(No Model.)

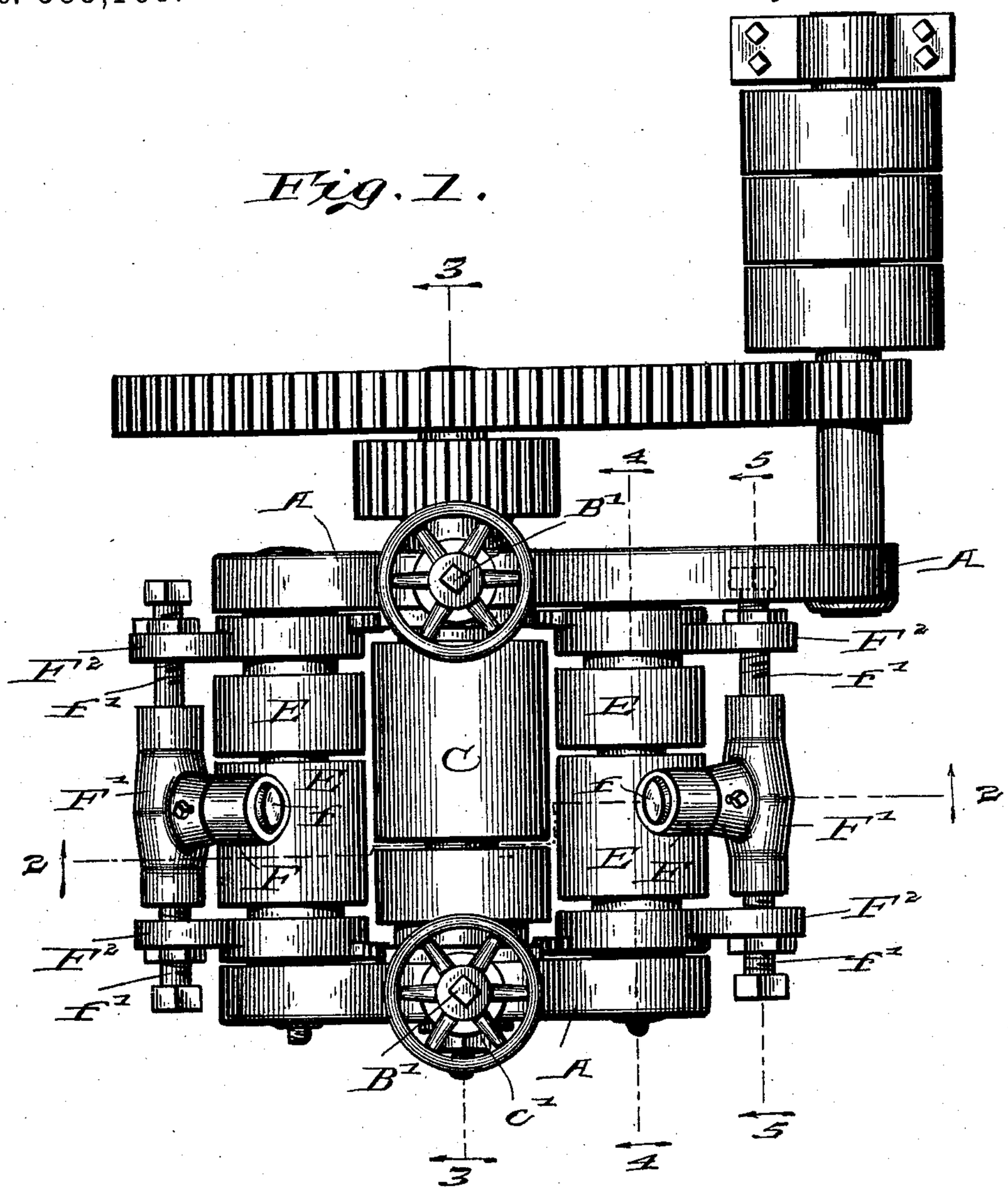
4 Sheets—Sheet 1.

C. A. BERTSCH.

METAL BENDING MACHINE.

No. 583,166. Patented May 25, 1897.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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METAL BENDING MACHINE.

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Fig. 2.

