

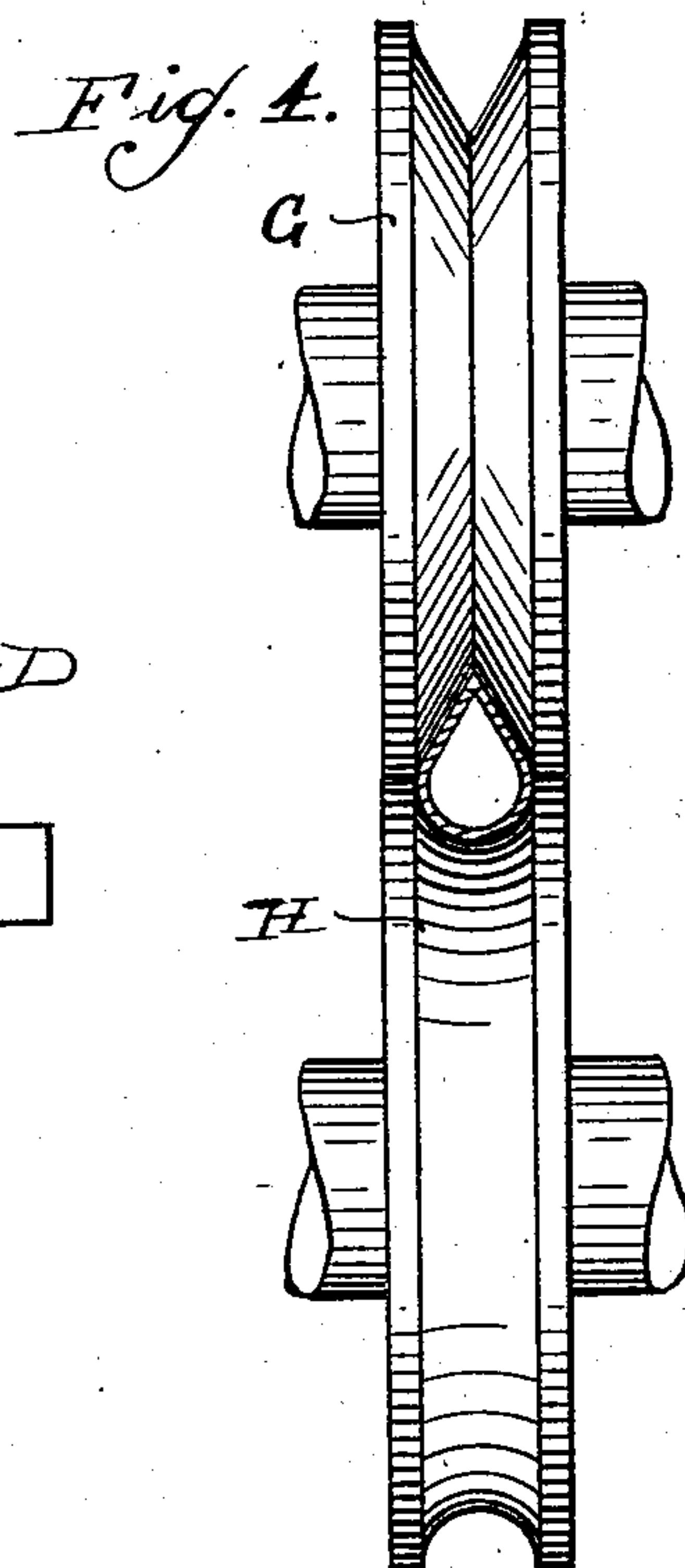
