

(No Model.)

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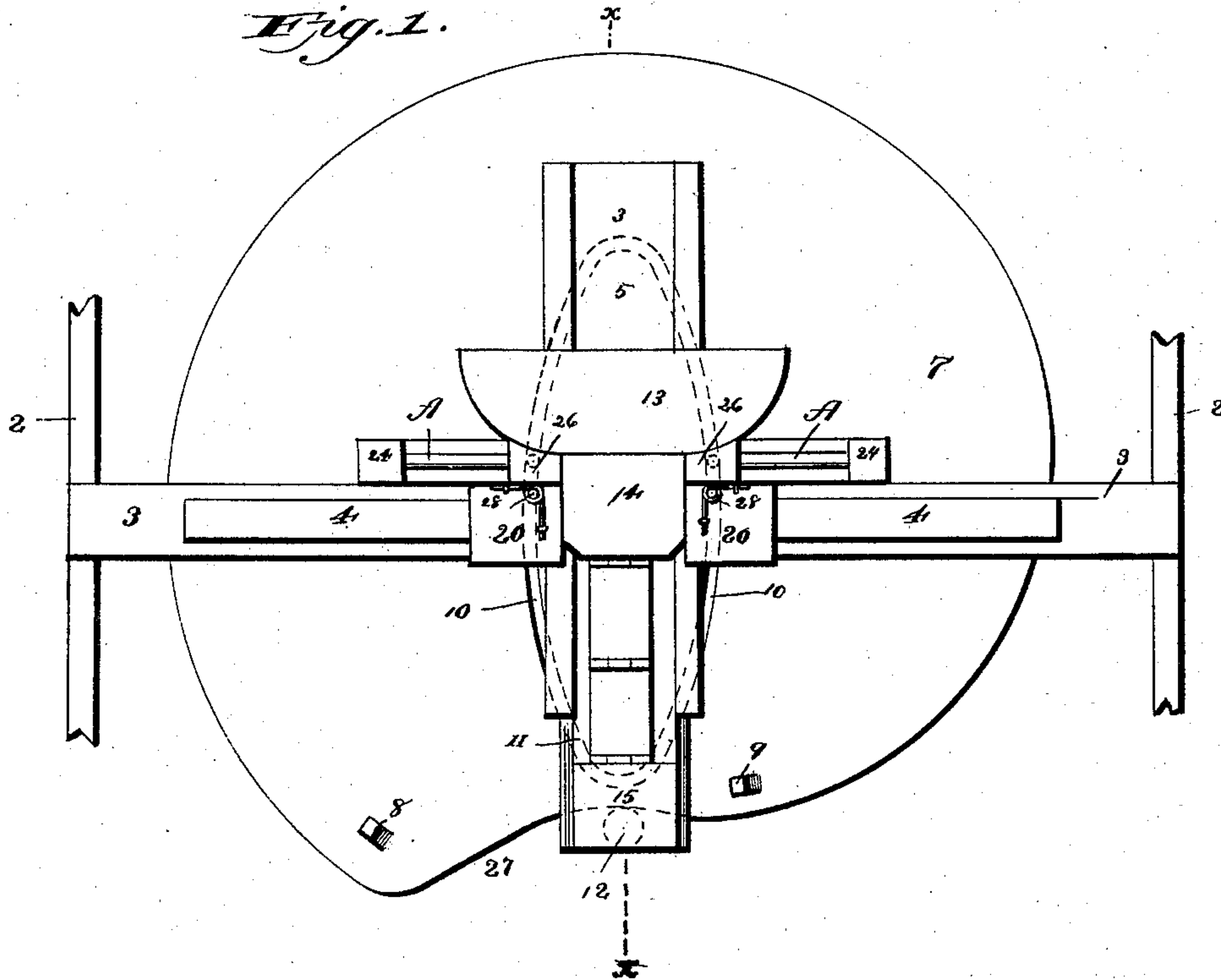
J. F. McNUTT & H. F. GRIMMESEY.

TUBE BENDING MACHINE.

