(No Model.) 2 Sheets—Sheet 1.

J. C. STURGEON.

MECHANISM FOR PIERCING METAL INGOTS.

No. 601,783. Patented Apr. 5, 1898.

Fig. 1.

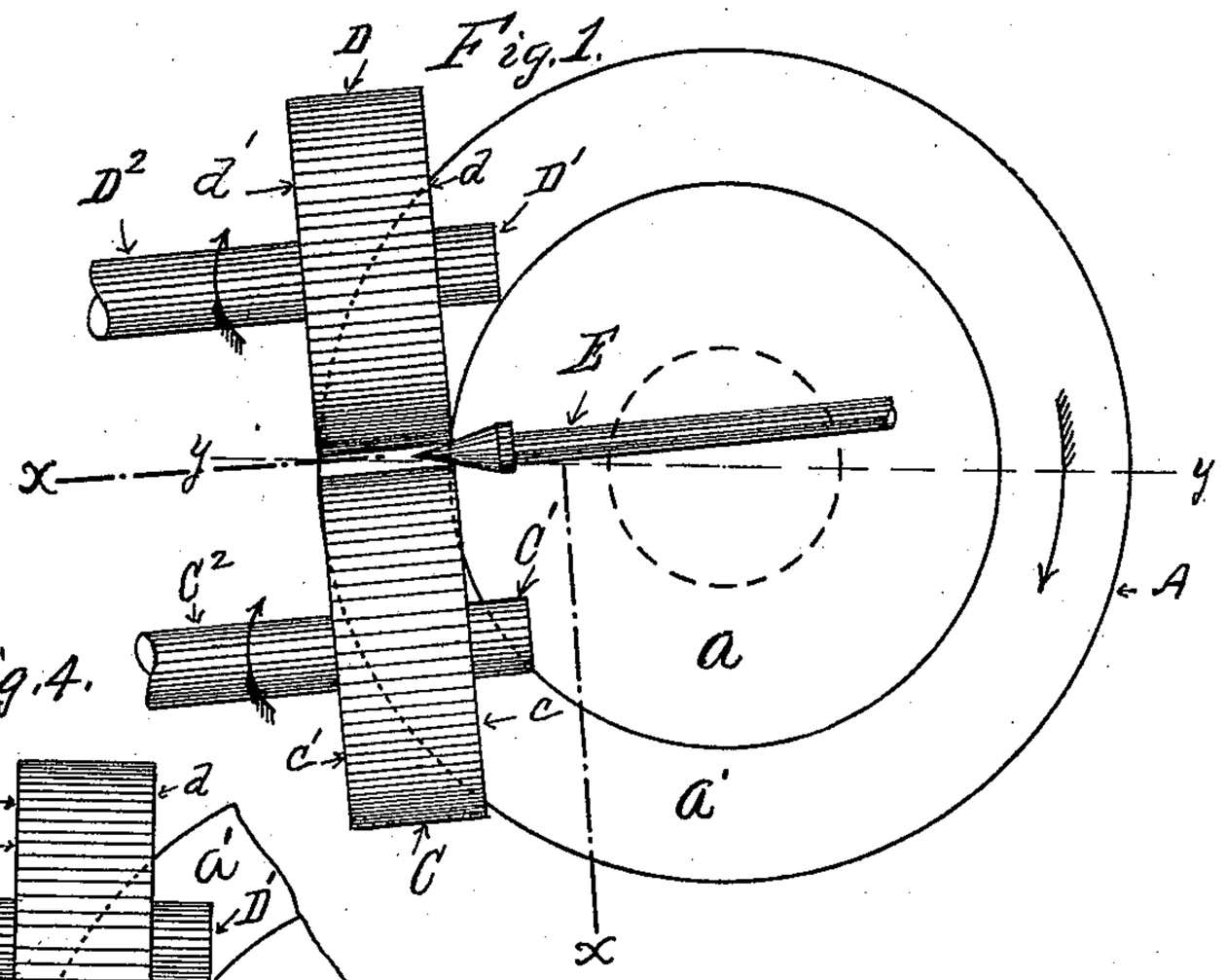


Fig. 4.

