H. F. Mann,

Making Sheet-Iron.

No. 46,371. Patented Feb. 14, 1865.

Fig. 2.

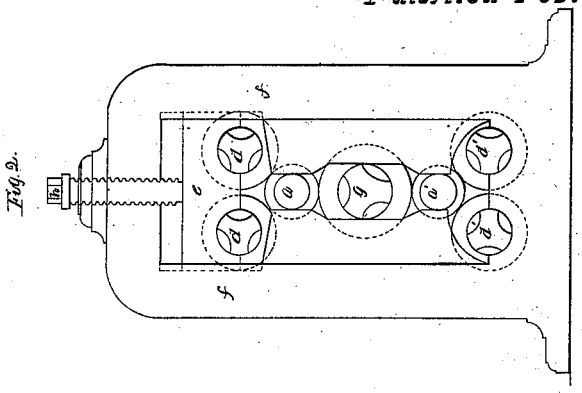


Fig. 1.

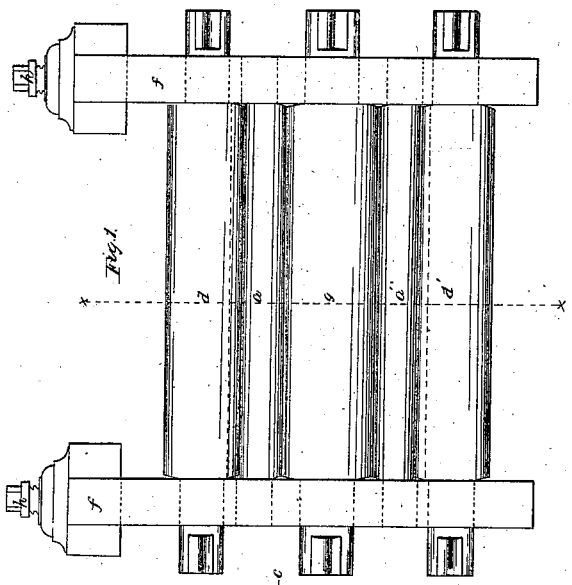


Fig. 5.

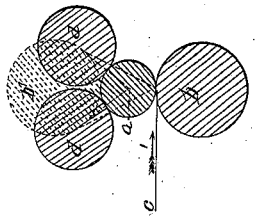


Fig. 3.

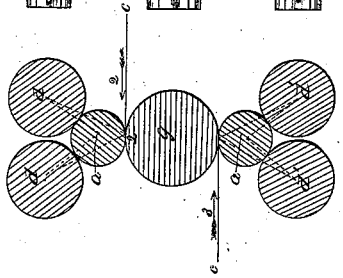


Fig. 6.

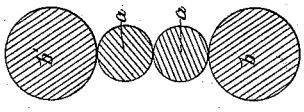
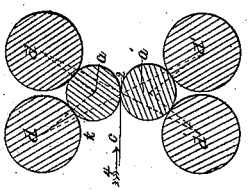


Fig. 4.



Witnesses.
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R. Bakewell.

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UNITED STATES PATENT OFFICE.

HENRY F. MANN, OF PITTSBURG, PENNSYLVANIA.

MACHINE FOR ROLLING METAL.

Specification forming part of Letters Patent No. **46,371**, dated February 14, 1865.

To all whom it may concern:

Be it known that I, HENRY F. MANN, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Arrangement of Rolls for Rolling and Stretching Metals; 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, in which—

Figure 1 is a front elevation of a set of rolls arranged in the manner which I propose. Fig. 2 is an end view or elevation of the housing and rolls shown in Fig. 1. Fig. 3 is a cross-section through the rolls at right angles to their axis through the line *x x*, Fig. 1. Fig. 4 represents a modification of my invention, being a cross-section of a set of rolls where two small-diameter working-rolls are employed. Fig. 5 represents another modification of my improvement, being a cross-section through a set of rolls, and illustrating the difference between my arrangement and that ordinarily adopted. Fig. 6 is a cross-section through a set of rolls arranged in the manner in use before my invention.

To enable others skilled in the art to make use of my invention, I will proceed to describe the construction and operation of my improvement.

My improvement is applicable to the arrangement of rolls for rolling, stretching, or forming sheets, bars, or pieces of iron, copper, or other metal, well known as "three-high" rolls, as well as to the more common arrangement of a pair of rolls. In either case the horizontal axes of the working-rolls are situated in the same vertical plane, and consequently their points of contact are in the same plane. It is manifest, therefore, that the number of rolls high (of working-rolls) which constitute the set forms no part of my invention.

