L. H. BRINKMAN.

METHOD FOR BENDING PIPES OR TUBES.

APPLICATION FILED MAY 27, 1919.

1,429,924.

Patented Sept. 26, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

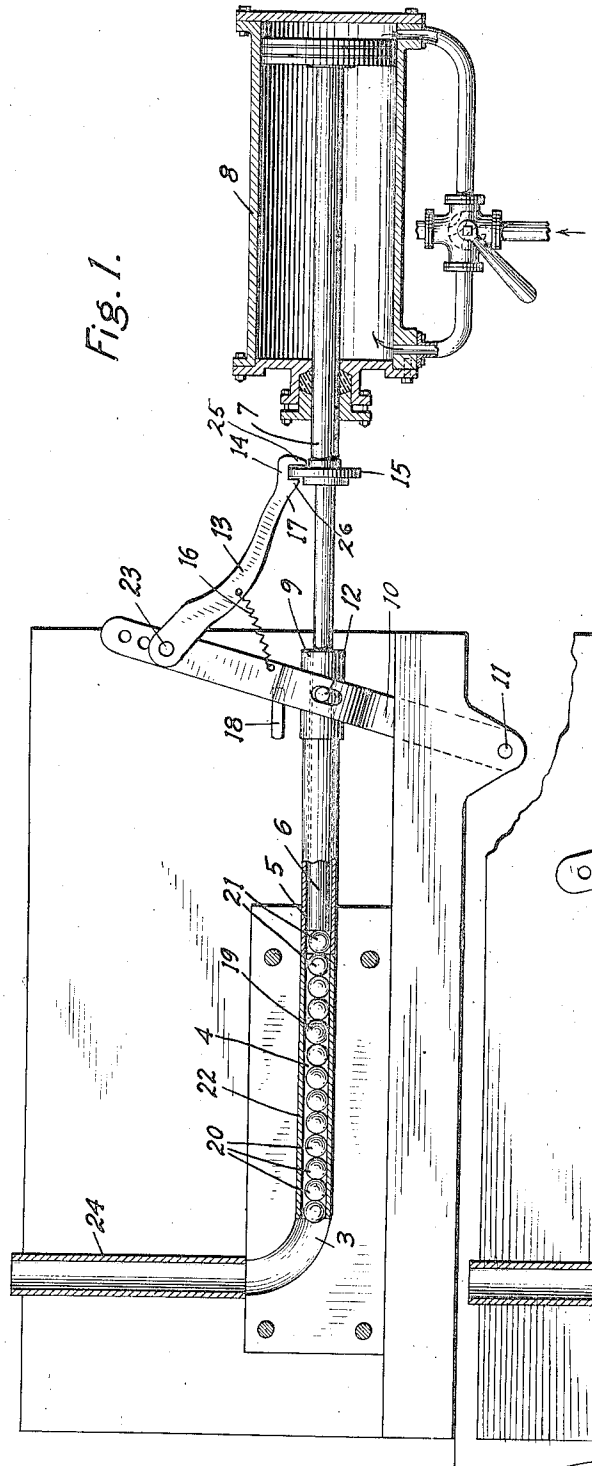
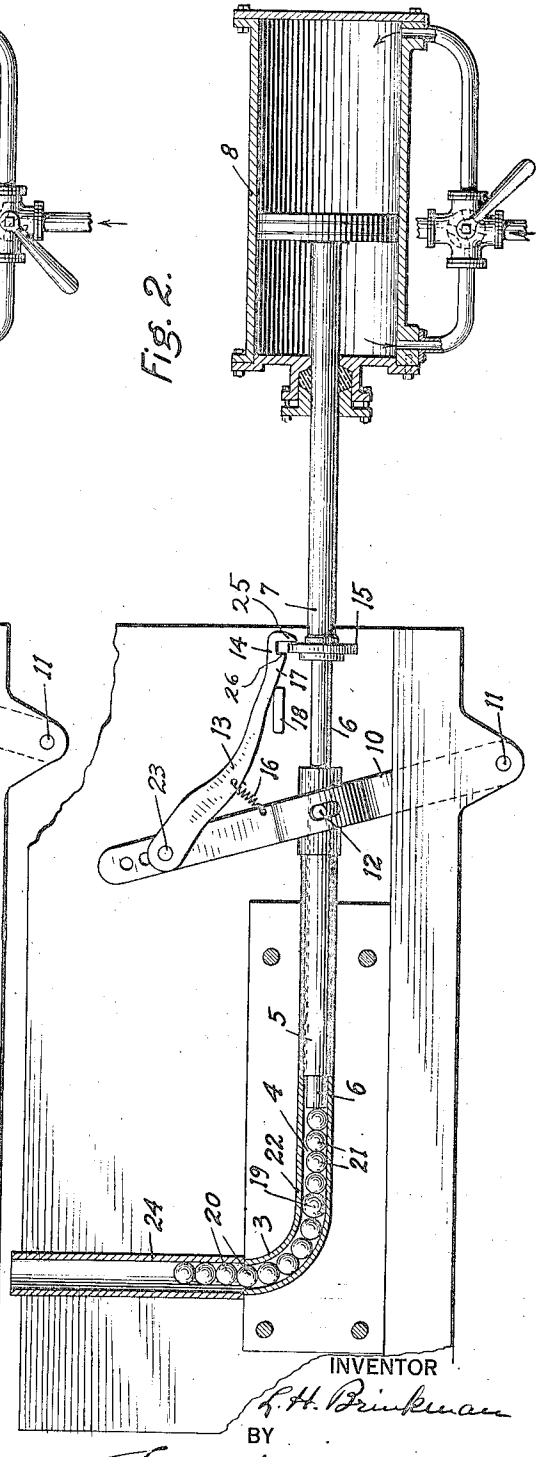


