(No Model.) 2 Sheets—Sheet 1.

# S. O. HASKIN.

## ROLLING MILL.

No. 511,422. Patented Dec. 26, 1893.

FIG. 1

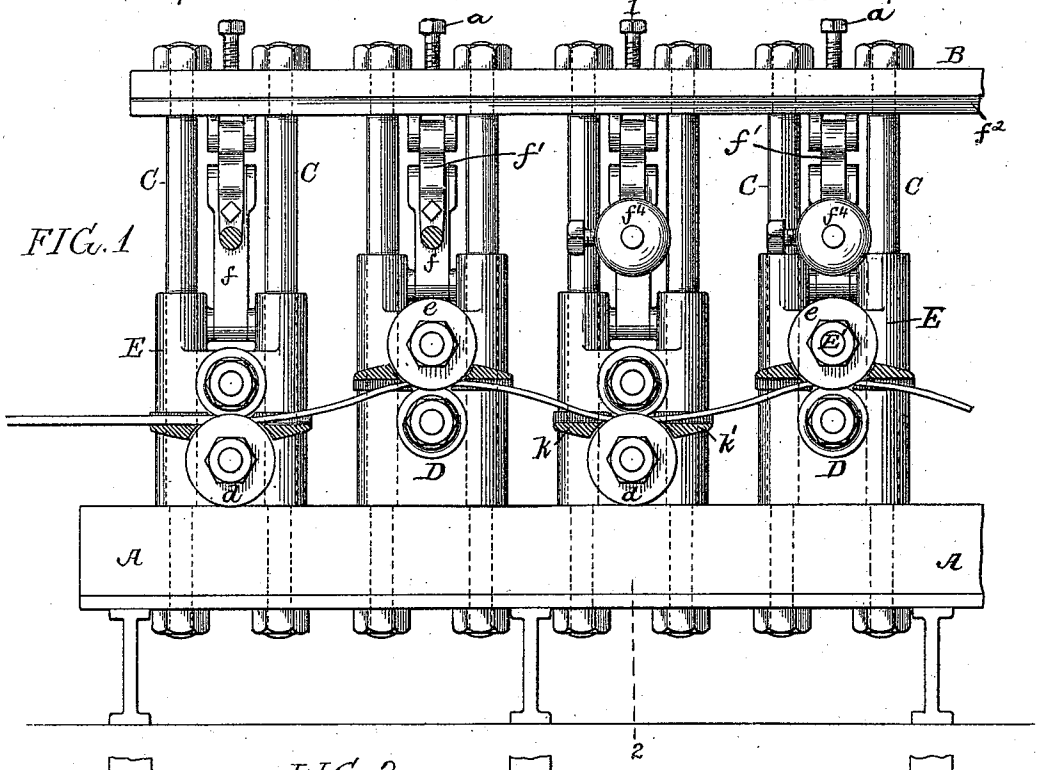
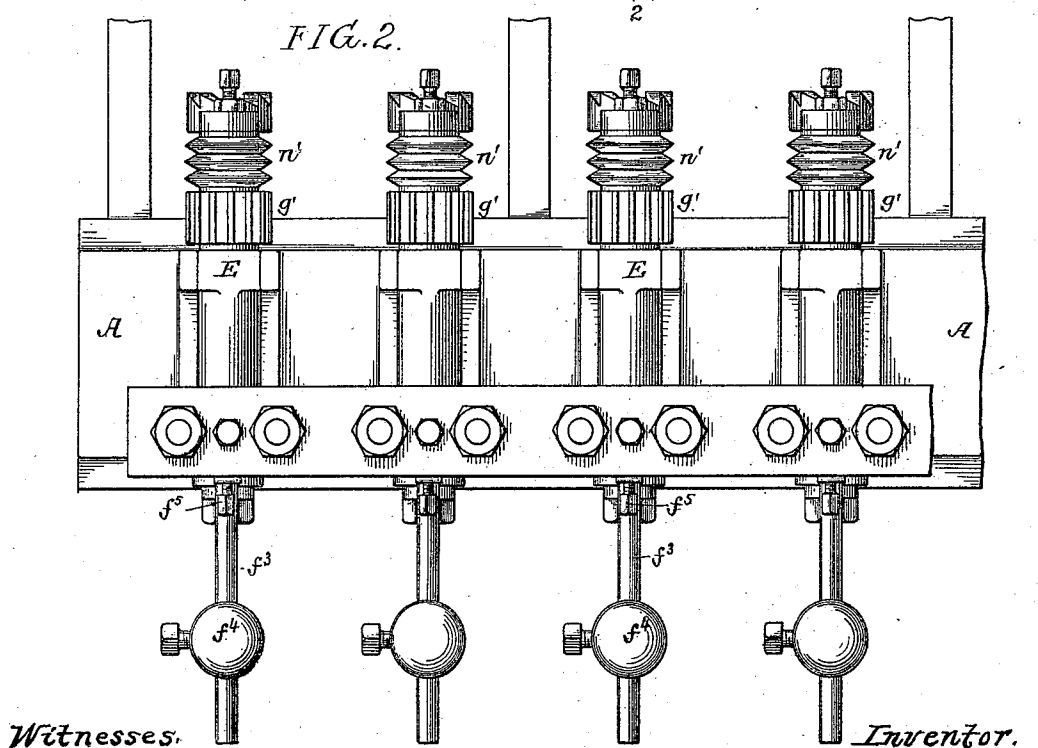



