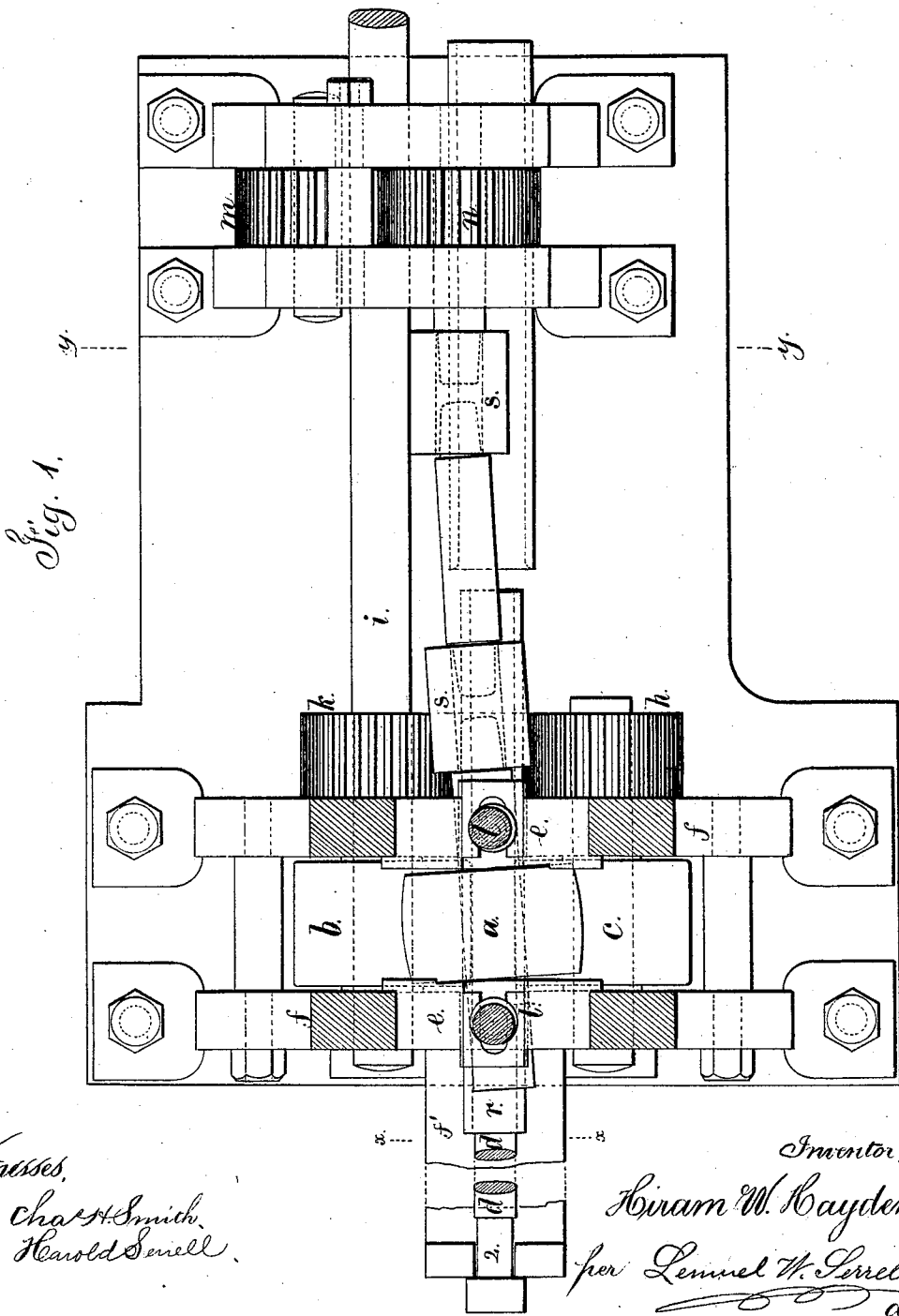


H. W. HAYDEN.
Machines for Rolling Tubing.

No. 149,310.

Patented April 7, 1874.