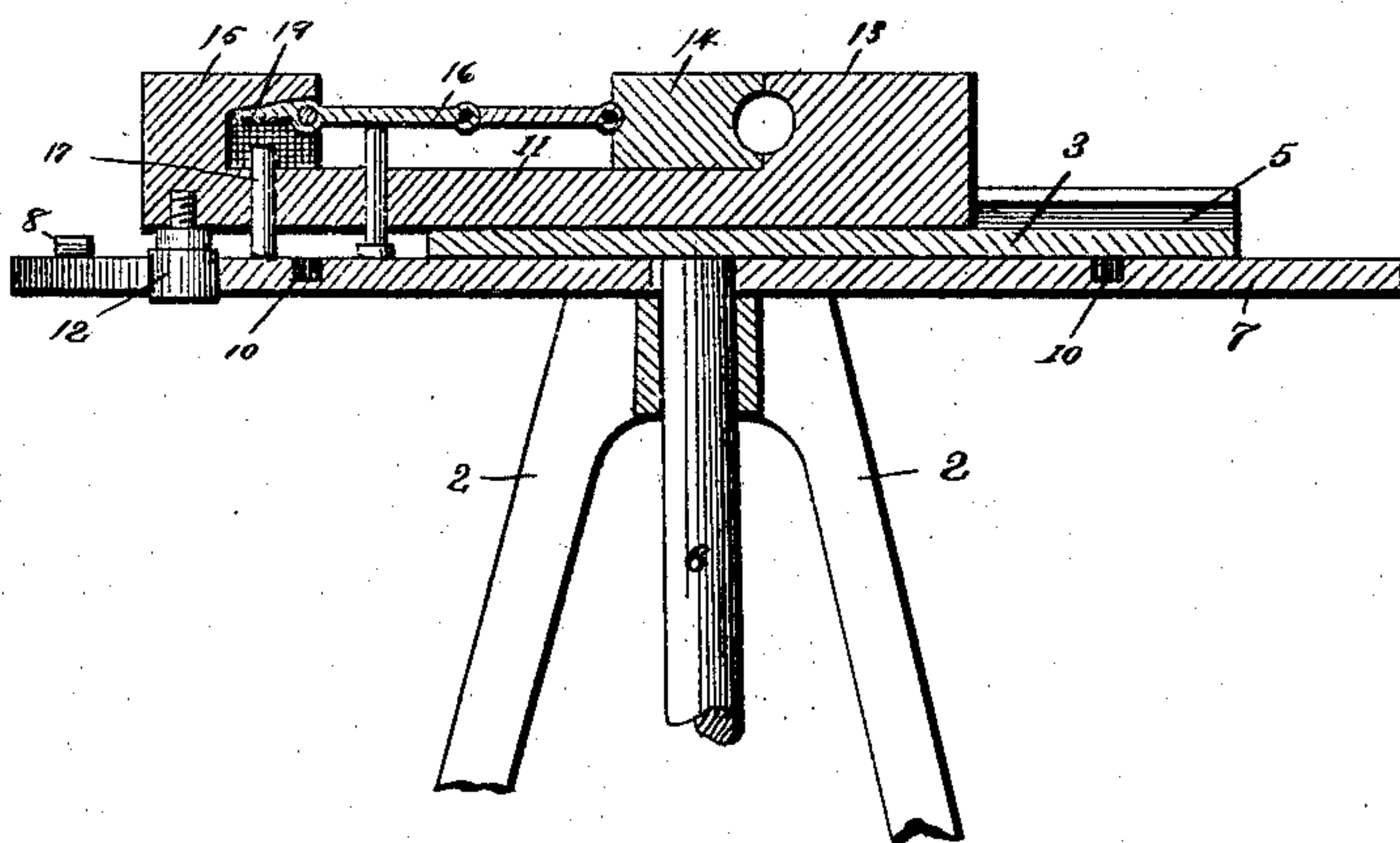
No. 407,675.

Patented July 23, 1889.

*Fig. 1.*



*Fig. 2.*



Witnesses

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By their Attorney

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(No Model.)

