N. KING & W. SCOTT.

Rolling-Mill.

No. 168,504. Patented Oct. 5, 1875.

Fig. 1.

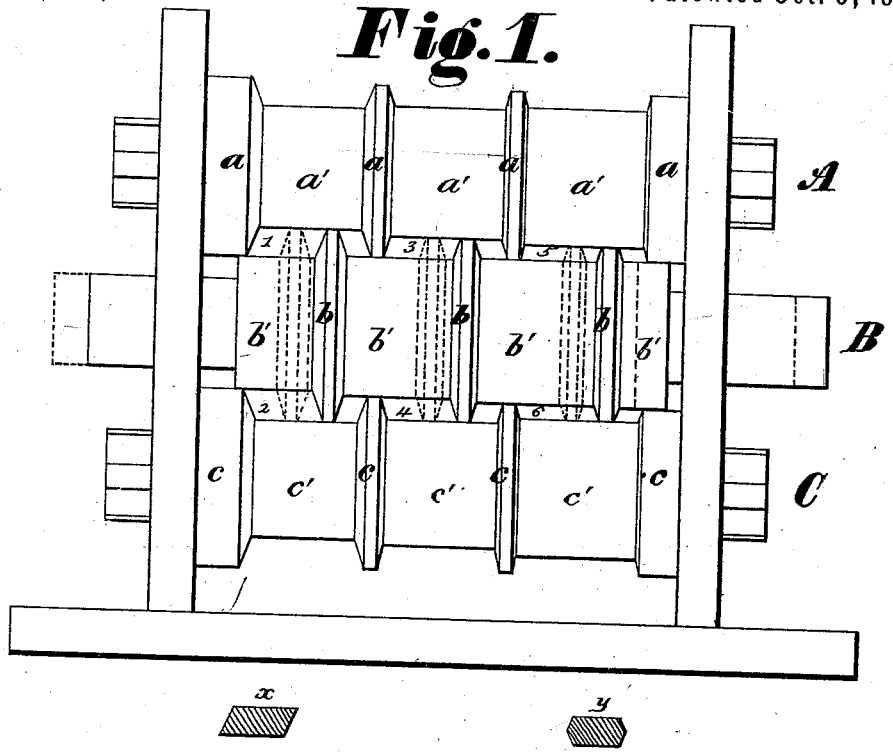

Fig. 2.

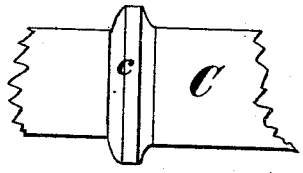

Fig. 3.

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NORMAN KING AND WINFIELD SCOTT, OF ETNA, PENNSYLVANIA.

IMPROVEMENT IN ROLLING-MILLS.

Specification forming part of Letters Patent No. **168,504**, dated October 5, 1875; application filed August 19, 1875.

To all whom it may concern:

Be it known that we, NORMAN KING and WINFIELD SCOTT, of Etna, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Rolls; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a front elevation, and Figs. 2 and 3 are details.

This invention relates to reducing and finishing rolls for rolling bar-iron, as well as skelp and nail plates. Its object is to do with one set of rolls the same work as now necessitates the use of a whole train of rolls—viz., producing any size whatever of bars with the one set of rolls. Our invention, then, consists in a single set of rolls, two or three high, one or more being longitudinally movable, and all the rolls presenting plain cylindrical working-surfaces, furnished with collars whose sides are inclined or curved, for purposes hereinafter described, the squeezing being effected on all four sides of the pile for the reduction of the iron. This avoids the necessity of weakening the rolls by cutting V or other shaped grooves in them. The former is the approved way of "squeezing" on four sides of the pile. As the two-high rolls are not much in use, we will direct our description to the three-high, in which we make the middle roll movable endwise within the standards, and the upper and lower stationary, or vice versa.