FIG. 2.




Witnesses.
Albert Popkins.
Jas. L. Skidmore.

Inventor.
Stanley O. Haskin
by his Attorneys
Howson & Howson.

THE NATIONAL LITHOGRAPHING COMPANY,
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(No Model.) 2 Sheets—Sheet 2.

# S. O. HASKIN.

## ROLLING MILL.

No. 511,422. Patented Dec. 26, 1893.

FIG. 3.

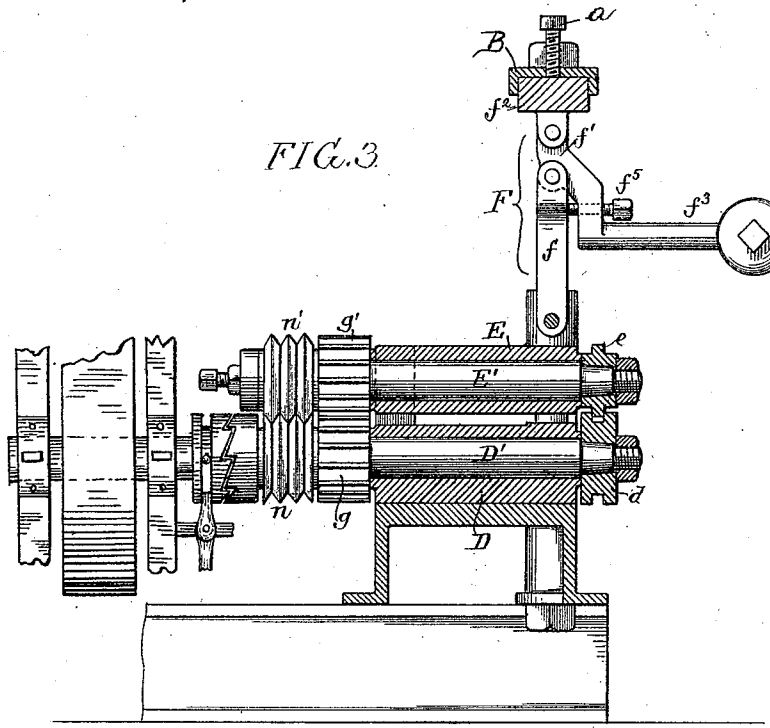



FIG. 12.

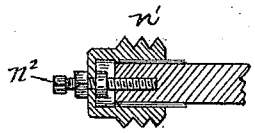



FIG. 4. FIG. 5. FIG. 6. FIG. 7.