2 Sheets—Sheet 2.

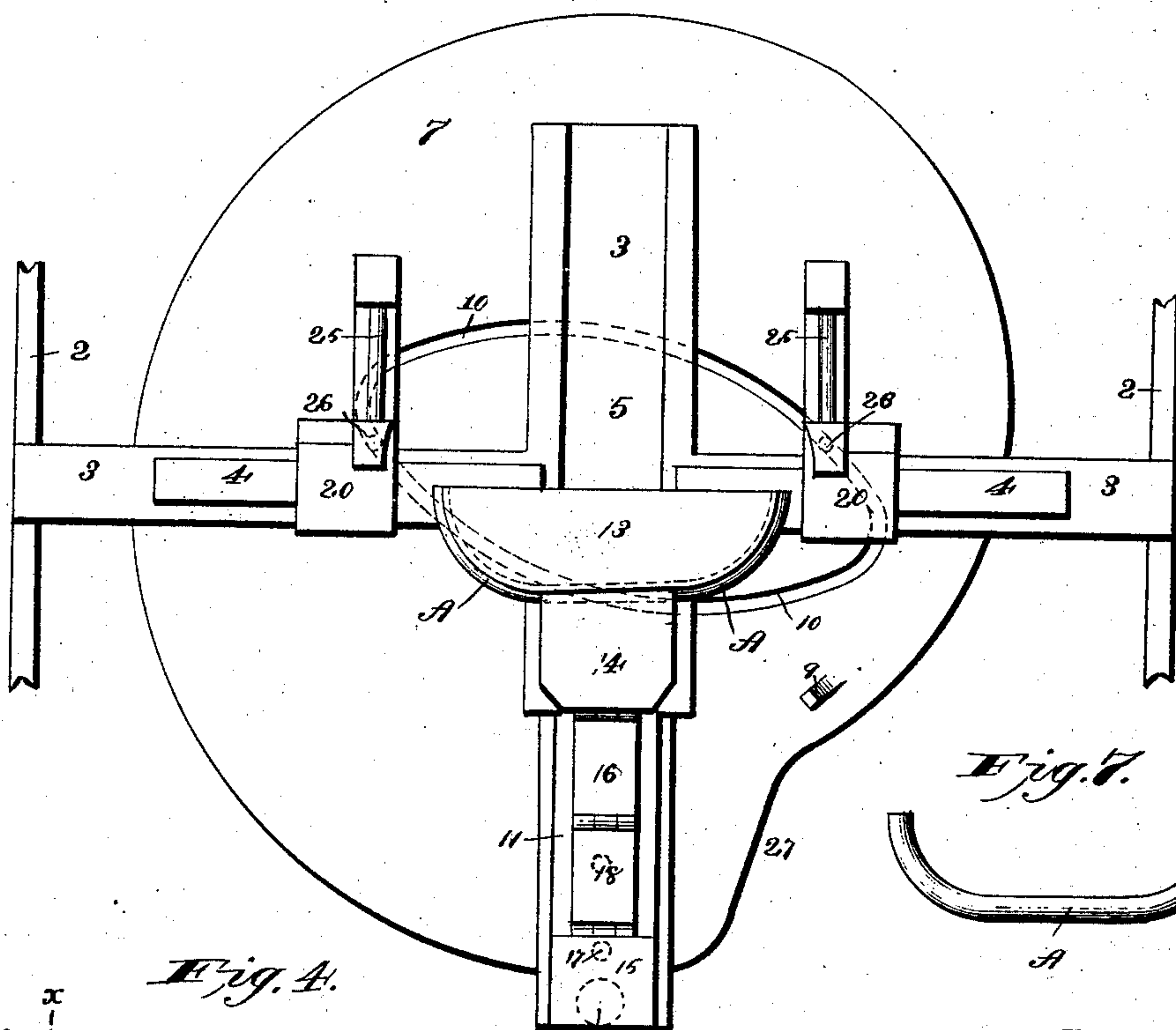
J. F. McNUTT & H. F. GRIMMESEY.

TUBE BENDING MACHINE.

