

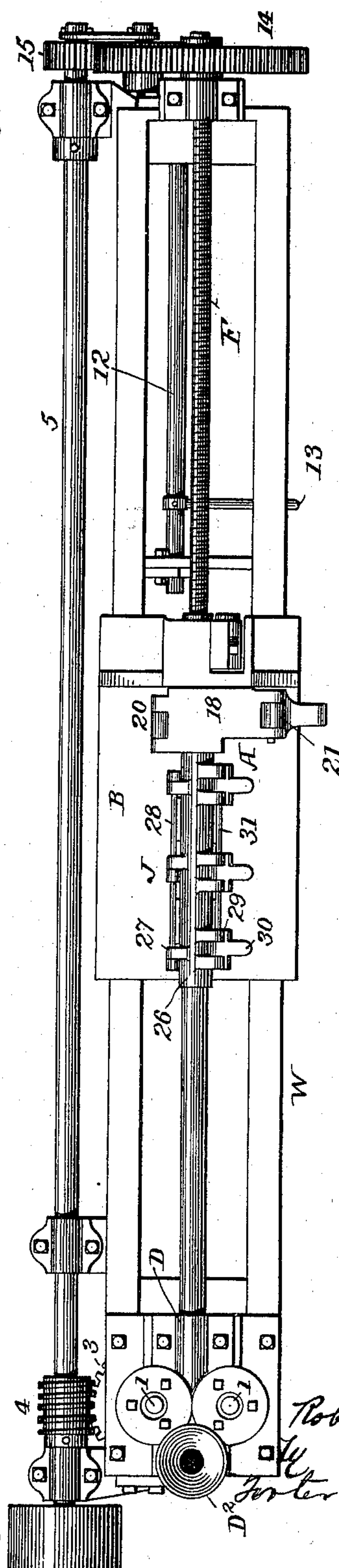
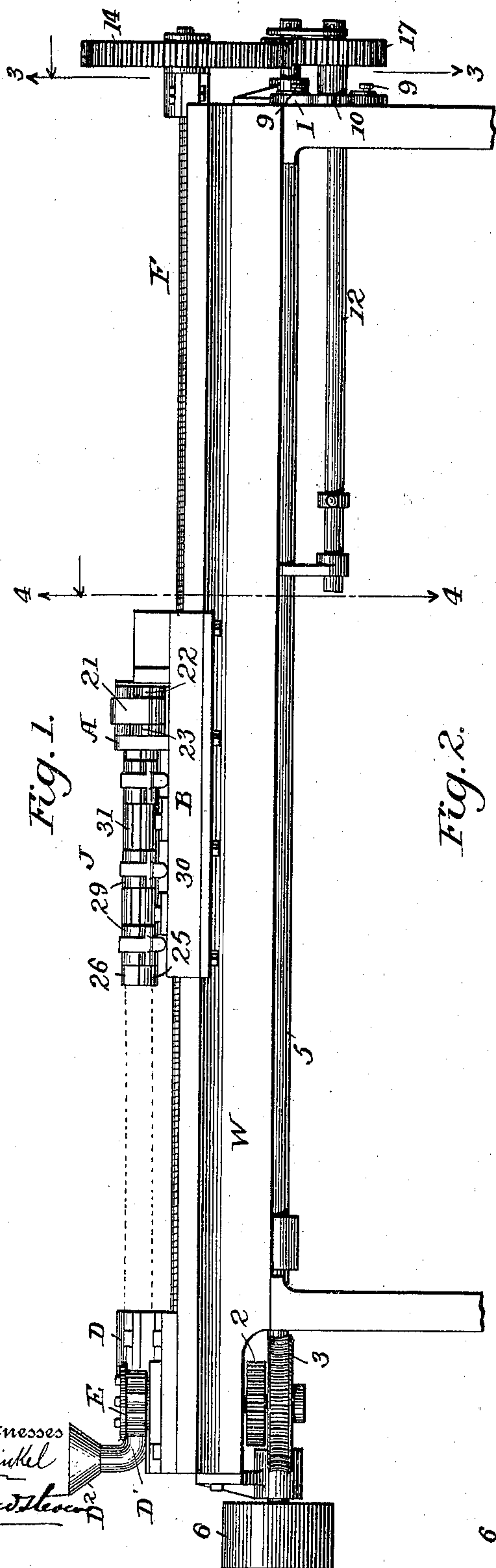
(No Model.)