Fig. 2.



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Fig. 3.

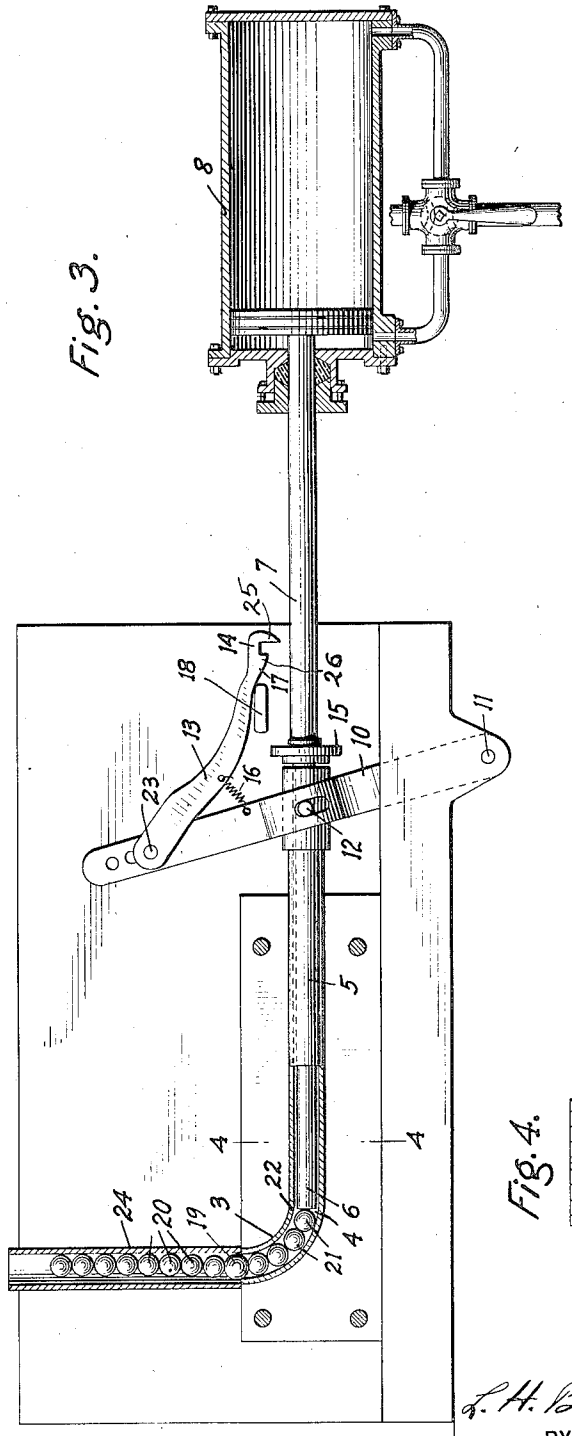
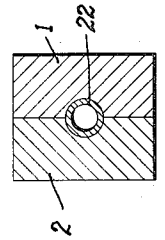


Fig. 4.



