(No Model.)

D. K. MILLER.

ROLLING METALS.

No. 467,512. Patented Jan. 26, 1892.

FIG. 3.

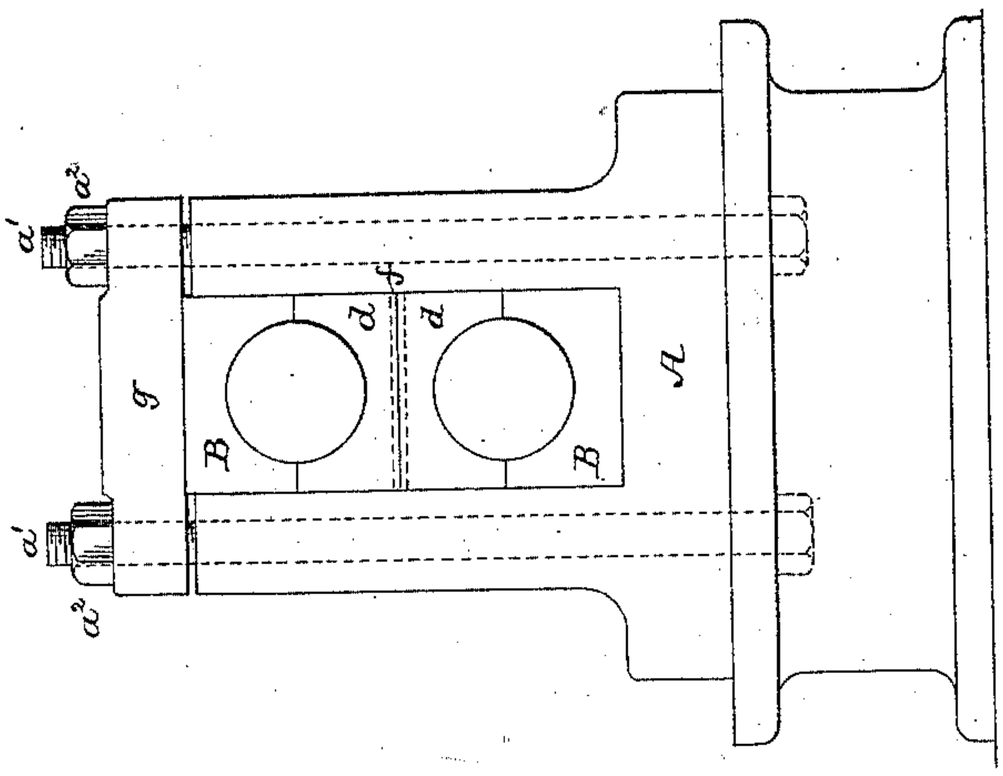


FIG. 2.

