No. 614,242. Patented Nov. 15, 1898.

L. H. BRINKMAN.

TUBE BENDING APPARATUS.

(Application filed June 2, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

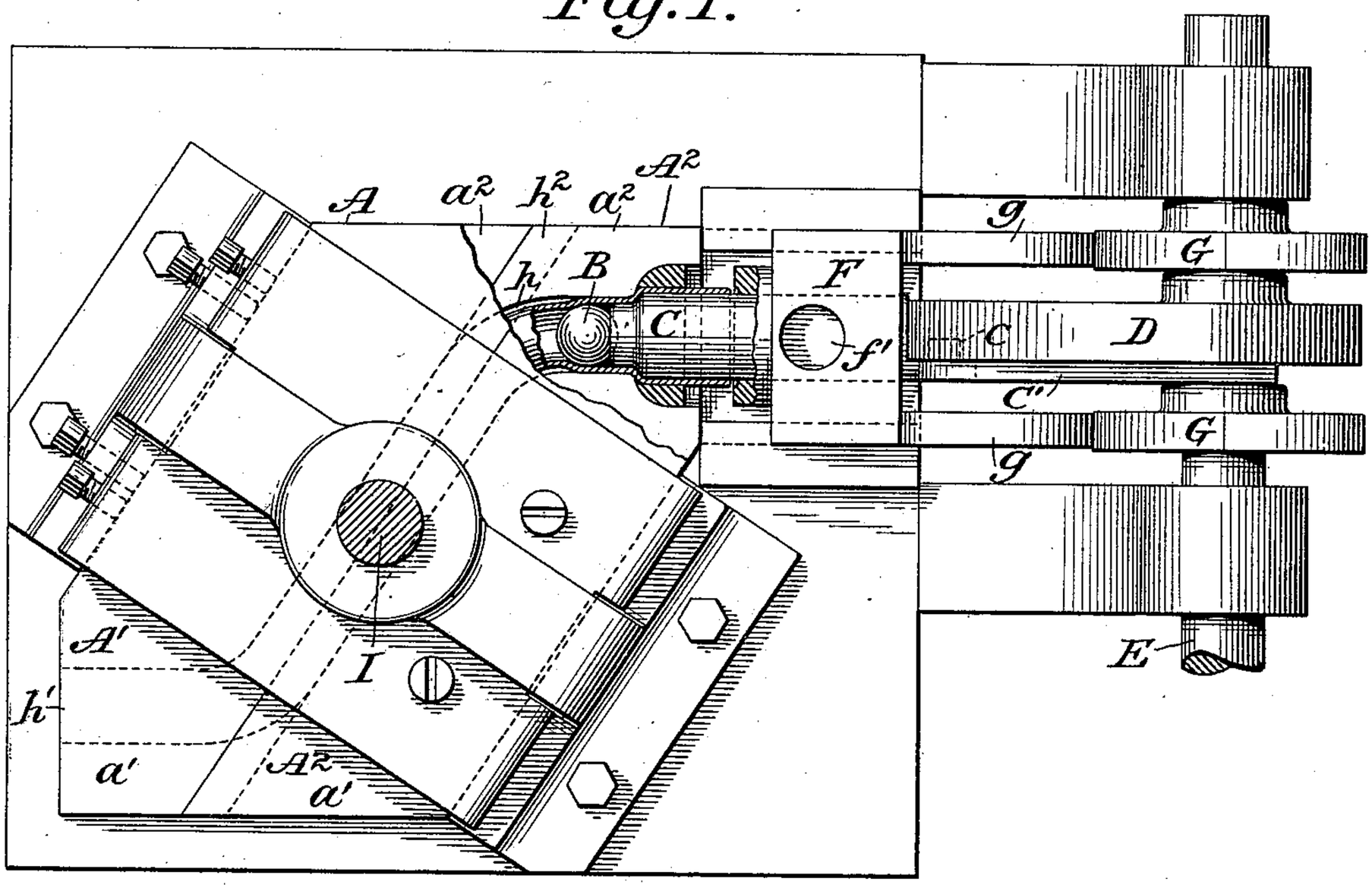

Fig. 2.

