-bending machine embodying my invention. Fig. 2 is a vertical central longitudinal sectional view of the same, parts being shown in elevation. Fig. 3 is a front elevation of the machine. Fig. 4 is a partial front elevation of the machine, showing the operation of bending a metal blank. Fig. 5 is a top plan view of the rolls and adjacent parts, parts of the machine being shown in section. Fig. 6 is a detail perspective view of a portion of a blank which it is desired to bend into ring form in the machine herein shown and described.

The object of my invention is to provide a machine for bending metal blanks into the form of rings or short tubes preparatory to welding, although it may be used for other purposes, and the particular apparatus herein shown is especially designed to bend into ring form a blank cut from a metal skelp and provided on one face with a central projecting bead or rib which is intended to project inwardly from the inner face of the completed ring.

In Fig. 6 I have shown a portion of such a blank in detail, in which A represents the body of the blank, which may be severed from a rolled skelp in any desired manner, and *a* is the central longitudinal bead, projecting from one face of the skelp. The ends of the skelp (one of which is shown at *a'*) are preferably parallel and cut at an angle to the plane of the main body, so that they will

unite advantageously when they are welded together after being bent into the form of a ring or tube.

B represents the base-plate of the bending-machine, upon which are secured the forward vertical standard C and rearward vertical standard C'.

D represents the lower roll-shaft, which is horizontally disposed and is mounted in fixed bearings in the standards C and C'. At the front end of the machine the shaft D is provided with a reduced portion which receives the lower bending-roller D', provided with lateral peripheral flanges *d d* for guiding the blank, said roller being secured on the shaft by a suitable nut *d'*, so that it can be removed and replaced when worn. At its rear end the shaft D is provided with a driving-gear D², engaging a pinion E² on a driving-shaft E, mounted in bearings in the standard C' and in a separate standard C² or bearing-support and said shaft is provided with the usual fast and loose pulleys E' E', by means of which the machine is driven. The shaft D is also provided (preferably between the standards C and C') with a pinion D³, as shown.

F represents a vertically-movable swinging frame for carrying the upper bending-roll shaft, said frame being pivoted at *f* in the standard C' and having its forward end extending into a vertical slot *c* in the standard C. The frame F is provided on its lower side with bearings *f' f'*, in which is mounted the shaft G for the upper bending-roll. The forward end of the shaft G is reduced to receive the upper bending-roll G', which is provided with a central annular groove *g* to receive the rib or bead *a* of the blank A, and said roll is held in position by a nut *g'*. The shaft G is also provided with a pinion G³, engaging the pinion D³ on shaft D, so that the two bending-rolls are driven in opposite directions by the driving-shaft E. Said pinions D³ and G³ are provided with teeth of such length that they will remain at all times in gear notwithstanding the vertical movements of the swinging frame F. The upper roll G' is of a length equal to the distance between the lateral flanges *d d* of the roll D', so that when the two rolls are in operative position the portion of the blank between them will be entirely inclosed, as will be seen in Fig. 2.

The swinging frame F and upper roll and shaft are normally held in such a position that the bending-rolls are separated, and this is accomplished by means of counterbalancing devices. In the present instance I provide at each side of the machine a counterbalance-lever *h*, pivoted at *h'* to a bracket secured to the base-plate B and provided at one end with an adjustable weight H, the other end of the lever *h* being connected by a link *h''* with the swinging frame F. The counterbalance-weights H H thus maintain the said swinging frame and upper roll normally in raised position.

I provide the following mechanism for depressing the upper bending-roll and its swinging frame, which is so constructed that the roll can be depressed or released by a quarter-turn or swing of an operating-arm, thus greatly expediting the work of the machine. This mechanism is best seen in Fig. 2.

L represents a stationary cam located at the upper end of the recess *c* in standard C and provided with a hollow attaching sleeve or bushing *l*, which extends vertically through an aperture in the upper part of said standard and is secured therein by a set-screw *l'*. The sleeve or bushing is of less diameter than the cam, forming a shoulder at the upper end of the cam which directly engages the top face of the recess *c* and relieves the bushing *l* and set-screw *l'* of strain.

