

No. 785,083.

PATENTED MAR. 21, 1905.

L. H. BRINKMAN.
APPARATUS FOR BENDING PIPE.
APPLICATION FILED DEC. 16, 1904.

Fig. 1.

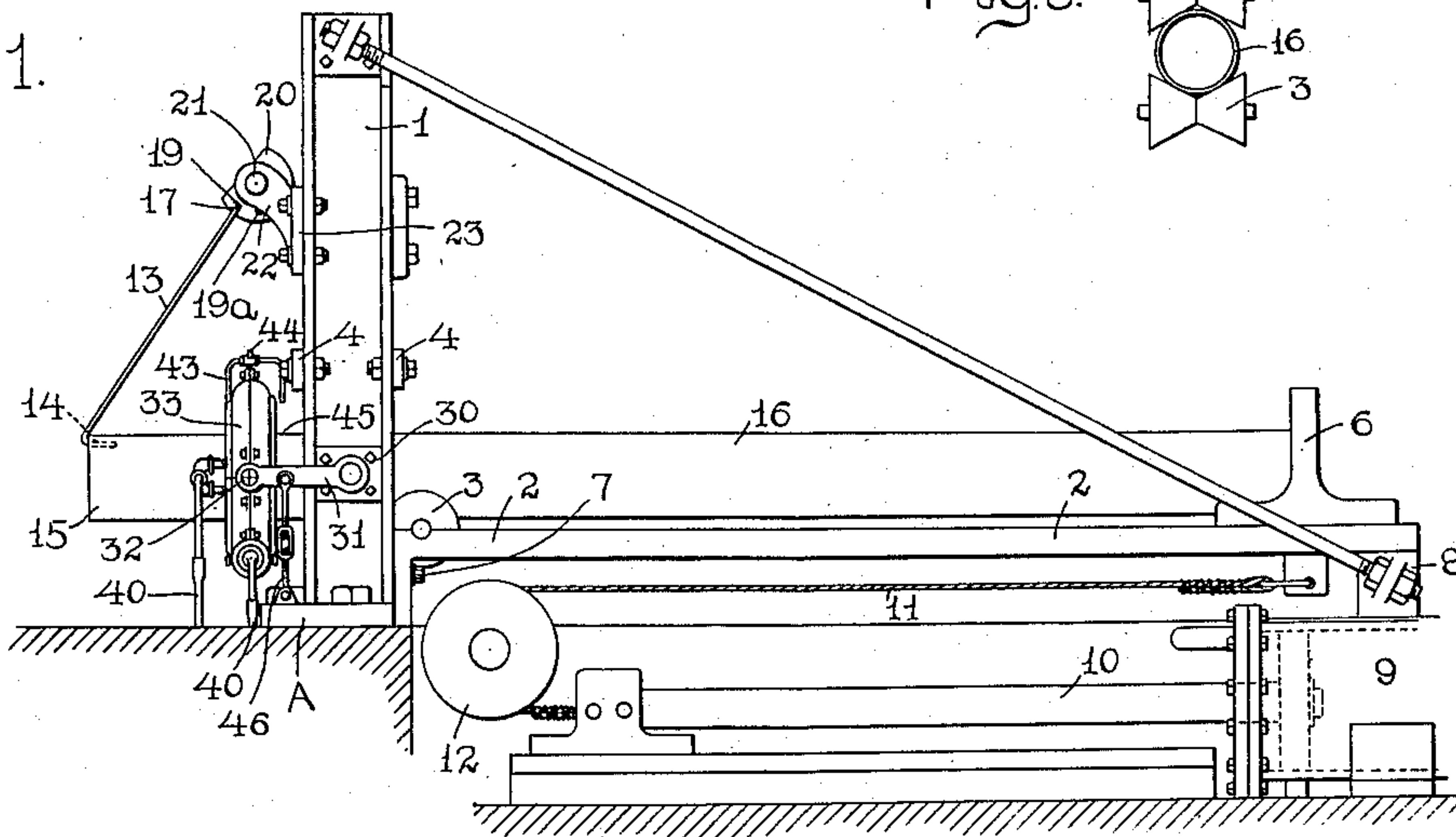


Fig. 6.

