J. S. SEAMAN.

Rolling Iron and Steel.

No. 57,388. Patented Aug. 21, 1866.

Fig. 4.

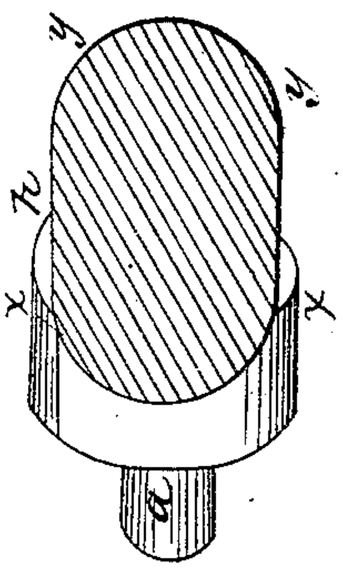


Fig. 2

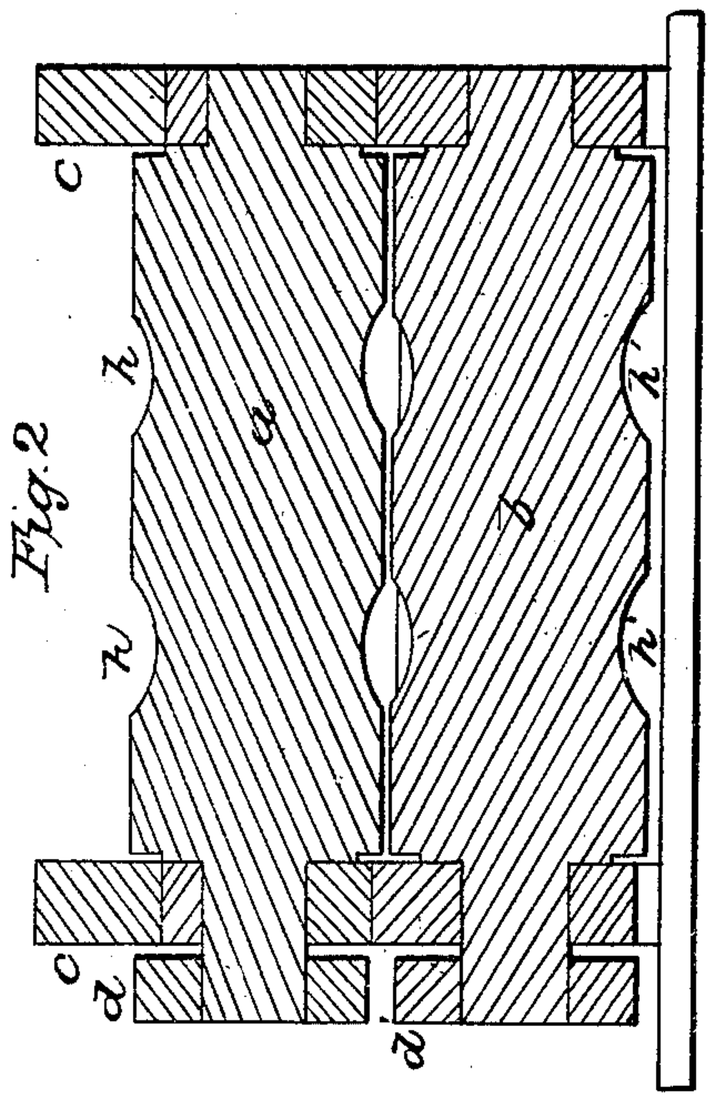


Fig. 3

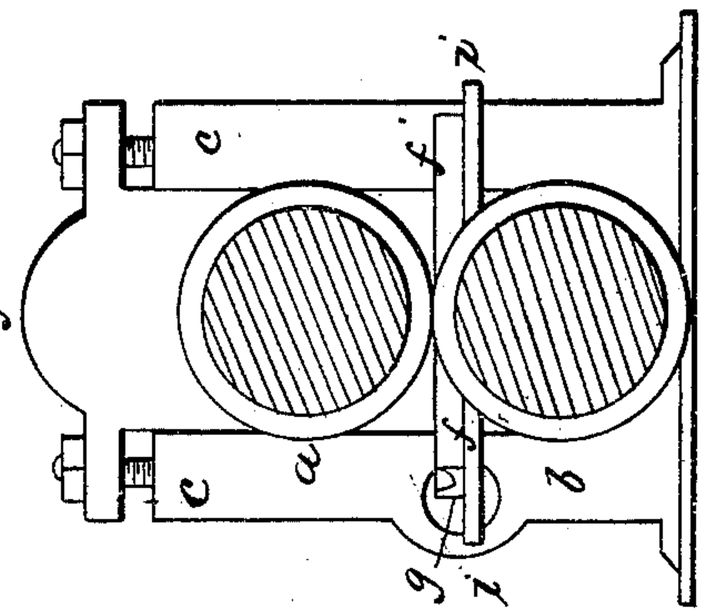
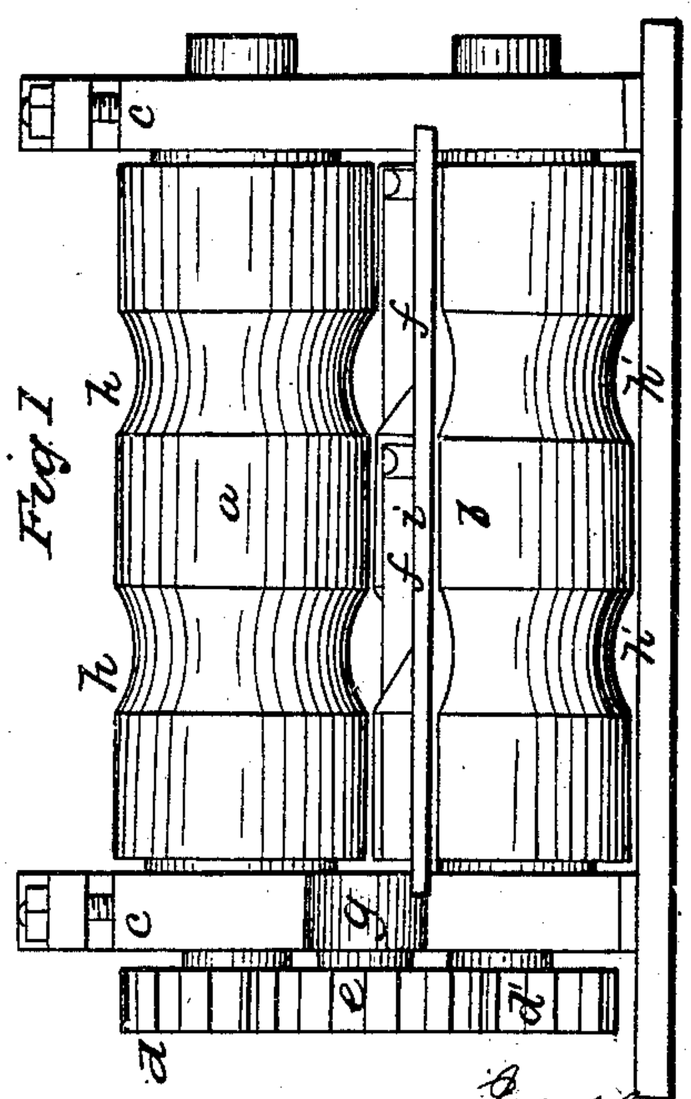


Fig. 1



WITNESSES.
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JOSEPH S. SEAMAN, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN ROLLING IRON OR STEEL.

Specification forming part of Letters Patent No. **57,388**, dated August 21, 1866.

To all whom it may concern:

Be it known that I, JOSEPH S. SEAMAN, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rolling Iron and Steel, which I call "Twist-Rolling;" and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, which represent the machinery used by me in my improved mode of rolling, which I call "twist-rolling."

In the drawings, Figure 1 is a front view of my rolls for twist-rolling. Figure 2 is a longitudinal sectional elevation through the axis of the rolls shown in Fig. 1. Fig. 3 is a transverse sectional elevation of the rolls through the line *x x*, Fig. 1; and Fig. 4 is a section through one of my rolls in a plane inclined at an angle of forty-five degrees to the axis of the roll through one of its grooves.

In the several figures like letters refer to similar parts.

My improvement consists in rolling iron or steel in such a manner as to cause the grain of the iron to form in spiral lines or to twist, while at the same time the exterior shape of the surface of the bar is cylindrical.

The advantage which I claim for twist-rolling is that iron thus rolled is stronger and more compact, and has more tensile force when the grain of the metal, instead of lying in parallel lines, is twisted somewhat after the manner of the fibers of thread when twisted by spinning.