M is a rotatable cam located below the stationary cam and rigidly secured to a hollow shaft *m*, the upper end of which is squared and receives an operating-lever *m'*. (See Fig. 3.) The interior of the shaft *m* is counter-bored and the lower portion is threaded internally to receive an adjusting-screw shaft *m''*, which may be projected below the cam M to directly engage the swinging frame F. The upper end of the screw-shaft *m''* is threaded and is provided above the upper end of the hollow shaft *m* with a jam nut or nuts *m'''* (two being shown) and a hand-wheel or other operating device *m''''*. The opposing faces of the cams L and M are so constructed that a quarter-turn of the shaft *m* will bring the high parts of the cams together and depress the swinging frame F to bring the upper bending-roll into operative relation with the lower roll, and a quarter-turn of shaft *m* in the opposite direction will allow the counterbalance-weights to lift the said frame and upper roll sufficiently to allow of the insertion and removal of the bent blank. The parts can be accurately adjusted by means of the screw-shaft *m''*, which can also be adjusted from time to time to compensate for any wear of the parts.

N represent a heavy bracket-casting provided with a depending flange *n* on its inner side which is bolted to the standard C. This casing has a recess to accommodate the lower roll and on one side is provided with an in-

clined-plane face *n'*, having at its lower and outer end a perforated ear *n''*, the aperture in which is threaded to receive a set-screw *n'''*, provided with a jam-nut *n''''*.

O represents a sliding adjusting-block mounted on the inclined face *n'* and secured adjustably thereto by means of a screw *o* (or bolt) passing through a longitudinal slot *o'*. The upper end of the block O is provided with ears *o''*, in which is mounted the lateral bending-roll *o'''*, and the lower end of said block is preferably provided with an abutment or lug *o''''*, which is engaged by the adjusting-screw *n'''*.

On the opposite side of the casting N is an inclined guiding-face *n''*, provided on each side with a flange *n'''*, said flanges being arranged so as to guide the lateral edges of the blank as it is pushed into the machine, so that the rib *a* thereof will engage the groove *g* in the upper roll, and the inclined face *n''* will guide the blank so that it will engage the top of the lower roll.

P represents a belt-shifter lever pivoted upon the base of the machine and connected to a sliding shifter-bar *p*, guided in a bracket secured to standard C' and provided with belt-engaging arms *p'* *p''* for shifting the driving-belt from the loose to the fast pulley, and vice versa.

In using this apparatus the blanks are heated and inserted one at a time into the machine, the blank being pushed up the inclined face *n''*, between the flanges *n'''* thereof, until its end lies upon the lower roll D between its flanges *d*. The depressing mechanism for the upper roll is then operated by giving the shaft *m* a quarter-turn, thus bringing the upper roll G' down upon the blank A, the bead *a* entering the groove *g* in the upper roll. The rolls D' and G' being rotated by the driving-shaft, as soon as the blank is gripped between them it will be drawn in between them and forced into contact with the lateral bending-roll *o'''*, as shown in Fig. 4 in full lines, thus bending the blank, and the operation is continued until the blank has passed entirely between the rollers G' and D', when it will be bent into a substantially perfect ring form. The upper roll is then lifted, thus stopping the movement of the blank, and the bent blank is removed and the ends welded in any suitable manner.

By adjusting the plate O so as to bring the roller *o'''* nearer to or farther from the rollers G' and D' the machine is adapted for bending blanks of different lengths to make rings of different diameter, as indicated in Fig. 4, in which dotted lines indicate a position of the roller *o'''* nearer to the main rolls G' and D' than that shown in full lines, and a portion of a blank for a ring of smaller diameter is also shown. If a blank is used not having a bead *a*, the groove *g* in the roller G' may be dispensed with. In the present case, however,

this groove is necessary to prevent the flattening out of the bead, which would otherwise occur.

What I claim, and desire to secure by Letters Patent, is—

1. In a metal-bending machine, the combination with the main frame, a fixed roller mounted therein, a pivoted frame, a movable roller mounted therein, and mechanism for driving the fixed and movable rollers, of a stationary cam, on the main frame, a rotatable cam, constructed to engage the stationary cam, and having a part engaging the pivoted frame, for moving said movable roller toward the stationary roller, and operating means for said rotatable cam, substantially as described.

2. In a metal-bending machine, the combination with the main frame, a fixed roller mounted therein, a pivoted frame, a movable roller mounted therein, and mechanism for driving the fixed and movable rollers, of a stationary cam, on the main frame, a rotatable cam, constructed to engage the stationary cam, and having a part engaging the pivoted frame, for moving said movable roller toward the stationary roller, one of said cams being provided with an adjustable bearing part engaging said pivoted frame for varying the amount of movement of said pivoted frame and movable roller, and means for operating said rotatable cam, substantially as described.