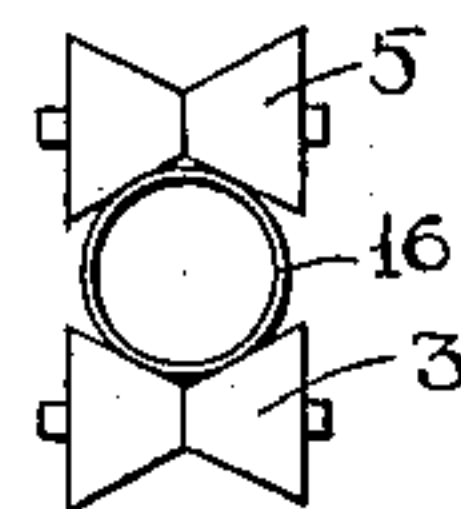


Fig. 2.

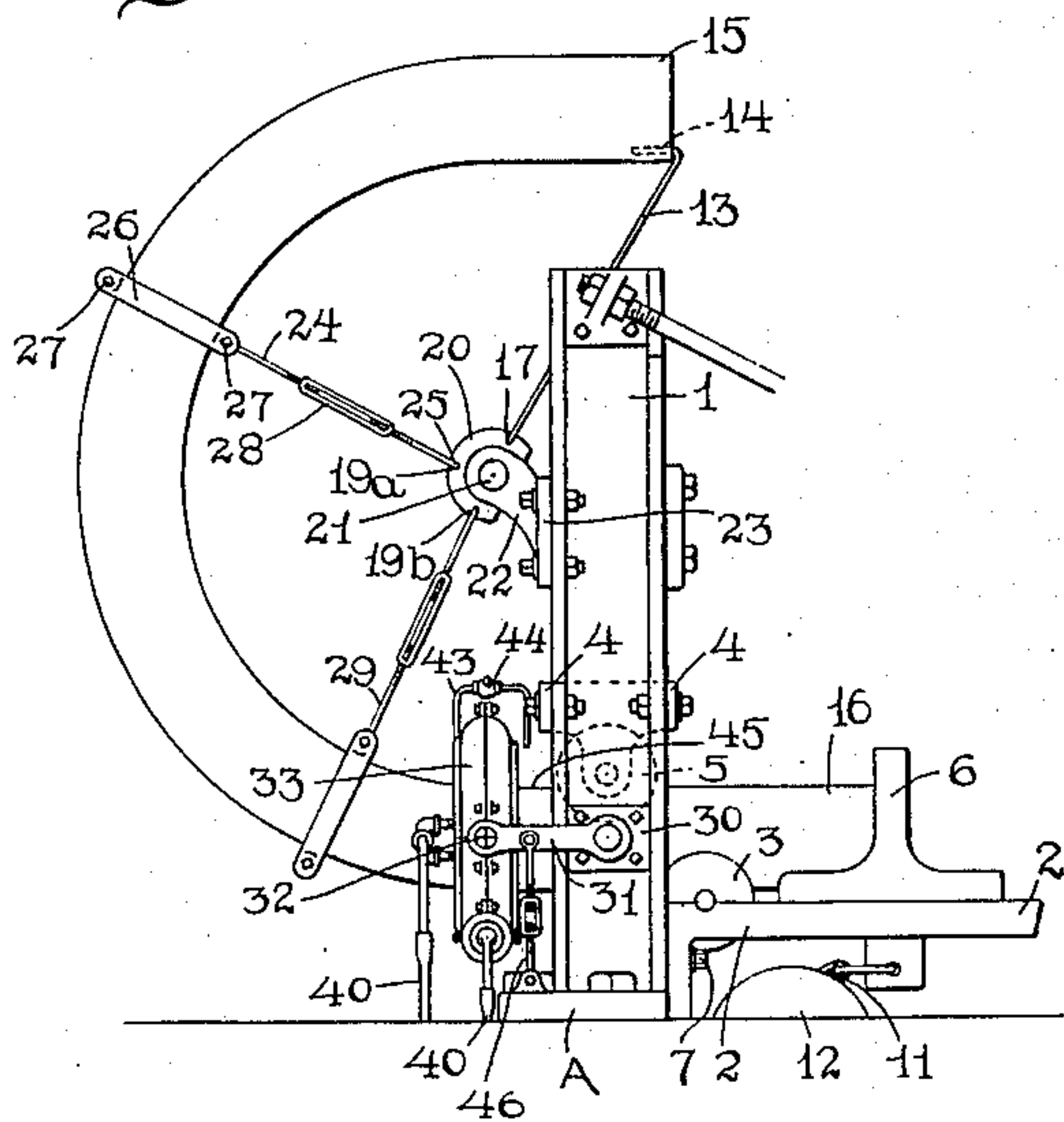


Fig. 3.