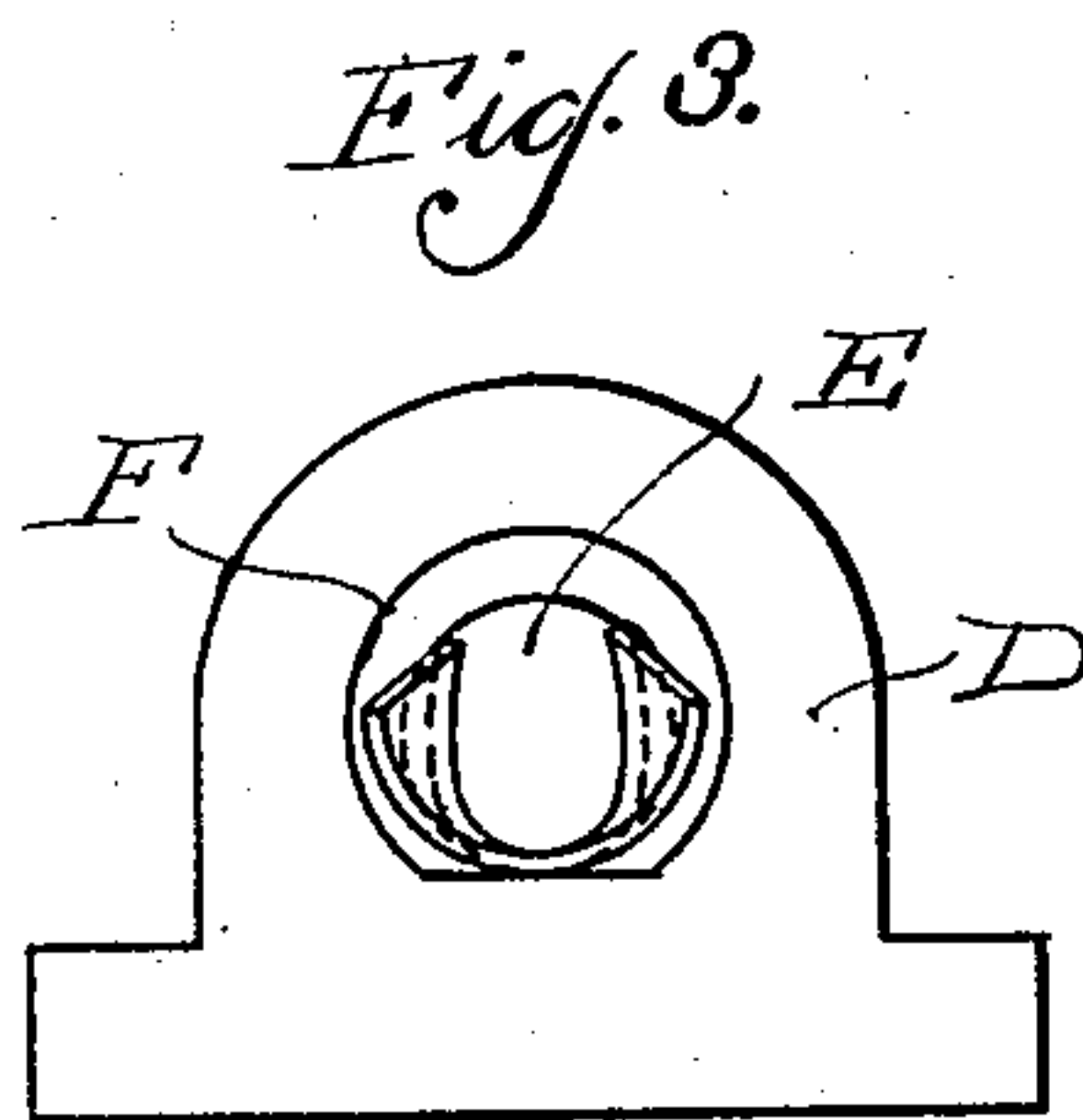
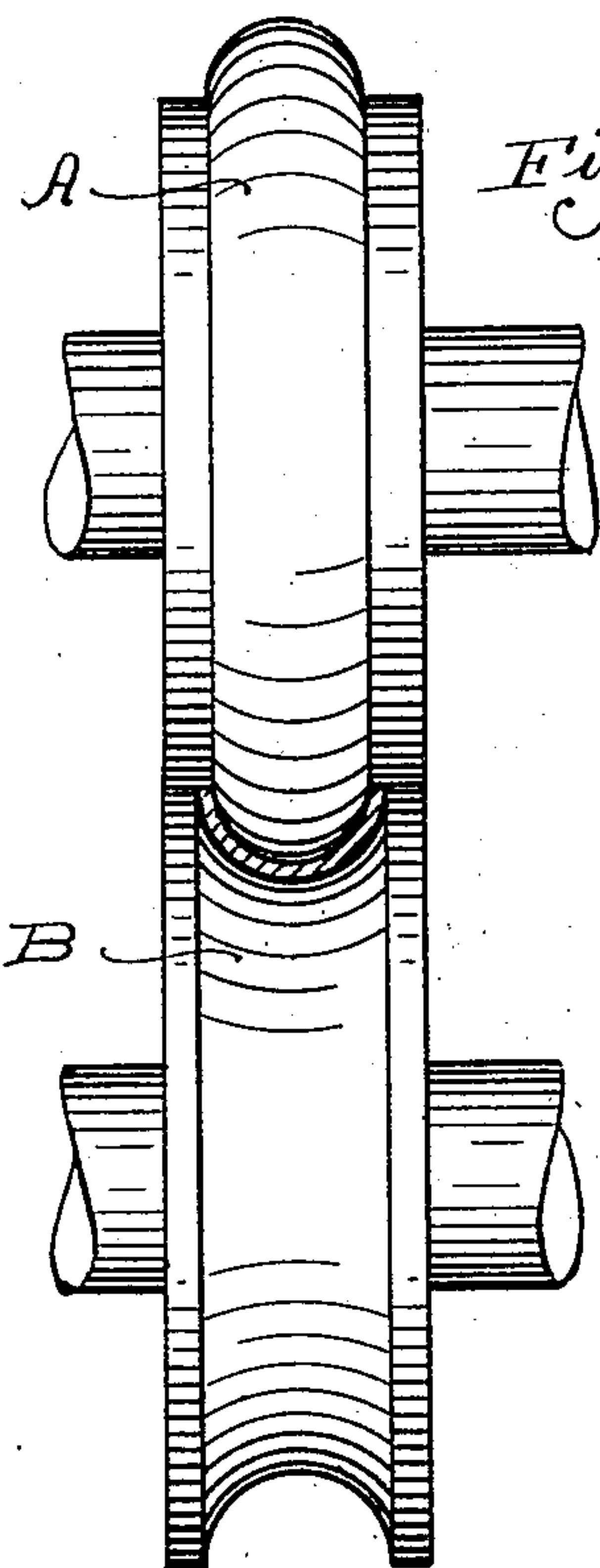