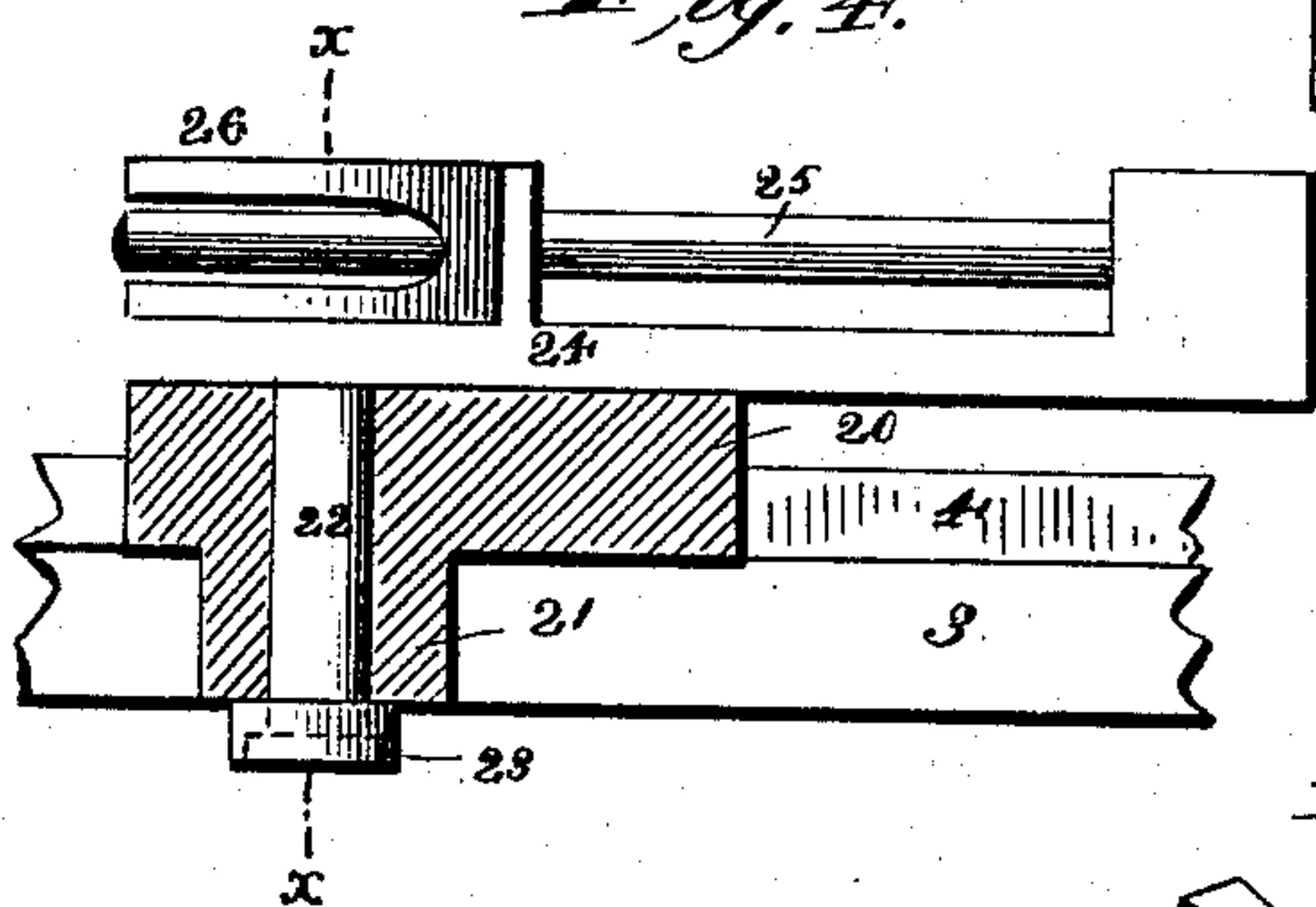
No. 407,675.