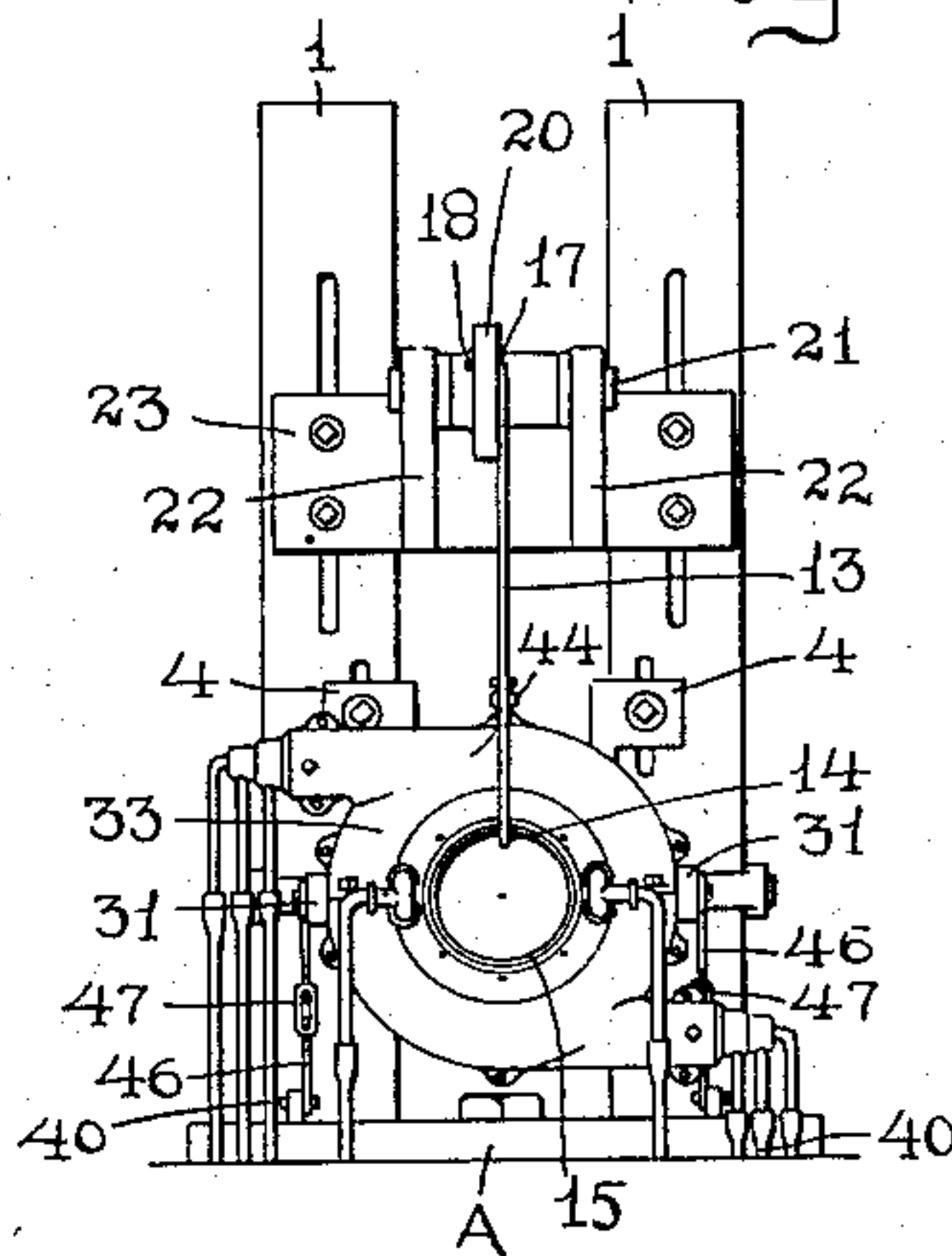


Fig. 4.

