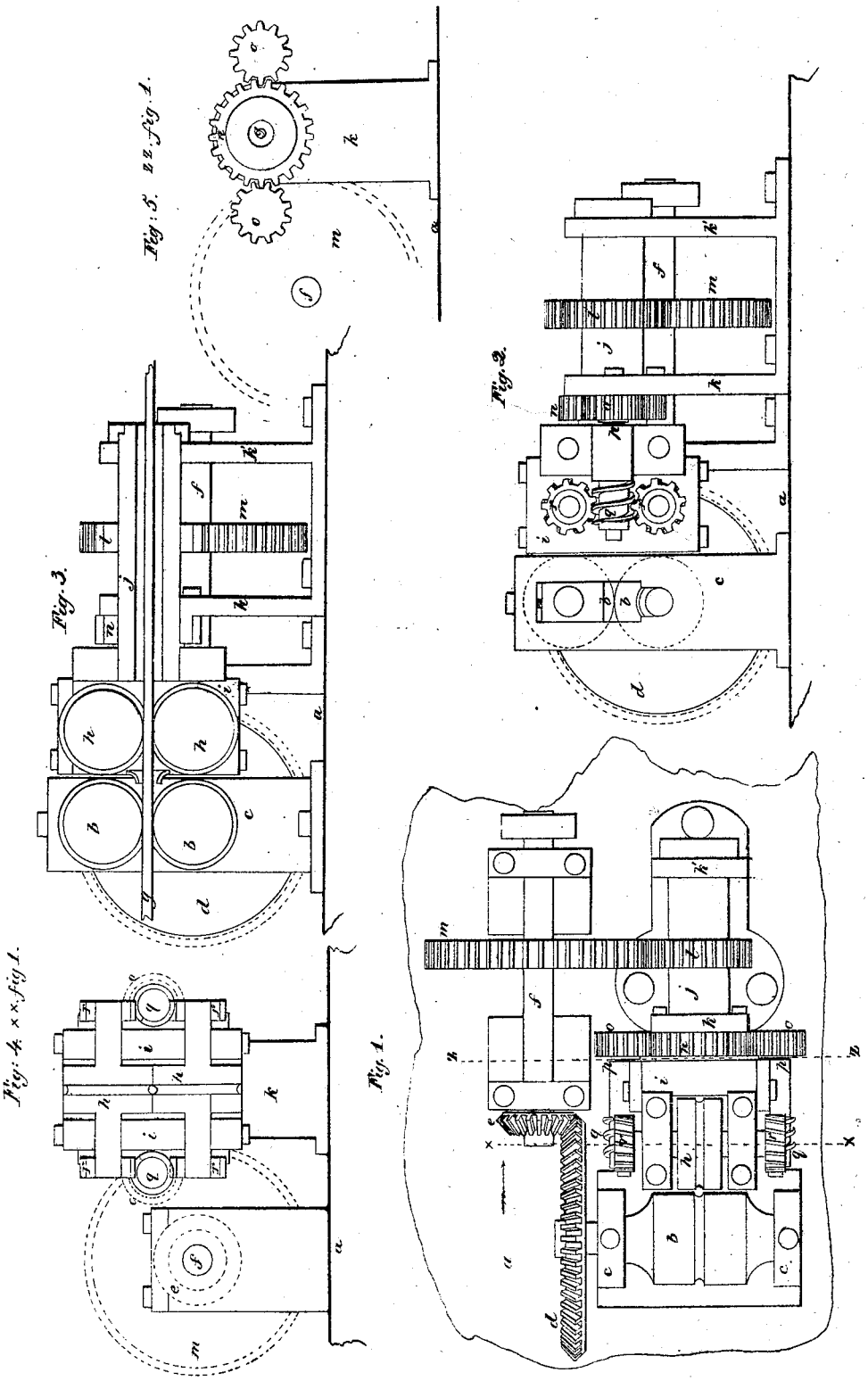
H. Ames,

Iron-Rolling Mill,

No. 5,323, Patented Oct. 9, 1847.



UNITED STATES PATENT OFFICE.

HORATIO AMES, OF FALLS VILLAGE, SALISBURY, CONNECTICUT.

IMPROVEMENT IN MACHINERY FOR TWISTING AND ROLLING IRON

Specification forming part of Letters Patent No. **5,323**, dated October 9, 1847.

To all whom it may concern:

Be it known that I, HORATIO AMES, of Falls Village, town of Salisbury, in the county of Litchfield and State of Connecticut, have invented new and useful Improvements in the Process of Working Iron and in the Machinery Therefor; and I do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes them from all other things before known, and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a plan of the machine; Fig. 2, a side elevation; Fig. 3, a longitudinal vertical section; Fig. 4, a cross vertical section taken at the line X X of Fig. 1, and Fig. 5 a like section taken at the line Z Z of the same figure.

The same letters indicate like parts in all the figures.

In the manufacture of iron either by rolling or hammering the fibers are all drawn longitudinally, which for the rails of railroads, for the tires of railroad-wheels, and a variety of other purposes renders it liable to break off in thin leaves or scales or to split lengthwise, this state of things being common in the two instances specified.

The object of my invention is so to treat the iron either in the original manufacture thereof or afterward as to avoid this defect and thereby render the iron for these purposes more durable by laying the fibers in such form and direction as to prevent it from scaling off or splitting; and my invention consists in twisting the iron in or before or after the operation of rolling or hammering, so that the fibers shall wind around one another in manner somewhat similar to the fibers of hemp in a twisted rope or strand.

The second part of my invention relates to the machinery by which I carry into effect my improved process, and consists in combining two or more sets of rollers, one or both of which are to be draw-rollers, and one set turning in the usual permanent bearings and the other set or sets working in a frame or chuck that rotates on an axis at right angles to the axis of the rollers to twist the bar of iron between the two sets of rollers.

