(No Model.)

J. C. STURGEON.

MECHANISM FOR ROLLING OUT HOLLOW METAL INGOTS INTO TUBES.

No. 601,784. Patented Apr. 5, 1898.

Fig. 1.

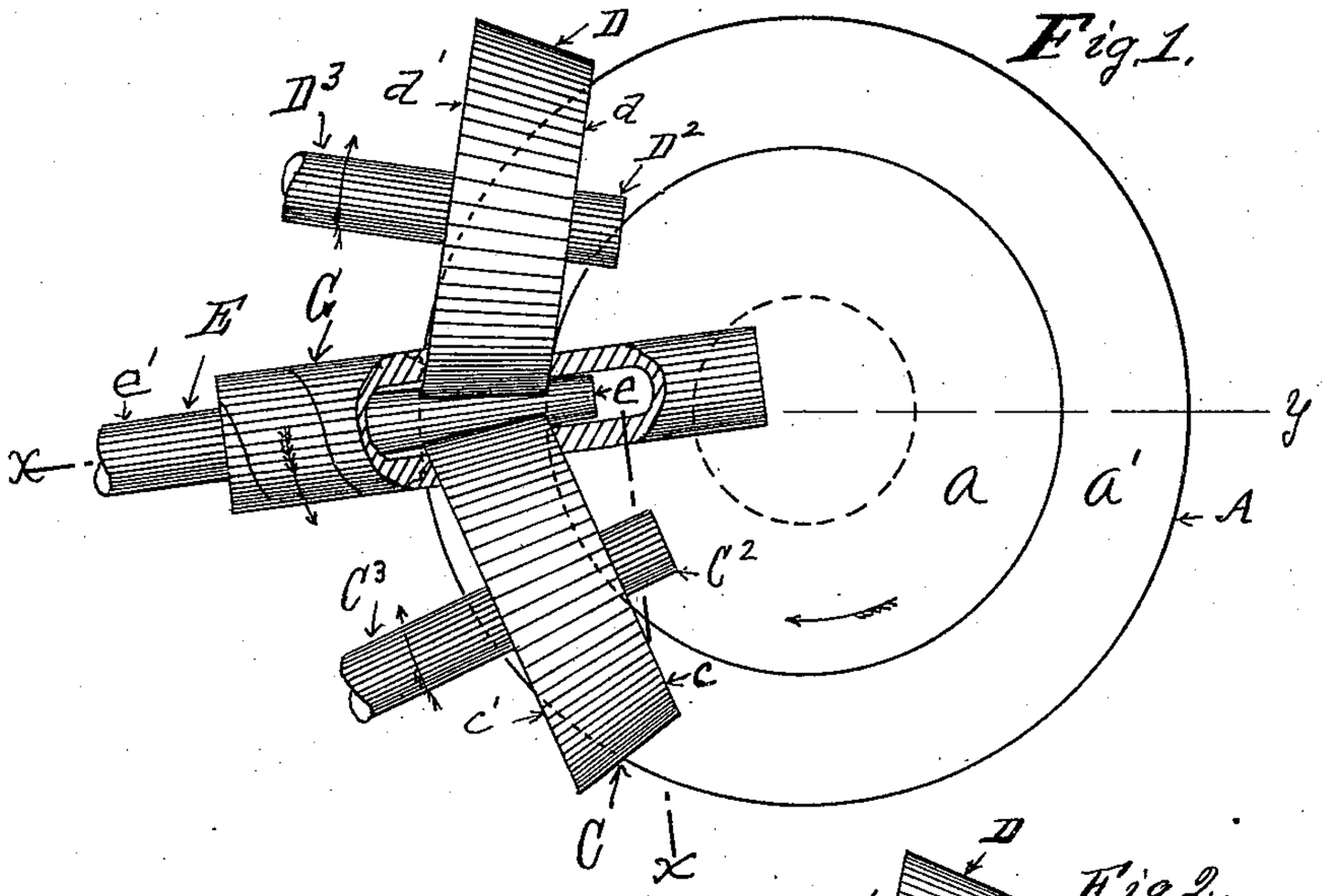


Fig. 2.