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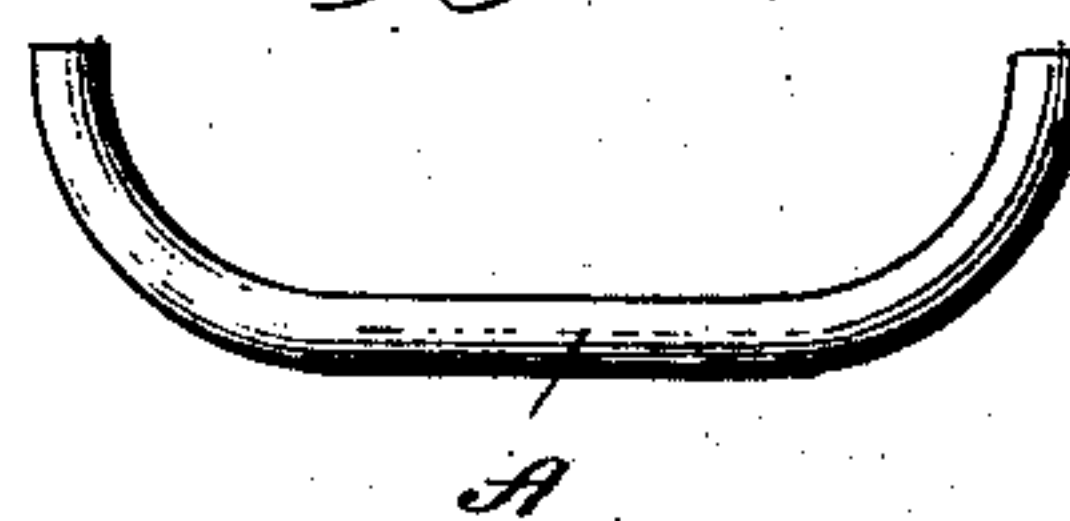
*Fig. 3.*