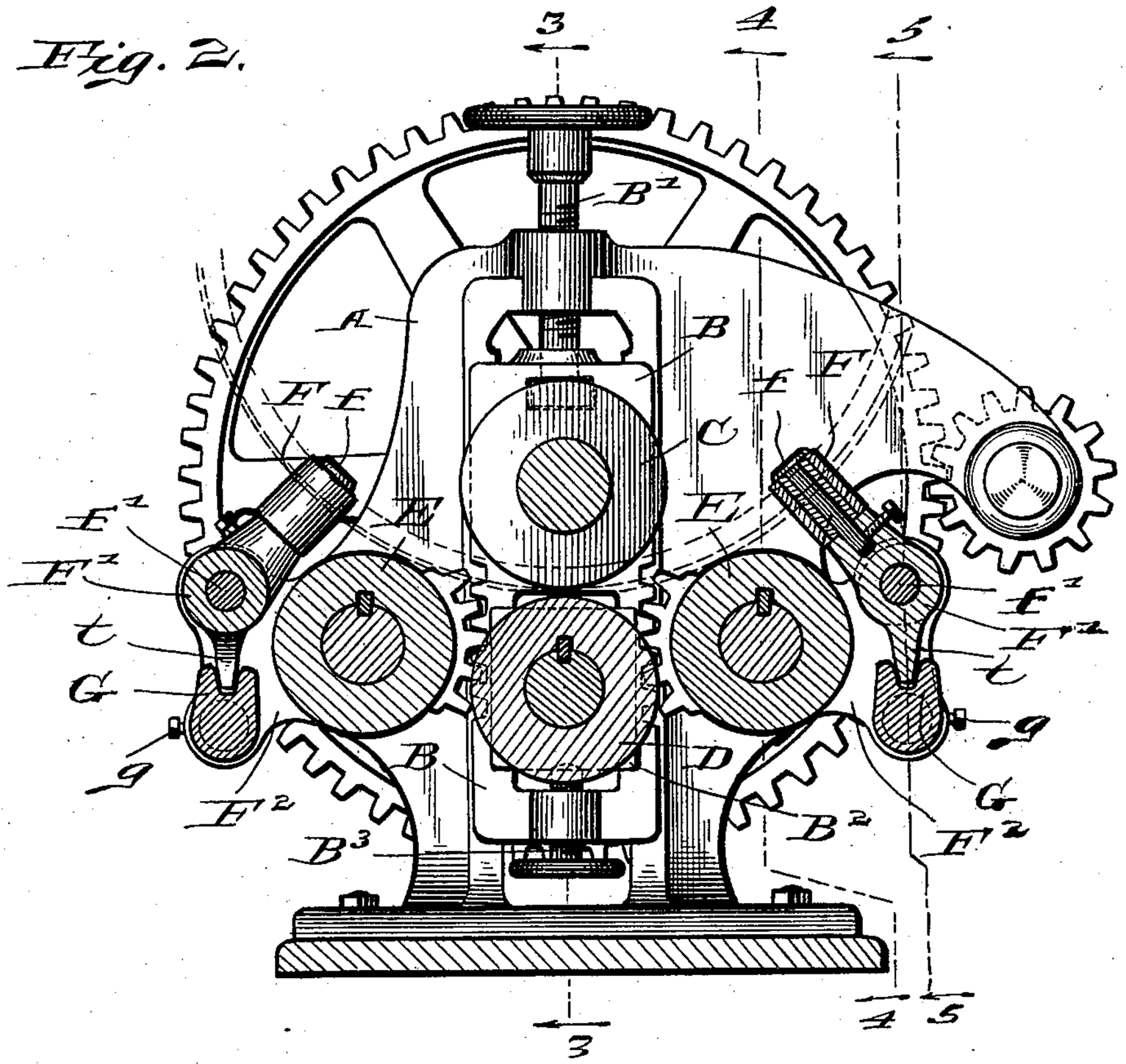


Fig. 6.