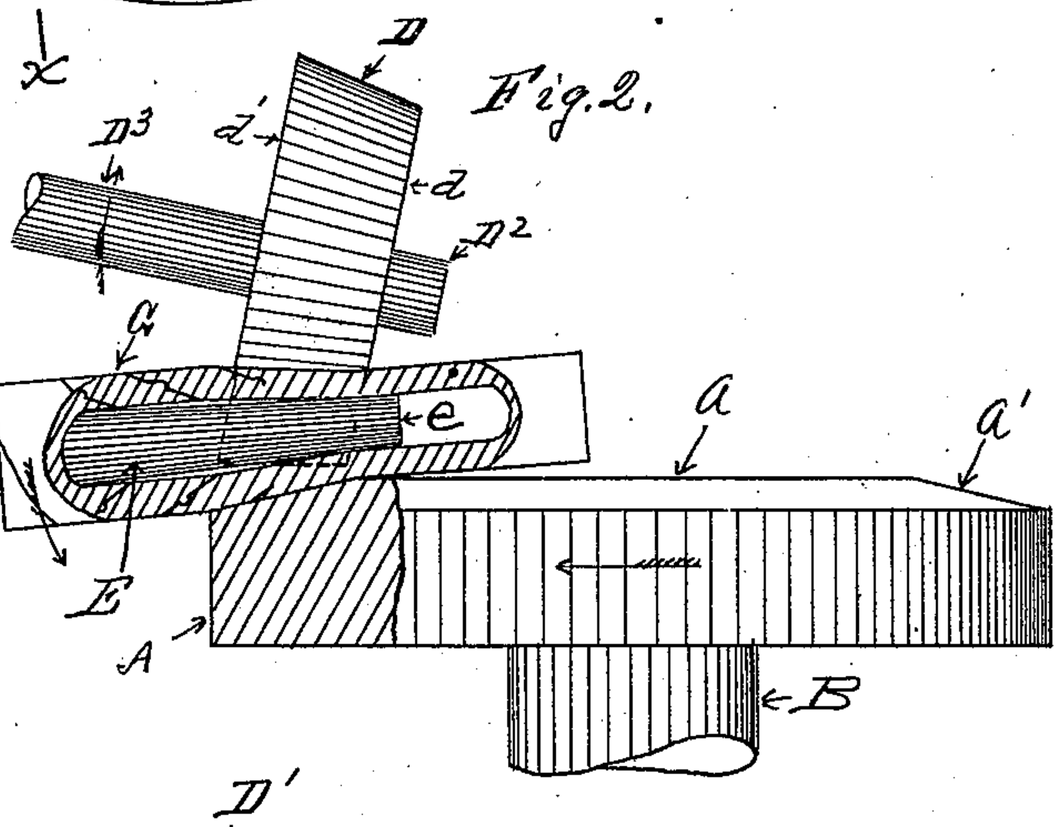
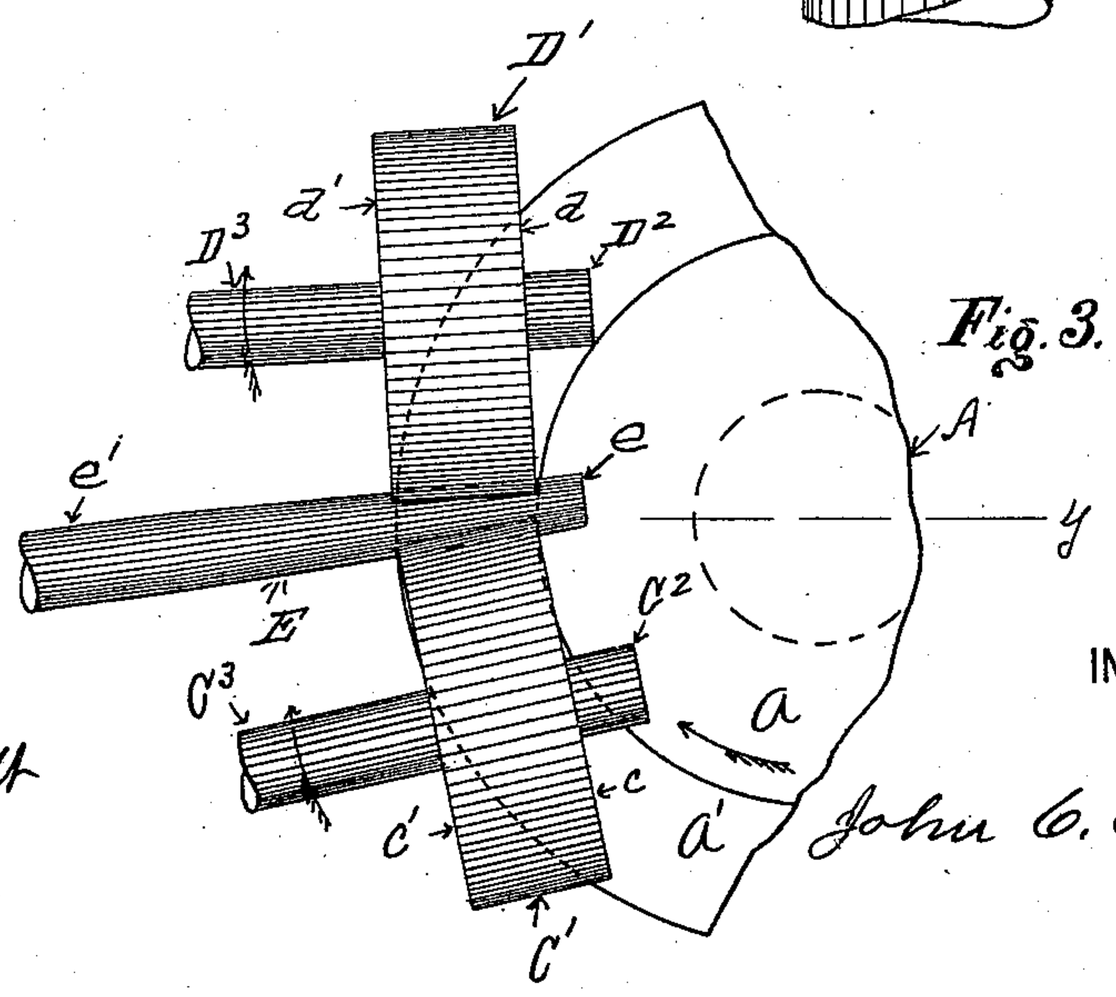


