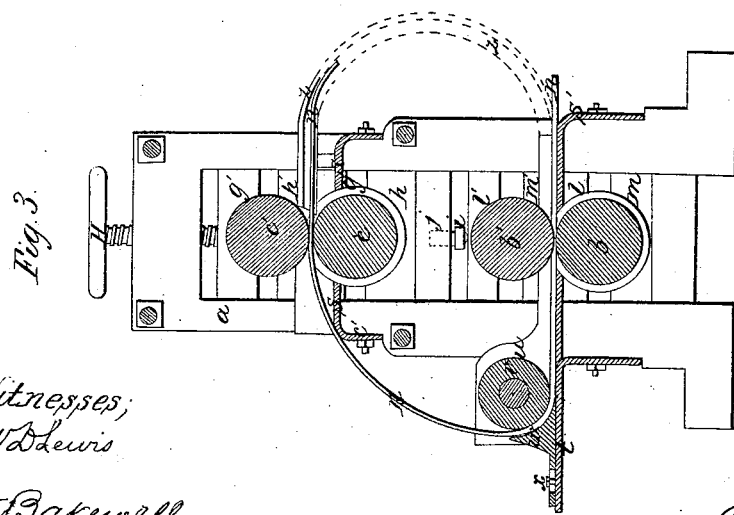
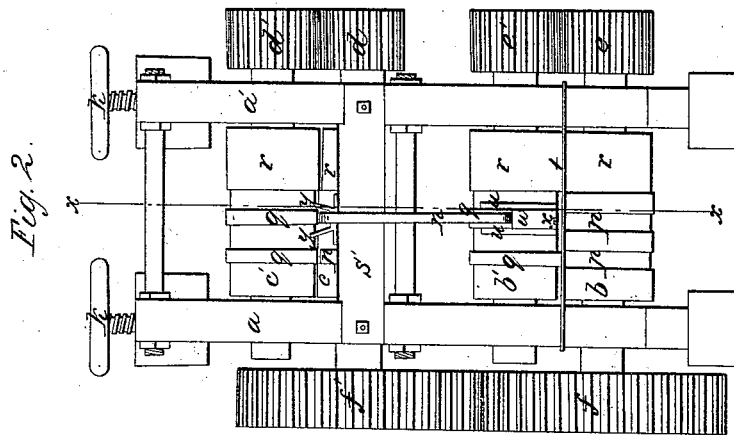
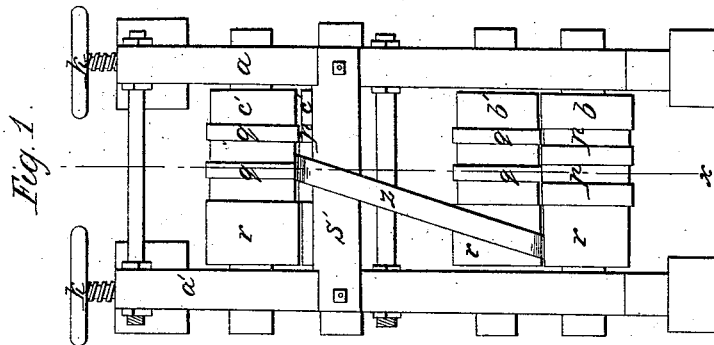


D. Hall,

Rolling Sheet Iron,

N^o 50,704.

Patented Oct. 31, 1865.



Witnesses;
W. Lewis

W. Bakewell

Inventor;
Daniel Hall

UNITED STATES PATENT OFFICE.

DANIEL HALL, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN MILLS FOR ROLLING IRON AND STEEL.

Specification forming part of Letters Patent No. 50,704, dated October 31, 1865.

To all whom it may concern:

Be it known that I, DANIEL HALL, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rolling-Mills; 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 vertical elevation of the front of my machine. Fig. 2 is a vertical elevation of the rear of my machine. Fig. 3 is a vertical section through *xx* of Figs. 1 and 2.

In the several figures like letters of reference denote similar parts.