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UNITED STATES PATENT OFFICE.

LOUIS H. BRINKMAN, OF GLENRIDGE, NEW JERSEY.

METHOD FOR BENDING PIPES OR TUBES.

Application filed May 27, 1919. Serial No. 300,163.

To all whom it may concern:

Be it known that I, LOUIS H. BRINKMAN, a citizen of the United States, residing at Glenridge, county of Essex, and State of New Jersey, have invented new and useful Improvements in Methods for Bending Pipes or Tubes, of which the following is a specification.

This invention relates to bending pipes or tubes.

The object of the invention is to provide a method for producing bent tubes.

Other and ancillary objects of the invention will appear hereinafter.

In the accompanying drawings which illustrate the invention,

Fig. 1 is a view partly in longitudinal section and partly in elevation of an apparatus whereby the invention may be practiced;

Fig. 2 is a similar view, but showing the apparatus in a different phase of its operation in the formation of the tube;

Fig. 3 is a similar view showing a still different phase of operation; and

Fig. 4 is a section on the line 4—4 of Fig. 3.

Referring to the drawings, a split die comprising the two half sections 1 and 2, is mounted upon a suitable support and includes a passage or channel having a curved portion 3 and a straight portion 4 through which the tube to be bent is forced endwise. Telescoping within the end of the straight portion 4 is a sleeve 5 which telescopes upon plunger 6 secured to the piston rod 7 of a suitable hydraulic cylinder 8. This cylinder may be controlled in any well known manner to move the piston forward and back and so reciprocate the plunger 6. The sleeve 5 is fixed to a head 9 which slides upon the plunger 6 and is adapted to be so slid by a lever 10 pivoted to the support at 11 and engaging with the cross head by a pin and slot connection 12. To the upper end of the lever 10 is pivoted a link 13 having in its outer end a jaw 14 adapted to embrace a flange 15 fixed upon the plunger 6. The spring 16 tends to hold the jaw 14 in engagement with the flange, but as the plunger moves to the left (see Fig. 1) the cam surface 17 upon the arm 13 will come against a stationary projection 18 upon the support and the jaw be thrown out of engagement with the flange. Adapted to be forced through the channel of the die by the plunger 6, is a series of balls comprising the relatively large ball 19, a number of small balls 20 which precede it and a number of other small balls 21 which succeed it.

In the operation of the apparatus, the plunger 6 is retracted toward the right (see Fig. 1) and also the sleeve 5 is retracted toward the right and the jaw 14 placed in engagement with the flange 15. A tube 22 to be bent, is then placed within the straight portion 4 of the die passage and the series of balls are placed therein with the large ball near the end of the tube 22. The cylinder is then actuated to force the plunger 6 to the left and through the arm 13 the sleeve 5 is also forced to the left, but the lever arms are such that it moves at a slower speed than the plunger. By means of the holes as 23 at the upper end of the lever arm 10, the ratio of speeds of the plunger and sleeve may be made any that is desired. The movement of the sleeve forces the tube 22 into the curved portion 3 thereby bending it and meanwhile the plunger 6 moving at a higher rate of speed forces the small balls 20 through the portion being bent. On account of the smallness of these balls, the diameter of which is less than the bore of the tube, binding and consequent friction is avoided and yet the tube is held approximately in form. The tube having been bent to the desired extent, the jaw 14 is released from the flange 15 by the lug 18 as before described, when the tube 22 stops, but the plunger continues its movement and forces the larger ball corresponding to the bore of the tube desired through the bent portion thereby "ironing it out," thereby smoothing up the tube and making it of the desired bore. To avoid friction, the large ball is forced through the bend by the plunger 6 through the instrumentality of the succeeding small balls 21, they serving to establish a driving connection with the large ball without undue friction and this series of succeeding small balls being of a length sufficient to reach through the bent portion of the tube.