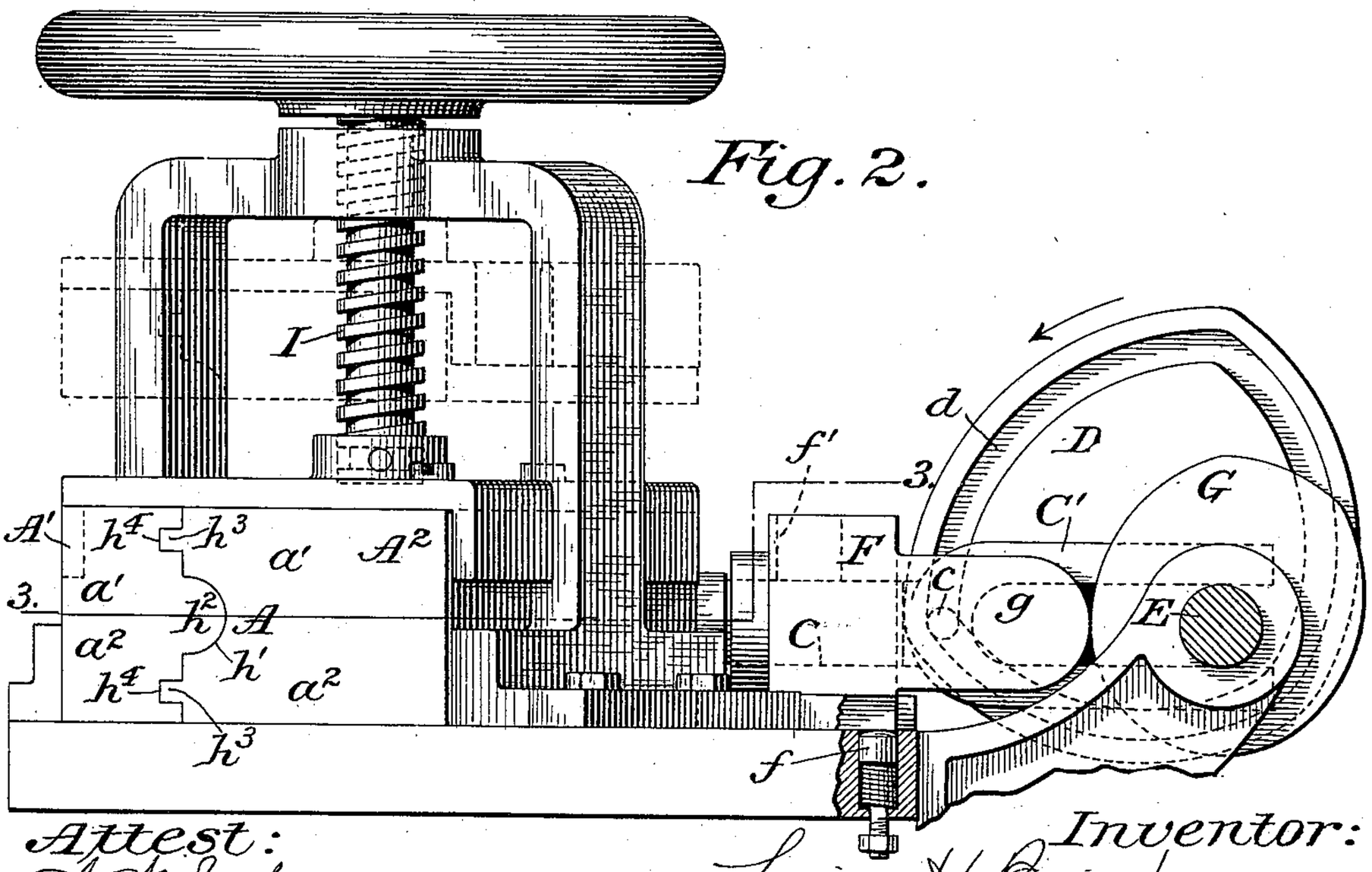

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Fig. 3.

