No. 670,920. Patented Mar. 26, 1901.

B. E. V. LUTY.

APPARATUS FOR ROLLING SHEET METAL.

(Application filed Jan. 12, 1899.)

(No Model.)

Fig 1.

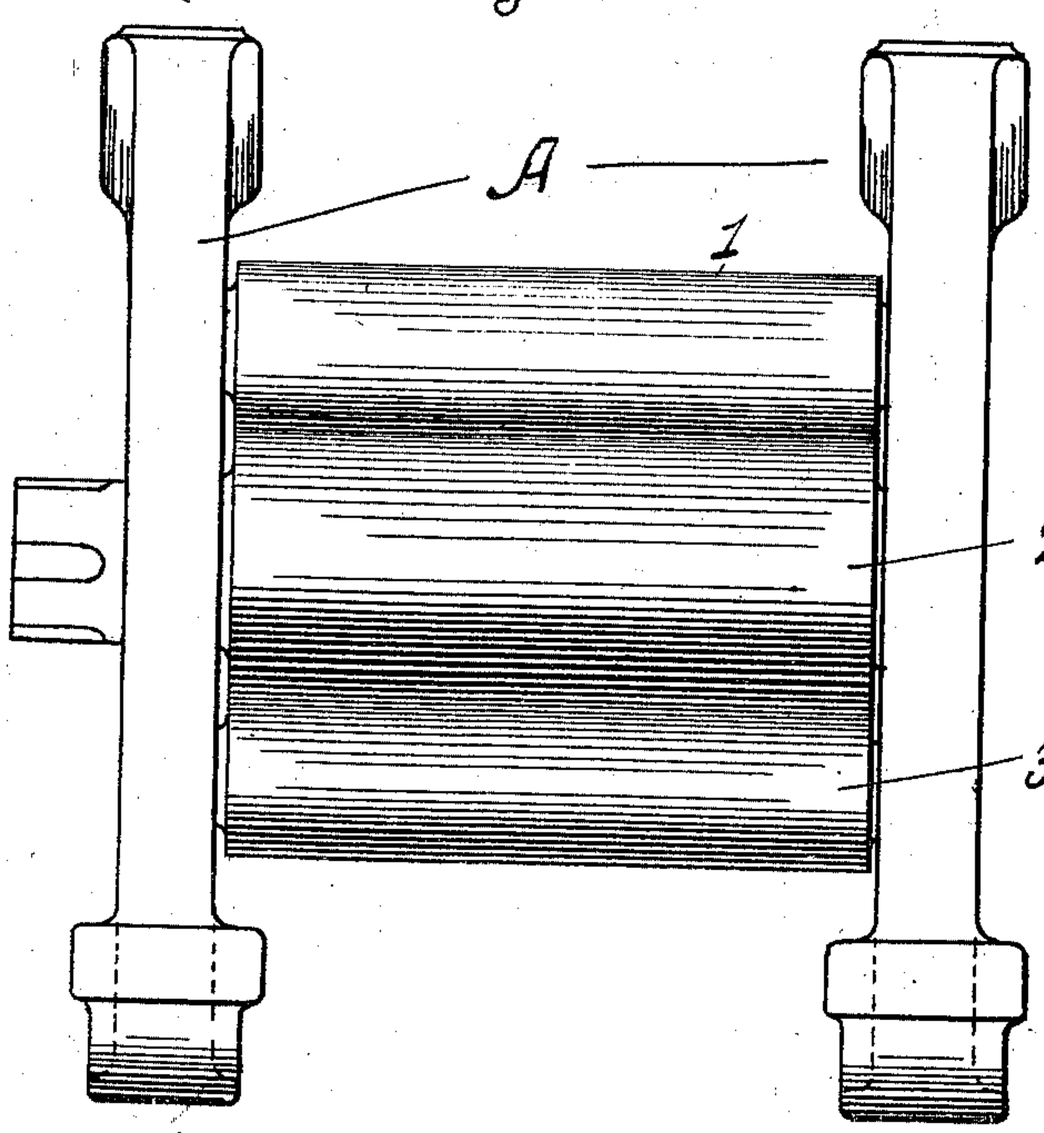
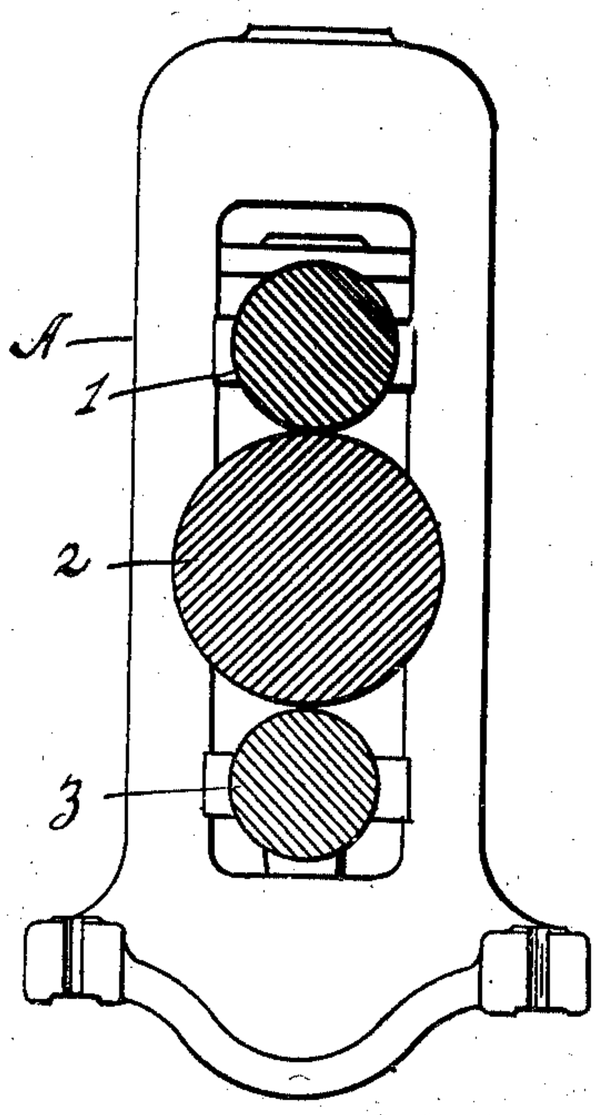


