L. R. CUSTER.

MILL FOR ROLLING SHAPES.

APPLICATION FILED MAY 22, 1905.

929,400. Patented July 27, 1909.

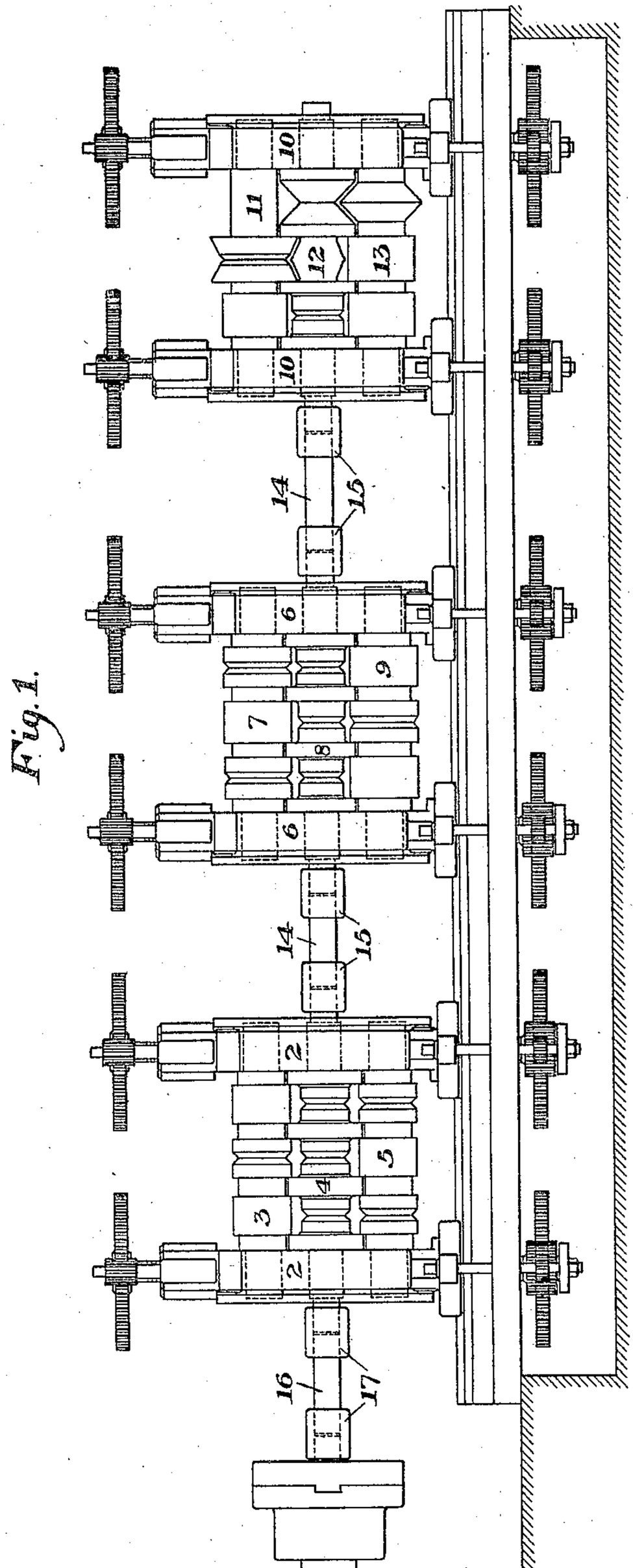

Fig. 1.

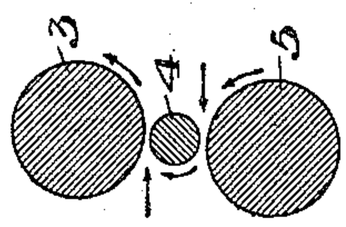

Fig. 3.