3 Sheets—Sheet 1.

R. CLARKE.  
APPARATUS FOR BENDING PIPES.

No. 604,021.

Patented May 17, 1898.



Witnesses  
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(No Model.)

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Fig. 4.

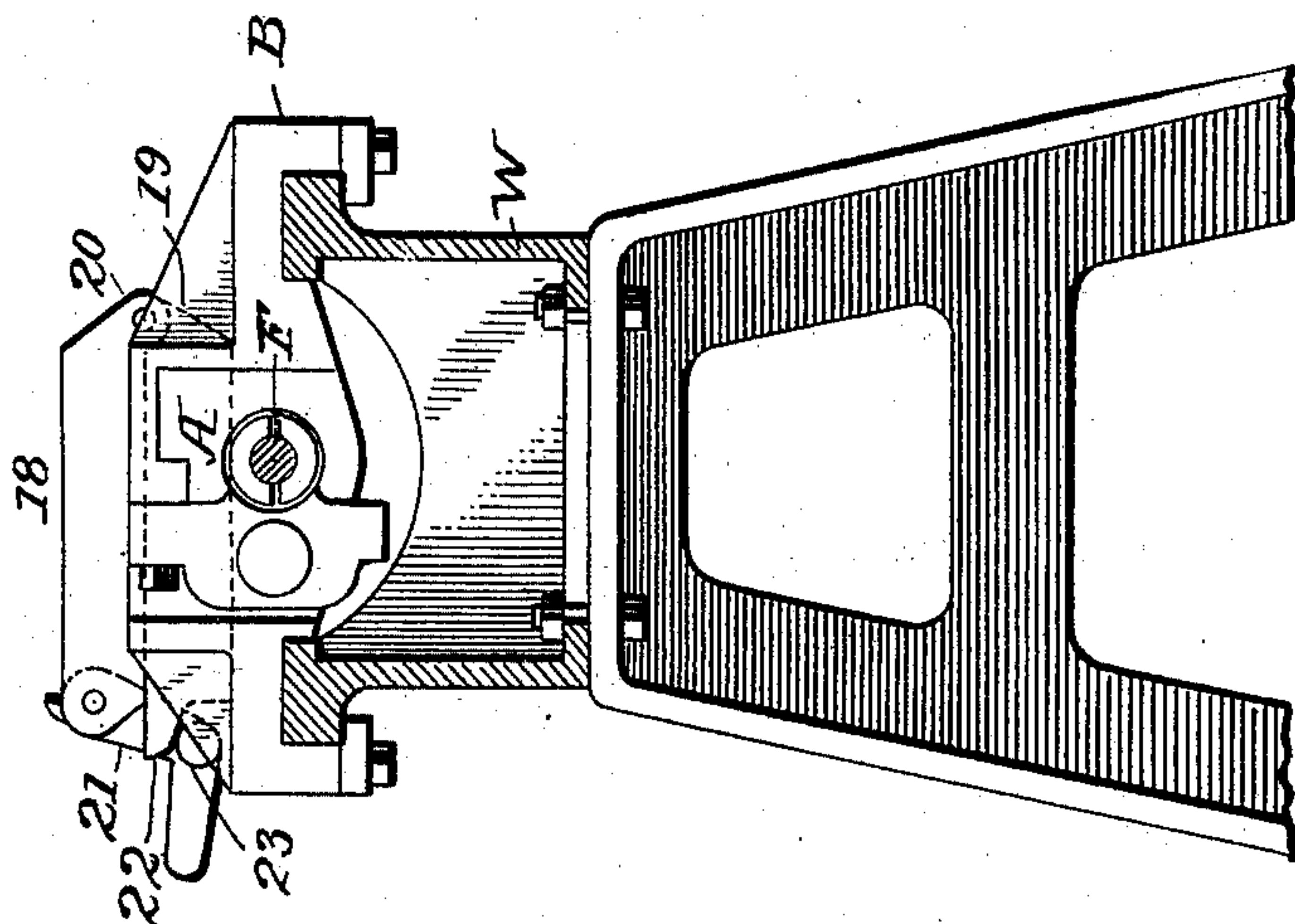
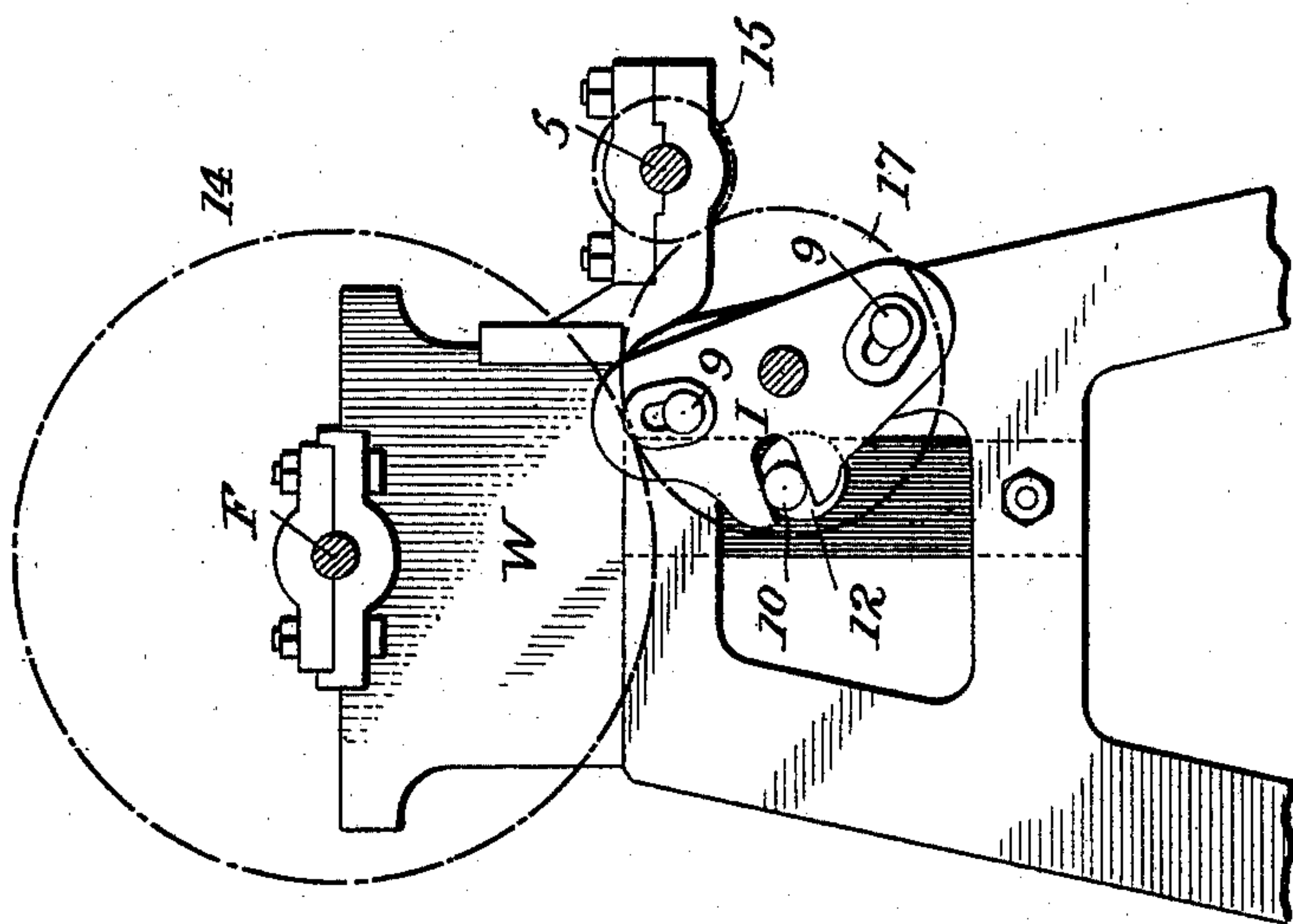