Fig. 3.



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MECHANISM FOR ROLLING OUT HOLLOW METAL INGOTS INTO TUBES.

SPECIFICATION forming part of Letters Patent No. 601,784, dated April 5, 1898.

Application filed November 1, 1897. Serial No. 657,031. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. STURGEON, a citizen of the United States, residing in Erie, in the county of Erie and State of Pennsylvania, have invented certain new and usefnl Improvements in Mechanism for Rolling Out Hollow Metal Ingots into Tubes; 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

This invention relates to improvements in mechanism for rolling out hollow metal ingots into tubes; and it consists, substantially, of a disk and a pair of rolls overlapping and rotating adjacent to the face of one side of said disk and a mandrel so located in the axis of the passage between the rolls and disk that the smaller end extends just beyond the exit end of said passage, and the larger end of the mandrel extends out a considerable distance beyond the ingress end of said passage, so that when the heated hollow ingot or billet is placed thereon and inserted between the periphery of the disk and the rolls they impart to it a rotary motion, and at the same time a longitudinal movement, and as it moves forward, the passage between the disk and rolls narrowing, it is reduced in diameter and drawn out upon the mandrel longitudinally into a tube, which passes off the small end of the mandrel at the exit end of said passage. The mechanism for further reducing and elongating the tube is the same in construction and operation, except that the mandrel is of smaller size, and likewise the passage between the disk and rolls is smaller. The arrangement of the rolls relatively to the surface of the disk where they contact with the ingot or billet in its passage is such that a substantially uniform speed of rotation is imparted to every portion of the ingot or billet passing between them, thus rolling and drawing out the hollow ingot or billet without materially disturbing or distorting the grain or fiber thereof. The mandrel I preferably make tapering, and it is held firmly against longitudinal movement, but may rotate freely with the ingot or billet being worked thereon, as desired.

In the accompanying drawings I show diagrammatically my improved mechanism for rolling hollow metal ingots out into tubes, and therein I show approximately different shapes and relative positions of the rolls and disk and the mandrel upon which the ingots are rolled and drawn out. I have not, however, attempted to show the framework or housings or the gearing for imparting motion to the disk and rolls or the other portions of a fully-organized machine, as these features form no part of my invention and their construction and application to the mechanism herein shown are well understood by those skilled in the art to which these inventions appertain. I do not mean, however, to confine myself to the exact shapes and proportions shown of the mechanism I have devised and shown and herein described, as these shapes and proportions may be varied considerably to suit different conditions without departing from the spirit of my invention.

In the drawings, Figure 1 is a top or plan view of a disk, a pair of conical rolls overlapping the periphery of the face thereof, and the mandrel and a hollow metal ingot on the mandrel on its passage between the disk and rolls. Fig. 2 is a view of the same, partially in elevation and partially in section, on the line $x\,x$ in Fig. 1. Fig. 3 is a top or plan view of a section of the disk, a pair of rolls of equal size at both ends overlapping the periphery of the face of the disk and at an angle to each other, and a mandrel located in the axis of the path of an ingot or billet passing between the disk and rolls.

In the drawings, A is a disk supported and rotating on a shaft B, to which suitable driving power may be applied. The face of this disk consists of a central plane surface a, around which there is a beveled working surface a'. Over this beveled working surface a' I place a pair of rolls C D. These rolls overlap the disk A, and the inner ends $c\ d$ thereof are closer to the inner edge of the beveled surface a' of the disk than the outer ends $c'\ d'$ thereof are to the outer edge of the beveled surface a' of the disk, as shown by the dotted line indicating the lower part of the roll in Fig. 2 of the drawings.