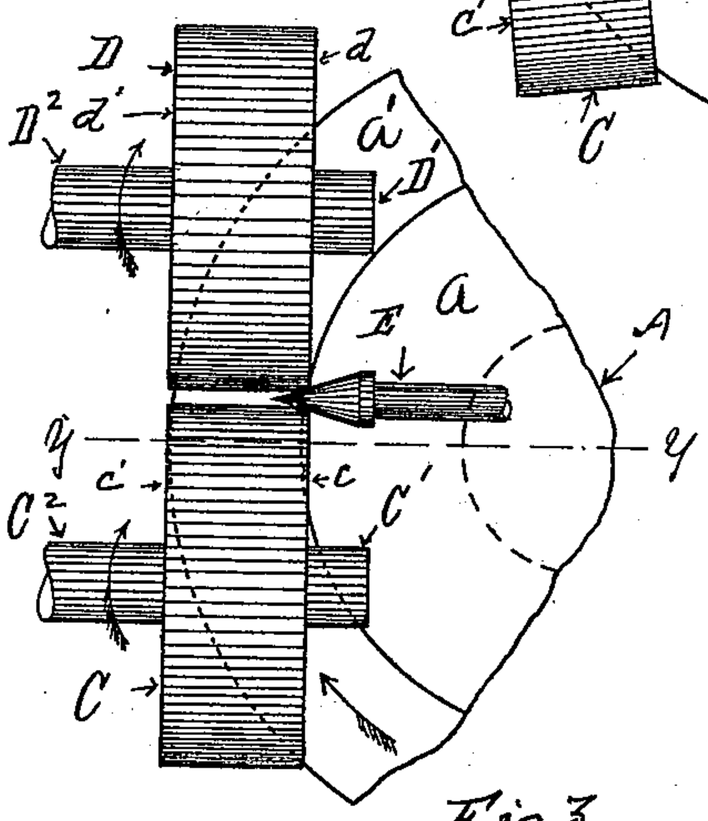


Fig. 2.

