

No. 648,080.

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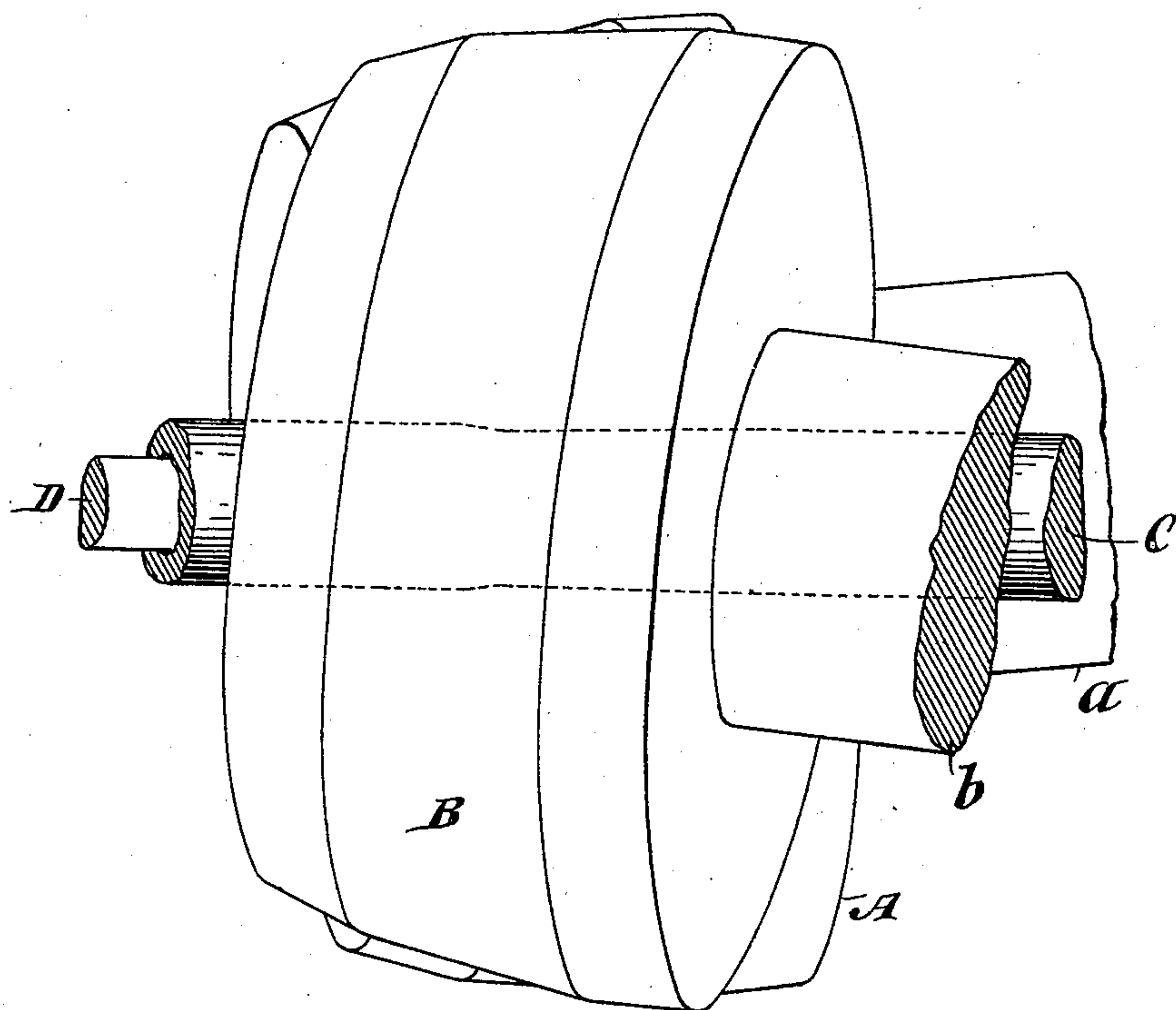
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CROSS ROLLING PIERCING MACHINE.

(No Model.)

(Application filed Nov. 28, 1899.)

2 Sheets—Sheet 2.

Fig. 2



Witnesses.
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CROSS-ROLLING PIERCING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 648,080, dated April 24, 1900.

Application filed November 28, 1899. Serial No. 738,525. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. QUIMBY, of Orange, New Jersey, have invented a certain Improvement in Cross-Rolling Piercing-Machines, of which the following is a specification.

This improvement relates to the class of machines for piercing solid billets by means of crosswise-acting rolls presenting a pass, in traveling through which a suitably-hot billet is subjected to a reduction in diameter and is forced against the point of a piercing-punch, and thereby transformed into a tube-blank.

In cross-rolling piercing-machines heretofore employed the working faces of the rolls have been so proportioned as to diminish in diameter in a ratio corresponding to the ratio of diminution in diameter of the reduced section of the billet, thus enabling the pass to impart to the metal composing the reduced section of the billet a uniform speed of rotation.

In other cross-rolling piercing-machines heretofore employed the billet during its progress through the pass is subjected to the action of rolls of gradually-increasing diameter or to the action of rolls the diameters of which do not diminish in as great a ratio as that in which the diameter of the reduced section of the billet diminishes, in either of which cases by an adequate expenditure of power the smaller end of the reduced section is forced to rotate more rapidly than the larger end, and there is thereby imparted to the metal a twist in the same direction as that in which the billet is rotated.