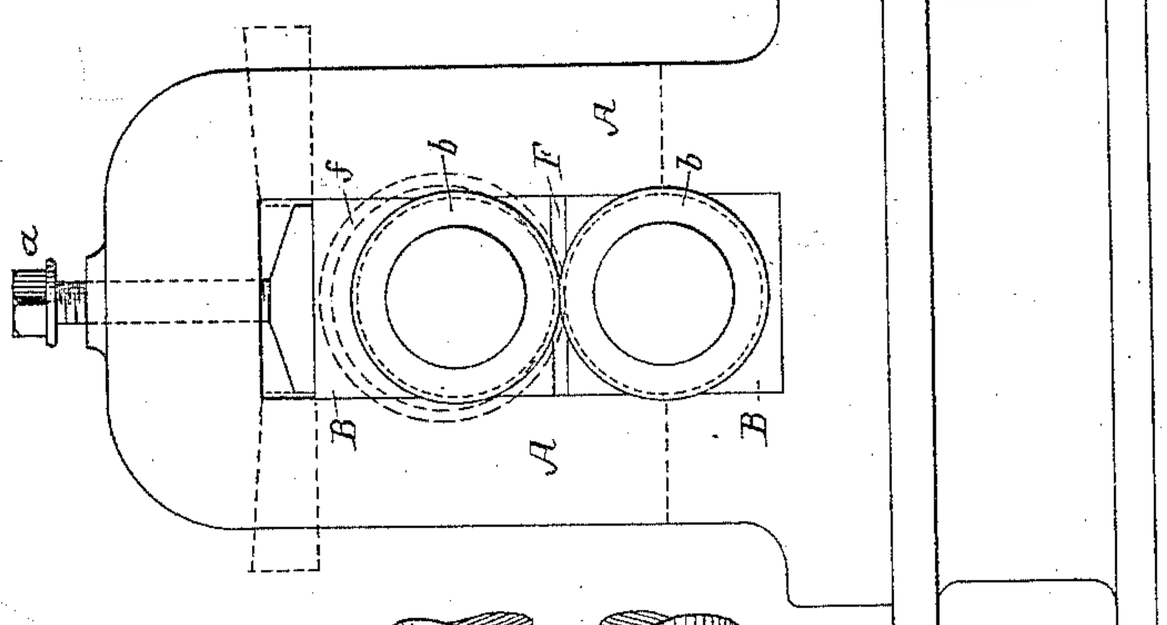
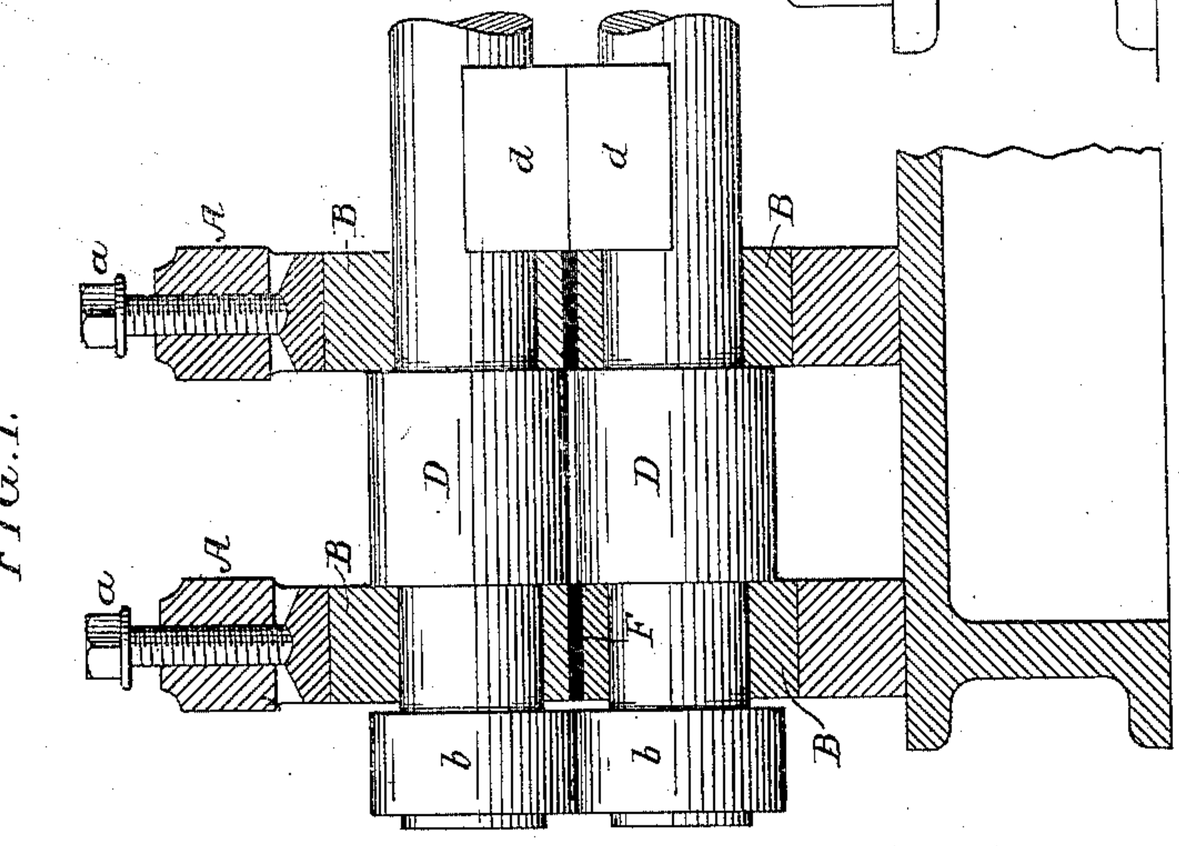