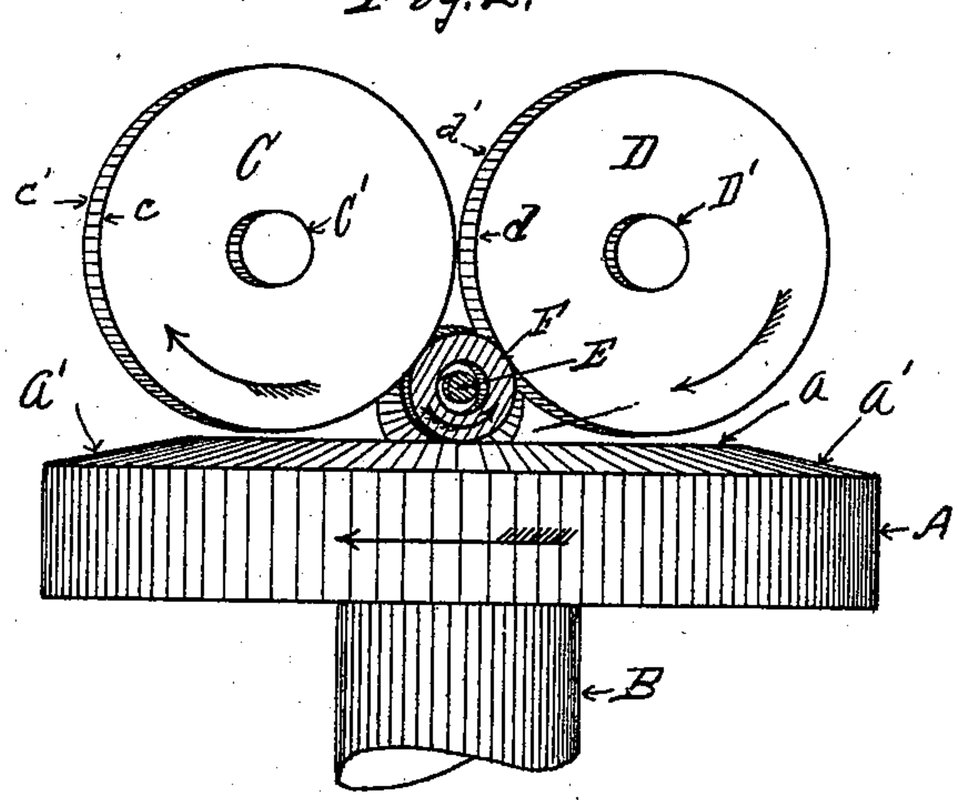
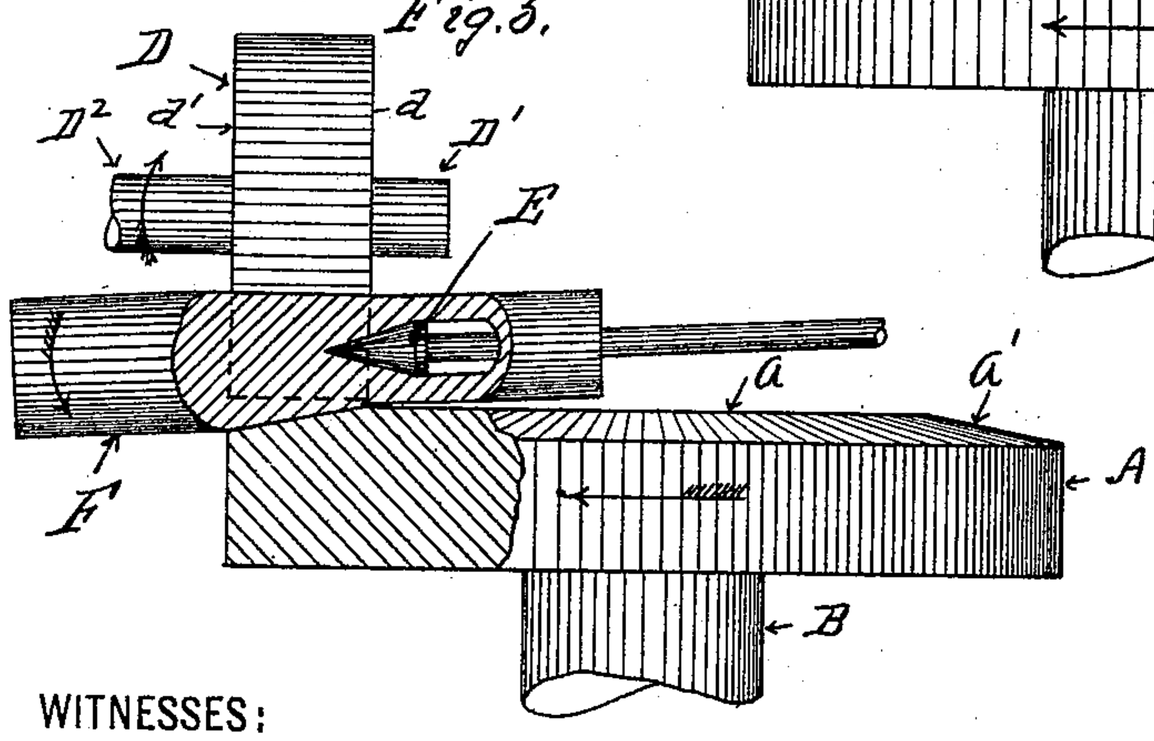


Fig. 3.



WITNESSES:

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(No Model.)