My invention consists in certain improvements in mills for rolling iron and steel, and is especially adapted to the rolling of bars of steel and of hoop-iron.

The principal features of my invention are, first, the arrangement in one set of housing of two pairs of rolls having their axes all in the same vertical plane, instead of one pair or of a set of three-high rolls, as ordinarily employed; and, secondly, an apparatus consisting of a bending-roller and guides for causing hoop-iron to pass automatically from one pair of rolls to the other pair situate above or below it, so as to give the iron three passes between the rolls without requiring any manipulation and without the loss of time incident to the completion of one entire pass of a long strip or band of hoop-iron before another pass is commenced, as is necessary without the use of my apparatus.

In the drawings, *a a'* are the housing of a set of rolls. In the housing there are set two pairs of rolls, *b b'* being the lower pair, and *c c'* the upper pair. The upper pair of rolls, *c c'*, work together, being geared by the small cog-wheels *d d'*, (shown in Fig. 1,) and the lower pair of rolls, *b b'*, work together by means of the gearing *e e'*. The lower roll, *b*, of the lower pair is geared with the lower roll, *c*, of the upper pair by means of the large gear-wheels *f f'*. In Fig. 1 the gearing is not shown, but is the same as is shown in Fig. 2.

The gear-wheels may, if preferred, be set in separate housing detached from the housing *a a'* of the rolls, in which case the connection of the gearing with the rolls is made by coupling on the projecting necks of the rolls and

shafts of the gearing-wheels. This, however, is a matter of convenience of arrangement, and not of necessity. In order to support these two pairs of rolls in the housing, it is necessary to have a separate set of riders and carriages for the two sets of rolls.

In the drawings, Fig. 3, *g g'* are the riders or upper journal-bearings, and *h h'* the carriages or lower journal-bearings for the upper pair of rolls. The lower carriage of the upper pair of rolls may rest on the cross-piece *j* of the housing-frame.

k is the pressure-screw for the rider of the top roll, *c'*, of the upper pair. The upper roll, *b'*, of the lower pair has a separate pressure-screw, *i*, which screws into the cross-piece *j* of the housing-frame, as shown in Fig. 3, the head of the screw pressing on the upper rider, *h'*, of the lower pair of rolls. The lower pressure-screw, *i*, has a squared shoulder, by which it is turned with a wrench. *l l'* are the riders, and *m m'* the carriages, for the lower pair of rolls.

The arrangement of riders, carriages, and pressure-screws for the rolls are the same in both of the housings *a* and *a'*.

In the drawings the rolls represented are flanged and grooved, being such as are used for making band or hoop iron. If used for rolling bars of steel, other rolls must be substituted, one pair being made without grooves with parallel faces, but of different diameter at different points in the length of the roll, so as to reduce the steel when rolled on its side, the other pair of rolls being each grooved with grooves varying in depth and width at different points on the rolls, so as to roll the steel on its edge.

The advantages which I propose to derive from the use of two pairs of rolls in one housing over a single pair or a set of three-high rolls are that in rolling steel, which is alternately rolled between flat rolls on its side and then between grooved rolls on its edge, one pair of rolls may be made without grooves and the other pair with grooves, so that the piece of steel may be passed from one to the other pair alternately without being passed over the top of the rolls to return it to the front of the mill, as is necessary where only one pair is used, and for this kind of rolling the three-high rolls are obviously inappropriate, because,

as the grooves or plane surfaces in the middle roller in the set must match with the grooves or plane surfaces on the rolls above and below it, they cannot be used for rolling steel alternately on the edge and side. Another advantage is that the frequent adjustment of the rolls by the pressure-screw where one pair only is used is avoided by the use of two pairs, which can be adjusted to roll steel to any desired size.

In the use of two pairs of rolls for rolling narrow hoop and band iron the collars or flanges of the rolls can be made stronger, and thus are not so liable to break as where three-high rolls are used, in which it is impossible to use collars or flanges wider than the piece of metal to be rolled by them.