Fig. 3.



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(No Model.)

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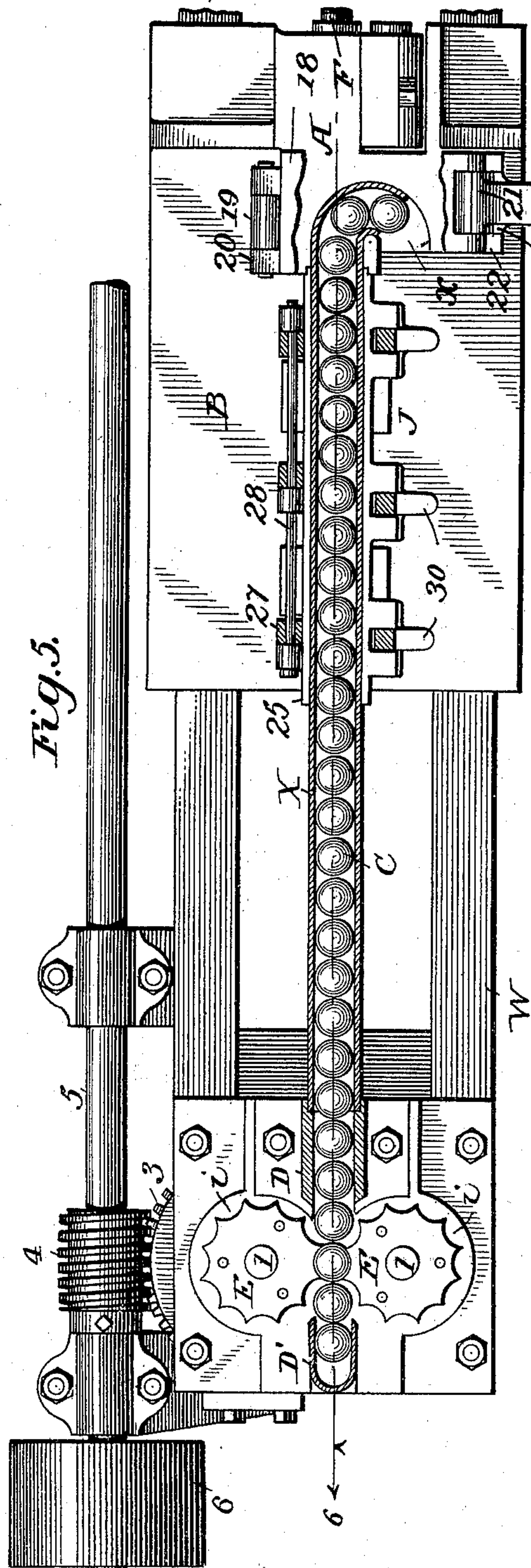


Fig. 5.