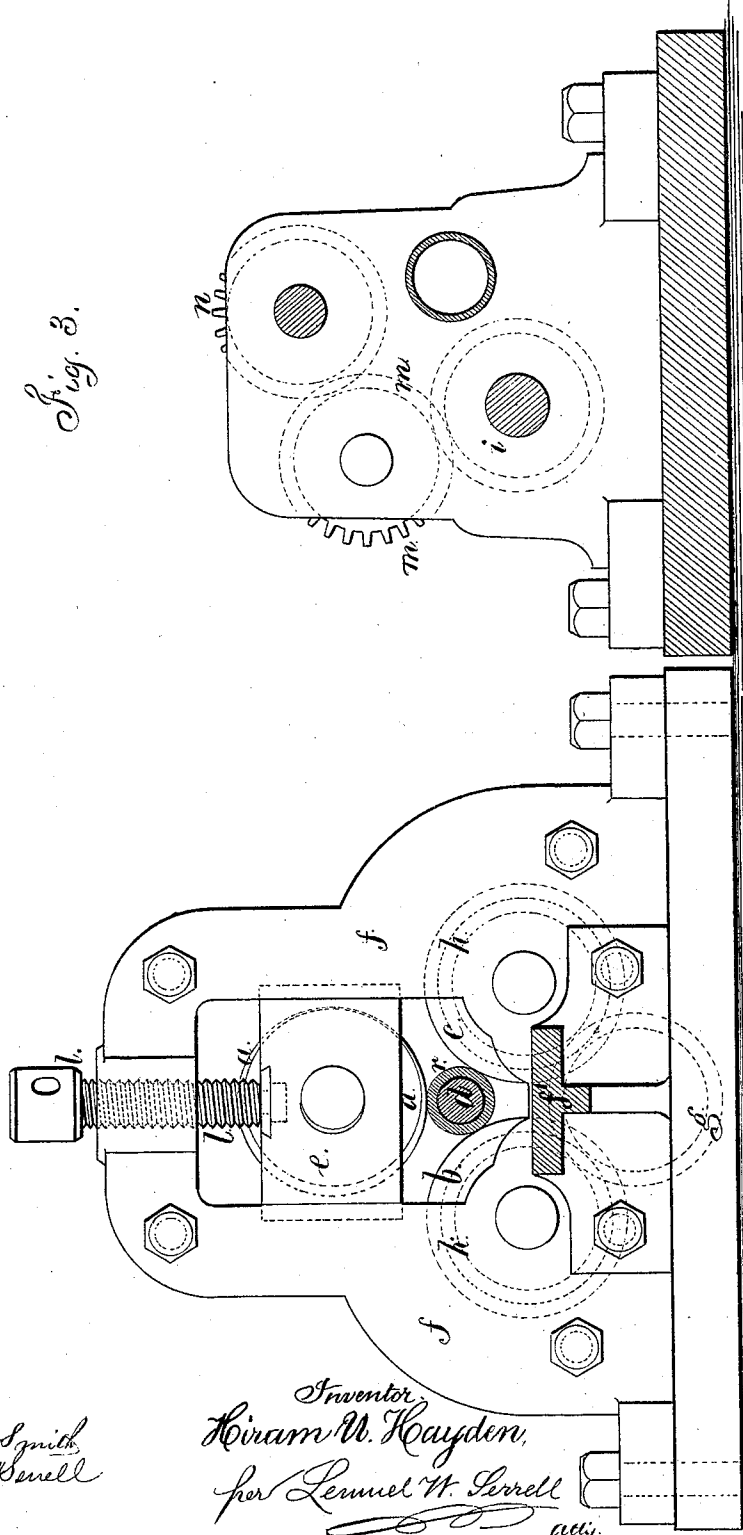
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Fig. 3.

Fig. 2.



Witnesses,
Chas. H. Smith
Harold Sewell

Inventor,
Hiram W. Hayden,
per Lemuel W. Terrell
att'y.

UNITED STATES PATENT OFFICE.

HIRAM W. HAYDEN, OF WATERBURY, CONNECTICUT.

IMPROVEMENT IN MACHINES FOR ROLLING TUBING.

Specification forming part of Letters Patent No. **149,310**, dated April 7, 1874; application filed September 11, 1873.

CASE B.