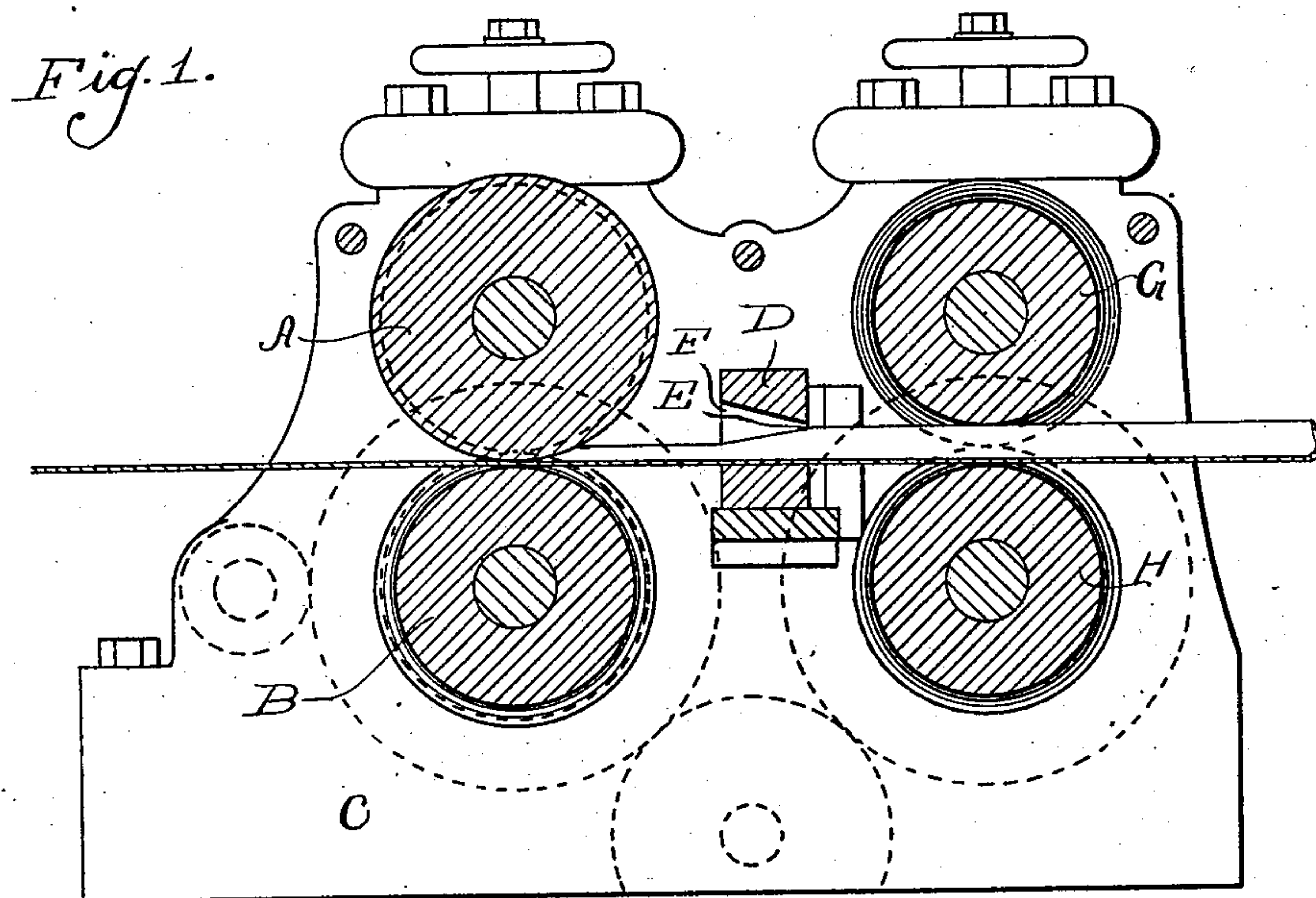
No. 724,426.

