2 Sheets—Sheet 1.

B. LAUTH.

MACHINES FOR ROLLING BAND AND HOOP IRONS.

No. 182,834. Patented Oct. 3, 1876.

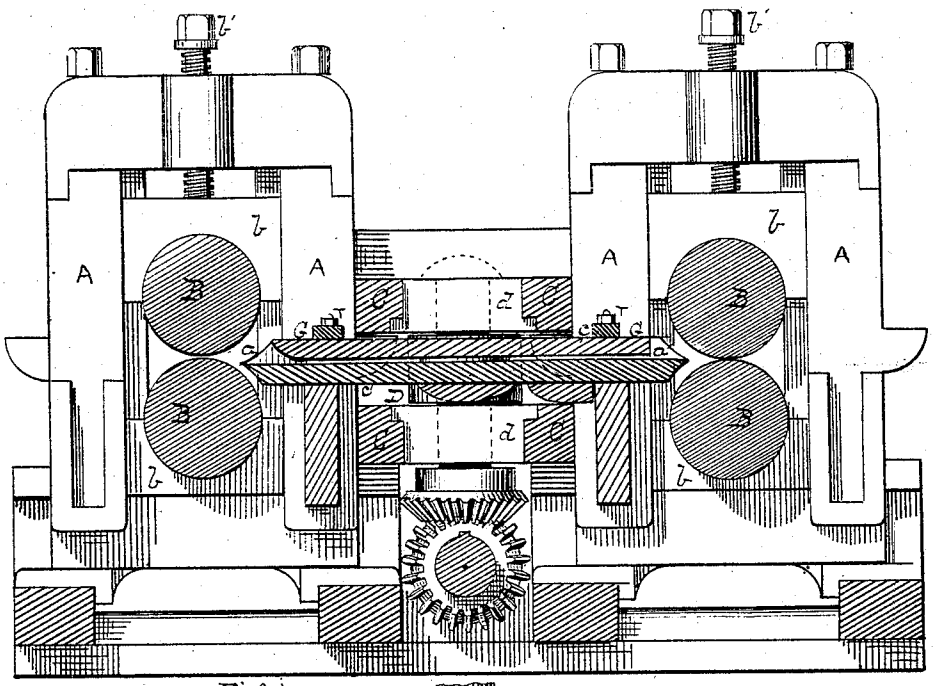

Fig 1.

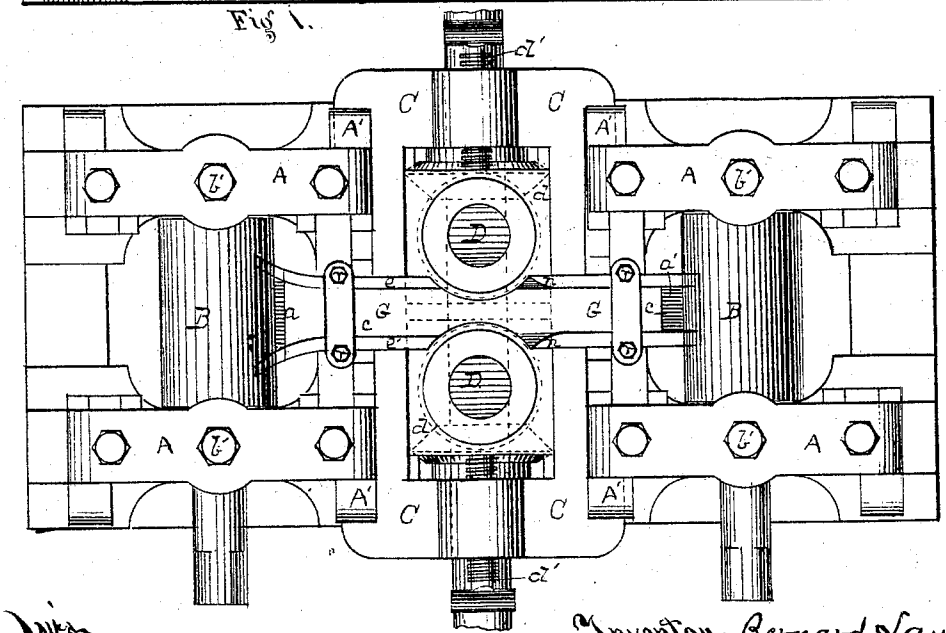

Fig. 2.

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2 Sheets—Sheet 2.

B. LAUTH.

MACHINES FOR ROLLING BAND AND HOOP IRONS.