In the rolling of metals, especially in the formation of sheet metal and hoop-iron, it is well known and has been for many years that the employment of rolls of small diameter is very advantageous, turning out much better work than where rolls of large diameter are employed. The reason of this is that, as in stretching or shaping metals by means of rolls the rolls sink into the body of the metal, the rolls of large diameter present practically a broader surface to the metal passing between them, or, in other words, the metal being rolled comes in contact with more of the surface of the roll than is the case with rolls of less diameter. The consequence is that the metals are more easily and rapidly reduced and stretched by rolls of small than by rolls of larger diameter, and that the work can be more efficiently and rapidly effected and with less power with the small rolls.

In rolling heavy sheets or plates of iron, however, rolls of small diameter will not answer the purpose when used in the ordinary way, because the small roll will spring in the middle and thus produce faulty work. The same difficulty is also experienced where sheet metal is rolled, the width of the sheet requiring too great a length of rolls and consequent distance between the housings to permit the use of small-diameter rolls, for where the rolls are long they will, if of small diameter, yield in the center, as before described, and roll out the metal of uneven thickness, stretching it more at the edges than in the center of the sheet.

My invention is designed to remedy the difficulty and enable one or more rolls of small diameter to be used, of any required length, with the same ease as the larger-sized rolls, and with greater advantage.

Before explaining the mode in which I put my invention in practice, I will proceed to explain the method heretofore practiced, with a view to obviating the difficulty experienced in the use of long rolls of small diameter.

Fig. 6 represents two small-diameter rolls, *a a'*, with two rolls of larger diameter, *b b'*, all placed with their axes in the same vertical plane. The rolls *b b'* are of sufficiently large diameter to sustain the pressure on the smaller-diameter rolls *a a'*, caused by the passage of the metal between the two small rolls, or between one of the larger rolls *b* and one of the smaller rolls *a*, but as these rolls only touch at the tangential point the effect of the pressure of the rolls as the metal sheet passes between them is to cause the two small rolls to yield horizontally in the direction in which the metal sheet or plate is passing, and the effect of this springing of the small rolls out from between the larger rolls is to destroy their efficiency.

The same consequence results from the use

Fig. 2,) and the pressure of the screws *h*, being applied to the bearing-block *e*, is communicated by the supporting-rolls *d d* to the upper small-diameter roll, *a*. The axes of each pair of supporting-rolls are a little farther apart than the diameter of those rolls, so that their peripheries may not touch each other, but they both revolve in contact with the small-diameter working-roll, which they support. The surface speed of the supporting-rolls *d d'* is the same as that of the small-diameter operative roll *a*, although the diameter may differ.

A modification of the arrangement just described, or, rather, an adaptation of the supporting-rolls to the use of two small-diameter rolls, is shown in the sectional Figs. 3 and 4. In the former figure a large-diameter working-roller is placed in connection with two small-diameter working-rollers, *a* and *a'*, in which case the metal plate *c*, to be operated upon, is passed in one direction (see arrows 2) between the upper small-diameter roll, *a*, and the large-diameter working-roll *g*, and is returned in the reverse direction (see arrows 3) between the large-diameter working-roll *g* and the lower small-diameter roll *a'*. Above the upper small-diameter roll, *a*, are placed two supporting-rolls, *d d*, arranged as in Fig. 5, and two supporting-rolls, *d' d'*, are placed below the lower small-diameter roll, *a'*, their journals turning in bearings in the lower part of the housing, as shown in Fig. 2.

Fig. 4 illustrates the mode of arranging the rolls where two small-diameter rolls, *a a'*, are used without the intermediate large-diameter working-roll, *g*. The relative situation of the supporting-rolls *d d* and *d' d'* to the two small- and *g* in the direction of the arrow 2 in Fig. 3, or between the rolls *a* and *a'* in the direction of the arrow 4 in Fig. 4, the upward pressure of the upper small-diameter roll, *a*, against the upper supporting-roll, *d*, will be in the direction of the dotted line *i d*, which falls outside of the point *k* of contact between the surfaces of the supporting-roll *d* and the working-roll *a*, and therefore the pressure of the roll *a* against the roll *d* will keep it in place.

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

1. The use of two supporting-rolls or their equivalent, placed with their surfaces in contact with that of small-diameter working-rolls placed above the upper small-diameter working-roll and below the lower one, whether an intermediate roll of larger diameter is used or not, for the purpose of supporting working-rolls of small diameter for rolling metallic sheets, bars, or plates, substantially in the manner hereinbefore described.

2. The use of two small-diameter rolls in combination with an intermediate roll of larger diameter, the small-diameter rolls being supported as hereinbefore described, the term "small diameter" being used relatively to the diameter of the larger roll, and not, as otherwise, limiting or defining the diameter of the smaller rolls.

In testimony whereof I, the said HENRY F. MANN, have hereunto set my hand.

H. F. MANN.

Witnesses:
W. BAKEWELL,
WM. D. LEWIS.