The present invention consists in so arranging the rolls and so proportioning the diameters of their reducing-faces that the smaller end of the reduced section of the billet will be made to rotate less rapidly than the larger end, from which it results that there is imparted to the metal of the reduced section of the billet a backward twist—that is, a twist in the direction opposite the direction of rotation of the billet.

The obvious advantages due to the resulting lower speed of rotation at which the pierced billet is delivered are the greater convenience of handling and the diminution in the friction encountered by the pierced billet by its contact with the stationary guide or

trough which receives it while it is issuing from the pass.

The rolls for carrying the invention into effect may be of any desired size and of various forms, provided that those parts of their working faces which operate to reduce the diameter of the billet, and which hence form what, for present convenience, may be called the “reducing-pass,” progressively diminish in diameter in a ratio more rapid than the ratio in which the reducing-pass diminishes in width.

The rolls are mounted upon shafts which are arranged to be more or less convergent, according to the ratio of diminution in the diameters of the reducing-sections of the rolls, and such ratio of diminution is determined by the number of convolutions of backward twist which it is desired to give to the work during the reducing operation.

The accompanying drawings, representing a pair of rolls embodying an illustration of the invention, are as follows:

Figure 1 is a top view showing in longitudinal section a portion of a billet in the pass and showing the piercing-mandrel by which the previously-reduced section of the billet is pierced and finally expanded to its original external diameter. Fig. 2 is a side elevation showing the oppositely-oblique positions of the rolls.

As roll-housings and gearing for driving rolls are well known, it is not deemed necessary to herein show them.

The drawings represent two similar rolls A B, mounted, respectively, on shafts *a b*, lying in vertical planes which are more or less convergent, as illustrated in Fig. 1. The shafts *a* and *b* are also inclined in opposite directions from the horizontal plane of the central longitudinal axis of the pass, as indicated in Fig. 2. The billet C is introduced into the wider end of the pass, and the parts of the rolls which the billet first encounters are, say, six times the diameter of the billet. For example, if the original diameter of the billet is four inches, the diameter of the parts of the rolls first acting on the billet will be twenty-four inches. Assuming the billet in its passage through the pass to be reduced to three and three-quarter inches in diameter, the diameter of the rolls progressively di-

minishes, and at the end of the reducing-section the rolls are, say, twenty-two inches in diameter, so that while the ratio of the diameter of the roll to the diameter of the billet at the entrance to the reducing-pass is as ninety to fifteen at the end of the reducing-pass the ratio of the diameter of the roll to the diameter of the reduced end of the billet is only as eighty-eight to fifteen. Hence while the billet at the entrance to the pass is having imparted to it one revolution the end of the reduced section of the billet at the opposite end of the pass is having imparted to it a fraction less than one revolution, and the consequent retarding or holding back effect gives a backward twist to the metal composing the reduced section. The number of convolutions of this backward twist depends upon the number of revolutions of the billet during the reducing operation. As will readily be perceived, the number of such revolutions may be varied by increasing the angles of obliquity of the two rolls, in which case the billet will be driven forward more rapidly and will therefore have a less number of revolutions imparted to it during the reducing operation and, of course, a less extensive backward twist, or the angles of obliquity of the rolls may be diminished, in which case the billet will be driven forward with less rapidity and will have imparted to it a larger number of revolutions and a more extensive backward twist during its travel through the reducing-pass, or the extent of backward twist may be diminished by shortening the length of the reducing-pass and appropriately changing the angles of convergence of the vertical planes in which the shafts of the rolls lie. Finally, the number of convolutions of the backward twist imparted during the reducing operation may be increased by a more rapid and extensive reduction in the diameters of the reducing-sections of the rolls—as, for example, by progressively reducing the diameter of the reducing-section from twenty-four to twenty-one inches and, of course, appropriately

changing the angles of convergence of the vertical planes in which the shafts of the rolls lie. In all of these cases, however, as will be seen, the ratio of reduction in the diameters of the reducing-sections of the rolls is always greater than the ratio of reduction in the width of the pass.

The piercing-mandrel D is arranged in the usual relation to the roll-pass, so that the advancing billet is centrally pierced by the point d of the conical head D' of the mandrel. By the action of the rolls the metal is driven forward and made to exude from the annular space between the base d' of the mandrel-head and the adjacent part e of each of the usual enlarging-sections E of the rolls.

What is claimed as the invention is—

1. In cross-rolling piercing-machines, rolls having reducing-sections of conical form arranged on opposite sides of a reducing-pass which progressively diminishes in width in a prescribed degree from its entrance end to its discharge end; the said reducing-section of the rolls progressively diminishing in diameter in a ratio greater than the ratio of diminution in the width of the reducing-pass, in combination with a suitably-arranged pointed mandrel for piercing the metal driven forward by the action of the rolls.

2. In cross-rolling piercing-machines, in combination with a suitably-arranged piercing-mandrel, rolls having reducing-sections of conical form arranged on opposite sides of the reducing-pass, the said reducing-sections progressively diminishing in their diameters in a ratio greater than the ratio of diminution in width of the reducing-pass, whereby the reduced section of the billet has imparted to its larger end a speed of rotation relatively greater than the speed of rotation imparted to its smaller end.

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