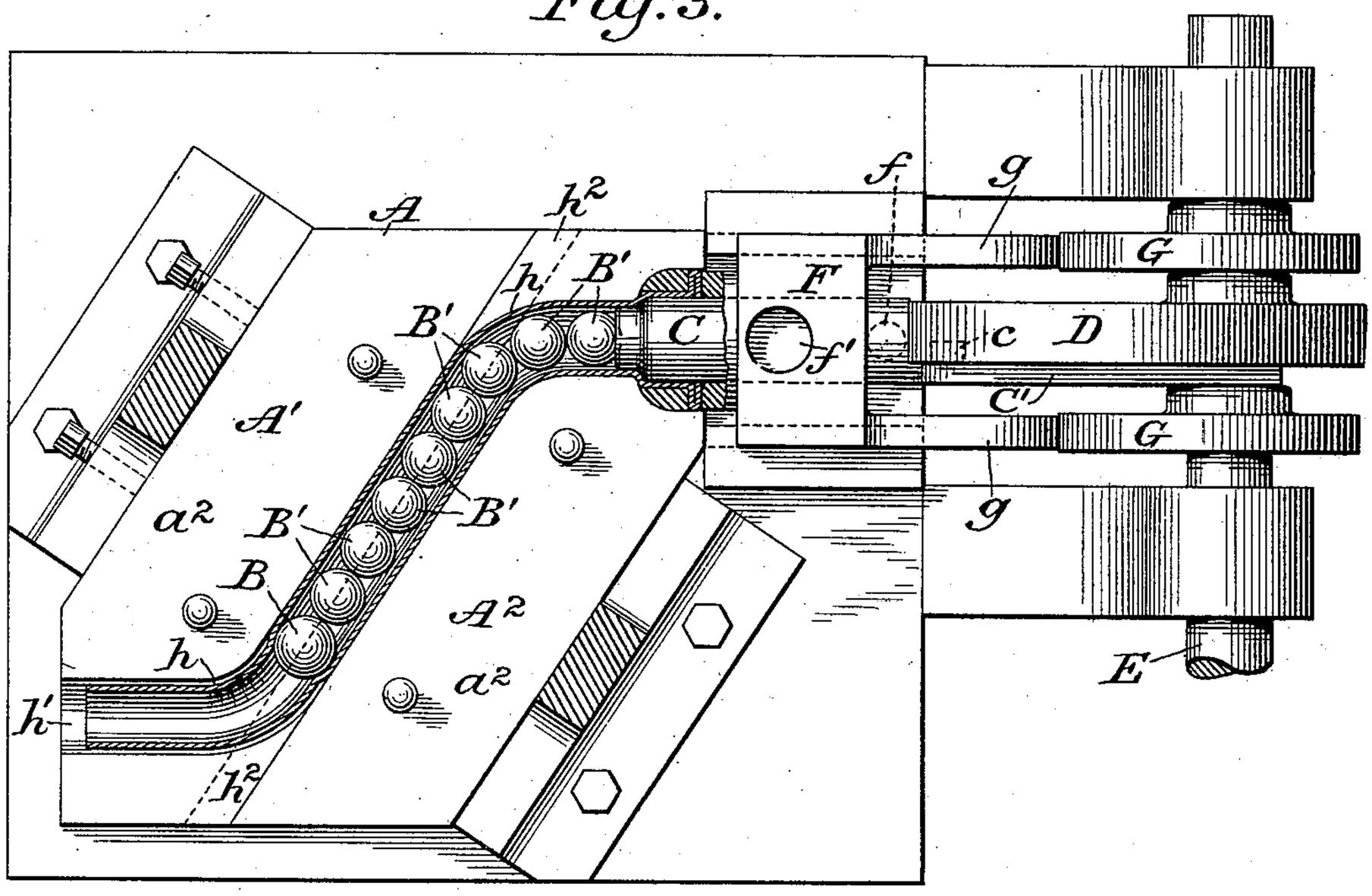


Fig. 4.