FIG. 1.



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UNITED STATES PATENT OFFICE.

DANIEL K. MILLER, OF PHILADELPHIA, PENNSYLVANIA.

ROLLING METALS.

SPECIFICATION forming part of Letters Patent No. 467,512, dated January 26, 1892.

Application filed March 28, 1889. Renewed December 17, 1890. Again renewed June 25, 1891. Serial No. 397,433. (No model.)

To all whom it may concern:

Be it known that I, DANIEL K. MILLER, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Rolling Metals, of which the following is a specification.

The object of my invention is to attain practical accuracy and uniformity in the thickness of rolled bars, plates, sheets, or other forms of rolled metal; and this object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal section of sufficient of a rolling-mill to illustrate the invention. Fig. 2 is an end view looking in the direction of the arrow 1, Fig. 1; and Fig. 3 is an end view looking in the direction of the arrow 2, Fig. 1, but illustrating a modification in the construction of part of the mill.

It is well known that in rolling-mills as at present constructed accuracy in the rolling and absolute or even substantial uniformity in thickness in all parts of the bar, plate, sheet, or other form in which the metal is rolled cannot be attained, for as there is always a variation in the degree of hardness or density of the metal subjected to the action of the rolls and consequent variation in the degree of resistance to compression offered by said metal, and as there is always more or less spring in even the heaviest roll housings or frames it follows that the softer portions will be compressed to a greater extent than the harder or denser portions, and thick and thin places in the rolled metal must result, and although such inequalities in thickness may be extremely slight they are sufficient to entail considerable expense in addition to that of rolling in order to bring the rolled metal into condition for use for many purposes in which great accuracy is desired. If, however, the rolls of the mill are prevented from separating beyond a certain predetermined limit, or rather if such separation requires the exercise of more force than is required to compress the metal which is being rolled, it follows that the metal compressed between the rolls must necessarily be reduced to a thickness corresponding with such predetermined limit of separation of the rolls.

In the rolls shown in Figs. 1 and 2 of the drawings, A A represent the opposite housings, which are adapted for the reception of the bearing-boxes B B of the upper and lower rolls D D, each of the boxes in the present instance being shown as a two-part box, although it may consist of a single box, if desired.

Between each pair of boxes is interposed a filling-piece or block F, of metal or other material, which offers to compression a resistance greater than the maximum strain which is exerted upon the roll-boxes by the housings.

In preparing the mill for operation the upper box is subjected by means of tightening-screws *a a* to a downward pressure considerably in excess of that required to compress the metal which is to be rolled, the result being that the housings are stretched or subjected to a strain greater than any strain to which they are likely to be subjected by the rolling operation. Hence there can be no stretch or spring of the housings during the rolling operation and no separation of the rolls due to the elasticity of the metal composing the housings, while the interposed filling pieces or blocks F serve to permit of such stretching or straining of the housings without bringing any portions of the rolls into contact and without exerting any undue pressure upon the journals of the rolls, so that the rotation of the rolls when no rolling is being done does not require any more power than though the housings were not under strain. The pass presented by the rolls under these circumstances is substantially accurate and uniform at all times, as said rolls cannot be separated beyond the predetermined limit by the strain of the metal passing between them, nor can the rolls approach closer to each other than the distance regulated by the thickness of the interposed medium F. Hence it follows that metal originally thicker than the pass presented by the rolls when fully separated must by the action of the mill be reduced throughout to a uniform thickness corresponding to the size of said pass. There may, however, be a tendency of the rolls to spring in the middle and thus produce rolled forms thicker in the center than at the edges. If, however, the rolls have journals projecting beyond the