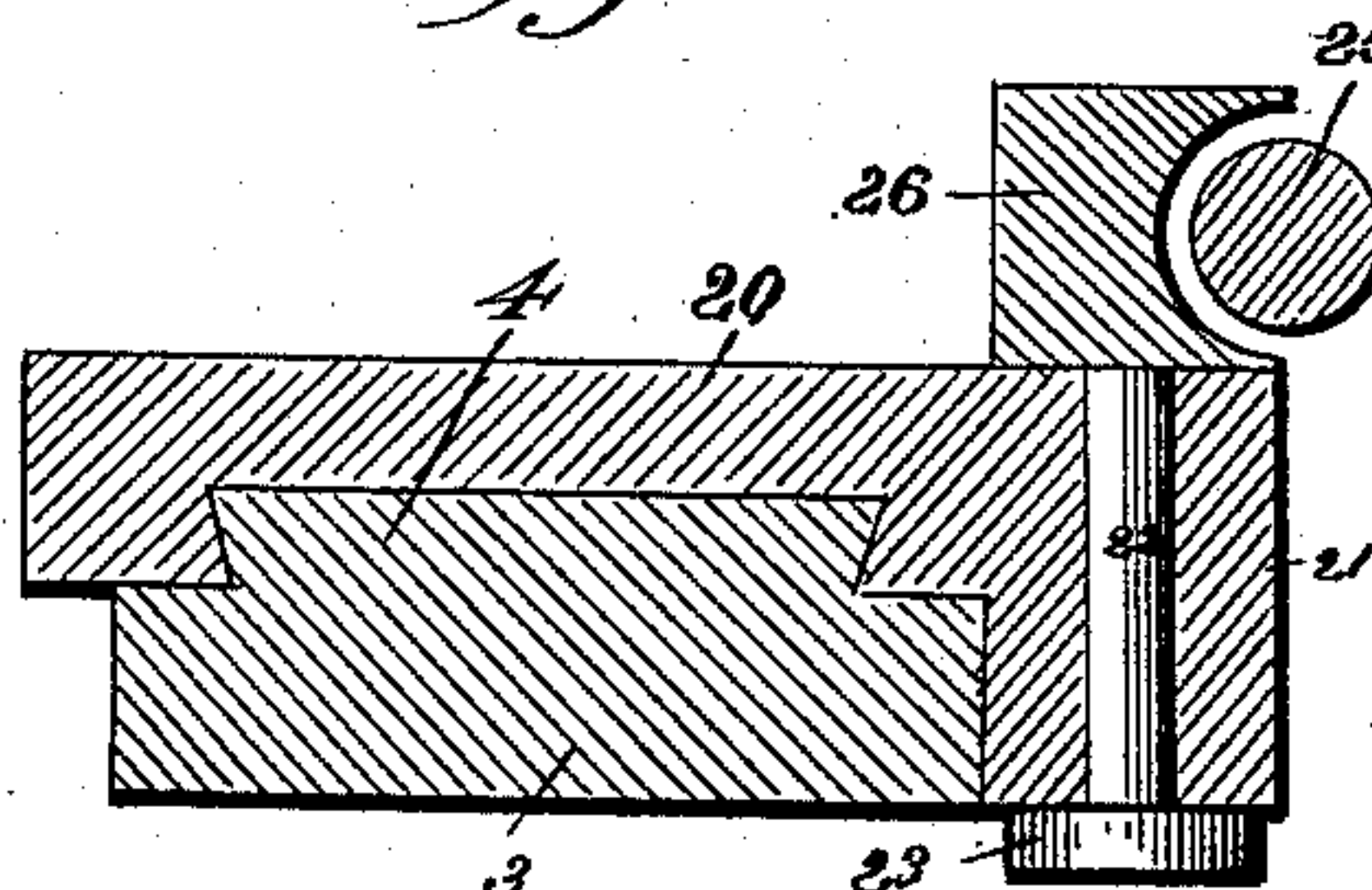
*Fig. 4.*



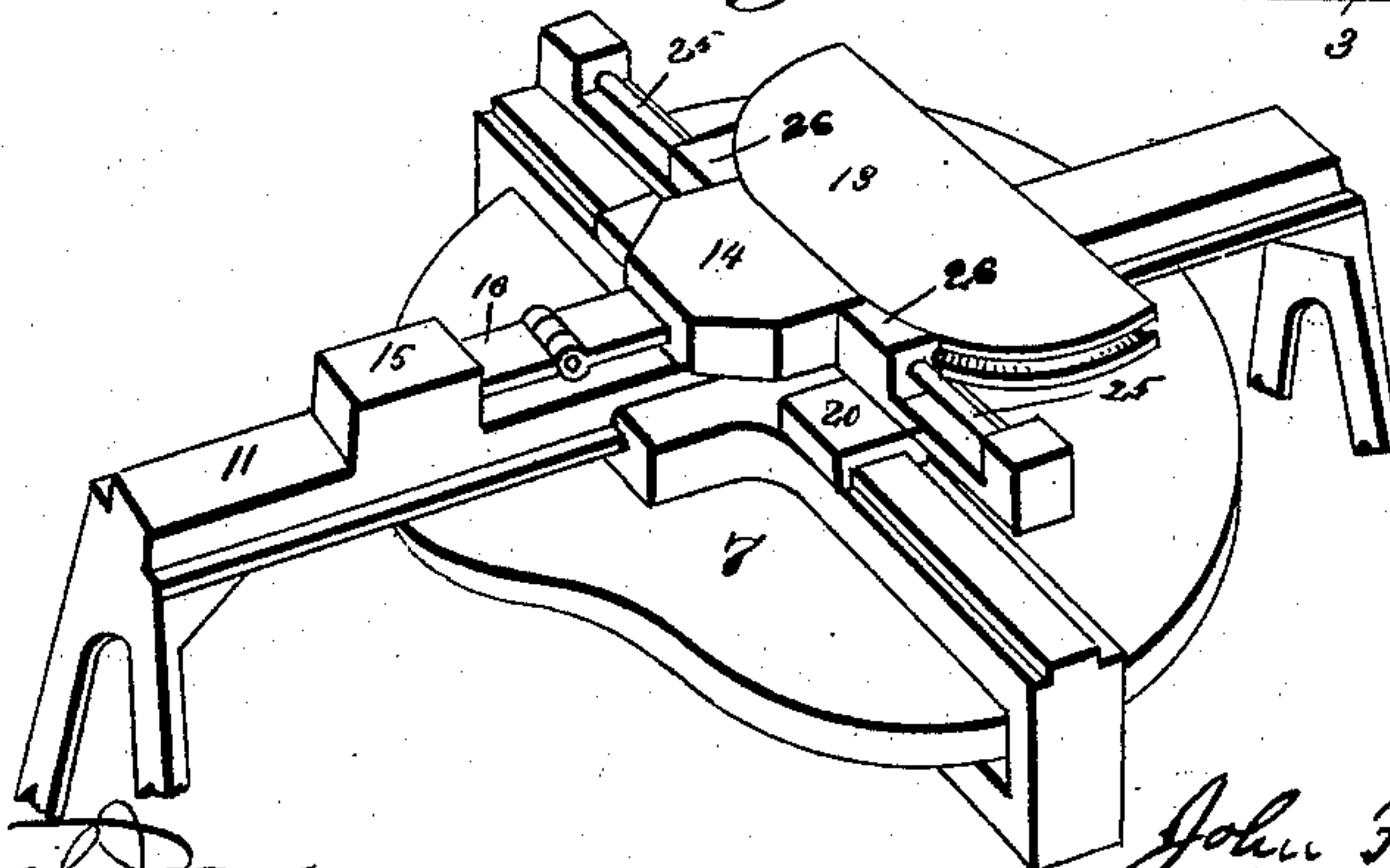
*Fig. 7.*



*Fig. 5.*



*Fig. 6.*



Witnesses

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# UNITED STATES PATENT OFFICE.

JOHN F. McNUTT AND HIRAM F. GRIMMESEY, OF WARREN, OHIO.

## TUBE-BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 407,675, dated July 23, 1889.

Application filed March 19, 1889. Serial No. 303,931. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN F. McNUTT and HIRAM F. GRIMMESEY, citizens of the United States, residing at Warren, in the county of Trumbull and State of Ohio, have invented certain new and useful Improvements in Tube-Bending Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

10 The object of the present invention is to produce a simple and practical machine whereby sheet-metal tubes may be accurately and rapidly bent at both ends at one operation, the operations of clamping, bending, and releasing the tube being accomplished automatically, as will be more fully hereinafter set forth.

20 The nature of the invention will be fully understood and appreciated from the following description, when taken in connection with the accompanying drawings, in which—

Figure 1 represents a plan view of our improved machine, the tube A being clamped in position ready to be bent; Fig. 2, a vertical sectional view upon the line  $x x$  of Fig. 1; Fig. 3, a plan view of the machine, the bending of the tube A having just been completed and the clamping device being about to release the same; Fig. 4, a detail side elevation, partly in section, of one of the sliding mandrels for holding the ends of the tubes during the process of bending; Fig. 5, a vertical sectional view on the line  $x x$  of Fig. 4; Fig. 6, a perspective view of a modification of the invention; and Fig. 7 a detail view of the bent tube.