Fig 2.



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APPARATUS FOR ROLLING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 670,920, dated March 26, 1901.

Application filed January 12, 1899. Serial No. 701,912. (No model.)

To all whom it may concern:

Be it known that I, BERTRAND E. V. LUTY, a citizen of the United States of America, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Rolling Sheet Metal; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form a part of this specification, in which—

Figure 1 indicates an elevation of an apparatus or mill adapted to the application of my method for rolling bars, pairs, or packs of sheet metal for sheet-iron, galvanized iron, tin-plate, &c. Fig. 2 is a vertical section of the same.

My invention relates to improvements in apparatus for rolling bars, pairs, or packs of sheet metal for sheet-iron, galvanized iron, tin-plate, &c.

Heretofore, so far as I am aware, in rolling iron and steel sheets in the manufacture of sheet-iron, galvanized iron, and tin and terne plates it has been necessary when the gage is lighter than No. 16 American sheet-iron gage to finish the material after roughing in packs of two, four, six, eight, twelve, or any other number of sheets to the pack. This work has been done usually on a stand of two-high chilled rolls driven at a practically uniform speed, the rolls being kept at a high temperature by the hot material passed between them. In order to prevent the too-rapid chilling of the metal being rolled, it is necessary that the rolls be kept at a high temperature, yet in order to prevent breakage of rolls overheating the same must be avoided. Consequently in order to observe both these conditions the product of the mill—*i. e.*, the number of heated packs, bars, or pairs of sheet metal passed through the same at a certain time—must be limited to a number calculated not to overheat the rolls, thus limiting the output of the mill, the output of which is further limited by the loss of time occasioned by reheating the packs repeatedly before the same are finished or reduced sufficiently. This arises from the fact that the pack after being passed between the pair of rolls is passed back over the top roll for the succeeding pass and cools so rapidly that but a very limited number of passes can be made before, as above stated, the metal must be reheated. These frequent reheatings not only limit the output of the mill, but are expensive, as a great deal of skilled labor is required and a large amount of fuel consumed. The only successful departure from the method herein outlined is that in some cases the work is divided between two or more stands of rolls similar to the one described, and sometimes the rolls in the stand on which the roughing is done are kept comparatively cool by having a thin stream of water run on them. This is practicable in this case, because the bars which are roughed down have much more body than the pairs or packs which are rolled in the finishing stand of rolls, and therefore stand the cooling effect of the rolls better.