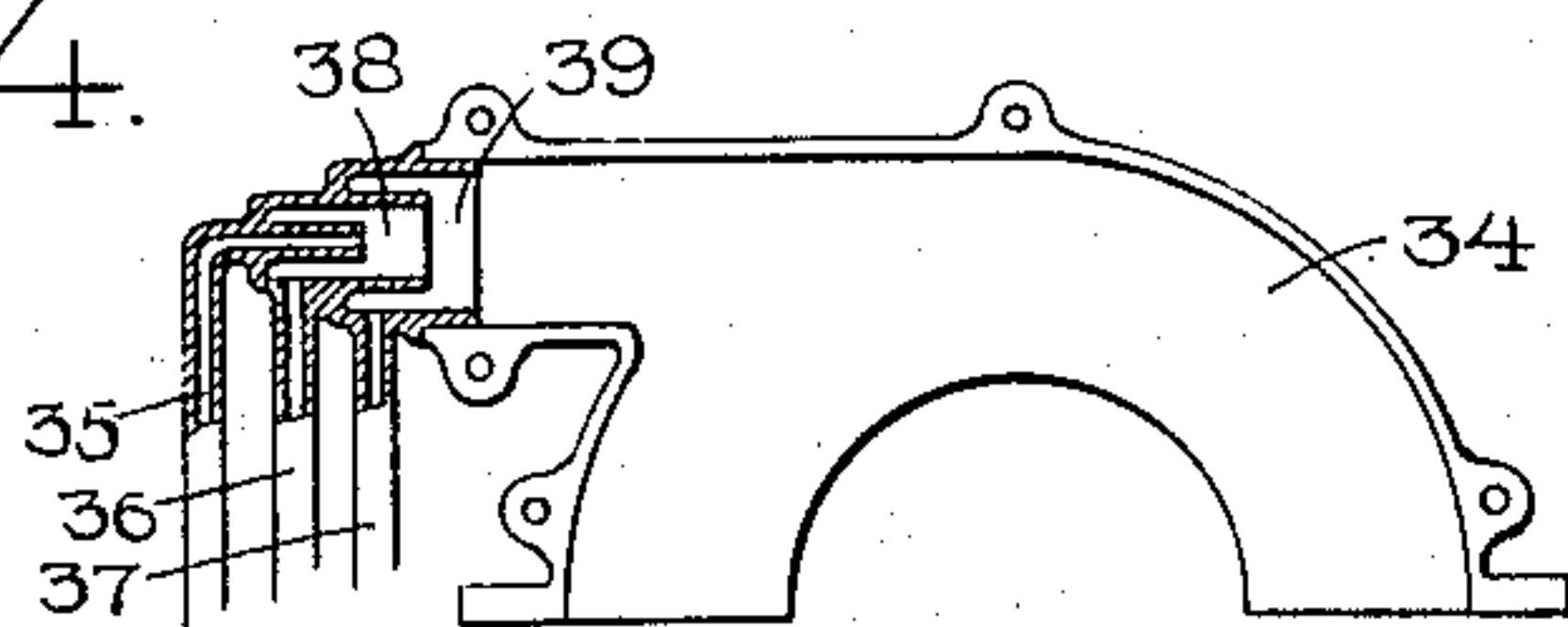
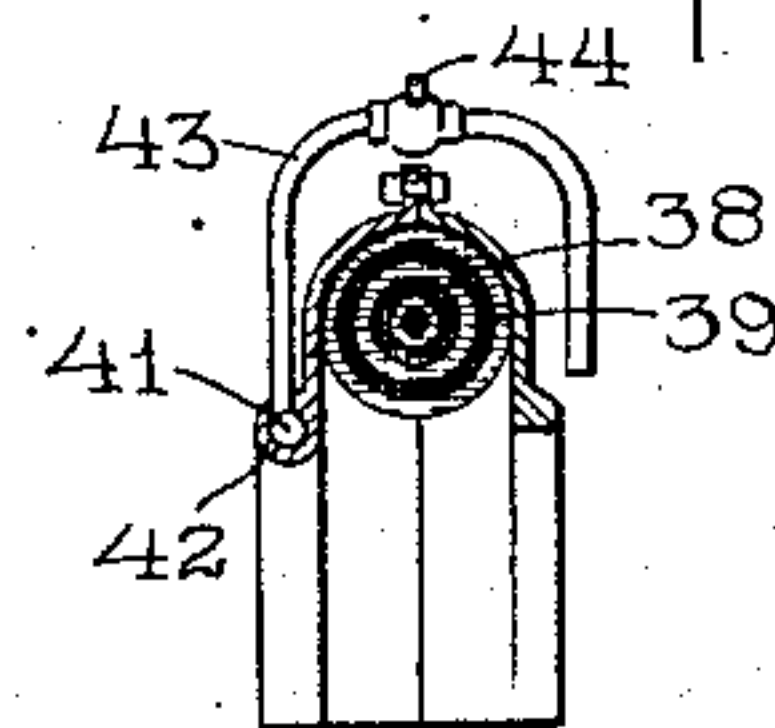