2 Sheets—Sheet 2.

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MECHANISM FOR PIERCING METAL INGOTS.

No. 601,783. Patented Apr. 5, 1898.

Fig. 6.

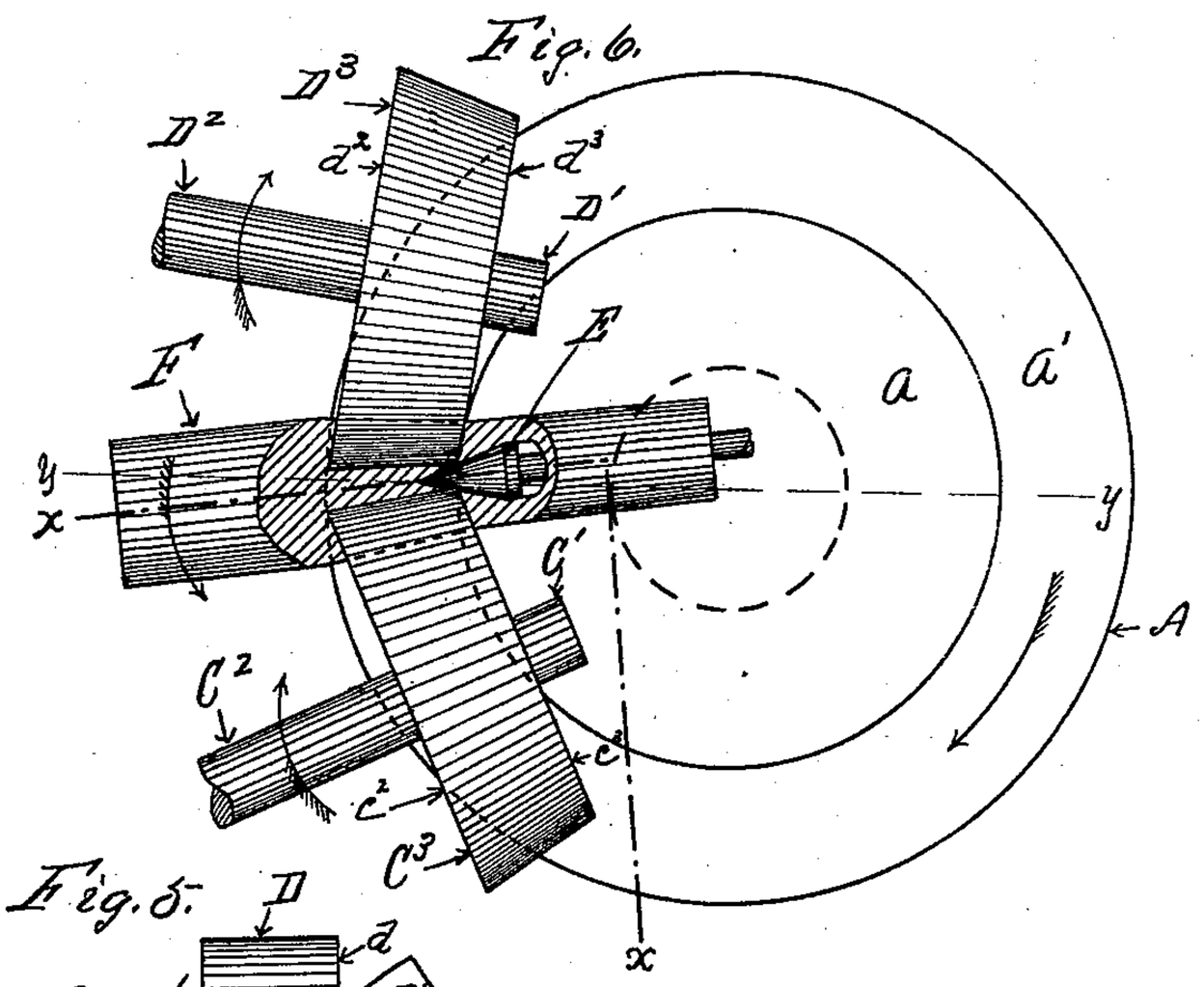


Fig. 5.

