

(No Model.)

M. V. SMITH.

## CONTINUOUS ROLLING MILL.

No. 274,525.

Patented Mar. 27, 1883.

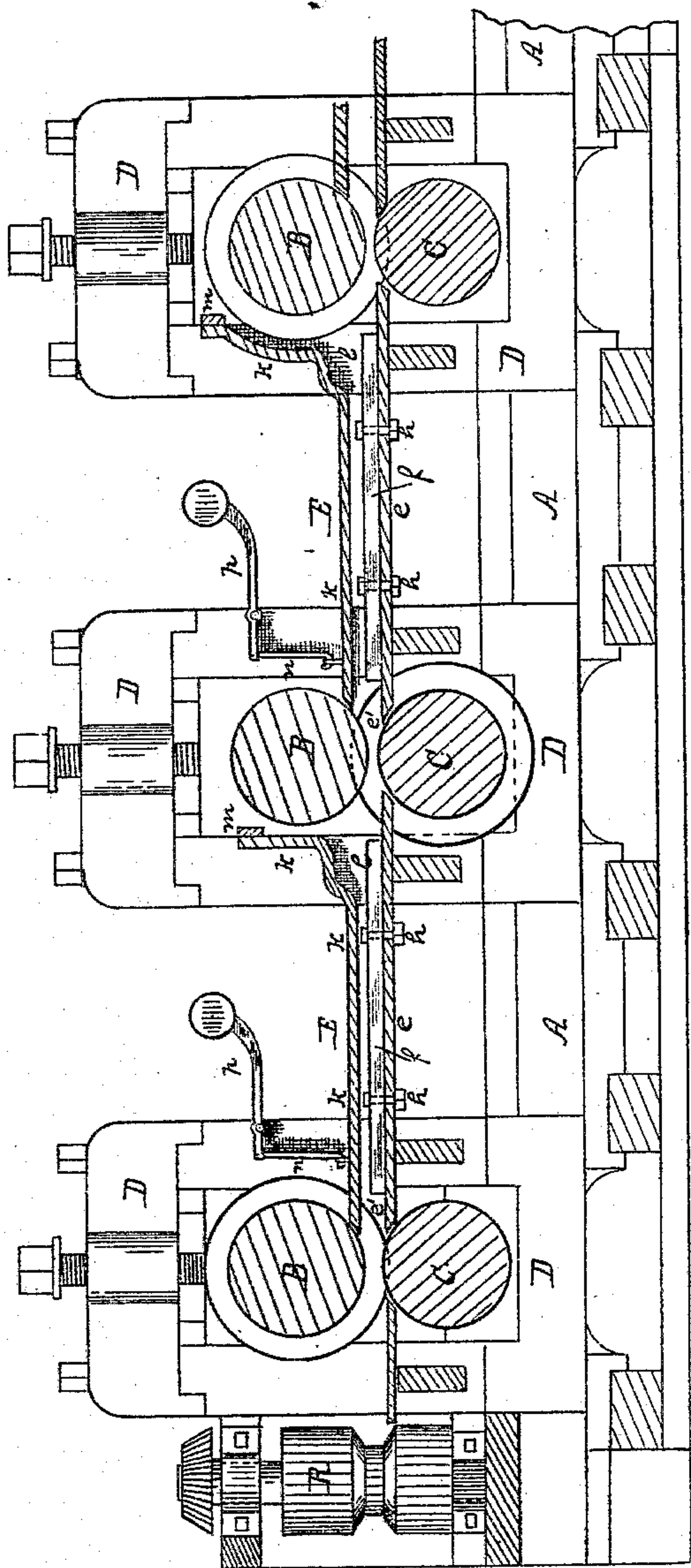
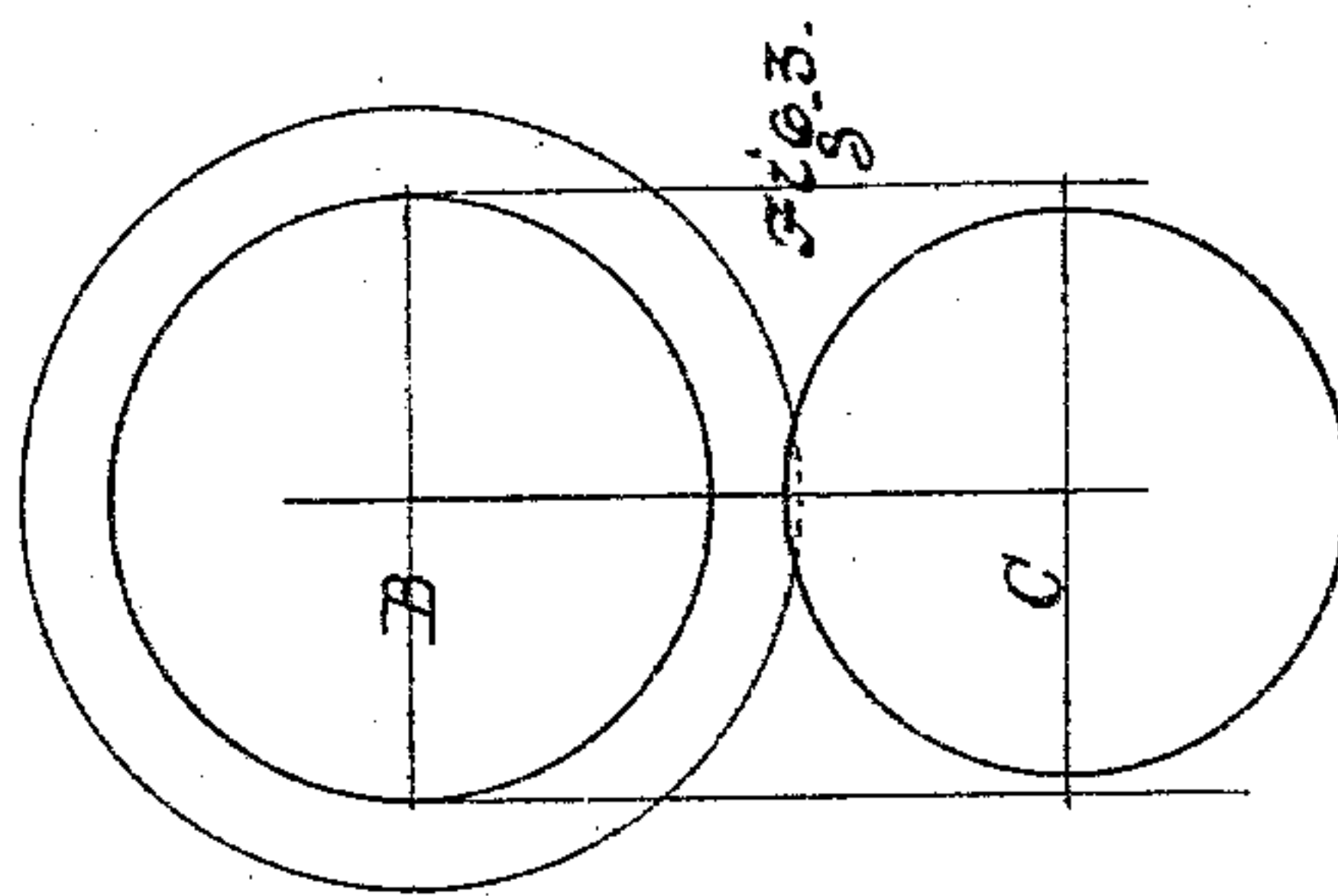