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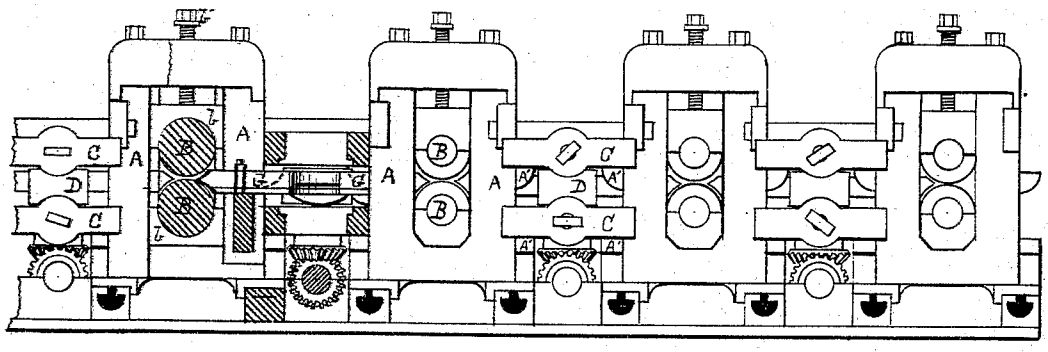

Fig. 3.

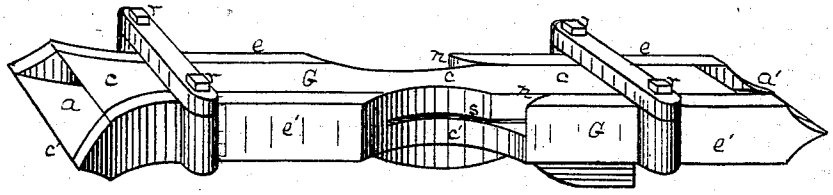

Fig. 4

Witnesses

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UNITED STATES PATENT OFFICE.

BERNARD LAUTH, OF HOWARD, PENNSYLVANIA.

IMPROVEMENT IN MACHINES FOR ROLLING BAND AND HOOP IRON.

Specification forming part of Letters Patent No. **182,834**, dated October 3, 1876; application filed August 17, 1876.

To all whom it may concern:

Be it known that I, BERNARD LAUTH, of Howard, county of Centre, State of Pennsylvania, have invented or discovered a new and useful Improvement in Metal-Rolling; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawing, making a part of this specification, in which—like letters indicating like parts—

Figure 1, Sheet 1, is a vertical longitudinal sectional view of so much of my improved machine as is necessary to illustrate its practical operation. Fig. 2, Sheet 1, is a top or plan view of the same portion of the machine. Fig. 3, Sheet 2, shows, partly in outline and partly in section, a side elevation of the entire machine to a reduced scale; and Fig. 4 is an enlarged view in perspective of the guide which I employ.

In general terms, my machine consists of a long housing or frame, or a series of such, carrying a series of horizontal and vertical plain-faced rolls, arranged alternately in pairs, in a common line of the feed, with a series of guides which extend from one pair of horizontal rolls to the next, and through between the intermediate pair of vertical rolls, the rolls all being properly geared, and provided with adjusting-screws, bearing-blocks, &c., such as are requisite in the use and operation of such and similar rolls.

The object of my invention is to produce from a heated bar or billet at a single pass through the machine a thin, flat, broad product, such as hoop-iron, pipe-iron, nail-plate, &c., such product varying with the size and form of the bar or billet, and the amount of drawing, spreading, narrowing, &c., which it receives in the operation, all of which elements are under the control of the operator.

In Figs. 1 and 2 I have shown so much of the machine in length as includes two pairs of horizontal and one pair of vertical rolls, and one guide. The remainder of the machine is formed by the addition of like vertical and horizontal rolls in pairs and like guides, all in the same line of feed, so that with an explanation of Figs. 1, 2, and 4 the operation of the entire machine, illustrated in Fig. 3, will be readily understood.

The upright frames or housings A A, which carry the plain-faced horizontal rolls B B, are of any suitable construction, and do not differ in any principle of operation from such as are common in sheet-rolling mills. Any suitable form or construction of bearing-blocks *b* and adjusting-screws *b'* may be added. These horizontal rolls are arranged in pairs at a little distance apart, and with a line of feed from one to the other horizontal, or nearly so. Between the upright housings A A, and supported by lugs A' thereon, or in other suitable way, I arrange horizontal frames or housings C, and, by means of bearing-blocks *d* and adjusting-screws *d'*, I mount therein a pair of vertical rolls, D D, also plain faced, by which term, as applied to both these rolls and also to the horizontal rolls, I mean that neither is grooved in any such way as that a collar on the opposite roll shall in operation enter therein. These vertical rolls are arranged at the proper distance apart for the bar, billet, hoop, or plate passing through between them to be engaged thereby, and narrowed or edged up, as may be desired, and to the desired extent, and their line of feed is in the same line with that of the horizontal rolls on each side.

One great practical difficulty which, in connection with the present invention, I have had to overcome, has arisen from the tendency of a comparatively broad, thin strap, hoop, or plate of iron, to buckle transversely or tip, so that one edge would be higher than the other whenever a lateral rolling pressure was applied to it sufficient to narrow it, or even to compact its edges.

By the term "to buckle transversely," I mean that the strap, hoop, or plate under an edgewise pressure, tends to bend or fold transversely to a U form, or to some irregular form, by bulging up or down between or at its edges, so that the folds or wrinkles thus formed run lengthwise of the strap, &c., instead of crosswise, as is generally the case in buckling.