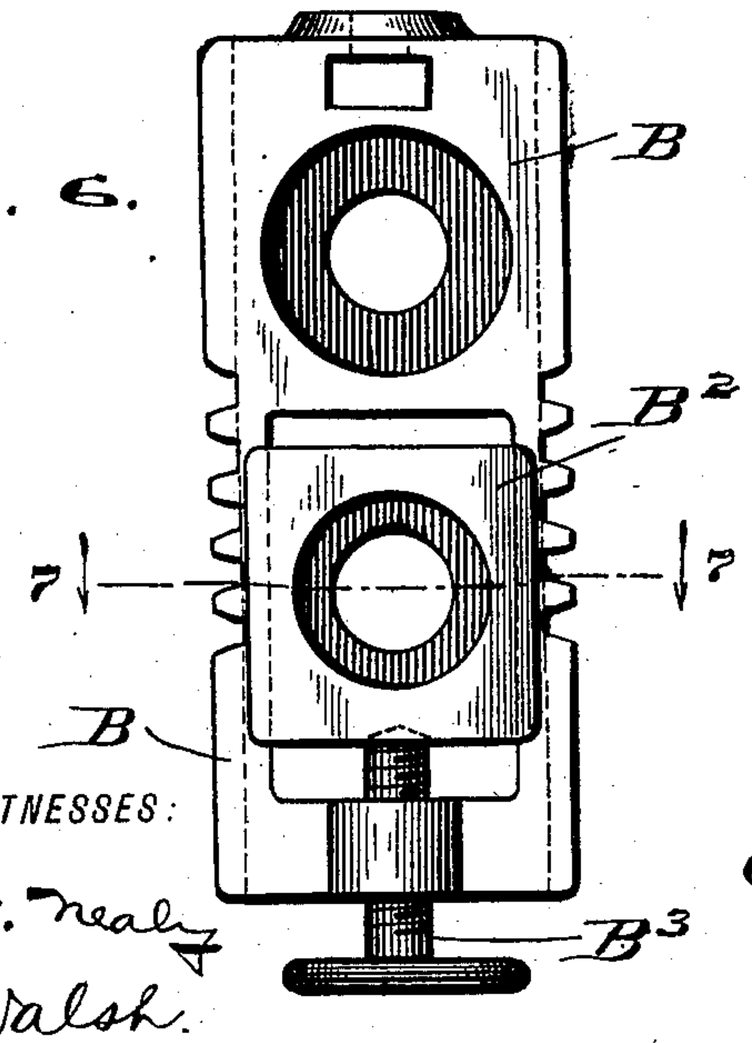
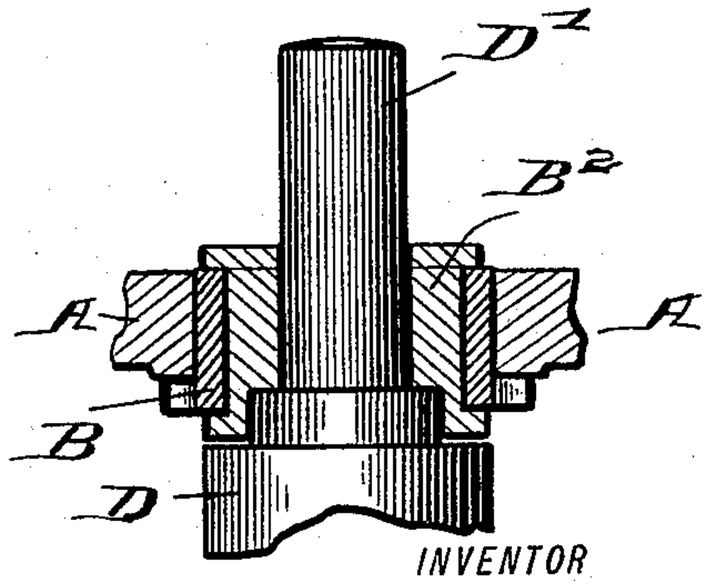


Fig. 7.



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METAL BENDING MACHINE.

No. 583,166. Patented May 25, 1897.

Fig. 3.