In Figs. 1 and 2 of the drawings the rolls C D, as shown, are conical and are located at an angle to each other, and in Fig. 3 of the drawings rolls C D are shown of equal size throughout. The rolls in Figs. 1 and 3 are

shown as having their adjacent surfaces at an angle with each other and so located with relation to the disk that the axis of the passage between the disk and rolls is at an angle to a radial line *y* through the center of the disk. These features, however, may be varied as desired. These rolls are supported on journals C^2 D^2 and shafts C^3 D^3, to which suitable driving power may be applied. In the axis of the path of travel of the ingot or billet between the disk A and rolls C D or C′ D′, I place a mandrel E, held firmly against longitudinal movement, but which may rotate or be fixed as desired. The inner end *e* of this mandrel is preferably smaller than the outer portion *e′* thereof and projects, preferably, a little beyond the inner end of the passage between the rolls and disk, so that when a heated hollow ingot is placed thereon and the mandrel with the ingot thereon inserted between the rolls and the periphery of the beveled surface *a′* of the disk the ingot or billet is engaged by the outer ends *c′ d′* of the rolls and the peripery of the beveled surface *a′* of the disk and rotated thereby and moved forward by the action of the disk and rolls toward the inner ends *c d* of the rolls, meanwhile being reduced and drawn out as the passage between the rolls and disk narrows, until it is finally forced off of the small end of the mandrel in the form of a tube.

When the conical rolls are used, the circumferential speed at which the inner ends *c d* of the rolls are driven is approximately the same as that of the inner edge of the bevel *a′* of the disk A, and the speed of travel of the periphery of the beveled surface *a′* of the disk is substantially the same as that of the outer ends *c′ d′* of the rolls; but when straight rolls are used there is sufficient slippage on the ingot being rolled between them as it travels through the constantly-narrowing passage between the rolls and disk that as it is rotated therein it is drawn out and elongated and reduced in diameter without material disturbance or distortion of the fiber or grain of the metal.

In practicing my invention the hollow ingot or billet is heated and the mandrel E inserted therein far enough so that the tapering end *e* thereof extends far enough beyond the end of the ingot or billet G to reach through the passage between the rolls and disk, when the mandrel E and the heated ingot or billet G thereon are then inserted between the outer ends *c′ d′* of the rolls and the periphery of the disk, and the projecting end of the mandrel E extends through the passage between the rolls and disk. The rolls and disk then acting upon the end of the ingot or billet G rotates it and draws it onward into the constantly-narrowing passage between the rolls and disk, meanwhile reducing it as it travels onward until it passes out between the ends *c d* of the rolls and the inner edge of the bevel *a′* of the disk and off of the end *e* of the mandrel E in the form of a tube, as illustrated in Figs. 1 and 2. For further reducing and drawing out the tube I use the same kind of rolls and disk with a more constricted passage between them and a smaller mandrel E, which is inserted in the heated tube resulting from the drawing out of the hollow ingot or billet, as hereinbefore described, the operation being substantially the same in all respects, and this portion of the operation is repeated until the tube is drawn out and reduced to the size of finished tube desired.

I have thus described my mechanism for rolling and drawing out hollow ingots into tubes and have shown and described convenient mechanism for practicing said invention; but, as before stated, the drawings are diagrammatic, and it is not intended that they shall represent the exact proportions and relations of the rolls and disk and their working surfaces or of the mandrel thereto, for these proportions and relations may vary widely with the conditions and character of the work to be performed.

Therefore, having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a machine for reducing and drawing out hollow ingots or billets into tubes, a disk, a pair of rolls overlapping the edge of the face of said disk, and a mandrel in the axis of the passage between said disk and rolls, extending throughout said passage, substantially as set forth.

2. In a machine for reducing and drawing out hollow ingots or billets into tubes, a disk having the periphery of its face beveled, a pair of rolls overlapping the beveled surface of said disk, and a tapering mandrel inserted in the ingress end of the passage between said disk and rolls, and extending throughout said passage in the axis thereof, substantially as set forth.

3. In a machine for reducing and drawing out hollow ingots into tubes, a disk, a pair of conical rolls overlapping the edge of the face of said disk, and a mandrel located in the axis of the passage between said disk and rolls, and extending throughout said passage, substantially as set forth.

4. In a machine for reducing and drawing out hollow ingots into tubes, a disk having the periphery of its face beveled, a pair of conical rolls overlapping the beveled surface of said disk, and a tapering mandrel inserted in the ingress end of and extending throughout the passage between said disk and rolls in the axis thereof, substantially as set forth.

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

JOHN C. STURGEON.

Witnesses:
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