To overcome this tendency, and by means of vertical rolls to narrow or edge up the

strap, hoop, or plate, I employ a guide, G, more fully shown in Fig. 4. This guide at its receiving end *a* receives the bar, billet, hoop, strap, or plate from the preceding pair of horizontal rolls, and at its opposite end *a'* delivers the same to the next pair of horizontal rolls, its arrangement or place in the machine for such purpose being represented in Figs. 1 and 2. The longitudinal opening *s*, from *a* to *a'* through the guide, is of such size in both breadth and vertical depth that the bar, &c., may pass freely along without danger of getting locked, but also shall be guided with the necessary accuracy in the line of feed and delivery.

The top and bottom plates *c c'* of this guide pass without break or interruption through between the vertical rolls D D, or at least through so much of the space between them as is limited (measuring lengthwise of the feed) by the beginning and end of the bite of the vertical rolls on the bar, &c., passing through; and the sides *e e'* of the guide are hollowed out to the same extent, as represented in Figs. 2 and 4, so that the opening *s* through the guide is uncovered on each side, such hollowing cut being made to a radius the same or slightly in excess of that of the vertical rolls, and extending at its deepest point on each side as far beyond the path of the edge of the bar, &c., as will be equal, or about equal, to one-half the amount of reduction in width to be effected thereby. The amount of edgewise reduction required is commonly very small, and is sometimes barely enough to square up and perfect the edge, so as to prevent its becoming rough, broken, or ragged. The parallel top and bottom plates *c c'* of the guide then operate to prevent the bar, billet, hoop, strap, or plate from buckling, or tipping, or twisting transversely, while the vertical rolls are acting on its edges, either to compress and narrow it transversely, or to perfect its edges, or both, and it is passed on to the next horizontal rolls, to be drawn and reduced in thickness, from which rolls it is conducted by a like guide (but of different proportions, as the changed shape of the iron may require) through between another pair of like vertical rolls, where it is again acted on in like manner, and so on continuously until a product of the required shape is produced; and as it may possibly happen sometimes that the forward end of the bar, &c., may be thrown a little out of line by the vertical rolls, or a splinter may be thrown out laterally, I make the side plates *e e'*, just beyond each hollowed-out place, somewhat sloping or bell-mouthed, as shown at *n n*, Fig. 4, so as to bring the bar, &c., back to the proper direction of feed, and prevent it or a splinter on it from catching and stopping the work.

The vertical depth of the opening *s* through the guide may be varied at pleasure by making the upper plate adjustable up and down by the use of adjusting-screws *r r*, though other equivalent means of effecting such adjustment may be employed.

As already stated, these rolls and guides are duplicated, as represented in Fig. 3, so as to form a series of any desired number, the entire series employed constituting the entire machine.

For most purposes in rolling metals, (and I apply my improvement to all metals capable of being worked in the manner described,) four pairs of horizontal and four pairs of vertical rolls will commonly suffice; but the number may be increased or lessened at pleasure. Preferably, the first pair of rolls in the line of feed is vertical and the last pair horizontal.

In giving the number of pairs or sets above stated, I assume that the ordinary skill of the experienced iron-worker is employed in bringing the iron or other metal to the form proper for the reduction desired before it is introduced into this machine.

By the use of plain-faced rolls I am enabled to roll all sizes of flat thin iron or other malleable metal rectangular in cross-section, without change in the machine, except changing the guides and readjusting the rolls, the only limit being that resulting from the lengths of the working-faces of the rolls and the strength of the machinery. A set of guides being provided for each size of product to be made, the entire machine is complete.

The machine may be turned on its side, or may be so built without a substantial departure from the invention described; and, in the description I have given, the terms "horizontal" and "vertical" are to be understood not absolutely, but with reference to the position of the machine, as shown.

The guides instead of being made close may be made of open or skeleton work, provided they afford a bearing-surface for the bar, billet, plate, or hoop over so much and such parts of its surface as to secure the same result, and in designating the guide as "close" I do so only in this sense.

I claim as my invention—

1. A series of two or more horizontal, and two or more vertical, plain-faced rolls, arranged in a common line of feed, in combination with a guide or guides which, between the vertical rolls, along the line of their bite, shall inclose the plate, bar, billet, or hoop on its flat sides, substantially as set forth.

2. In combination with a pair of vertical or edging rolls of a rolling-mill, a guide passing between said rolls, which, open at its edges or sides, shall inclose the top and bottom flat sides of the bar, billet, plate, or hoop, substantially as and for the purposes set forth.

3. In combination with the vertical edging-rolls D D, a guide, G, having open sides along the length of bite of the rolls, a close top and bottom through the same length, and bell-mouthed or sloping sides adjacent to the rolls,

as at *n n*, substantially as and for the purposes set forth.

4. The combination of adjustable plain-faced horizontal and vertical or edging rolls, and removable guides passing between vertical rolls, whereby, through readjustment of the rolls, and interchanging of the guides, metallic straps, hoops, and plates of different sizes can be produced without changing the rolls, substantially as set forth.

In testimony whereof I have hereunto set my hand.

BERNARD LAUTH.

Witnesses:

GEO. H. WISTAR,

ABRAHAM WEBER.