bearings such springing of the rolls will have the effect of causing said projecting portions of the roll-journals to approach each other, the bearings acting as fulcrums.. This tendency is therefore corrected by interposing between such projecting portions of the roll-journals filling mediums, which, like those heretofore alluded to as being interposed between the boxes of the rolls, are of such character as to offer greater resistance to compression than the force exerted to bring the rolls together. In Fig. 1 I have shown different forms of such fillings, and it will be evident that other forms may be used, if desired.

At one end of the mill rolls *b* are applied to the projecting ends of the journals of the main rolls and meet at a point equidistant between the axes of the rolls, while at the other side of the mill there are two blocks *d d*, one forming a bearing for the lower half of the journal of the upper roll and the other forming a bearing for the upper half of the journal of the lower roll.

As the housings have been subjected to such strain as prevents any stretching of the same when the mill is at work and as the outer rolls or filling-pieces prevent any approach of the outer projecting portions of the journals of the two rolls, these two causes cooperate to effectually preclude any deflection of the journal of either roll, such as would be caused by the springing of the rolls in the center.

Instead of having the rolls or blocks meet at the central line, it is preferable in most cases to use wedges or filling-pieces *f*, as shown, for instance, by dotted lines in Figs. 2 and 3, so that the thickness of the interposed medium may be varied, depending upon the size of the pass to be formed between the rolls D D, and the filling-piece of the roll *b* may be movable, being, for instance, in the form of a ring, as shown, and like rings may, if desired, be inserted between the rolls D D, or replaceable or adjustable filling-pieces between the rolls *b* and blocks *d* may in some cases serve in lieu of the filling-pieces between the boxes.

In Fig. 3 I have shown, instead of the compressing-screws *a* for acting upon the upper boxes of the rolls, tension-screws *a'*, passing through the housings and having at the upper ends nuts a^2, bearing upon the upper plate *g*, which acts upon the box of the upper roll, these bolts *a'* in this case being subjected to tension by the nuts, so as to constitute the resisting medium to prevent the undue separation of the rolls by strain exerted thereupon during the rolling operation, and it will be evident that other means than bolts or screws—say, for instance, wedge-plates, such as shown by dotted lines in Fig. 2—may be used for the stretching or straining of the housings without subjecting the rolls to strain, or both means may be employed, the wedges for straining or stretching the body of the housing and the bolts or screws for assisting the wedges and for straining that part of the housing above the wedges.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The mode herein described of securing uniformity in rolled forms of metal, said mode consisting in preventing separation of the rolls beyond a predetermined limit by subjecting the roll-housings prior to the rolling operation to a strain in excess of the pressure required to effect the reduction of the metal without subjecting the rolls to the strain, substantially as specified.

2. The mode herein described of securing uniformity in each of a number of thicknesses of rolled forms of metal, said mode consisting in subjecting the housings of the rolls before the rolling operation to strain in excess of the pressure required for the reduction of the metal which is being rolled, restricting the approach of the rolls under the strain by a medium presenting a greater resistance to compression than the force exerted to bring the rolls together, and varying the thickness of said medium to accord with the desired thickness of the rolled product, substantially as specified.

3. The mode herein described of securing uniformity in rolled forms of metal, said mode consisting in subjecting the housings of the rolls before the rolling operation to strain in excess of the pressure required for the reduction of the metal which is being rolled and preventing springing of the rolls by interposing between their journals beyond the housings a medium offering greater resistance to compression than the metal which is being rolled, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DANIEL K. MILLER.

Witnesses:
WILLIAM D. CONNER,
HARRY SMITH.