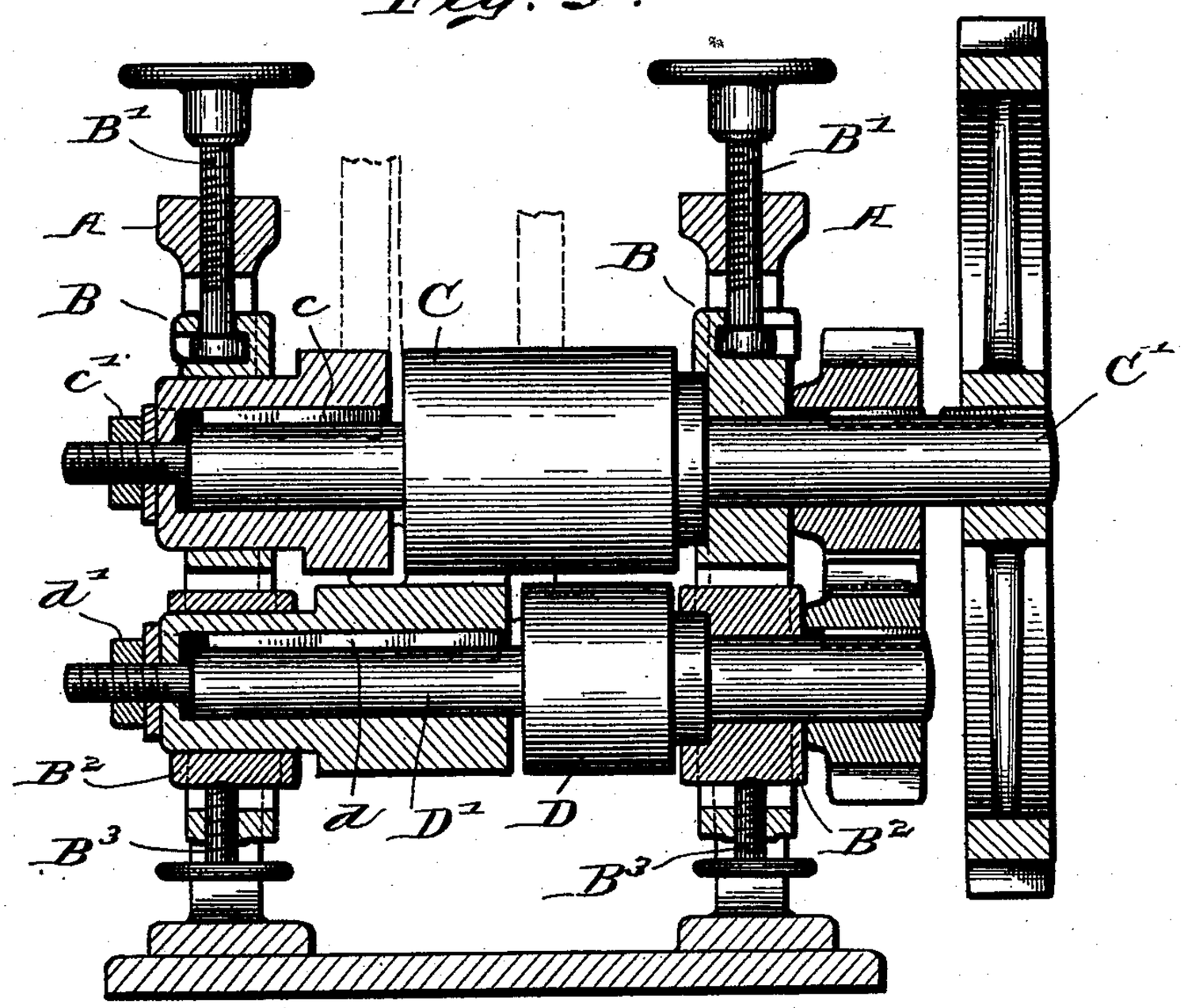

Fig. 8.

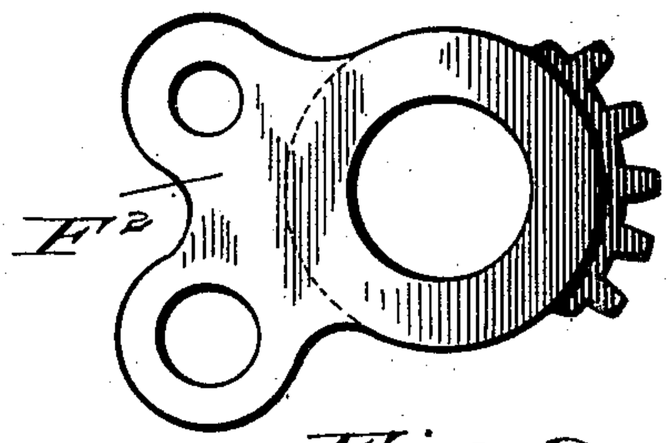

Fig. 9.

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METAL BENDING MACHINE.

No. 583,166. Patented May 25, 1897.

Fig. 5.