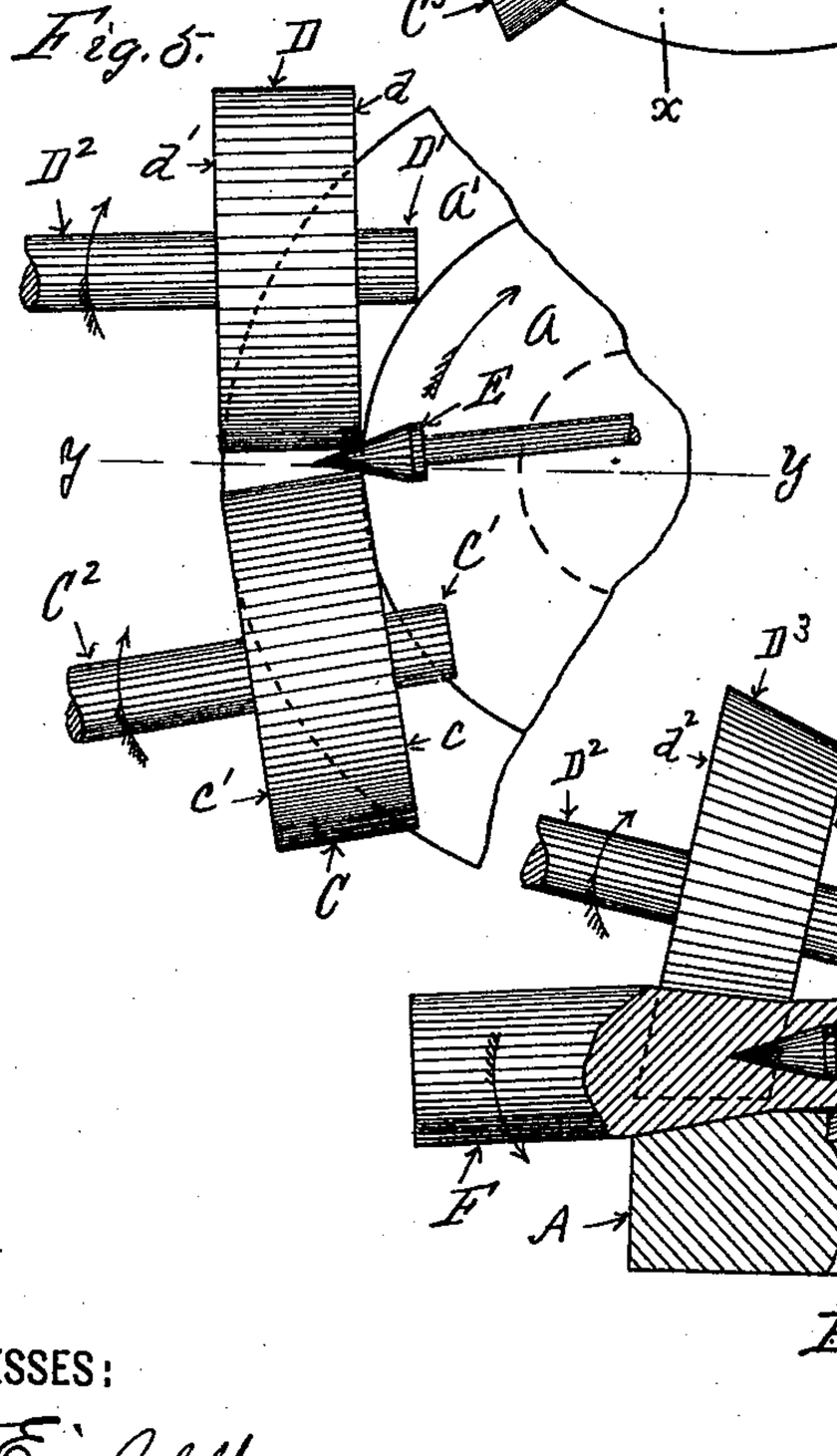