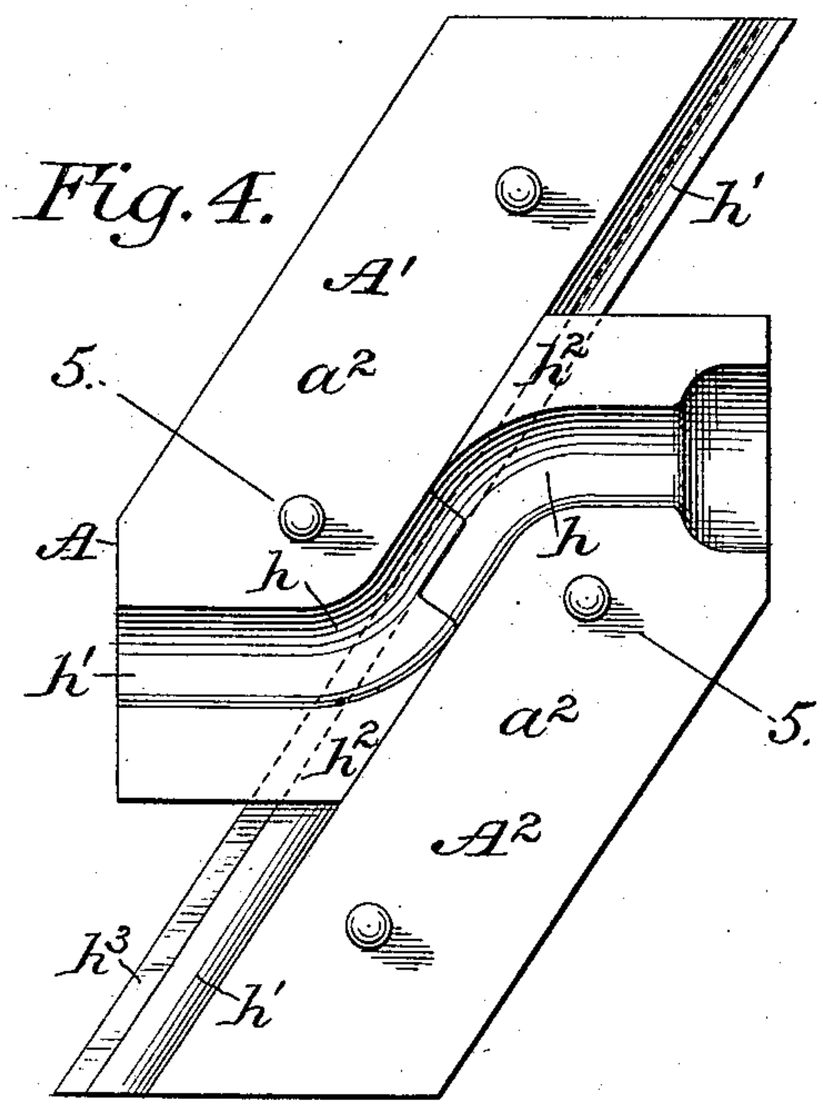


Fig. 5.

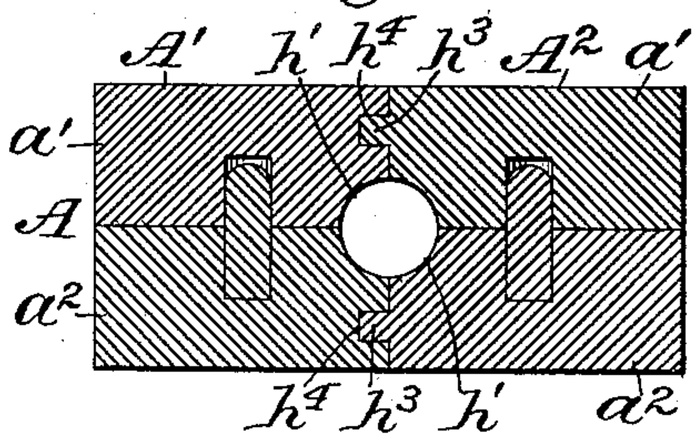
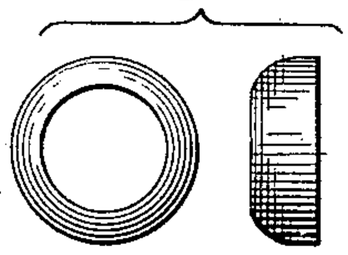


Fig. 6.