3. In a metal-bending machine, the combination with a fixed roller and a roller movable with respect thereto, of means for moving said movable roller into operative relation with the fixed roller comprising among their members, a fixed cam, a rotatable cam in engagement therewith, an operating-shaft for said rotatable cam extending through said fixed cam, a part connected with said rotatable cam for engaging a part connected with the movable roller, and an operating device connected with said shaft, substantially as described.

4. In a metal-bending machine, the combination with a fixed roller and a roller movable with respect thereto, of means for moving the movable roller into operative relation to the fixed roller, comprising among its members, a fixed cam, a rotatable cam engaging the same, and provided with a shaft extending through the fixed cam, an adjusting device extending longitudinally through said shaft and engaging a part connected with the movable roller, and an operating device connected with said shaft, substantially as described.

5. In a metal-bending machine, the combination with a main frame and a fixed and a movable roller, of a fixed cam having a horizontal cam-face, and a hollow sleeve of less diameter than the cam, engaging an aperture in a portion of said frame and secured there-

in, a rotatable cam engaging the fixed cam and provided with a hollow shaft extending through said sleeve, an operating device connected with said shaft, an adjusting-screw extending longitudinally through said shaft and the cam secured thereto and engaging a part connected with said movable roller, a hand-operating device for said screw, and locking means for securing said screw in its adjusted position, substantially as described.

6. In a metal-bending machine, the combination with the main frame, and a fixed roller mounted therein, of a frame pivotally connected to said main frame, a movable bending-roller mounted in said pivoted frame, driving mechanism for said fixed and movable rollers, a rotatable cam for moving said pivoted frame and movable roller toward the fixed roller, and an adjustable part cooperating with said cam for varying the position to which said movable roller is moved by equal movements of said rotatable cam, and an operating device connected to said cam, substantially as described.

7. In a metal-bending machine, the combination with the main frame, and a fixed roller mounted therein, of a frame pivotally connected to said main frame, a movable bending-roller mounted in said pivoted frame, driving mechanism for said fixed and movable rollers, a rotatable cam for moving said pivoted frame and movable roller toward the fixed roller, a bearing part carried by said cam, and engaging said pivoted frame, means for adjusting said bearing part with respect to said cam, and an operating device for said cam, substantially as described.

8. In a bending-machine, the combination with the main frame and a fixed bending-roller carried thereby, of a frame pivotally connected to the main frame, a movable bending-roller mounted in said pivoted frame, a rotatable cam having a cam portion on a face disposed at an angle to its axis of rotation, and interposed between said pivoted frame and a part connected with the main frame, a hand-operated lever for said shaft and an adjusting-screw extending longitudinally through said shaft and through said cam and engaging said pivoted frame, substantially as described.

9. In a metal-bending machine, the combination with the main frame, of a shaft mounted in fixed bearings in said frame, and having a portion extending beyond said frame and carrying a bending-roller, of a swinging frame, pivotally mounted in the main frame, a shaft mounted in said swinging frame, and having a projecting portion at the end farthest from the said pivotal connection carrying a bending-roller, adapted to cooperate with the fixed bending-roller, a counterbalance for said swinging frame normally holding the roller carried thereby out

of operative relation with the fixed roller, and a rotatable cam having a part connected therewith for engaging said swinging frame, to move the roller carried thereby into operative relation with the fixed roller, substantially as described.

10. In a metal-bending machine, the combination with the main frame, a fixed shaft mounted therein and having one end projecting beyond the main frame, and a bending-roller carried by said projecting portion of the fixed shaft, of a vertically-movable frame pivoted to the main frame and having its free end working in a vertical slot in said main frame, a shaft mounted in said pivoted frame, having a projecting portion extending over the fixed bending-roller, a movable bending-roller mounted on the projecting portion of said movable shaft, and provided with a

central annular groove, driving mechanism for said shafts, a bracket secured to the main frame adjacent to said fixed rollers and provided on one side thereof with a horizontal guide, having lateral guiding portions, and on the other side of said roller, with an inclined support, an adjustable bending-roll, located on said support, a counterbalance for said pivoted frame and the roller carried thereby, and means for forcing said movable frame toward the fixed bending-roller, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

GEORGE HENRY WHITE.

Witnesses:

JOS. W. BARR,

ELIZABETH MULLIGAN.