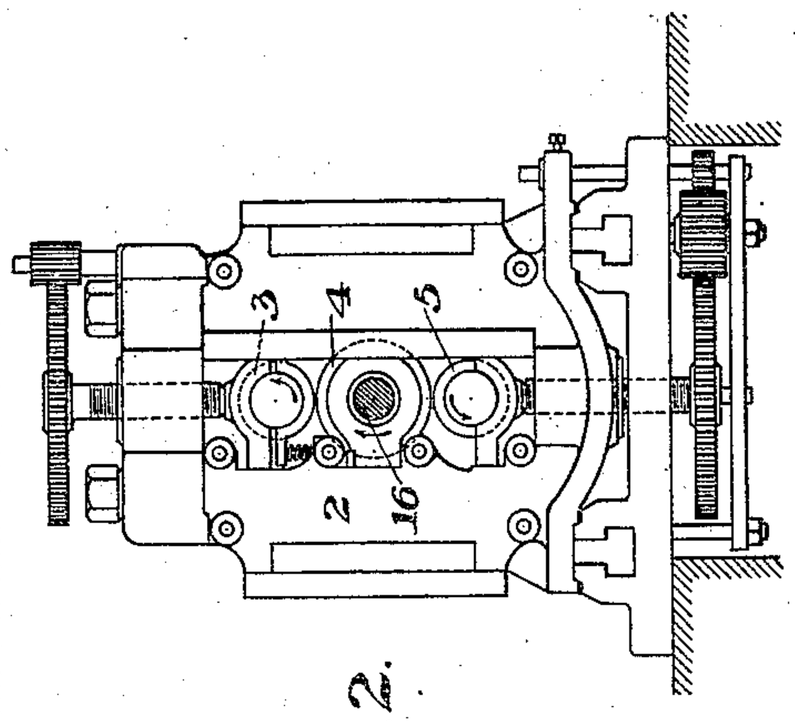

Fig. 2.

WITNESSES

Warren W. Swartz

R. A. Balderson

INVENTOR

Louis R. Custer

by Bakewell & Reynes

his attys

ANDREW. B. GRAHAM CO., PHOTO-LITHOGRAPHERS, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

LOUIS R. CUSTER, OF MUNHALL, PENNSYLVANIA.

MILL FOR ROLLING SHAPES.

No. 929,400. Specification of Letters Patent. Patented July 27, 1909.

Application filed May 22, 1905. Serial No. 261,499.

To all whom it may concern:

Be it known that I, LOUIS R. CUSTER, of Munhall, Allegheny county, Pennsylvania, have invented a new and useful Improvement in Mills for Rolling Shapes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation of a rolling mill, showing three stands of three-high rolls, and constructed in accordance with my invention; and Fig. 2 is a sectional end elevation of the same. Fig. 3 is a sectional elevation of the rolls showing their vertical centers staggered or out of the same vertical plane.

The object of my invention is to provide means by which the power required to drive such mills is greatly reduced and in which loss of power caused by friction due to slipping between the meeting faces of the rolls and the blank being reduced between them is avoided.

Another object of my invention is to provide means by which one of the rolls is positively driven, the remaining rolls being caused to rotate by contact with the blank between the faces of the rolls.

It also consists in arranging the rolls of each train in such manner as to have the vertical center of the middle roll out of line with the vertical centers of the top and of the bottom roll.

Heretofore in the operation of three-high rolling mills for rolling flanged metal shapes it has always been the practice to positively drive all of the rolls in such roll train. It being practically impossible to have all of the rolls positively driven and of the same diameter in any one stand of rolls, this has resulted in the surface speed of the rolls being different. When a blank is being rolled between such rolls, the difference in the surface speed causes one or another of the rolls to slip on the surface of the blank between them, which results in the expenditure of a large amount of power necessary to overcome the friction between the slipping faces. This also results in the rapid wear of the rolls, decreasing the life of the rolls and increasing the cost of maintaining the mill.

Another object of my invention is to overcome these difficulties and to provide means by which the power used in driving such mills is greatly reduced and in which the surface speed of the rolls between which the metal is reduced is equal, and loss of power due to friction caused by slipping between the faces of such rolls and the metal between them is avoided.