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UNITED STATES PATENT OFFICE.

LOUIES H. BRINKMAN, OF NEW YORK, N. Y.

TUBE-BENDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 614,242, dated November 15, 1898.

Application filed June 2, 1898. Serial No. 682,321. (No model.)

To all whom it may concern:

Be it known that I, LOUIES H. BRINKMAN, a citizen of the United States, residing in the borough of Brooklyn, city of New York, State of New York, have invented certain new and useful Improvements in Tube-Bending Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates more especially to the finishing of tubes which are bent approximately to the desired form by other means; and it has for its objects to bring the tube exactly to the desired form, to make it of uniform cross-section and smooth from end to end, to enable the bends to be turned out ready for use, and also to adapt the machine for the production of tubes bent on a compound curve with offsets of different lengths.

The apparatus or appliances or devices in which an embodiment of the invention is illustrated herein will be described in detail hereinafter, with reference to the accompanying drawings, in order that the nature of the invention and its mode of operation and use may be clearly understood.

In the drawings, Figure 1 is a plan view of the apparatus, with parts broken out to show details of construction. Fig. 2 is a side elevation of the same, also partly broken out. Fig. 3 is a view similar to Fig. 1, but in section on the plane indicated by the line 3 3 of Fig. 2 and with parts in different positions. Figs. 4 and 5 are detail views of the die which forms a part of the apparatus shown in the other figures. Fig. 6 shows detail views of a removable collar shown in position in Fig. 3.

The apparatus shown in the drawings comprises a die, in which the tube is firmly held, a series of rounded or substantially spherical bodies, and means for forcing such bodies through the tube while it is held in the die and also for shaping the end of the tube.

The die A, represented in the drawings, will be more fully described hereinafter. For the present it is sufficient to state that it is shaped internally to conform to the shape which the finished tube is to have and that it is held firmly in position. The rounded or substantially spherical bodies B B′ are pushed through the tube while it is held in the die, the first body B having a transverse diameter substantially equal to the desired internal diameter of the tube, while the other bodies B′ are by preference slightly smaller, so that they may pass easily through the tube. The first ball or body B forces the metal of the tube outward against the surface of the die, and as it passes through the throat of the bend, where the metal on the outer curvature is stretched more or less, while the metal on the inner curvature is generally wrinkled somewhat and thickened, it smooths out the wrinkles and expands the metal on the inner curvature, making the metal of substantially uniform thickness throughout the circumference of the tube at any point in the bend. The bodies B′ simply act as pushers between the body B and the actuating means and are given a rounded shape that they may pass easily through the tube.

As a means for forcing the body B into and through the tube a reciprocating plunger C may be employed, this plunger being withdrawn at each reciprocation far enough to permit the bodies B B′ to be placed in front of it one by one and forced into the tube by the next forward movement. The plunger may be actuated by a cam D on the shaft E, the periphery of the cam bearing directly against the outer end of the plunger. In order to steady the plunger in its movement and also to provide for its withdrawal, a fork C′ is secured to or formed with the plunger and straddles the shaft E. A pin *c*, carried by the fork, engages a groove *d* in the side of the cam D, the cam-groove effecting the withdrawal of the plunger. The pin fits loosely in the cam-groove, so that the forward movement of the plunger shall be effected by the periphery of the cam, as stated above. The plunger may be formed, as represented, to expand the end of the tube somewhat at its first stroke, if it is desired that the tube shall have an enlarged end. Tubes of the kind which this apparatus is chiefly designed to turn out are largely used in plumbing and are commonly provided with a flange to be engaged by the sleeve-nut which couples the bend to the adjacent tube. This flange is commonly soldered on and frequently comes off. One object of this invention is to provide for the formation of an integral flange. For this