To all whom it may concern:

Be it known that I, **HIRAM W. HAYDEN**, of Waterbury, in the county of New Haven and State of Connecticut, have invented an Improvement in the Manufacture of Seamless Metal Tubes, of which the following is a specification:

Tubes have been made upon a mandrel in a draw-bench, but with the expenditure of great power, and in some instances the tube has been rolled lengthwise by numerous grooved rollers, forming a die. In other instances, two rollers have been used at opposite sides of the tube, the axis of said rollers being slightly inclined to the axis of the tube. In these cases, however, it was necessary to form a trough for guiding the tube, or to employ lateral rollers to maintain the tube in a proper central position, and the reducing operation was not uniform or reliable. Three embossing-rollers have also been set in a head, and the head revolved around the tube.

My present invention relates to an improvement in rolling tubes or other articles of a cylindrical character, for reducing the thickness or diameter of the same, and straightening the article operated upon; and my invention consists in two rollers with axis parallel or nearly so to the axis of the tube, and a third roller with its axis diagonally or at sufficient inclination to cause a movement of the pipe endwise of the mandrel. These rollers are all driven in the same direction by connections to the motive power, and it will be apparent that all the rollers operate to reduce or compress the metal. The roller or rollers that are nearly parallel to the axis of the pipe serve to reduce the metal in the direction of the periphery or circumference of the tube or cylinder, and the diagonal roller tends to describe a screw-formed path, and extend the metal in that direction, and at the same time there is an end movement given to the tube to feed it along.

In the drawing, Figure 1 is a plan with the frame partially in section. Fig. 2 is a section at the line *x x*, and Fig. 3 is an elevation at the delivery end of the machine, the bed being in section at the line *y y*.

The tube is operated upon by the rollers *a b c*, and is usually upon the mandrel *d*, while being

reduced, but the mandrel *d* may be dispensed with in cases where the interior of the tube is not required to be smooth, or when the diameter of the tube is to be reduced without materially reducing the thickness of the metal of tube. The bed-rollers *b* and *c* are supported in boxes within the frame *f*, and they are, preferably, connected together by the gear-wheels *g h k*, so as to revolve at a uniform speed, the power being applied through the shaft *i* of the roller *b*. The roller *a* is in boxes *e e*, that are adjustable in the frame *f*, the set-screw *l*, or equivalent, being employed to force the roller *a* down upon the tube *r*. The tube is to be made either from an ingot or from a tube of greater thickness. The roller *a* is revolved by gearing *m n* from the shaft *i*, and slip-couplings or universal joints are employed at *s*, so as to allow of the axis of the roller *a* being placed at greater or less inclination to the axis of the tube. The mandrel *d* is made with a neck at *h*, that sets into a notch of the frame *f*, so that the mandrel is free to revolve with the tube, as the same is reduced, and hence acts in the capacity of an interior roller. The rollers *a b c*, all revolving in the same direction, revolve the tube and mandrel, and if the tube or mandrel, or both, were mounted so as to be moved along by independent mechanism, then the rollers would act upon and reduce the tube or ingot by a rolling operation, increasing its length without necessarily diminishing the bore of the tube, the rollers being slightly conical, to prevent the formation of a shoulder in the metal; but in order to make the rollers move the tube along and draw it off the mandrel, one or more of the rollers may be placed at an inclination to the tube, so that the tendency of such roller is to draw the tube along. I have shown the roller *a* as placed in this diagonal position for the purpose aforesaid.

It will be evident that this mode of manufacturing tubes may be extended indefinitely to pipes or tubes of any size, and that the same is applicable to iron and steel tubes as well as to those of softer metal, and that boiler-tubes and cylinders may be made in this manner, the mechanism being properly proportioned. The rolling operation takes place from end to

end of the tube, and the tube is polished both internally and externally, the bore being of uniform size, and there is no loss by injury to the ends of the tubes.

I claim as my invention—

1. Two rollers with axes parallel or nearly so, with the tube or cylinder to be reduced or straightened, and a third roller with its axis at an inclination to the other rollers, and revolved in the same direction, substantially as specified, for rolling a tube, cylindrical bar, or tubular ingot, substantially as set forth.

2. Two rollers, parallel or nearly so with the mandrel, and one diagonal to the same, in combination with means for holding the mandrel, but allowing it to revolve substantially as set forth.

Signed by me this 4th day of September, 1873.

H. W. HAYDEN.

Witnesses:

GEO. D. WALKER,
HAROLD SERRELL.