The object of my invention is to overcome these difficulties; and to this end my invention consists in the employment of a stand of three or more rolls, one or more of which—*i. e.*, that one or those most constantly in contact with the heated material—is or are of greater effective heat-radiating surface than the others. In other words, in adapting a mill in which the heat-losing capacity of each reducing-surface is substantially proportioned to its heat-receiving capacity to the production of sheets, whereby the pairs or packs when heated may be repeatedly passed between the same, whereby a greater number of passes may be made than at present before they are too cool to be acted upon.

In the accompanying drawings, which form a part hereof, I show a form of mill or apparatus adapted to the application of my improved method, in which like reference characters indicate like parts wherever they occur.

I am aware that a mill comprising three rolls in the stand is known as a three-high mill and is in extensive use. In the three-high mill as now constructed and operated the middle roll is comparatively much smaller than the top and bottom rolls, which insures a greater draft or reducing power. The difficulties of maintaining the large rolls hot, and yet not heating the small roll enough to injure it, utterly precludes the use of the regular three-high mill for rolling sheets, mainly because the middle roll (even if it

were the same size as the other rolls) would get too hot. I have discovered that the temperature of a roll is determined by the relation which exists between its heat-receiving and its heat-radiating capacity. The ordinary three-high mill therefore is utterly inapplicable to the rolling of sheets, because the middle roll, while having a smaller heat-radiating surface than the top or bottom roll, receives about twice as much heat as either of them, being in contact with the heated metal at every pass, while the top and bottom rolls are subjected to this radiating effect only at alternate passes.

Referring now to said drawings, A represents an ordinary and usual form of housing in which the rolls 1, 2, and 3 are suitably journaled. In the accompanying drawings the roll 1 is shown slightly larger than roll 3, although this may be reversed, or both may be of the same size, without in any wise departing from my invention. The roll 2, or the intermediate roll, is comparatively as large as to radiating-surface as the other two rolls combined, so that its effective heat-radiating surface is equal to the effective heat-radiating surfaces of the other two rolls combined, and in order to produce the results attained by me it is essential that the effective heat-radiating capacity of the small rolls combined equals the effective heat-radiating capacity of the large roll, the result of which is to maintain all the rolls of the mill at the same or substantially the same temperature, which insures against breakage of the rolls and injury to the product of the mill.

In the practice of my invention the middle or intermediate roll or rolls need not exactly equal the heat-radiating area of the top and bottom rolls. A general correspondence is all that is necessary in order to keep the rolls at a temperature that will prevent injury to the metal being rolled by being too low and to the rolls by being too high.

In carrying out my invention the bars, pairs, or packs having been heated in the usual or any suitable manner are passed back and forth alternately between the top and middle and between the middle and bottom rolls, it being immaterial which way the first pass is made, and a reduction is accomplished at each pass. When as many passes have been made as possible or desirable, the metal is matched, doubled, or otherwise treated and the operation repeated with more metal. By this means it is possible to make a greater number of passes with consequent greater reduction for each heating than is now the case, while the rolls are all subjected to a heating effect which keeps them substantially all at the same temperature.

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

In a mill substantially as set forth, the combination of a series of rolls in vertical alinement, the effective heat-radiating surface of the top and bottom rolls combined being equal to the effective heat-radiating surface of the intermediate roll.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

BERTRAND E. V. LUTY.

Witnesses:
CLARENCE A. WILLIAMS,
JOHN H. RONEY.