Another advantage of my improved process is that the iron or steel thus rolled is more compressed by the rolling than when passed between grooved rolls in the ordinary manner, and is, therefore, more compactly welded together, resembling more nearly iron or steel which has been forged under a hammer than rolled metal.

By my process of twist-rolling ingots of steel may be successfully welded, which is usually done by hammering, and cannot be effected by the ordinary method of straight-rolling.

In order to enable others skilled in the art to use the machinery adapted to my process of twist-rolling, I will proceed to describe its construction and operation.

The effect of twist-rolling iron or steel is accomplished by passing it repeatedly through reducing-rolls so constructed and arranged as to cause the iron to revolve on its axis as it passes through between the rolls.

I use a pair of cylindrical metallic rolls, *a* and *b*, set, one above the other, in suitable housings *c c*. These rolls do not quite touch each other, as seen in Fig. 2, and each is geared, by means of a cog-wheel, *d d'*, into an idler cog-wheel, *e*, the shaft of which has its bearing in the housing-frame at *g*. Thus these two rolls *a* and *b* revolve in the same direction, and not in the direction which they would have if they revolved by rolling in contact. These rolls are of equal diameter, and are grooved at corresponding points, the grooves *h h'* being arcs of circles and extending around the rolls.

A bar of iron or steel, when passed between such a pair of rolls at right angles to their axes, will touch the rolls only at a tangential point or line; but if passed between them, through the groove, at any other angle the length of its bearing on the face of the roll will be increased, and at a certain angle (depending on the relative degree of curvature of the roll itself in one direction and of the groove in a direction at right angles thereto) the bearing-surface will be a right line. This is shown in Fig. 4, which is a cross-section of one of the rolls, through its groove, at an angle of forty-five degrees to the axis of the roll, the lines *x y* on the upper and lower surface of the roll in the groove being perfectly straight.

By taking advantage of this fact, and passing the bar of iron into the groove of the rolls at an angle which will give the longest possible straight bearing-surface, and restraining the bar of iron, so as to cause it to preserve the same angle as it passes through the rolls, the metal is exposed to a different kind of treatment to that which it experiences when rolled between rolls which pinch it only at the tangential point. Especially is this the case when the rolls both revolve in the same direction, because the bar is thus compelled to revolve on its own axis, and is not pinched, but compressed, owing to the long bearing-surface of the rolls on both sides.

In order to secure this result, I attach to the fore plate, *i*, of the housing-frame a guttered box or channel, *f*, which is set horizontally at

the proper angle of inclination to the axes of the rolls, the lowest point of the channel or groove in the box *f* being at the same level as the lowest point of the groove *h'* in the lower roll, *b*. This channel *f* approaches the lower roll, *b*, on the front side so as nearly to touch it, and, being intercepted by the roll itself, is continued by a similar channel-box, *f'*, set at the same angle and with its gutter in the same straight line on the rear side of the rolls.

When the bar of iron or steel is introduced into the rolls it is placed in the gutter in the channel-box *f* and passed forward until it enters the pass in the grooved portion of the rolls. As the rolls *a* and *b* revolve in opposite directions the bar is caused to turn on its own axis by the pressure and motion of the rolls upon it, and is thus screwed through between them, being at the same time forcibly compressed by the long bearing-surface which each of the rolls has upon it.

The effect of this operation is such as before stated: The metal is pressed instead of being pinched, and at the same time a twist is given to the grain of the metal, which adds greatly to its strength.

Having thus described my improvement, what I claim as my invention, and desire to secure by Letters Patent, is—

1. Giving the grain of iron or steel a twist by rolling it on its axis under compression, in the manner and by means substantially as and for the purposes hereinbefore described.

2. Subjecting metallic bars to rolling compression between parallel bearing-surfaces of greater length than the tangential bearing-point given by rolls when the metal is passed between them at right angles to their axes, such bearing-surfaces being obtained by causing the metallic bar to pass between grooved cylindrical rolls at an angle to their axes other than a right angle, said rolls being constructed substantially as and for the purposes hereinbefore described.

In testimony whereof I, the said JOSEPH S. SEAMAN, have hereunto set my hand.

JOSEPH S. SEAMAN.

Witnesses:

ALLAN C. BAKEWELL,

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