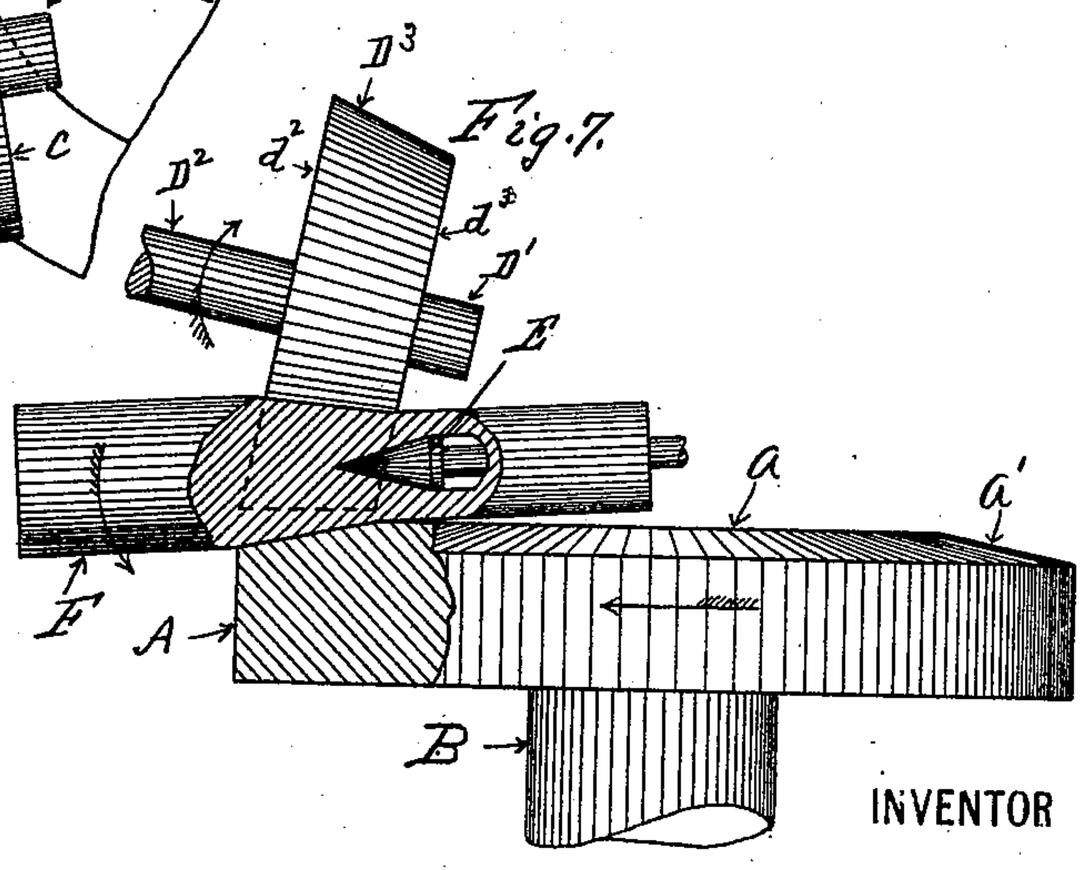