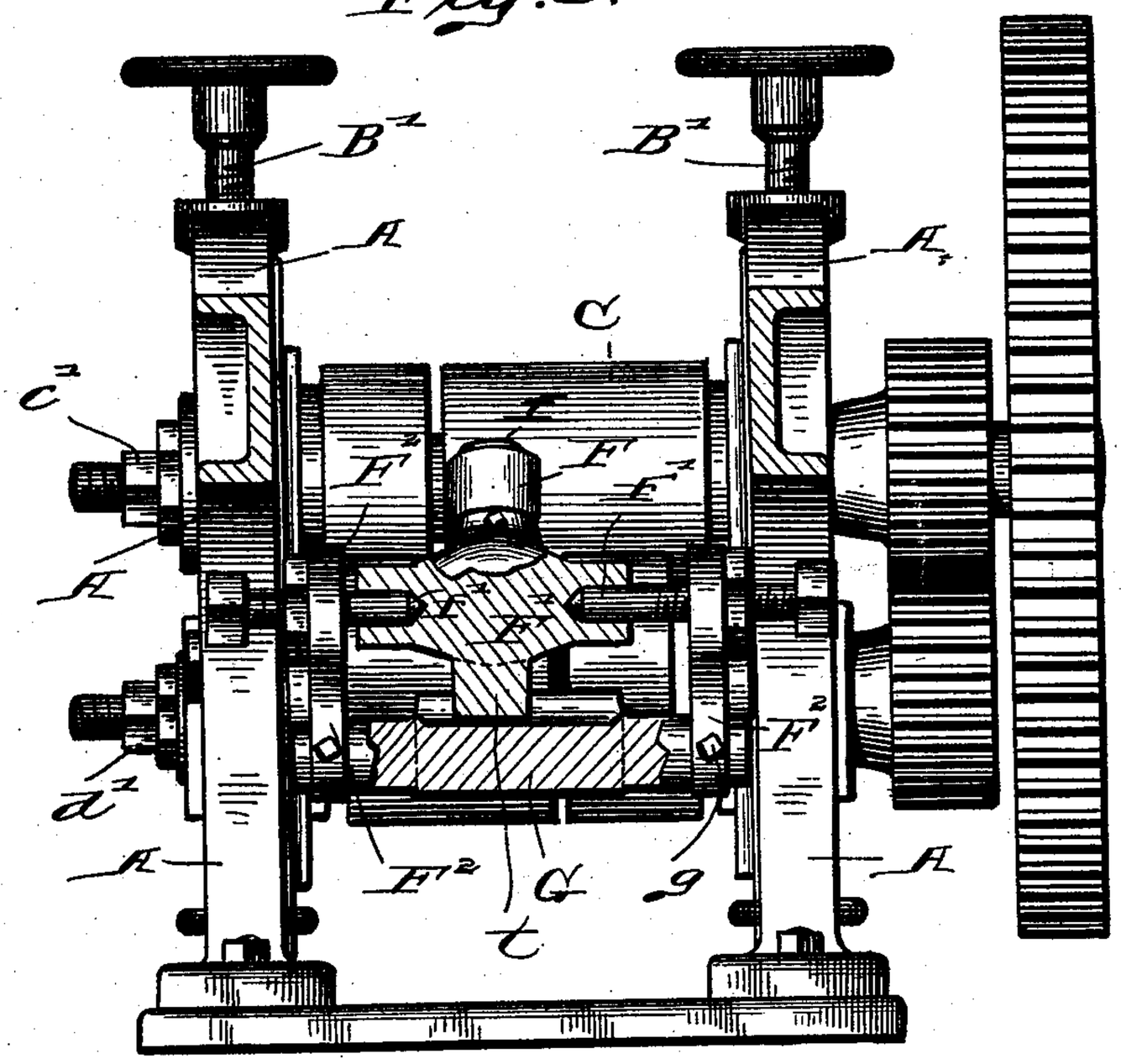
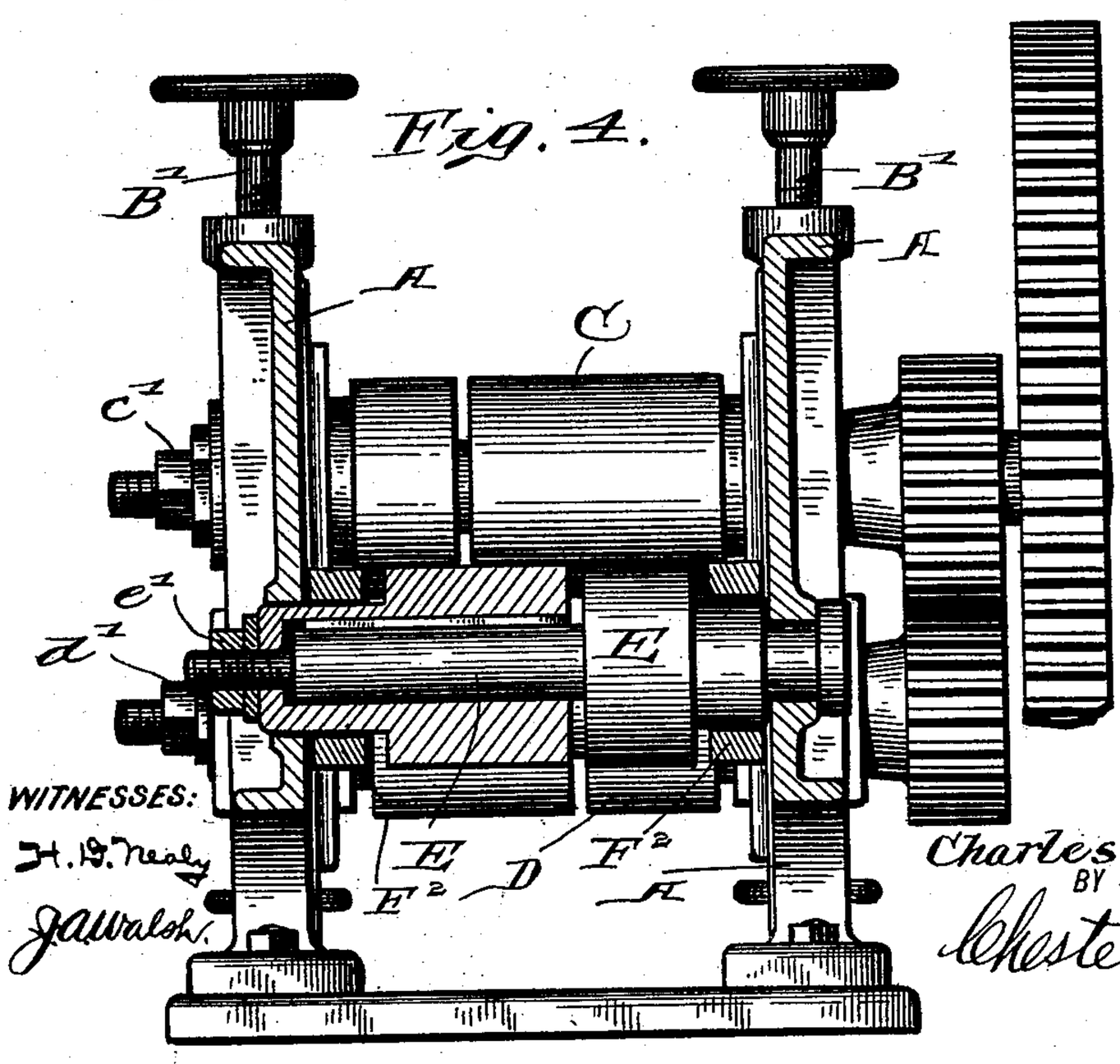