To enable any one skilled in the art to apply my improved process of treating iron and to construct and use the machine which I have invented therefor, I will describe the mode of procedure which I have essayed, as well as the manner of constructing and using the machine therefor.

The bloom of iron or a bar previously formed is taken while in a heated state and twisted while undergoing the operation of hammering, which may be done by securing one end of the bloom or bar in a clamp and rotating it while the hammer rests on the other end or by securing the two ends in separate clamps and turning one of them or both in opposite directions until the required twist has been given and then subjecting it to the operation of hammering; but when the bar is to be drawn by rolling it is to undergo the operation of twisting while passing between the rollers or after it has passed between one set and before it passes between the second set, and when it is twisted on its way to the rollers one end of the bar may be secured to a clamp which is to be rotated as the bar passes between the draw-rollers. As the bars thus prepared are in most instances to be reworked to receive the required form or forms according to the purposes to which they are to be applied, it will be evident that they may be twisted as they pass from the hammer or the rollers, instead of giving the twist before the hammering or rolling, and to effect this the end of the bar may be clamped as it leaves the hammer or rollers and the required twist given; but it is better to give the twist before the iron has undergone the operation of rolling or hammering, as it is then more highly heated and the fibers will not be so severely strained as they would be after the metal has been partly cooled. When iron has been treated and worked according to this process, the fibers, instead of running in the bar longitudinally in straight lines, will run in the direction of a helix, gradually approaching to a straight line from the circumference to the axis of the bar, so that when used for making tires or for other analogous purposes the bar will be prevented from splitting along its length by the tenacity of the fibers, which cross the bar in the direction of a helix instead of the mere adhesion of the fibers together, and when used for the rails of railroads or similar purposes none of the fibers

can be separated from the mass longitudinally, as heretofore; nor can the iron be stripped off in scales until the fibers have been cut off on each side, for by their direction they pass diagonally from one side over the surface and down the other side, whereby they are completely tied together.

Of the machinery for working iron in accordance with the foregoing process.—In the accompanying drawings, *a* represents a frame properly adapted to the purpose, and *b b* two grooved rollers, such as are used in rolling-mills for rolling bars of iron, the groove in each being semicircular, or nearly so, that the two together may form a cylindrical bar. These two rollers are placed one above the other with their journals in appropriate boxes in the two standards *c c*. The shaft of the lower roller extends out beyond one of the standards and is provided with a bevel cog-wheel *d*, which meshes into a bevel-pinion *e* on the main driving-shaft *f*, which turns the lower roller to feed in the bar of iron *g*, the upper roller being carried by the motion of the lower one. Just back of the first set of rollers above described there is another pair *h h*, similar to the first, except that the grooves in them are smaller to draw the iron slightly after passing the first set. They are mounted in a hollow chuck or frame *i* on the forward end of a hollow shaft or mandrel *j*, that has its bearings in two standards *k k'*, and which is provided with a cogged pinion *l*, the teeth of which engage with a cog-wheel *m* on the main shaft, by which the second set of rollers are made to rotate at right angles to their axes and on an imaginary line passing through the bite of the two sets of rollers and in the center of the two holes formed by the grooves on the rollers at the bite of each set, the axis of the hollow shaft or mandrel being in this imaginary line. Back of the chuck and attached to the front face of the forward standard *k* there is a cog-wheel *n*, the cogs of which mesh into the cogs of two pinions *o o* on two short arbors *p p*, one on each of two opposite sides of the chuck, the other ends of these short arbors being provided each with a short screw *q*, the threads of which engage with the cogs of two pinions *r r*, one on the end of each of the rollers of the second set, so that the cog-wheel *n*, being permanently attached to the standard, when the hollow shaft with its clutch and the second set of rollers is turned the two cogged pinions *o o* travel about this wheel, which turns the arbors to which they are attached in the direction the reverse of the rotation of the chuck, and the threads of the screws in turn engaging with the cogs of the pinions on the shafts of the second set of rollers causes these to rotate on their axes and in the same direction as the first set and with a velocity relatively to the rotation of the first set proportioned to the amount of drawing action which they are intended to exert on the bar that is to pass between them. In this way it will be obvious that when the machine is put in motion and a bar of iron fed in it will pass between the first pair of rollers and be partly drawn, and then pass between the second pair, which, having two motions—one on their axis and another at right angles thereto—and on the axis of the bar of iron that it (the bar of iron) will in consequence be twisted between the two pairs of rollers and also drawn by them and the fibers compressed.

From the foregoing it will be obvious that the extent of drawing action of either or both sets of drawing-rollers can be regulated at pleasure by simply varying the size of the grooves and their relative motions, and that the degree of twist can be determined by the relative motions of the draw-rollers on their axes and their rotation on the axis of the bar of iron. It will be equally obvious that the number of draw-rollers can be increased without changing the principle of my invention. It is to be understood that the iron when subjected to the compound operation of drawing and twisting is to be in a heated state, such as is practiced by and known to iron-masters in the manufacture of iron.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The method herein described of treating iron to increase its toughness or durability for certain purposes, such as railroad bars and tires, &c., by subjecting it while in a highly-heated state to the compound operation of drawing and twisting, substantially as herein described.

2. In the machinery above described, giving to one set of rollers a rotary motion on their axes and a rotary motion at right angles thereto on the axis of the bar of iron, when this is combined with another pair of rollers that have simply a rotary motion on their axis, substantially as described, whereby the bar of iron in a highly-heated state is drawn and twisted, as described.

HORATIO AMES.

Witnesser:
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S. C. HARFORD.