30 In the drawings, the numeral 2 designates a suitable supporting-frame supporting a suitable bed-plate 3, which is provided with the ways 4 4 and the groove 5, the latter being at right angles to the said ways. Journalled in the frame is a vertical shaft 6, provided at its upper end with a horizontal cam 7, this cam being provided upon its upper face with the beveled lugs 8 and 9 and an approximately elliptical groove 10, as shown. Working in the said groove 5 is a sliding bar 11, provided upon its underside at one end with a depending anti-friction roller 12, which 45 bears against the periphery of the cam, and upon its upper side, at the other end, with a former 13, rigidly secured to the said slide

and having its front edge curved and provided with a semicircular groove for the reception of the tube. The front edge of this former is curved to any desired degree and shape, according to the degree of curvature to be given to the tube.

55 Supported upon the sliding bar 11 in close proximity to the former 13 is a clamping-block 14, which is pivotally connected to an abutment 15 upon the sliding bar by means of a pair of toggle-levers 16, and is provided in its edge adjacent to the former with a semicircular groove similar to the one in the front edge of the former. Passing loosely through apertures in the sliding bar 11 and resting upon the face of the cam are two vertically-movable pins, numbered, respectively, 17 and 18, the former being located immediately below an extension 19 of the toggle-levers, and the latter between the pivotal connection to the abutment and the joint or knuckle of the toggle, these pins being adapted to be operated successively by the beveled lugs 8 and 9.