PATENTED APR. 7, 1903.

F. F. BISCHOFF.  
PROCESS OF MAKING TUBING.  
APPLICATION FILED APR. 9, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:

*E. F. Wilson*  
*John Snowhook*

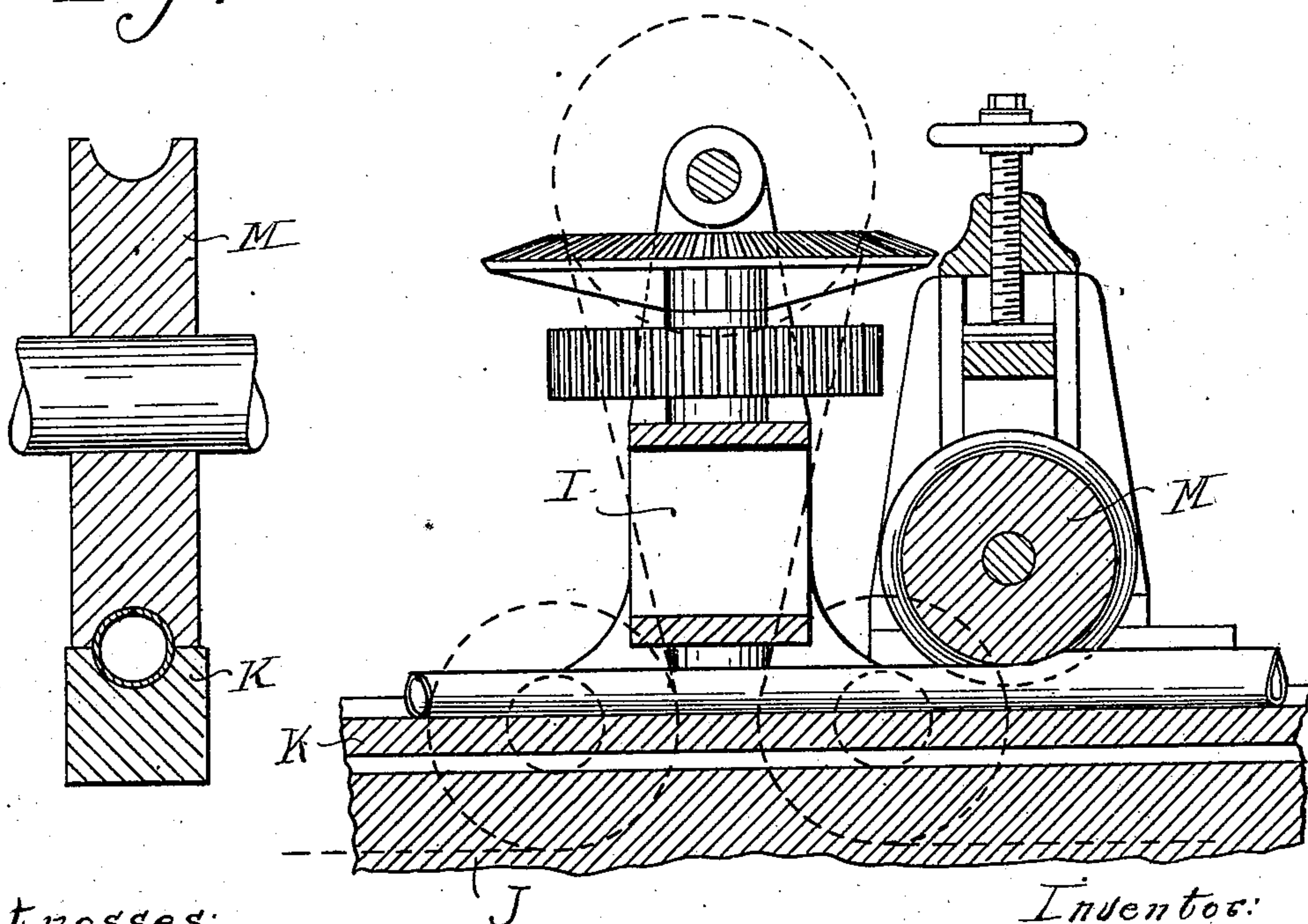
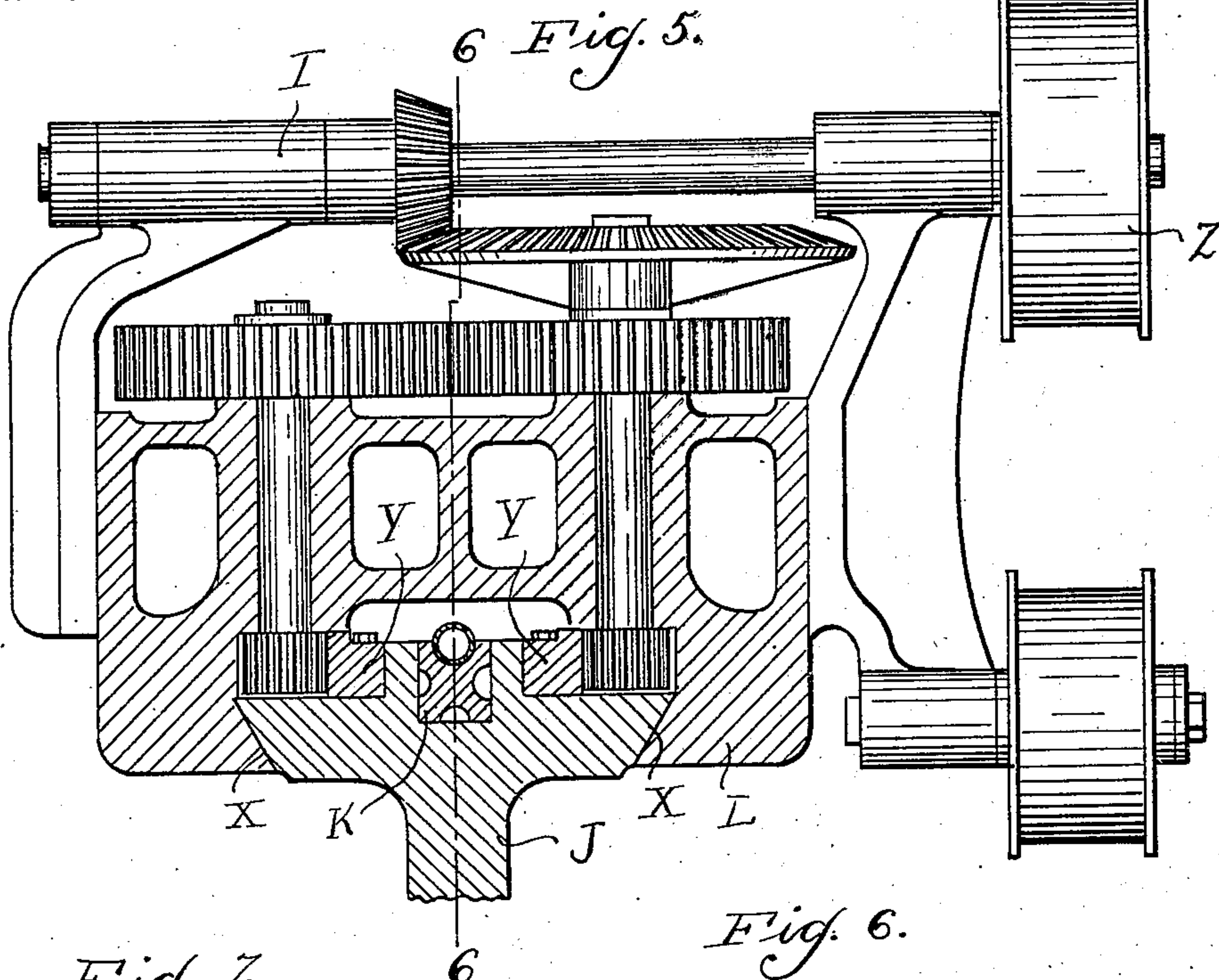
Inventor:  
*Frederick F. Bischoff*  
By *Rudolph K. Loh* Atty.