Fig. 1.



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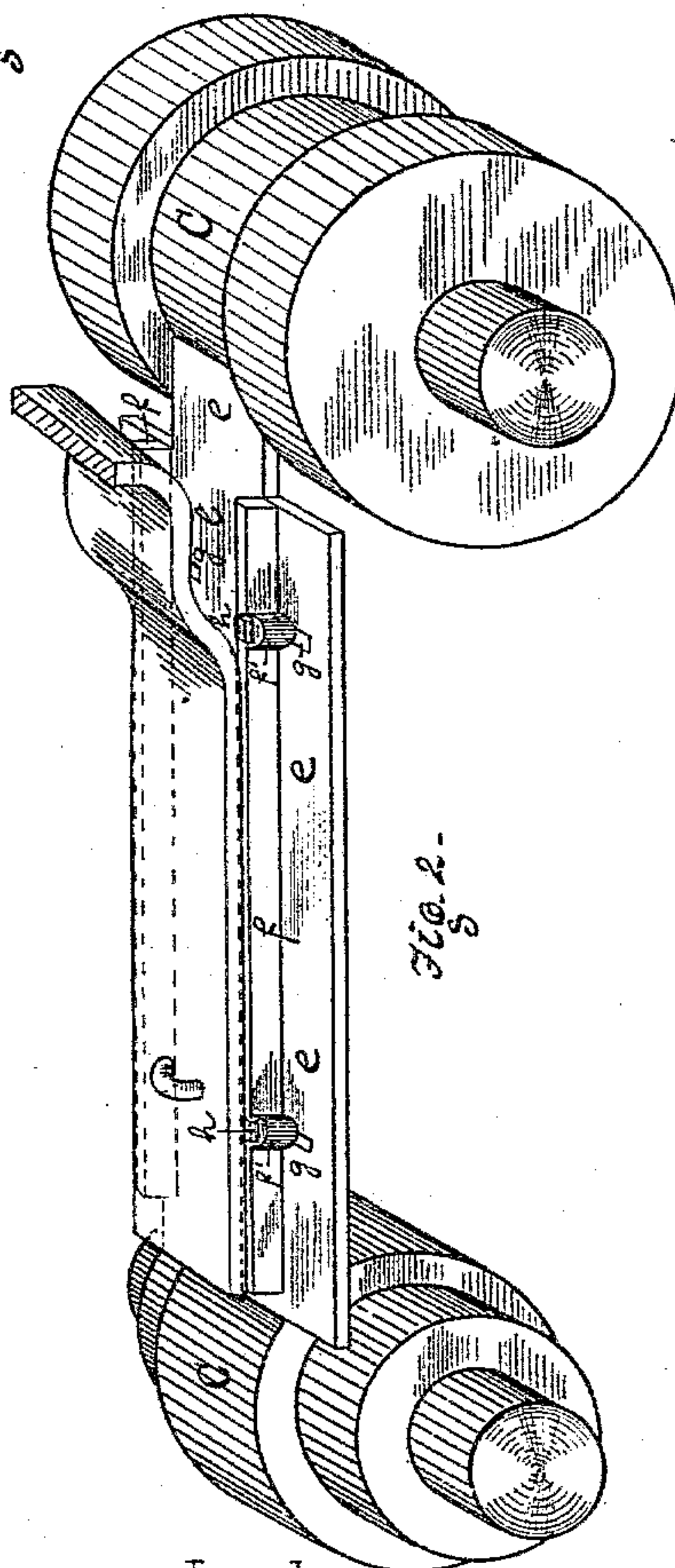