Fig. 5.



Witnesses

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APPARATUS FOR BENDING PIPE.

SPECIFICATION forming part of Letters Patent No. 785,083, dated March 21, 1905.

Application filed December 16, 1904. Serial No. 237,067.

To all whom it may concern:

Be it known that I, LOUIS H. BRINKMAN, a citizen of the United States, residing at West Hartford, in the county of Hartford and State of Connecticut, have invented a new and useful Improvement in Apparatus for Bending Pipe, of which the following is a specification accompanied by drawings forming a part of the same, in which—

Figure 1 represents a side elevation of my apparatus at the beginning of the operation. Fig. 2 represents the same after a semicircular bend has been given to a pipe. Fig. 3 represents a front view. Fig. 4 is an enlarged vertical central sectional view of the upper half of the burner with the plane of the section at right angles to the axis of the pipe. Fig. 5 is an enlarged sectional view of the upper half of the burner with the plane of the section parallel to the axis of the pipe, and Fig. 6 is a detached view showing the shape and position of the supporting-rolls with reference to the pipe.

Similar reference letters and figures refer to similar parts in the different views.

The object of my present invention is to provide an improved apparatus for bending metal pipe, especially pipe of the larger sizes, without requiring the pipe to be filled to resist any crushing strain incident to the process of bending and which will enable the pipe to be uniformly and gradually bent by the automatic action of the bending apparatus.

My invention relates to improvements upon the pipe-bending apparatus described and claimed in my application Serial No. 208,094, allowed November 9, 1904. In that apparatus I feed a pipe, supported in a horizontal position and held from displacement by the bending strain, longitudinally past a heating apparatus adapted to successively heat limited sections of it, and at the same time I hold the advancing end of the pipe at a fixed distance from a point concentric with the curvature of the pipe, which may be determined as desired, and I also provide means for immediately cooling the bent portion as it is fed past the heating apparatus in order to preserve its curvature.

My improvement relates to means for adjusting the annular burner to make it concentric with different sizes of pipe, to means of support for the curved portion of the pipe to insure uniformity of curvature and to prevent distortion and flattening of the pipe under the bending strain, which is especially advantageous when the curvature of the pipe is to exceed ninety degrees, to means for unequally heating the periphery of the pipe, and also to means for controlling the advance movement of the pipe, and I accomplish these results by the construction and arrangement of parts as hereinafter described, and pointed out in the annexed claims.

Referring to the accompanying drawings, 1 1 denote vertical posts mounted on a base A. Suitably supported by a frame 2 at the rear of the posts is a grooved roll 3. Adjustably attached to the posts 1 1 above and in front of the roll 3 are brackets 4, in which is journaled a similar grooved roll 5. (Shown by dotted lines in Fig. 2.) The roll 5 may be vertically adjusted to fit pipe of varying sizes received horizontally between the rolls. These rolls serve for a support for the pipe to be bent and also by their grooved shape prevent lateral movement of the pipe, as shown by Fig. 6. They also resist the bending strain as the pipe is moved forward. Any desirable method of imparting a forward movement to the pipe may be employed, in this instance a pushing-plate 6, mounted upon ways on the frame which is attached at 7 to the posts 1 and supported at its outer end by the posts 8. The pushing-plate 6 is moved by a hydraulic cylinder 9, with a piston-rod 10 connected with the pushing-plate 6 by a flexible connection 11, passing over a wheel 12. This forward movement of the pipe is resisted by a radial rod 13, the lower end of which is provided with a hook 14, which is inserted in the end 15 of the pipe 16 to be bent. On the other end 17 of the radial rod 13 is a hook 18, which is inserted in a hole 19 in a plate 20, carried by a rock-shaft 21, journaled in brackets 22, projecting from the plate 23, which is adjustably mounted on the posts 1 1 at a suitable distance above the grooved rolls 3 and 5 to