Fig. 7.



WITNESSES:

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UNITED STATES PATENT OFFICE.

JOHN C. STURGEON, OF ERIE, PENNSYLVANIA.

MECHANISM FOR PIERCING METAL INGOTS.

SPECIFICATION forming part of Letters Patent No. 601,783, dated April 5, 1898.

Application filed November 1, 1897. Serial No. 657,030. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. STURGEON, a citizen of the United States, residing in the city of Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Mechanism for Piercing Metallic Ingots or Billets and Drawing Them Out 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.

My invention relates to improvements in mechanism for piercing metallic ingots or billets and making tubes therefrom; and it consists in mechanism so constructed that it is adapted to pierce a longitudinal hole through and elongate a heated metallic ingot or billet without subjecting it to such torsional strain as will distort the grain or fiber of the metal therein.

This mechanism consists, substantially, of a disk and a pair of rolls overlapping and running adjacent to the face of one side of said disk and a piercing-mandrel located near the point of exit in the axis of the path of the ingot or billet in its passage between the disk and rolls, that as the ingot or billet is rolled out between them it will be pierced longitudinally by the mandrel. In accomplishing this result the heated ingot or billet is inserted between the periphery of the disk and the rolls, which impart to it a rotary motion and at the same time a longitudinal movement, and as it moves forward it is drawn out longitudinally and in its forward travel is forced against the point of a piercing-mandrel placed in the path of the axis of rotation of the ingot or billet. The arrangement of the rolls relatively to the surface of the disk where they contact with the ingot or billet in its passage between them is such that a substantially uniform speed of rotation is imparted to every portion of the ingot or billet passing between them, thus drawing out the ingot or billet longitudinally without materially disturbing or distorting the grain or fiber thereof during the reduction of its diameter and its elongation and its forward movement over the piercing-mandrel. The piercing-mandrel may be stationary, or rotated, if desired, to facilitate the piercing of the blank, but the gripping power of the disk and rolls on the ingot or billet passing between them imparts sufficient longitudinal force to its forward movement to force it onto and over the piercing-mandrel interposed in the axis of its path of travel.

In the accompanying drawings I show approximately the shapes and different relative positions of the disk and rolls and piercing-mandrel of the mechanism which I employ in the construction of my invention. I have not attempted to show the framework or housings or the gearing for imparting motion to the disk and rolls or other portions of a fully-organized machine, these general features forming no part of the invention herein claimed, as their construction and application to the parts herein shown are well understood by those skilled in the art to which this invention appertains. I do not mean, however, to confine myself to the exact shapes and proportions shown, as these may be varied to a considerable extent 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 parallel rolls overlapping the periphery of the face thereof at an angle to a radial line through the axis of the disk, and a piercing-mandrel the point of which is located in the axis of the path of the traverse of an ingot or billet passing between said disk and rolls. Fig. 2 is a side view in elevation of the same, looking across the disk toward the inner ends of the rolls, and also showing the end of an ingot or billet being drawn out and pierced. Fig. 3 is a view of the same, partially in elevation and partially in section, on the lines $x\ x$ in Fig. 1, showing a section of the ingot or billet during its passage between the disk and rolls, together with the piercing-mandrel in operation. Fig. 4 is a top or plan view of a section of the disk, showing a pair of parallel rolls overlapping the periphery of the face thereof at one side of and parallel to a radial line through the axis of the disk and a piercing-mandrel located in the axis of the path of the traverse of an ingot or billet passing between the rolls and disk. Fig. 5 is a top or plan

view of a section of the disk, showing a pair of rolls of equal size at both ends overlapping the periphery of the face of the disk and arranged at an angle to each other and to a radial line through the axis of the disk and a piercing-mandrel located in the axis of the path of an ingot or billet passing between the rolls and disk. Fig. 6 is a top or plan view of a disk and a pair of conical rolls overlapping the periphery of the face of the disk and a piercing-mandrel located in the axis of the path of the traverse of an ingot or billet passing between the rolls and disk. Fig. 7 is a view of the same, partially in elevation and partially in section, on the lines y y in Fig. 6, showing a section of an ingot or billet during its passage between the disk and rolls, together with the piercing-mandrel in operation.