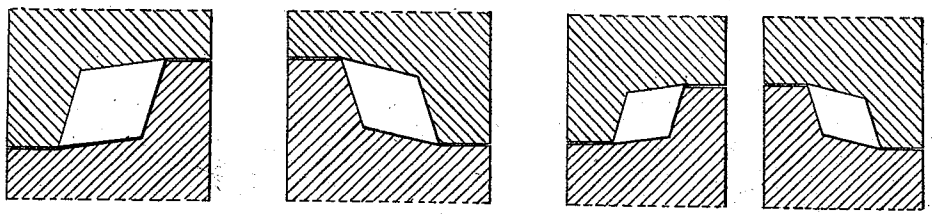
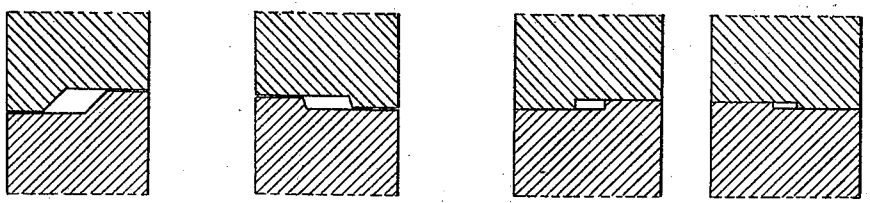


FIG. 8. FIG. 9. FIG. 10. FIG. 11.



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WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

STANLEY O. HASKIN, OF McDONALD, TENNESSEE.

## ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 511,422, dated December 26, 1893.

Application filed February 23, 1892. Serial No. 422,525. (No model.)

*To all whom it may concern:*

Be it known that I, STANLEY O. HASKIN, a citizen of the United States, and a resident of McDonald, county of Bradley, State of Tennessee, have invented certain Improvements in Rolling-Mills, of which the following is a specification.

The object of my invention is to provide an improved continuous train of rolls in which the billet will be prevented from looping between the sets of rolls and to make a train of rolls in which the first end thereof can be worked to its full capacity while at the same time the size of the rolled bar or billet can be altered without changing the capacity of the mill.

My invention further relates to the special construction of parts by which the operative may readily handle the several rolls.

In the accompanying drawings:—Figure 1 is a side view of my improved rolling mill. Fig. 2 is a plan view. Fig. 3 is a transverse section on the line 1—2, Fig. 1. Figs. 4, 5, 6, 7, 8, 9, 10 and 11 are views of the different passes. Fig. 12 is a vertical longitudinal section of the upper grooved adjusting collar, Fig. 1.

B is the running top connection secured to the base A by vertical bolts C C.

D are the pillow blocks for the bottom rolls, the shaft D′ of each bottom roll being journaled therein.

*d* is the bottom roll secured to a conical extension of the shaft D′ by a nut or other suitable fastening device.

The vertical bolts of each set of rolls pass through the pillow blocks, as shown, holding the said pillow blocks in position upon the base A. Adapted to slide on the bolts C C is the vertically adjustable journal-box E for the shaft E′ carrying the top roll *e;* this top roll meshes with the bottom roll and forms the pass of any form desired for the billet. The sliding journal box is raised and lowered by toggle lever mechanism F, having one link *f* pivoted to a projection on the journal box whereby the rolls may be cleared of obstructions. Connected to this link is a lever *f′* which is pivoted to a block $f^2$ carried by the top connection B. This latter lever has an arm $f^3$ provided with an adjustable weight $f^4$; $f^5$ is a set screw on the lever which strikes against the link *f*, thus limiting the motion of the lever and regulating the drop of the sliding journal box E.

The set screws *a* in the top connection B serve not only to take up lost motion but with the set screws $f^5$ they regulate the length of movement of the toggle lever mechanism when both rolls are in working position. The two rolls are geared together by gear wheels *g g′*, and on each shaft are V-shaped or grooved roll guides *n n′* for adjusting the rolls endwise in respect to each other. In Fig. 12, the upper roll guide *n′* is shown splined to the shaft and adapted to be moved thereon longitudinally by a set screw $n^2$.