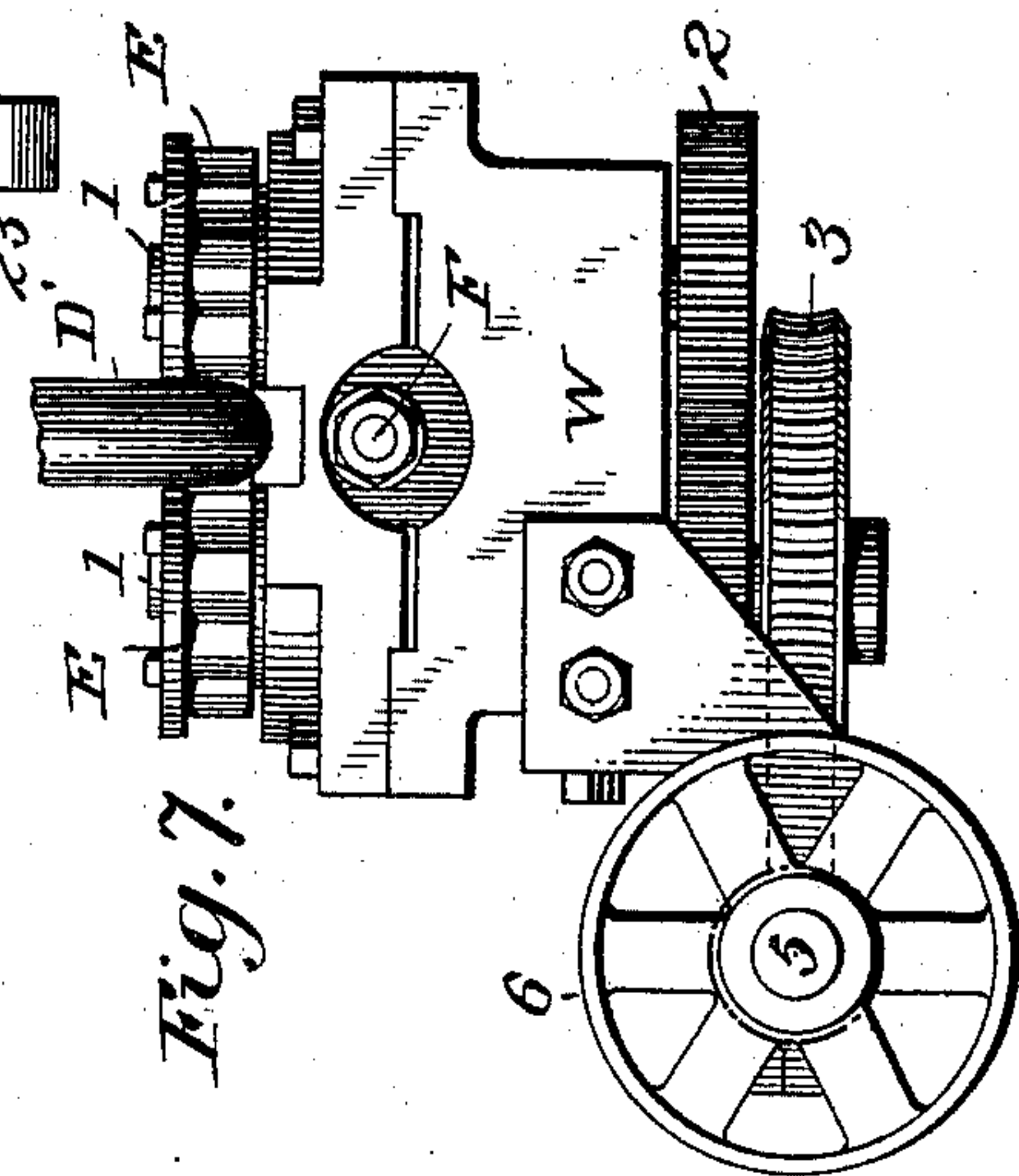
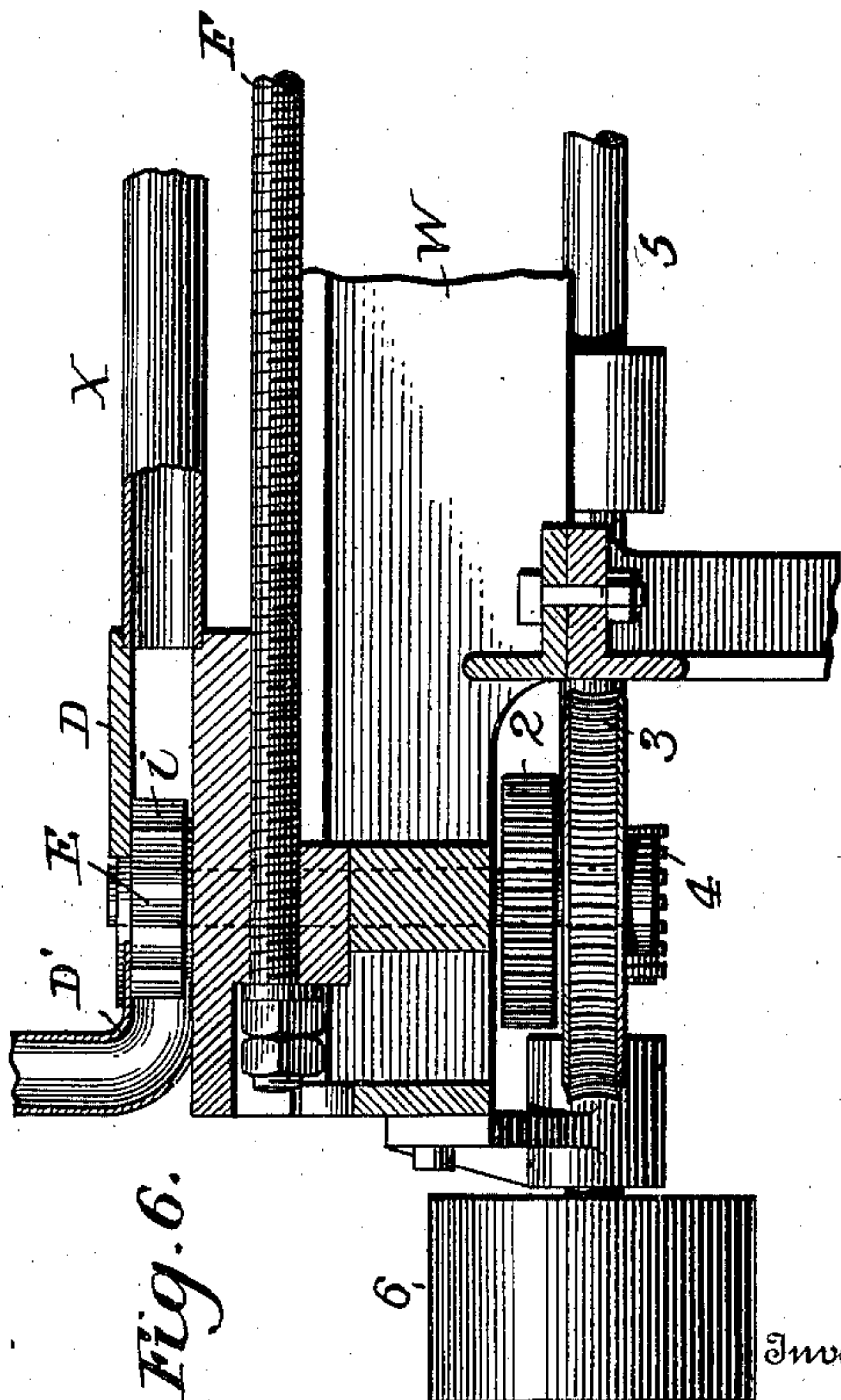