Fig. 2.

Witnesses \_\_\_\_\_

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[OVER] *for Martin V. Smith*  
*by James I. Kay*  
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# UNITED STATES PATENT OFFICE.

MARTIN V. SMITH, OF McKEESPORT, PENNSYLVANIA.

## CONTINUOUS ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 274,525, dated March 27, 1883.

Application filed December 31, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, MARTIN V. SMITH, of McKeesport, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Continuous 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 a part of this specification, in which—

Figure 1 is a longitudinal central section of my improved rolling-mill. Fig. 2 is a perspective view of the conductor and a roll at each end thereof, and Fig. 3 is a diagram view of one set of rolls illustrating my invention.

My invention relates to certain improvements in continuous rolling-mills where a series of sets or pairs of horizontal rolls are mounted in common line of feed and the metal is fed from one pair of rolls to the next through or by means of a guide or conductor, the metal being thus gradually reduced by each pair of rolls until brought to the desired size and the rolls being geared to run at different speeds, so that as the metal is elongated it is fed more rapidly through the mill. In mills of this general construction difficulty has been experienced on account of the tendency of the forward end of the plate, hoop, or bar to turn up after passing through one pair of rolls, so that it is not in proper position to feed automatically into the next pass in the mill, and is liable to catch upon any projection on the roof of the guide or against the upper roll of the next pass, and for either reason to buckle or even become jammed in the conductor. The object of my invention is to overcome this difficulty in continuous mills, as well as to improve the construction of the guides or conductors employed between the several sets of rolls.

My invention consists, first, in forming the top roll of each set or pair in the continuous mill of slightly larger diameter at the working-face than the lower roll, by which means the metal passing through is delivered in a downward direction upon the bottom of the conductor, thus overcoming its tendency to catch against the conductor-roof, and enabling it to feed more accurately to the next pass; and, second, in certain other improvements in the construction of the rolls and in the conductors

between the several sets of rolls composing the mill.

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

My invention is illustrated in connection with rolls for the manufacture of plate for making pipe or tubing, commonly known as "pipe-iron."

The mill A is formed of a series of sets or pairs of horizontal rolls mounted in common line of feed, there being any desired number in the series, according to the required reduction of the metal, this being determined by the skilled operator.

The rolls B C, composing each pass or set, are mounted in a suitable housing, D, and are connected in the usual manner with the driving-gear. The sets of rolls shown are composed of tongue and groove rolls, and the tongues and grooves of the alternate sets are reversed, so that while in passing through one set the fins are formed along the upper edges of the plate, the next set rolls off these fins and forms fins along the lower edges of the plate, the serious finning of the metal being thus prevented.

Whether my invention is employed with these tongue and groove rolls, with groove-rolls, or with plain-faced rolls, according to the shape of the metal to be formed, the upper roll, B, in each pass or set is made slightly larger in diameter through its working-face than the diameter through the working-face of its corresponding lower roller, C. The difference of diameter between the two rolls need not be great, its purpose being to obtain a larger circumference, and hence a greater circumferential travel of the upper roll, by which the metal is discharged in a downward direction upon the conductor. The several housings supporting each set of rolls are secured to a suitable bed-plate or otherwise mounted so that the rolls are in common line of feed.