The shaft D′ is provided with a clutch which can be thrown into gear with the clutch on the driving shaft for driving the train of rolls. Clutches are provided for each pair of rolls so any number of the rolls can be thrown out of gear if required.

In order to prevent the looping of the billet between the sets of rolls from excessive draft or variation in temperature of the metal, I arrange the passes of the rolls in different planes, with the alternating rolls higher than the intervening rolls, as shown in Fig. 1. By this arrangement the loop will pass either under or over the rolls, and the excess of metal is thus taken up by a single loop instead of by many short loops or buckles, as in other trains; and as this loop is caused to pass over or under the rolls it is obvious that doubling or folding of the metal, as it passes between the rolls, is effectively prevented. This doubling of the metal has been a serious defect in continuous roll trains, as heretofore constructed, and I regard this feature of my invention by which it is prevented as of great importance and value.

On each side of each roll are guides *k k′*, one a receiving guide and the other a delivery guide for directing the rod to the next pair of rolls, each of said guides being provided with suitable guards, as clearly shown in Fig. 1.

I prefer to make the passes for reducing a billet to a rod in the manner indicated in Figs. 4 to 11 inclusive. Fig. 4 illustrates a pass of a roll arranged at an incline toward one side and Fig. 5 illustrates a pass inclined toward the opposite side. By this arrangement the necessity of turning the bar or rod

after it has left one pair of rolls and before entering the next pair is avoided. Figs. 6, 7, 8 and 9 are views of the passes showing the reduction of the billet in the same form of pass as shown in Figs. 4 and 5, and Figs. 10 and 11 show the final passes. In the present instance these passes are flat for making flat bars, but it will be understood that any number of passes may be used between 5 and 11, according to the character of the metal and the size of the billet and the size of the finished bar. It will be seen that by this method of rolling, the output of the train need not vary materially when making large or small sizes of rods or bars as the same size billets may be used by simply extending the train by adding more pairs of rolls, which will be more readily understood, when it is understood that the speed of the rolls increases in the same ratio as the elongation of the billet or rod throughout the entire train; it will be readily understood that starting from a billet of any stated size, the only difference in making a large or small rod is that the former would require fewer passes, and it will come near the first end of the train and at the less speed per minute than the latter, which would require more passes and would have to go the entire length of the train and be delivered at a higher speed, thereby enabling the first end of the train to be worked to its full capacity without in any way interfering with the latter end of the train; and hence if a stated number of tons is worked at the first pass the same number of tons can be delivered by the final pass.

I claim as my invention—

1. In a continuous roll train, the combination with the hollow rolls, their shafts, and bearings for said shafts, of grooved adjusting collars carried by each shaft intermeshing with each other and adjusted laterally by means of set screws, substantially as described.

2. In a continuous roll train the combination with the alternating pairs of rolls, of intervening pairs of rolls having their passes in a different plane from and inclined oppositely to the passes of the said alternating rolls, substantially as and for the purpose set forth.

3. In a continuous roll train, the combination with the alternating pairs of rolls, of intervening pairs of rolls having their passes in a different plane from the passes of the said alternating rolls, thereby providing for looping of the metal and preventing doubling between the rolls, substantially as described.

4. In a continuous roll train, the combination of the base and the head connected by vertical bolts, the pillow blocks, the shafts therein, a roll carried by each shaft, a vertical sliding bearing with a shaft journaled in said bearing and carrying the upper roll, gears on the shafts meshing with each other, adjusting collars on each shaft having grooves meshing with each other for the purpose of aligning the rolls, and means for adjusting said collars, substantially as described.

5. In a rolling mill the combination with the upper rolls journaled in a sliding bearing, of a toggle lever consisting of the weighted lever $f^3$, connected at its upper end to the head, and the link $f$ connected to the sliding bearing, with means for regulating the play of said toggle lever and for taking up lost motion, substantially as and for the purpose set forth.

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

STANLEY O. HASKIN.

Witnesses:
J. H. McLEAN,
W. LANDISS.