Fig. 7.





# UNITED STATES PATENT OFFICE.

ROBERT CLARKE, OF BROOKLYN, NEW YORK.

## APPARATUS FOR BENDING PIPES.

SPECIFICATION forming part of Letters Patent No. 604,021, dated May 17, 1898.

Application filed December 29, 1897. Serial No. 664,234. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT CLARKE, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Apparatus for Bending Pipes, of which the following is a specification.

My invention relates to that class of apparatus for bending pipes such as is shown in Letters Patent of the United States granted to me October 3, 1893, and numbered 506,157; and my invention consists in certain improvements intended to secure increased efficiency in the apparatus and a more regular and uniform product, as fully set forth hereinafter and as shown in the accompanying drawings, in which—

Figure 1 is a side view of my improved apparatus; Fig. 2, a plan of Fig. 1; Fig. 3, an enlarged part sectional plan; Fig. 4, a transverse section, enlarged, on the line 4 4, Fig. 1; Fig. 5, a rear end view; Fig. 6, a section on the line 6 6, Fig. 5; Fig. 7, a front end view.

The principal operation of my improvement can be best understood by reference to Fig. 5, in which A represents a die, shown as consisting of two separable sections, in which there is a curved socket  $\alpha$ , corresponding to the curve which is to be imparted to the pipe X. This die A is carried by a carriage B, which moves in a right line parallel with the axis of the pipe X and toward a tube D, having a recess to receive one end of the pipe X, serving as a stationary abutment therefor.

As the carriage B travels toward the tube D, which holds the pipe stationary, there is of course a tendency of the die A traveling onto the pipe to bend the latter to conform to the socket  $\alpha$ . It has been found in practice, however, that this is not sufficient to prevent the pipe from bending and wrinkling in the die A, and therefore a series of spheres C, preferably of hard metal with smooth polished surfaces, is placed within the pipe X. If these spheres are held stationary and the pipe is bent in the socket and the carriage travels forward, there would be a slight traversing movement of the spheres, but in many cases not sufficient to prevent the pipe from wrinkling or forming transverse waves, so that a perfect and regular and uniform bend is not secured. To prevent this result, I impart to

the series of spheres a movement longitudinally in a direction opposite to that of the movement of the carriage B, so that as the carriage B moves toward the left the series of spheres move toward the right, and I prefer to impart to the spheres a movement greater in extent than that which is imparted to the carriage. Thus if the carriage moves six inches toward the left the series of spheres move at the same time thirty-six inches toward the right, and I have found that by this means I am enabled to bend the pipe into bends which are absolutely uniform and regular in their contour.

Of course it will be understood that the bend may be a bend on a flat plane or it may be a bend upon a spiral plane, the pipe in such case following a spiral socket in a suitably-formed die.

Different means may be employed for imparting movement to the carriage for supporting the die thereon and for imparting movement to the series of spheres.