In the drawings, 2, 2 are the housings, 3 the top roll, 4 the middle and 5 the bottom roll of the roughing stand of rolls; 6, 6 are the housings; 7, 8, 9 the rolls of the intermediate stand, 10, 10 the housings, and 11, 12, 13 the rolls of a finishing stand of rolls. As shown in Fig. 1, the three stands of rolls are in line with each other, with the middle rolls 4, 8 12 connected together by means of the usual spindles 14 and coupling boxes 15. The middle roughing roll 4 is also connected by the leading spindle 16 and coupling boxes 17 to the shaft 18 of a steam engine or other suitable driving motor. The middle roughing roll 4 is positively driven through the spindle 16 and in turn positively drives the middle roll 8 of the intermediate stand and through it, the middle roll 12 of the finishing stand. The top rolls 3, 7 and 11 and the bottom rolls 5, 9 and 13 are not connected together, and are caused to rotate by contact with the blank being reduced between them and the positively driven middle rolls. The rolls are grooved to conform to the flanged shapes to be rolled in them.

When rolls having different diameters are arranged with their centers in the same vertical plane, the metal being reduced between them will curve upwardly or downwardly around the roll having the smaller diameter as it issues from between the rolls. To prevent this and cause the metal to issue horizontally from between the rolls, guides are employed which are located on the delivery side of the roll passes. Frequently these guides are broken by the strain put upon them, and when such guides break there is great danger of the metal bending and forming a "collar" on the roll, resulting in breaking the roll or making it necessary to change the rolls in order to remove the collar from the roll.

By arranging the rolls, as is shown in Fig. 3, with the vertical centers of the frictionally driven rolls 3 and 5 in front of the vertical center of the driving roll 4 in the direction of the line of feed of the blank being rolled, this difficulty is overcome, the blank is delivered from the rolls without bending and the strain on the guides is greatly reduced.

The top and bottom rolls being caused to

rotate by contact with the metal between them and the positively driven middle rolls, all of the rolls in each stand are caused to rotate at the same surface speed and slipping between the metal and the surfaces of the rolls is prevented. This reduces the wear and largely increases the life of the rolls.

As the top and bottom rolls are driven frictionally the diameter of these rolls can be made larger than the diameter of the positively driven middle roll and in this way the power required to drive the mill is greatly reduced.

The roughing rolls are shown with a groove in the top and bottom of the pass. By so constructing the passes in these rolls, I am enabled to roll the shapes from either a flat or a square blank, in the same set of rolls. When a square blank is used it is inserted in the pass with two of its opposite corners perpendicular to the axes of the rolls, one of the two ridges formed on the blank in these passes being afterward removed in passing through the later passes. When desired the rolls may be constructed to reduce flat blanks only, in which case the passes are shaped similarly to the idle passes shown in the drawings.

The use of driving pinions for positively driving the rolls and of spindles and coupling-boxes to connect the top rolls together and bottom rolls together, is dispensed with, and in this way the cost of equipping and maintaining the mill is reduced. As there are no positively driving gears having practically fixed centers between the top or bottom rolls and the middle rolls, the rolls may be reduced in diameter in re-dressing to a greater extent than is possible with existing mills, and in this way also the life of such rolls is increased.

The top and bottom rolls being revolved by contact with the blank between them and the positively driven middle roll, the rolls will all rotate at the same surface speed regardless of their relative diameters.

The arrangement of the rolls may be changed and my invention may be applied to a single stand of rolls or to the rolls of a continuous mill, the rolls in each stand may have their centers in the same vertical plane, and other variations in their construction and arrangement may be made within the scope of my invention, since

What I claim is:—

1. A rolling mill for rolling shapes comprising a roll having positive driving means, and a second roll arranged to be rotated by contact with a blank between the rolls, at least one of said rolls being grooved and the center of the driven roll being out of line vertically with the center of the other roll; substantially as described.

2. A three-high rolling mill comprising a middle roll having positive driving means, and top and bottom rolls arranged to be rotated by contact with a blank between the rolls, at least one of said rolls being grooved, and the vertical center of the middle roll being out of line with the vertical centers of the top and bottom rolls; substantially as described.

3. A three-high rolling mill comprising a positively driven middle roll, and top and bottom rolls, the centers of said top and bottom rolls being out of vertical alinement with the middle roll, and with each other; substantially as described.

In testimony whereof, I have hereunto set my hand.

LOUIS R. CUSTER.

Witnesses:
C. L. WILSON,
W. A. KELLY.