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 in Figs. 1, 2, and 3 of the drawings, the axes of the rolls C and D are parallel to each other and at an angle to a radial line y y passing through the center of the disk A, and in Fig. 4 of the drawings the axes of the rolls C and D are parallel to each other and parallel to a radial line y y passing through the center of the disk A; but the line of the traverse of the ingot or billet between the disk and rolls is at one side of said radial line y y, and in Fig. 5 of the drawings the adjacent sides of the rolls C and D are at an angle to each other, and in Figs. 6 and 7 the rolls are conical in shape and the adjacent sides thereof at an angle to each other. These features may, however, be varied as desired. These rolls are supported on suitable journals C′ and D′ and shafts C^2 and D^2, to which suitable driving power may be applied.

In the axis of the line of travel of the ingot or billet between the disk A and the rolls C and D, I place a piercing-mandrel E, so that the point of it will extend inward between the ends c and d of the rolls and the inner portion of the beveled surface a' of the disk A, so that when the ingot or billet rotates and travels toward and nearly reaches the ends c d of the rolls and the inner edge of the beveled surface a' of the disk it will encounter and be pierced longitudinally by the piercing-mandrel.

The circumferential speed at which the inner ends c d of the rolls are driven is approximately the same as the circumferential speed of the inner edge of the bevel a' of the disk A, and while the travel of the periphery of the bevel a' of the disk A is somewhat faster than that of the periphery of the ends c' d' of the rolls C D there is sufficient slippage of the disk and rolls on the ingot or billet at that point 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 any material disturbance or distortion of the fiber or grain of the metal and gradually forced forward into and through the narrowest portion of the passage and over the point of the piercing-mandrel E and out from between the rolls and disk. In piercing some kinds of ignots or billets, however, I prefer to use the conical form of rolls C^3 D^3 shown in Figs. 6 and 7, as their outer ends c^2 d^2 being of greater diameter than their inner ends c^3 d^3 the travel of the peripheries of their outer ends more nearly approximates the travel of the periphery of the beveled working surface a' of the disk, and therefore there is less torsional strain and slippage of the parts on the ingot or billet at that point than there is with the straight rolls. Otherwise the operation and results produced by these rolls and the disk are the same as hereinbefore described.

In operation the end of a heated ingot or billet F is inserted between the periphery of the bevel a' on the disk A and the outer ends of the rolls. It then immediately commences to rotate and travel forward toward the inner edge of the bevel a' and at the same time is elongated and reduced in diameter as it moves forward until it encounters the point of the piercing-mandrel, which pierces it, and it travels onward over the mandrel until finally the ingot or billet is pierced throughout its entire length, and at the same time it is considerably elongated and reduced in diameter.

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 piercing-mandrel thereto, for these proportions and relations may vary widely with the conditions and character of the work to be performed.

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

1. The combination of a disk, a pair of rolls overlapping the face of said disk, and a mandrel in the axis of the passage between said disk and rolls, substantially as set forth.

2. The combination in an ingot or billet piercing machine, of a disk, a pair of rolls overlapping the edge of the face of said disk, and a piercing-mandrel located in the axis of the passage between said disk and rolls at or near its narrowest point, substantially as set forth.

3. The combination in an ingot or billet piercing machine, of a disk having the periphery of its face beveled, a pair of rolls over-

lapping the beveled surface of said disk, and a piercing-mandrel located in the axis of the passage between said disk and rolls at or near the exit end of said passage, substantially as set forth.

4. The combination in an ingot or billet piercing machine, of a disk, a pair of conical rolls overlapping the edge of the face of said disk, and a piercing-mandrel located in the axis of the passage between said disk and rolls at or near its narrowest point, substantially as set forth.

5. The combination in an ingot or billet piercing machine, of a disk, having the periphery of its face beveled, a pair of conical rolls overlapping the beveled surface of said disk, and a piercing-mandrel located in the axis of the passage between said disk and rolls at or near the exit end of said passage, substantially as set forth.

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

JOHN C. STURGEON.

Witnesses:

FRED EINFELDT,

F. J. BASSETT.