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES A. BERTSCH, OF CAMBRIDGE CITY, INDIANA.

METAL-BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 583,166, dated May 25, 1897.

Application filed May 11, 1896. Serial No. 591,096. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. BERTSCH, a citizen of the United States, residing at Cambridge City, in the county of Wayne and State of Indiana, have invented certain new and useful Improvements in Metal-Bending Machines, of which the following is a specification.

The principal object of my said invention is to produce a machine by which angle-iron can be bent into regular curves or circles of a true or even form. This has been difficult to do, because the tendency of such iron in being bent is to twist or warp sidewise, and it has required a great deal of extra work to restore it to a true condition after being bent.

A further object is to provide means for adjustment of the machine, so that curves or circles of varying dimensions may be produced on a single machine, and also so that iron of varying thicknesses may be treated.

A machine embodying my said invention will be first fully described and the novel features thereof then pointed out in the claims.

Referring to the accompanying drawings, which are made a part hereof and on which similar letters of reference indicate similar parts, Figure 1 is a top or plan view of such a machine, together with the driving-gear therefor; Fig. 2, a transverse vertical sectional view thereof, as seen from the dotted line 2 2 in Fig. 1; Figs. 3, 4, and 5, longitudinal vertical sectional views as seen from the dotted lines 3 3, 4 4, and 5 5, respectively, in Figs. 1 and 2, the gearing and portions of the rolls and similar parts being in each figure shown in elevation for purposes of better and more complete illustration; Fig. 6, a detached view of the adjustable frame containing the bearings for the driving-rolls; Fig. 7, a detail horizontal view as seen when looking downwardly from the dotted line 7 7 in Fig. 6 and including the end of the roll; Fig. 8, a detached side elevation of the support for the guide-rollers, and Fig. 9 a plan view of the same.

In said drawings the portions marked A represent the main frame of the machine; B, the adjustable frame carrying the driving-rolls; C and D, said driving-rolls; E, the bending or curving rolls; F, guide-rollers; and G, rocking heads, by which said guide-rollers are adjusted.

The frame A, as shown, is of suitable form to carry the various working parts of the machine. It contains stationary bearings for the gear and pulley shafts, and also for the curving-rolls E, as will be readily seen upon an inspection of the drawings. It also has large central slots or ways, within which the adjustable frames B are mounted. As shown in Fig. 1, I preferably provide a reversible driving-gear, and the machine is thus adapted to operate when running in either direction. By this means time is saved, as the machine does not run back idle.