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2 SHEETS—SHEET 2.



Witnesses:

*E. F. Wilson.*  
*John Snowhook*

Inventor:

*Frederick F. Bischoff*  
By *Rudolph M. [Signature]*  
Attorney.



# UNITED STATES PATENT OFFICE.

FREDERICK F. BISCHOFF, OF CHICAGO, ILLINOIS, ASSIGNOR TO CARL C. LAW, OF PITTSBURG, PENNSYLVANIA.

## PROCESS OF MAKING TUBING.

SPECIFICATION forming part of Letters Patent No. 724,426, dated April 7, 1903.

Application filed April 9, 1902. Serial No. 102,024. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK F. BISCHOFF, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Methods of Making Tubing; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a novel method of making butt or welded-joint tubing, the object being to provide a simple and cheap process whereby tubing of superior quality can be made in large quantities; and it consists in the novel steps hereinafter fully described and claimed.

In the accompanying drawings, illustrating the manner of carrying out my method, Figure 1 is a central longitudinal section of a machine in which the first three steps of my method are carried out. Figs. 2, 3, and 4 illustrate the first three steps, respectively. Fig. 5 is a transverse section of a machine in which the fourth and final step of the method is carried out. Fig. 6 is a central longitudinal section on the line 6 6 of Fig. 5. Fig. 7 is a detail view of the die and roller for performing said finishing operation and showing the tube in place therein.

My said method has for its principal object to produce perfectly straight tubing in any desired length, one of the principal features of my invention consisting in maintaining the tube straight throughout each step of the method.

Another feature of my invention consists in so forming the tubing that the abutting edges thereof will exert a constant pressure against each other.

Other features of my method consist in carrying out several steps in a single operation, thereby minimizing the cost of the tubing.

In carrying out my method I take a strip of sheet metal of predetermined width and pass same between rollers A and B, journaled in the frame of the machine C, (shown in Fig. 1,) the roller A having a circumferential rib or shoulder of semicircular cross-section and

the roller B having a corresponding groove. The said rollers bend said strip to semicylindrical form, and as it leaves said rollers said strip enters a die or bell D, having a circular opening E and a partially-flaring mouth F, the bottom of the circular opening being flush with the bottom of the mouth and in horizontal alinement with the bottom of the groove of roller B, so that the strip will travel constantly in the same horizontal plane. The flaring mouth of the die or bell D engages the edges of the strip and bends the latter so that it will pass through said circular opening E, said strip being thereby bent to a U shape or horseshoe form and the curvature at the bottom of same being reduced to a smaller diameter than it is desired to give the finished tube. Upon leaving the die or bell D the U-shaped or horseshoe-form strip passes between two rollers G and H, the latter having a semicircular groove having substantially the same radius as the curved portion of the strip and receiving the latter, while the roller G is provided with a V-shaped groove which receives the flanges of the strip and forces the edges thereof together, so that upon leaving said rollers a tube shaped similarly to an egg in cross-section is formed. It is essential that the lowest or middle portion of the strip should travel constantly in the same horizontal plane, as the slightest deviation will cause imperfections in the finished tube or will produce a bent tube.