purpose the plunger C is encircled by a collar F, which at the proper time is forced against the projecting end of the tube to form a flange, as represented in Fig. 3. The collar F may be driven forward by cams G on the shaft E through arms *g*. It may be retained in its forward position by a spring-actuated latch *f*, which moves into the rear of the collar as soon as it reaches its extreme forward position, movement of the collar thereafter being unnecessary. In order to permit the bodies B B′ to be fed in front of the plunger, the collar F is provided with an aperture *f*′ of sufficient size and in the proper location to permit the bodies to be dropped through it one at a time in front of the plunger as the latter reaches its extreme rearward position.

The die A which is shown in the drawings is adjustable to suit tubes of a compound bend with offsets of different lengths. It is composed of two main parts A′ and A², which are adjustable longitudinally with respect to each other and each of which is divided on another plane into two sections *a*′ and *a*². Each part A′ and A² is like the other, but with the relative positions of the curved portions of the die reversed and at opposite ends. In each part is formed completely one bend or throat *h*, while the intermediate portion is formed partly in the meeting faces of each. As the throat or bend is formed wholly in one part, it is possible to vary the length of the straight portion between the two bends more or less by adjusting the one part of the die longitudinally upon or with respect to the other. For this purpose the semicircular groove *h*′ in each part is carried from the throat *h* clear to the farther end of the part, and back of the throat each part is formed or provided with a semicircular filling-piece *h*², which fits closely in and fills the semicircular groove in the opposite part. The filling-piece is carried forward to the point where the outer curvature of the throat meets and merges in the straight portion, so that the throat or bend is formed wholly in the corresponding part of the die and in the filling-piece, which is a part thereof. Suitable tongues and grooves *h*³ *h*⁴ may be provided to insure close union of the parts. The several parts of the die may be held firmly together and the whole secured rigidly in place by any suitable means, such as a screw-press I of ordinary construction, which permits the die to be removed easily whenever it is required for purposes of adjustment.

The mode of operation of the apparatus will be readily understood without any further explanation herein.

It will also be understood that the invention is not to be limited to the precise construction and arrangement of parts shown and described herein.

I claim as my invention—

1. A machine for finishing bent tubes, said machine comprising a stationary die to hold the tube, a series of substantially spherical bodies and means to force said bodies through the tube as the same is held in the die.

2. A machine for finishing bent tubes, said machine comprising a stationary die to hold the tube, a plunger reciprocating toward and from the open end of the tube and means to deliver substantially globular bodies, one after another, in front of said plunger to be forced thereby into the tube.

3. A machine for finishing bent tubes, said machine comprising a stationary die to hold the tube, a plunger reciprocating toward and from the open end of the tube, a collar loosely encircling said plunger and means to force said collar against the end of the tube while the plunger is inserted within the same.

4. A machine for finishing bent tubes, said machine comprising a stationary die to hold the tube, a plunger reciprocating toward and from the open end of the tube, and a collar loosely encircling said plunger, said collar having an aperture to permit a substantially spherical body to be placed in front of the plunger to be forced thereby into the tube.

5. An adjustable die for tube-finishing machines, said die being composed of two parts adjustable longitudinally with respect to each other, said parts having in their opposing faces and at opposite ends a substantially semicircular groove and at the other ends a curved throat substantially circular in cross-section and a filling-piece to fill the semicircular groove of the opposite part, said throat being carried through the end of said filling-piece to meet the bottom of the semicircular groove in the opposite part.

6. An adjustable die composed of two parts adjustable longitudinally with respect to each other, the said parts having each formed therein a complete throat or bend and a portion of the intermediate straight part.

This specification signed and witnessed this 4th day of March, A. D. 1898.

LOUIES H. BRINKMAN.

In presence of—
A. N. JESBERA,
F. M. EGGLESTON.