The adjustable frames B are mounted in the large vertical ways formed centrally in the main frame A and are adapted to be raised and lowered as a whole by means of the heavy screws B′, which pass down through the upper portions of the frame A and engage with the upper ends of these adjustable frames, as shown most plainly in Fig. 3. Within the upper ends of the frames B are perforations, which serve as bearings for the upper drive-roll C. In the lower portions of said frames B are adjustable blocks B^2, in which are bearings for the lower drive-roll D. These bearing-blocks B^2 are adjusted by means of the heavy screws B^3, mounted in the lower ends of the frames B, as shown most plainly in Figs. 6 and 3. By this means the roll D may be adjusted nearer to or farther from the roll C, so as to accommodate thicker or thinner iron, or to grip the same more or less tightly without disturbing the position of the latter, and by turning the screws B′ the frames B, carrying both rolls, may be elevated or depressed in relation to the curving-rolls E and the amount of curvature caused in the iron by passing it through the machine thus varied as may be desired.

The roll C, as most plainly shown in Fig. 3, is mounted on the shaft C′, which in turn, as before stated, is mounted in the upper portion of the adjustable frames B. The shell or outer portion of this roll is divided into two parts, as also plainly shown in said Fig. 3, and one portion has its end turned to form a gudgeon for the roll and rests in the bearing in the corresponding frame B, while at

the other end the shaft C′ rests directly in said bearing. A spline *c* is inserted in appropriate keyways in the shaft and in the interior of the movable roll-section. The shaft, extends through to the outside of the frame and its extended end is turned down still smaller and is screw-threaded and bears a nut *c′*, as best shown in Fig. 3. The construction is such that by manipulating this nut one portion of the roll C can be adjusted toward the other and the groove between the two portions thus diminished or increased in width, thus adapting the machine for use with iron having thinner or thicker flanges, as will be readily understood. The spline *c* prevents any rotary movement between the parts, while freely permitting this longitudinal movement. As not only the end of the shaft, but also the end of the adjustable portion of the roll, extends through the frame B to the outside, this adjustment may be effected without dismembering the machine, all that is necessary being simply the manipulation of the nut *c′* and the corresponding nuts on the shafts of the other rolls.

The roll D is like the roll C, except that the fixed and movable sections are of differing lengths, so that the respective grooves between the ends of the sections shall not register. This roll, as before stated, is mounted in the adjustable blocks B^2, which in turn are carried by the frames B. Said roll is mounted on the shaft D′ and has the spline *d* and nut *d′* corresponding to the similar parts of the other roll structure.

The curving-rolls E are similar in construction to the rolls C and D, but are mounted in bearings formed directly in the frame A, as shown most plainly in Fig. 4. These rolls, like the rolls C and D, are divided in two parts and are provided with shafts, splines, and nuts.

As will be observed by an inspection of the drawings, the grooves in the rolls D and E are in registry or line, while the groove in the roll C is at a different point. As will also be observed and as is illustrated by means of dotted lines in Fig. 3, the grooves in the rolls D and E are used when it is desired that the flange shall be upon the outer side of the curve or circle being formed, while the groove in the roll C is used when it is desired that said flange shall be upon the inner side of such curve or circle. By arranging the grooves and constructing the rolls in the manner described I am therefore enabled to curve iron of varying sizes and thicknesses to any desired degree or curvature and with the flange either upon the outer or inner sides of the resulting curve or circle, and I am also enabled to accomplish by a single machine what has heretofore required either numerous machines or long rolls having numerous grooves to accomplish, while I am able to secure an accuracy of adaptation of the machine to its work hitherto unapproached.

As will be observed, I have illustrated a machine embodying four bending-rolls C D E E. As is well understood among those skilled in the art, an efficient bending-machine may be produced having three rolls only, and I wish it understood that I may dispense with the roll D, or with one of the rolls E, (together with the corresponding guide-roller,) without affecting the remaining features of my invention. I prefer not to do this, however, except in the smaller sizes of machines or for the lighter grades of iron or in bending large curves or circles. As will be readily understood, where the roll D is used it can be set so as to grip the metal bar tightly and feed it through the rolls with a positive feed, and where the two rolls E are used it is much easier to adjust the machine to produce perfect work, although the curvature can be made by proper manipulation of the rolls C and D in connection with but one roll E.

I have shown all four of the rolls as made in sections, with one section adjustable toward or from the other. In most cases this is mainly necessary with the rolls C and D. It is, nevertheless, an advantage with the heavier sizes of iron or in bending small curves to have the rolls E also adjustable in this particular, although not really necessary.