From the foregoing it will be seen that during the bending operation the tube is pushed forward by the sleeve while the train of balls is pushed forward by the plunger. The plunger, however, moving at a higher speed than the sleeve, the small balls will move through the bend in the tube at a speed equal to the difference of the speeds of the sleeve and plunger. When,

however, the bending has been completed the movement of the sleeve is stopped while the movement of the plunger continues, passing the large ball through the bent portion at a speed with relation to the tube, greater than the previous speed of the balls.

The parts are so adjusted that the large ball will have reached approximately the beginning of the bend in the tube 22 at the time that this tube stops, so that the large ball proceeds in its operation of ironing out the bend immediately that the bend has been formed. Thus in Fig. 1 is shown the condition of the apparatus and the relative position of the balls as the operation of bending is about to be initiated. Fig. 2 shows the condition of the apparatus just as the tube has stopped and the large ball is about to enter about the bend, while Fig. 3 shows the position of the apparatus just as the large ball has completed its travel through the bend. A tube 24 may conveniently be provided for receiving the balls as they emerge from the tube being operated upon so as to prevent them from scattering and upon retraction of the plunger, they will run back into the apparatus. The bending of the tube having been completed as indicated in Fig. 3, the hydraulic cylinder is controlled to move the plunger 6 to the right to its initial position. As the plunger so moves, the flange 15 will come against the lower end of the elongated lip 25 (this lip being longer than the other as shown) and the link 13 and lever 10 will be drawn to the right into the initial position as before described, the spring 16 drawing the link 13 down so that the jaw 14 fully embraces the flange as soon as the link has become disengaged from the projection 18. Then, as the plunger moves in the opposite direction the short lip 26 is engaged by the flange. The outer half of the die may then be lifted off, the bent tube removed, a straight section to be bent placed in the die, the halves of the die secured together and the operation repeated indefinitely.

While the invention has been illustrated in what is considered its best embodiment, it may have other applications without departing from its spirit and is not therefore, limited to the apparatus shown in the drawings, nor to the precise details of method as recited.

What I claim is:—

1. The method of bending a tube which consists in bending the tube and meanwhile causing balls of less diameter than the desired bore of the tube to move through the portion being bent and subsequently passing a larger ball through the bent portion of the tube.

2. The method of bending a tube which consists in forcing the tube end wise through a curved channel or passage and meanwhile causing balls of less diameter than the desired bore of the tube to move through the portion being bent.

3. The method of bending a tube which consists in forcing the tube end wise through a curved channel or passage and meanwhile causing balls of less diameter than the desired bore of the tube to move through the portion being bent, and subsequently passing a larger ball through the bent portion of the tube.

4. The method of bending a tube which consists in bending the tube and meanwhile causing balls of less diameter than the desired bore of the tube to move through the portion being bent.

5. The method of bending a tube which consists in bending a tube while internally supporting it on a diameter less than the desired bore of the tube and subsequently passing through the bent portion a body of larger diameter.

6. The method of producing a bent tube which consists in bending a tube and meanwhile causing small balls to move through the portion being bent and subsequently passing a larger ball through the bent portion of the tube at a higher speed than the previous movement of the said small balls with relation to said tube.

7. The method of bending a tube which consists in forcing the tube endwise through a curved channel or passage, and meanwhile causing relatively small balls to move through the portion being bent and subsequently passing a larger ball through the bent portion of the tube while it remains in the bending channel.

8. The method of forming a bent tube which consists in forcing the tube endwise through a curved channel or passage and meanwhile causing relatively small balls to move through the portion being bent, stopping the endwise movement of the tube and passing a larger ball through the bent portion of the tube as it lies in the curved channel or passage.

9. The method of producing a bent tube which consists in bending a tube and meanwhile forcing through it a train of balls comprising a plurality of balls of less diameter than the desired bore of the tube, followed by a larger ball, the smaller balls being moved through the bent portion of said tube as it is being bent, stopping the bending of the tube and continuing the movement of the train of balls after the tube has been bent and passing the said larger ball through the bent portion.

In testimony whereof I have signed this specification this 7th day of May 1919.

LOUIS H. BRINKMAN.