75 Adapted to work upon the ways 4 at right angles to the sliding bar 11 are two independent slides 20 20, each of which is provided with a downward extension 21 at one side, this portion 21, as shown in Figs. 4 and 5, extending down alongside of the bed-plate. Passing vertically through these slides and their depending portions 21 are vertical pivotal pins 22, provided upon their lower projecting ends with anti-friction rollers 23, which latter rest in the elliptical groove 10 in the cam. Pivotaly secured to these slides, preferably by the said pins 22, are the mandrels 24, for holding the ends of the tube while the tube is being bent. These mandrels each consist of a bar having rigidly secured to a block upon its outer end an inwardly-projecting rod 25, which terminates about even with the inner end of the mandrel-bar. Secured rigidly upon the inner ends of the mandrel-bars and surrounding the ends of the rods 25 are the ring-dies 26, there being sufficient space between the interior of the dies and the bars for the free passage of the tube. These rods and dies serve to guide the ends of the tube and preserve its sectional area and contour while being bent or curved.

100 The operation is as follows: The tube to be bent is inserted upon the mandrel-rods 25 and



between the grooved edges of the former and clamp. The cam 7 is then revolved in the direction of the arrow. As the cam rotates, the lug 9 will first raise the pin 17, and thereby, through the medium of the toggle, securely clamp the tube between the clamp and former. The cam continuing to rotate in the same direction, the sliding bar 11, together with the former and clamp, will, by means of the roller 12 and the abrupt portion or incline 27 of the cam, be drawn forward in the direction of arrow shown in Fig. 1. As the cam thus rotates and the former moves forward, the slides 20 will, by means of the elliptical groove 10 and the rollers 23, be caused to move out in opposite directions away from the clamp, the pivoted mandrels, holding the ends of the tube, being swung around gradually as the former advances until they assume a position approximately at right angles to that which they normally occupy, the corners of the ring-dies 26 being beveled or cut away to conform to the curvature of the edge of the former. When the tube is completely bent and the former has advanced its maximum distance, the slides 20, with their mandrels, will have been carried out a sufficient distance to entirely free the tube at both ends, as shown in Fig. 3. As the cam still continues to rotate, the beveled lug 8 will raise the pin 18 and release the tube by drawing back the clamp 14 through the medium of the toggle. While the cam is completing its revolution the operator may insert another tube upon the mandrels and the operation be repeated. In order that the slides and mandrels may be readily drawn out to insert or remove a tube, we may, if it is desired, make the pins 22 vertically movable, in order that the rollers 23 may be disengaged from the groove 10 in the cam. To restore the mandrels to their normal positions automatically after each operation, springs 28 may be employed.

In the modified form of the machine shown in Fig. 6 the parts 11 and 13 are stationary, being attached to the frame of the machine, and the sliding blocks, carrying the mandrels and their ways, are made movable, the same effect being produced.

What we claim and desire to secure is—

1. The combination, with a support and bed-plate, of a sliding bar provided with a former, and oppositely-movable mandrels upon opposite sides of the former, substantially as herein described.

2. The combination, with a support and bed-plate, of a sliding bar provided with a clamp and former, a cam for operating this sliding bar, and oppositely-movable mandrels arranged upon opposite sides of the said former, substantially as described.

3. The combination, with a support and bed-plate provided with ways and a groove at right angles to the said ways, of a former and a bar moving in said groove, slides mounted on the ways, and pivoted mandrels mounted on the said slides, substantially as described.

4. The combination, with a bed-plate, of a former supported by the said bed-plate, a tube-clamp, slides upon opposite sides of the former and adapted to move in opposite directions, and pivoted mandrels upon the said slides, substantially as described.

5. The combination, with a support and bed-plate, of a former and clamp therefor, oppositely-moving slides located upon opposite sides of the former, pivoted mandrels upon these slides, and a cam provided with a groove for moving the said slides, substantially as described.

6. The combination, with a former, a sliding clamping-block, and a toggle-lever provided with an extension and connected to the said clamping-block, of vertically-moving pins adapted to operate the said lever, and means for operating the pins, substantially as described.

7. The combination, with a former and clamp, of oppositely-moving slides upon opposite sides of the former, and mandrels pivoted upon these slides, these mandrels being provided with inwardly-projecting rods and ring-dies, as and for the purpose described.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN F. McNUTT.

HIRAM F. GRIMMESEY.

Witnesses:

T. L. WARNER,  
JAMES B. STULL.