The guide-rollers F are mounted on stud-shafts *f*, which extend out from the rocker-heads F′, said rocker-heads, as shown most plainly in Figs. 1 and 5, being carried in swinging arms F^2, mounted on the ends of the rolls E. The immediate means of supporting the heads F′ are pivot-bolts *f′*, which extend into the ends thereof from the arms F^2. These pivot-bolts are provided with lock-nuts and are adjustable back and forth, so that the guide-rollers may be brought into line with either of the grooves, the position of said guide-rollers being preferably between the paths of travel of the iron in passing through the respective grooves, as is best illustrated in Figs. 1 and 5.

The rocking heads G are also mounted in the arms F^2 and are provided with grooves in their upper sides, as most plainly shown in Fig. 2, into which the projections *t*, extending out of the heads F′, enter. These rocking heads G are held in place in the arms F^2 by means of set-bolts *g*. When it is desired to adjust the angle of the guide-rollers relative to the curving-rolls, it is only necessary to loosen these set-screws *g*, rock the heads G somewhat in their bearings, and retighten the set-screws, as will be readily understood. This ordinarily, however, is not necessary, as the inner sides of the arms F^2 are in the form of toothed segments and the adjacent sides of the adjustable frames B are in the form of rack-bars engaging with said toothed segments, so that as the frames B carrying the rolls C and D are moved up and down the positions of the guide-rollers are correspondingly changed automatically. Nevertheless it is a fact that these devices need

occasional adjustment to adapt them for varying classes of work, and therefore the mechanism described is provided for the purpose.

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

1. In a metal-bending machine, the combination, of the frame, curving-rolls mounted therein, ways in said frame, adjustable frames in said ways, other ways in said adjustable frames, adjustable bearing-blocks in said ways, and rolls mounted, respectively, in said adjustable frames and said adjustable bearing-blocks, substantially as described and for the purposes specified.

2. In a metal-bending machine, the combination, of the frame containing bearings for the rolls, a roll-shaft, a two-part roll mounted thereon, one part of which has its end formed to serve as a gudgeon to rest in the bearing and extends through to the outside of the framework, an extension on said shaft projecting through said roll part to outside its end, and means including said shaft extension for moving said roll portion on said shaft from the outside, whereby adjustment between the two portions may be had without dismantling the machine, substantially as set forth.

3. The combination, in a metal-bending machine, with the bending-rolls, of guiding-rollers mounted on stud-shafts, rocking heads carrying said stud-shafts and provided with extensions or tailpieces, and other rocking heads engaging with said extensions or tailpieces and provided with means of adjustment, whereby the relations of said guiding-rollers to the bending-rolls may be adjusted, substantially as shown and described.

4. The combination, in a metal-bending machine, of the framework, bending-rolls mounted therein and provided with circumferential grooves, the groove in the upper roll or rolls not being in line with the grooves in the lower rolls, guide-rollers positioned alongside said rolls, and adjustable pivot-bolts supporting the heads on which said guide-rollers are mounted, whereby said rollers can be adjusted to proper relation with either of the sets of grooves, substantially as shown and described.

5. The combination, in a metal-bending machine, of a framework, bending-rolls mounted in said framework, adjustable frames between said rolls, other rolls mounted in said adjustable frames, pivoted arms mounted on the ends of the fixed rolls, and provided with or embodying tooth-segments, the adjustable frames being also provided with racks which engage with said segments, stud-shafts carried from the outer ends of said rocking arms, and guide-rollers on said stud-shafts, whereby, as said adjustable frames are raised or lowered, said guide-rollers are automatically varied in relation to the bending-rolls, substantially as set forth.

6. The combination, in a metal-bending machine, of a framework, bending-rolls mounted in said framework, adjustable frames or slides carrying one of the rolls, pivoted arms mounted on the ends of another roll, and a guide carried by said pivoted arms and extending out at substantially right angles across the path of the iron being bent, said arms being connected to said adjustable frames, whereby the position of the said guide is automatically changed as the positions of said frames are changed.

7. The combination, in a metal-bending machine, of a framework carrying bending-rolls, adjustable frames carrying the bearings for one or more of said rolls, pivoted arms mounted on another of said rolls and connected to said adjustable frames, a stud-shaft carried by said pivoted arms and extending out across the path of the metal being bent, a guide-roller mounted on said stud-shaft, and means for adjusting said guide-roller.

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 7th day of May, A. D. 1896.

CHARLES A. BERTSCH. [L. S.]

Witnesses:
CHESTER BRADFORD,
JAMES A. WALSH.