Conductors E are secured between the several set of rolls, the metal passing from one set along the conductor, and being automatically fed into the next set thereby, and thus carried through the entire mill. The bottom plate, e, of each conductor is supported at the ends on cross-bars fitting in seats in the housings, and its back or receiving end, e', rests against the roll, so as to strip the metal therefrom as



it is delivered. The bottom plate, *e*, is made of cast-iron, and the sides *f* of the conductor are so secured thereto as to be adjustable to different widths of pass. The bottom plate has transverse slots *g* formed therein, one on either side, near each end, and the sides *f* have bolt-holes *f'* corresponding in position to these slots, through which bolts *h* are passed to secure the sides to the plate, the nuts being unscrewed a short distance and the sides adjusted to the desired pass, the bolts sliding in the slots *g*, and the plates then secured in place by screwing up the nuts. The sides can thus be adjusted to feed the metal accurately into the next pass. The top *k* of the conductor is formed of a plate of wrought metal bent to the shape desired, it being bent at its delivery end so as to form an enlargement, *l*, in the conducting-space in front of the next pass of the rolls, to allow for any slight buckling of the metal when passing through, this enlargement giving sufficient room for such buckling when the speed of the rolls is accurately regulated, and also serving, from its position at the delivery end of the conductor, to force the metal through the rolls should such buckling occur. The forward end of the plate is then bent up and secured to a cross-bar, *m*, in the housing above the rolls. The rear or receiving end of the top plate, *k*, fits against the roll so as to act as a stripper, and is hung on a rod, *n*, attached to the end of a weighted lever, *p*, so that it is always held to the surface of the roll.

The operation of my improved rolling-mill is as follows: The billet or pile, when brought to the proper heat, is fed to the first set or pair of rolls, which may either be formed of horizontal rolls or of vertical grooved rolls, as at *R*, which grasp the sides of the billet or pile and force it into the first set of horizontal rolls. As the metal passes through the first set of horizontal rolls on account of the larger circumference, and consequently greater speed or travel of the upper roll, it draws more on the metal, and therefore prevents the turning up of the forward end of the plate, and discharges it in a slightly downward direction upon the bottom of the conductor. As the metal is thus discharged in a downward direction its tendency is to hold to the bottom of the conductor, so that there is no liability of its jamming against the conductor-roof, and its end is in proper position to feed automatically into the next set of rolls, through which it passes in the same manner, being so fed through the entire mill. The difficulty of the forward end of the plate turning up or of the buckling or jamming of the plate from this cause, which generally occurs where the working-faces of the rolls are of the same diameter, is therefore entirely overcome. In case the several sets of rolls are not geared to run at the proper relative speeds, and as the metal naturally buckles in

front of the next pair of rolls, room is provided for it to bend up in the enlargement *l* of the conductor, so that it does not jam up in the shallow part of the conductor, and on account of the shape of the enlargement it aids in forcing the metal through the rolls in case of serious buckling. The sides of the conductor can be adjusted in the manner above described to feed the metal accurately into the next pass as well as to suit another width of plate or bar in case the rolls are changed, the same conductors being thus capable of use in rolling many different widths of metal.

I am aware that continuous rolling-mills have been formed of tongue and groove rolls and suitable conductors wherein the tongue and groove of the alternate pairs were recessed, and the tongue-roll was of greater diameter than the groove-roll, the upper roll in each alternate pair being thus larger than the corresponding lower roll, and the upper roll in the other pairs being smaller than the corresponding lower rolls. In these continuous mills, however, the same difficulties were experienced which I have overcome, as the metal in passing through each alternate pair was thrown up against the conductor-roof, and thus caused to jam or buckle.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A continuous mill for rolling metal, formed of a series of two or more pairs of horizontal rolls arranged in common line of feed and guides or conductors between the pairs of rolls, the upper roll of each pair being larger in diameter at its working-face than its corresponding lower roll, substantially as and for the purposes set forth.

2. A continuous mill for rolling metal, formed of a series of two or more pairs of horizontal tongue and groove rolls and guides or conductors between the pairs of rolls, the tongues and grooves of the alternate pairs being reversed, and the upper roll of each pair being larger in diameter at its working-face than its corresponding lower roll, substantially as and for the purposes set forth.

3. A covered guide or conductor for conducting metal between the sets of rolls in continuous rolling-mills, having an enlargement at the delivery end to allow for buckling, substantially as set forth.

4. In rolling-mill guides or conductors, the combination of the bottom plate, *e*, having transverse slots *g*, with the sides *f*, and fastening-bolts *h*, substantially as and for the purposes set forth.

In testimony whereof I, the said MARTIN V. SMITH, have hereunto set my hand.

MARTIN V. SMITH.

Witnesses:

DANIEL N. HERWIG,  
JAMES I. KAY.