Another advantage of the two pairs of rolls over the three-high rolls is that iron may be passing through both pairs at the same time, which could not be done with three-high rolls, as the passage of a piece of iron between the first and middle rolls alters for the time the gage of the third roll and middle roll, so that if one piece of iron should pass through before the other the thickness of the piece which remained between the rolls would be altered by the sudden change of gage.

It is obvious from what I have just stated that the use of two pairs of rolls enables more work to be done in a given space of time than can be accomplished either with the three-high rolls or with a single pair.

I will now proceed to describe my apparatus for rolling narrow hoop and band iron. So far as the use of two pairs of rolls is concerned, the apparatus is the same as already described.

The rolls in both pairs have grooves *p* in the lower roll of the pair, corresponding with collars or flanges *q* in the upper roll, and a portion of the rolls (marked *r*) is left plain, or without grooves for finishing the iron. In front of the lower roll, *b* and *c*, of each pair is a horizontal guide-table, *s*, placed a little below the point of contact of the rolls, the flap *s'* of the guide-table, which would otherwise project beyond the housing, being turned down so as to give a rounded edge, and is bolted to the housing. The same arrangement is made in the rear of the machine, as seen in Fig. 3, excepting the lower pair of rolls have, instead of a guide-table, a fore plate, *t*, which projects horizontally beyond the housing.

On the fore plate, *t*, in the line of the groove through which the iron is passed, is set a guide-box, *u*, containing a roller, *v*, which revolves freely on its axis, and a guide, *w*, attached to the fore plate, *t*, by a bolt, *x*, which passes through a slot in the guide, whereby it is adjusted at a greater or less distance from the periphery of the roller *v*, so as to regulate the upward curve given to iron as it passes between the roller *v* and guide *w*. In front of the rolls, and extending from the groove in the upper pair of rolls to the plain portion of

the lower pair, is a curved guide-box, *z*, which is supported by the front guide-tables, *s s*. This guide-box *z* is made of iron, and has two sides and a bottom on the outside of the curve, the third side being open. *n* is the piece of hoop-iron passing through the rolls.

The operation of this apparatus is as follows: The iron, when rolled sufficiently thin, is inserted between the lower pair of rolls, *b b'*, from the front of the machine, into the groove in the rear of which is set the guide-roller *v*. As it passes through between the rolls it enters the guide-box *u* and passes under the roller *v*, and, having no other passage, it curves around the roller *v* and rises upward to the table *s*, where it enters a horizontal trough, *y*, (shown in Fig. 2, but not represented in Fig. 3,) which has flaring sides, so as the more readily to receive the iron, and is by it guided into the groove in the upper rolls, *c c'*. It then passes between the rolls *c c'*, and is further reduced in thickness, and as it passes out from these rolls it enters the curved guide-box *z*, which bends it downward and guides it to the plain portion of the rolls, between which it is further rolled and finished, passing out at the back of the rolling-mill.

By means of this apparatus a long piece of band or hoop iron will be operated upon simultaneously at three or more different points in the same mill, thus obviating the necessity of passing it entirely through one pair of rolls before it is inserted between the other pair, which saves a great deal of time and greatly lessens the amount of manipulation required.

The guide-box *z* may be used, if necessary, to guide the iron in its passage upward from the lower to the upper pair of rolls.

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

1. The use in one set of housing of two pairs of rolls, arranged with their axes all in the same vertical plane, the upper pair being geared together so as to pass the iron or steel through between them in one direction, and the lower pair being geared together so as to pass the iron or steel through between them in the opposite direction, for the purpose of enabling a continuous strip or band of metal to be passed backward and forward between the rolls, and thus operated upon at several points at the same time, and for other purposes hereinbefore set forth.

2. The combination of the guide-roller *v* and adjustable guide *w* and curved guide-box *z* with one or more pairs of rolls, in the manner and for the purposes hereinbefore set forth.

In testimony whereof I, the said DANIEL HALL, have hereunto set my hand.

DANIEL HALL.

In presence of—

A. S. NICHOLSON,
W. BAKEWELL.