As shown, the pipe D is in two sections D D', or, in other words, is cut away so as to admit of the entrance at opposite sides of the propelling-wheels E E, having corresponding peripheral sockets  $\alpha$ , so arranged that the spheres C will successively be received into these sockets and propelled forward through the pipe D as the wheels revolve. The wheels are secured to the ends of two vertical shafts 1 1 in bearings upon the frame W of the machine, and at the lower ends of these shafts are two gear-wheels 2, which gear with each other, and upon one of the shafts is a worm-wheel 3, which gears with a worm 4 upon a shaft 5, having a driving-pulley 6 at the end.

The end of the section D' of the shaft is turned up and connected with a hopper D<sup>2</sup>, into which the spheres are placed by hand after they successively pass from the bent end of the pipes, or they may be conveyed from the latter to the hopper by means of any suitable mechanical conveyers.

The carriage B derives its motion from a screw-shaft F, having at the rear end a cog-wheel 14, which meshes with a pinion 15 on the end of the shaft 5 and is driven thereby. The intermediate pinion 17 is carried by an adjustable support I, having slots to receive supporting-pins 9 9, extending from the frame,



and another slot to receive an eccentric-pin 10 on the end of a shaft 12, the turning of which will move the support I, so as to carry the gear 17 into and out of gear with the wheel 14 when it is desired to stop the traveling movement of the carriage. The shaft 12 turns in suitable bearings upon the frame and is provided with a handle 13, extending to one side of the frame, by means of which the operator can turn the shaft to adjust the support I.

It will of course be evident that by substituting a larger or smaller gear 17 for that shown the rate of travel of the carriage B may be changed.

Any suitable connection can be made between the screw-shaft F and the carriage, so as to cause the latter to move as the shaft revolves.

In the construction of the die A shown there are two parts 18 19, hinged together at 20, the part 18, provided with a link 21, which has projections 22 and may be swung to bring these projections under the lip 23 of the lower part 19 to lock the two parts in place during operations. By swinging out the link the two parts are unclamped at that end and the upper part may be swung over to expose the socket.

As the pipe X is generally of soft metal, it is desirable to have a tubular guide to support the same adjacent to the die A. Such a guide J is formed in separable parts—as, for instance, a lower part 25, secured to the carriage B, and an upper part having lugs 27, through which passes a rod 28 upon lugs extending from the lower portion, constituting a hinge upon which the upper part 26 may swing, and at the opposite side there are lugs 29 upon the upper part 26, through which and through corresponding lugs 30 on the lower part may pass a locking-rod 31, which is withdrawn in order to permit the upper part to be swung back to expose the interior of the guide-tube.

It will be evident that while I have shown the die and means for carrying it toward a stationary pipe the pipe might be forced into a stationary die, one being the equivalent of the other.

Without limiting myself to the precise construction and arrangement shown, I claim—

1. A pipe-bending machine, comprising a traveling die adapted to receive a pipe, means for moving the same, a bearing or holder for the pipe, and means for forcing a series of spheres through the pipe while it is forced through the die, substantially as described.

2. In a bending-machine, the combination of a stationary bearing or holder for the article to be bent, a carriage, a die upon the carriage and means for moving the carriage toward the stationary bearing or holder, substantially as described.

3. In a pipe-bending machine, the combination of a die, means for forcing a pipe through the die, and rotary devices for forcing a series of spheres through the pipe while it is being bent, the axis of the said rotary devices being at an angle to the line of movement of the pipe, substantially as described.

4. The combination of a stationary bearing for a pipe, a carriage, a die supported by said carriage and adapted to receive the end of the pipe, means for moving the carriage and a series of spheres, and means for propelling them through the pipe, substantially as described.

5. The combination with the die A and series of spheres, of propelling-wheels E, E adapted to receive and propel the spheres, substantially as described.

6. The combination with the die A, of a series of spheres, propelling-wheels E, E, and guide-tube D, D', substantially as described.

7. The combination of the traveling carriage B, die A, spheres and propelling-wheels, means for driving the wheels, means for propelling the carriage, and devices whereby to throw the carriage-propelling means into and out of operation, substantially as described.

8. The combination of the carriage, die, spheres, propelling-wheels, carriage-propelling screw F, shaft 5 geared to operate the propelling-wheels, gears 14, 15, 17 and a support for the gear 17, and means for shifting said support, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT CLARKE.

Witnesses:

CHAPLIN MOOREHEAD,  
WALTER H. HIGGINS.