give the desired curvature to the pipe under the bending strain exerted by the radial rod 13 as the pipe is pushed forward. By the adjustment of the plate 23 on the posts 11 the distance from the end 15 of the pipe 16 and the plate may be increased or diminished and a longer or shorter radial rod inserted to vary the curvature of the pipe. The plate 20 is also provided with other holes, 19^a and 19^b, similar to the hole 19 and arranged at intervals near its periphery. When the pipe has been advanced under the bending strain exerted by the radial rod 13 sufficiently to make the curvature of the pipe greater than ninety degrees, the downward strain exerted by the radial rod 13 then has a tendency to distort the pipe at its softest section within the burner, due to the downward pull of the rod 13. To obviate this distortion, I attach to the section of the pipe just emerging from the burner a second radial rod 24, the other end of which is provided with a hook 25, which is inserted in one of the holes in the plate 20. This second radial rod 24 is attached to the pipe 16 by semicircular bands 26 and bolts 27, and it is also provided with a turnbuckle 28, by which its length may be adjusted to the desired degree of curvature of the pipe. As the pipe is still further bent a third radial rod 29 may be similarly attached, enabling the bending of the pipe to be continued to produce a semicircular or return bend, as shown in Fig. 2.

Pivoted on plates 30, fastened to the posts 11 between the rolls 3 and 5, are arms 31, in the free ends of which are journaled gudgeons 32 of an annular gas-burner 33, by means of which I heat a portion of the pipe 16 to reduce its resistance to a bending strain. The annular gas-burner forms no part of my present invention and is substantially like that described and claimed in my pending application Serial No. 234,018. By means of the gas-burner I am enabled to surround a portion of the pipe with an annular mass of flame inclosed within the chamber 34, Fig. 4, which is fed by the pipes 35 36 37, by which gas and air under pressure are admitted to the chambers 38 and 39, there intermingled, and ignited in the chamber 34. Air under pressure enters the burner by the pipes 35 and 37, and gas under pressure is supplied by the pipe 36. The outer ends of these pipes are connected with the sources of air and gas supply by the pipes 40, which are preferably constructed of flexible material to allow the burner to be adjusted vertically to fit varying sizes of pipe to be bent. I cool the heated portion of the pipe after it is bent by jets of water from the annular chamber conveniently inclosed in the burner, as shown at 41, Fig. 5, through the holes 42. Also communicating with the chamber 41 is a pipe 43, having a stop-cock 44, said pipe 43 being extended over the top of the burner and arranged to deliver water from

said chamber 41 upon the top of the pipe at 45 immediately before it enters the burner in order to reduce the heat of this portion of the pipe relatively to the remaining periphery of the pipe, so that the resistance of the pipe to the bending strain on the inside of its curvature will prevent the buckling or wrinkling of the pipe due to upsetting.

Pivotaly attached to the arms 31 are rods 46, the other ends of which are pivotaly attached to the base A. These rods 46 are provided with turnbuckles 47, by means of which the arms 31 and burner 33 may be raised or lowered to bring the annular burner concentric to the pipe.