Referring to the drawings, A is the upper, B the middle, and C the lower roll. The rolls A and C are made with collars *a c* and cylindrical portions *a' c'*, respectively, diminishing in diameter toward the receiving ends of the rolls, making them assume, as to their entire length, a tapering form, with the large parts at the delivery end. If it is desired to reduce the thickness on the back pass of the bar, the lowest roll may be slightly larger than the uppermost. The middle roll B is made like rolls A and C, but tapers to a less degree. It, like rolls A and C, is provided with collars *b* and plain cylindrical surfaces *b'*; but the collars *b* have positions intermediate between collars *a c* of the rolls A C. The collars *a b c* have inclined or curved sides, with their broadest section next the respective rolls. The pressure or squeeze is given by the cylindrical portion of the rolls and the inclined or curved sides of the collars. Made thus with collars alone, the rolls could not give a "bite" on the pile unless the collar-sides were inclined or curved for feeding. The degree of inclination or curvature of the sides of the collars *a b c* may be fixed to suit the work. We find the best results are obtained by having the inclines gradually approach the perpendicular, toward the delivery end of the roll. The two extreme rolls may be, but we prefer to make only the middle roll, movable. This we accomplish by cutting away a portion of the working-surface or making the standard-slots larger, so as to permit the roll to move endwise. By this arrangement the collars *b* on roll B may be brought nearer to or removed farther from the collars *a c* on rolls A C, thus increasing or diminishing the area of the rolling-aperture between the collars, as may be desired.

The operation of such a set of rolls will be as follows: Numbering the apertures from 1 upward, the pile or bloom is first passed through 1, when it is squeezed into a form whose section is a rhomboid, as seen at *x*. It then, on return pass, comes through 2, an aperture of rhomboidal shape, but of an opposite order to that of 1. Hence the bar is now reduced at its acute corners, since these, in the return pass, bear against the inclined sides of the collars *b c*. This pass gives the bar a hexagonal form, as seen at *y*, and by this way of rolling the pressure is, in every pass, exerted to force the corners toward the center, and the fibrous quality of the bar is improved to a great degree thereby. The pile or bar is then given the direct pass through aperture 3, where, in consequence of the smaller size of the latter, it is again forced into the rhomboidal form, as at 1, and in the return pass through 4 the same effect is produced as in 2; likewise in 5 and 6, and so on till the finished bar is delivered, when it may have either of two forms, according to the style of collar used, inclined or curved. It may be an irregular hexagon—viz., a bar with its edges V-shaped. This form is admirably

adapted to nail-plate, as the nails produced therefrom will have a chisel-point and a solider head than that from a square-edged bar; or it may be a bar with rounded edges. Such a bar is less liable than a square one to chip or scale in reforging. On account of the reversal of the form of the aperture by the return pass, all danger or probability of a "flash" or "fin" on the edge is averted, because the pressure is on a corner from a plain surface, and the bar-edge does not get close to the part at the opposite corners.

By this construction bars of any size can be produced at pleasure, the dimensions being limited only by the lengthwise movement of the movable roll or rolls. Hence, as the reduction is done with the one set from the bloom to the gaged bar, it follows that any size of bar may be produced directly from the pile or bloom with one set of rolls. This alone will be of immense advantage, as it will enable the manufacturer to do without the customary long trains of rolls, each set being for a certain gage of bar, half of which are sometimes idle, their size not being wanted. If a manufacturer have a small order for an irregular size of bar-iron, with our rolls the order may be filled at a moment's notice, while, with the ordinary rolls, the order would have to be declined or new rolls built.

There is no need of grooving our rolls, since the lateral pressure is given by the opposing faces of the collars, and hence, as no grooves whatever are cut, it follows that our rolls are vastly stronger than grooved ones, since the strength of a roll is measured in inverse proportion to its deepest groove.

The usual fillets may be made on the rolls, though, from the foregoing, it will be seen that they are by no means necessary.

What we claim as new is as follows:

As an improvement in rolling-mills, the combination of two or more rolls, one or more of which is capable of endwise movement, and each presenting two or more plain cylindrical working-surfaces of different diameters, terminated by beveled collars, that alternate those of one roll with those of the next adjacent roll, substantially as described.

In testimony that we claim the foregoing we have hereunto set our hands this 10th day of August, 1875.

NORMAN KING.
WINFIELD SCOTT.

Witnesses:
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