I desire here to call attention to the fact that the middle of the strip cannot be maintained in the horizontal plane unless the die or bell D is provided with a horizontal bottom, as such bottom offers a support for the tube against the pressure exerted by the flaring mouth upon the flanges. By removing such support the tube will bend and leave the die or bell curved upwardly. The supporting of the bottom or middle portion of the strip during the second operation forms one of the essential features of my invention. The egg-shaped tube thus formed in the machine C is now placed in the machine I for the finishing operation. Said machine I (shown in Figs. 5 and 6) consists of a bed J of suitable length, adapted to receive



a die K, having a semicircular groove to receive the curved portion of the tube and over which a carriage L travels, which carries a roller M, having a semicircular groove corresponding in size with the groove in the die K and which receives the pointed portion of the tube and rolls same down to semicircular form and at the same time expands the curved portion to fit the groove in the die K, thereby making the tube perfectly cylindrical. It is essential that the said roller M be passed over the tube twice in opposite directions, as during its first passage it imparts a slight curvature to the tube, which the second passage corrects. As the strip issues from the first set of rolls, between which it has been subjected to a partially-equalized pressure on both faces, it frequently has a tendency to curve longitudinally, which is neutralized by varying the positions of said rolls from exact vertical alinement, so as to give the metal a slight set to neutralize this tendency. The support given to the middle of the strip is, however, principally necessary in the bell or die, for the reason that in passing through the latter it is subjected to the heaviest pressures and subjected to the greatest friction, both of which exert the greatest influence upon the longitudinal set of the metal.

It will be particularly noted that in passing through the die the entire bending pressure is exerted upon the edges of the strip, and this in a downward direction, and by virtue of the fact that the flanges are brought together such pressure is communicated to the web at a point rearward of the delivery end of the bell or die, and as such point is absolutely supported against the action of such pressure longitudinal bending of the strip is rendered impossible, as will be obvious.

In passing between the second set of rolls all tendency of the tube to bend longitudinally is further overcome by adjustment of the rolls out of vertical alinement.

In the final step the tube does curve longitudinally the first time that the bending-roll passes over the same; but this curvature is removed by passing the roll over the tube in the opposite direction, thereby producing a perfectly straight tube. By this means I obviate the necessity of the additional step of straightening the finished tube, which is now always required before the tube can be marketed.

By the foregoing method I produce a perfect butt-joint tube in substantially two op-

erations, such tube being superior to any cheap tubing now produced.

By thus expanding the tube in the final operation the latter will retain a constant contracting strain which exerts a strong pressure on the abutting edges against each other. In order to produce welded-joint tubing, the operations are exactly the same, except that the strip used is slightly wider for the same size tubing to provide some additional metal to be taken up in the joint.

The machine shown in Fig. 1 consists of a strong frame in which the rollers B and H are journaled in rigid bearings and the rollers A and G in sliding bearings, the latter being adjusted in any desired positions by means of hand-screws. All of said rollers are driven. The said machine (shown in Figs. 5 and 6) consists of a long bed J, carrying guide-rails X and racks Y, the carriage L moving on the said guide-rails X and receiving its motion from gear-pinions intermeshing with said racks Y, said gear-pinions being in turn geared to the pulley Z, which is driven by an endless belt.

I claim as my invention—

The herein-described method of making tubing which consists in laterally bending a strip of metal in a single operation, by means of traveling pressure, first, to semicylindrical form, second, to horseshoe form by means of pressure exerted on the edges of the strip in a downwardly and rearwardly inclined direction, the curved portion of said horseshoe-shaped strip having a radius smaller than that of the finished tube, and third, bringing the flanges together at an acute angle by means of pressure exerted on said edges in a downward direction, maintaining the middle portion of said strip constantly in the same plane throughout said three-part operation, supporting the middle portion of said strip against the downward and rearward pressures exerted on the edge portions of said strip to neutralize the tendency of said strip to curve longitudinally, and finally bending said flanges and expanding the curved portion of the tube to a common diameter by means of reciprocal traveling pressure exerted on the meeting edges of said flanges in a radial direction, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK F. BISCHOFF.

Witnesses:

RUDOLPH WM. LOTZ,  
JOHN SNOWHOOK.