The operation of my apparatus is as follows: The pipe to be bent is inserted between the rolls 3 and 5, after the proper adjustment of the roll 5 has been made, and is fed longitudinally through the annular burner 33, the necessary adjustment of the rods 46 having been made by a turnbuckle 47, by the pushing-plate 6, and hydraulic cylinder 9. The end 15 of the pipe 16 is engaged by the hook 14 of a radial rod of a length necessary to afford the desired degree of curvature to the pipe 16, and the plate 23 is adjusted vertically to allow the hook 18 on the other end 17 of the radial rod 13 to be inserted in the hole 19. When the pipe 16, by continued pressure of the pushing-plate 6, forms a bend of about ninety degrees, a second radial rod 24 is attached to the pipe near the burner and the hook 25 of said radial rod 24 inserted in the hole 19^a. The required length of the radial rod 24 is secured by adjustment of the turnbuckle 28. As the pipe 16 continues to bend a third radial rod is employed, as shown in Fig. 2. As the pipe passes beyond the chamber 34 of the annular burner 33 the pipe is cooled and the curvature retained by the streams of water flowing from the chamber 41 through the holes 42. By increasing the number of radial rods, as above described, I am enabled to bend nearly a complete circle without danger of flattening or distorting the portion of the pipe softened by the heat from the burner, which would otherwise tend to occur from the downward strain of a single radial rod in the end of the pipe. I also adjust the height of the annular burner by the rod 46 and turnbuckle 47, and thereby maintain the burner concentric with pipes of different diameters. The rear end of the pipe is held from lateral movement by the pushing-plate, and as the pushing-plate moves in ways on the frame 2 the longitudinal movement of the pipe is made to proceed in a right line, causing the advancing end of the pipe to be returned in the same plane as the unbent portion of the pipe.

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

1. In an apparatus for bending pipe, the combination of a pair of supports in different planes arranged to bear against the pipe to be

bent and on opposite sides, means for imparting a longitudinal movement to said pipe between said supports, means for applying a pulling strain to the advancing end of the pipe, and means for applying pulling strains successively at other points in the pipe as it is bent, the number of such points increasing with the increase in its curvature, all such strains being toward a point concentric with the desired curvature of the pipe.

2. In an apparatus for bending pipe, the combination with a framework, two fixed supports in different planes adapted to receive the pipe to be bent, means for heating a section of the pipe contiguous to one of said supports, means for imparting a longitudinal movement to the pipe between said supports, means for maintaining both the advancing end and other points of the pipe as it is bent, the number of such points increasing with the increase in its curvature, at a constant distance from a fixed point concentric with the desired curvature of the pipe.

3. In an apparatus for bending pipe, the combination of a framework, a pair of supports arranged to bear against opposite sides of the pipe to be bent and in different planes, means for moving the pipe longitudinally, means for heating a section of the pipe between said supports and its advancing end, and a series of radial rods adapted to be successively attached to the pipe as its curvature increases, whereby the pipe is held from distortion.

4. In an apparatus for bending pipe, the combination of a pair of supports in different planes and arranged to bear against opposite sides of the pipe to be bent, means for moving the pipe longitudinally between said supports, means for applying a pulling strain to the pipe behind said supports and toward a fixed point concentric with the desired curvature of the pipe, an annular burner for heat-

ing a section of the pipe behind said supports, and means for raising or lowering said annular burner in order to maintain said burner concentric with the pipe to be bent.

5. In an apparatus for bending pipe, the combination of a pair of supports in different planes and arranged to bear against opposite sides of the pipe to be bent, means for applying a pulling strain to the pipe behind said supports toward a fixed point concentric with the desired curvature of the pipe, means for heating a section of the pipe behind said supports, means for imparting a longitudinal movement to the pipe, and means for controlling the longitudinal movement of the pipe in a right line.

6. In an apparatus for bending pipe, the combination with a pair of rolls arranged to bear against opposite sides of the pipe and in different planes, means for heating a limited portion of the pipe behind said rolls, means for applying a bending strain to the pipe behind said rolls, a pushing-plate bearing against the end of the pipe in front of the rolls, means for moving said plate to impart a longitudinal movement to the pipe between said rolls, and ways for said pushing-plate parallel with the longitudinal movement of the pipe.

7. In an apparatus for bending pipe, the combination with means for imparting a longitudinal movement to the pipe to be bent, means for applying a bending strain to the pipe, means for successively heating limited portions of the pipe, and means for applying a cooling liquid to the pipe as it approaches the heating means and on the side subjected to upsetting strains during the process of bending.

Dated this 12th day of December, 1904.

LOUIS H. BRINKMAN.

Witnesses:

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