

(No Model.)

E. L. CLARK.

ART OF ROLLING METAL STRIPS.

No. 397,693.

Patented Feb. 12, 1889.

Fig. 2.

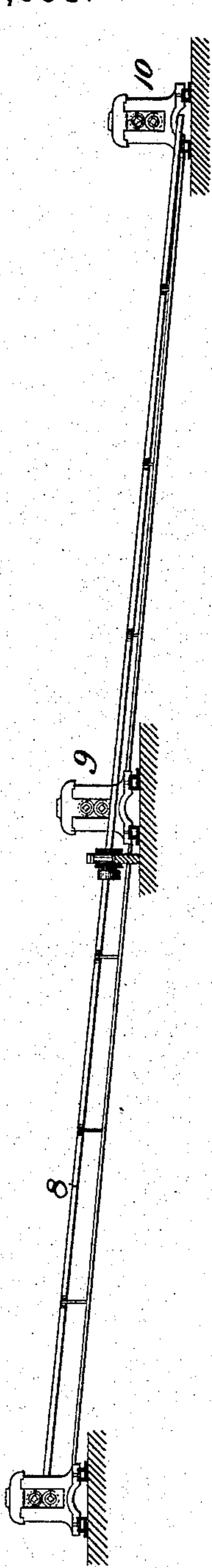


Fig. 1.

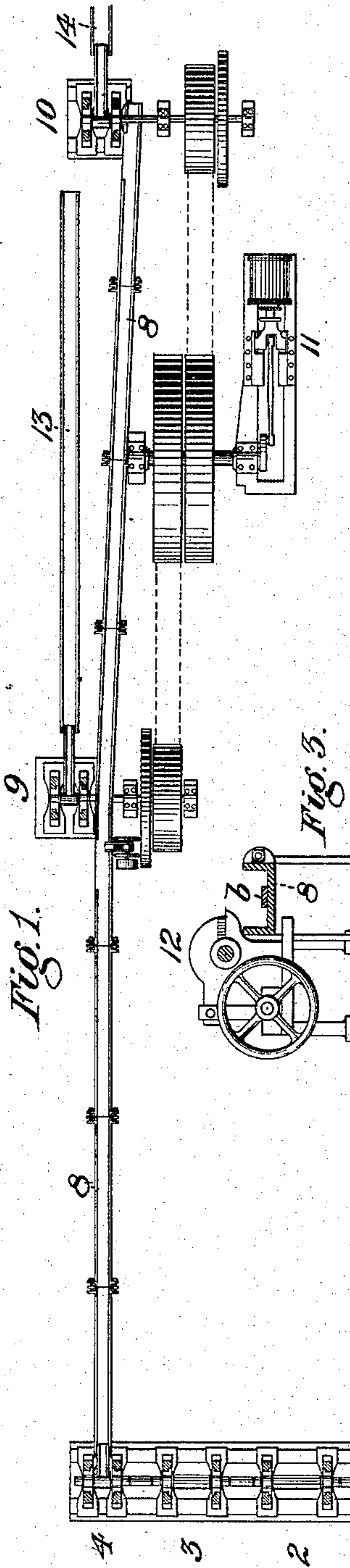
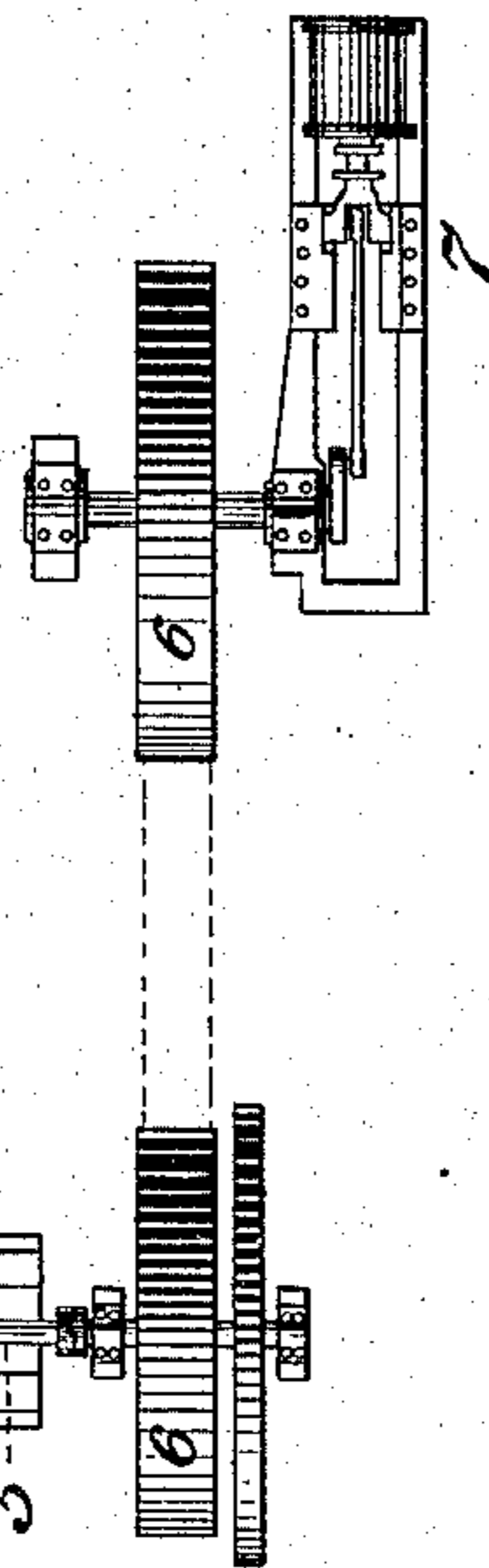


Fig. 3.



WITNESSES,

*N. T. Corwin*  
*H. S. Morrow.*

INVENTOR.

*Edward L. Clark*  
*by W. Baxendale & Sons*  
*his Attorneys*

# UNITED STATES PATENT OFFICE.

EDWARD L. CLARK, OF PITTSBURG, PENNSYLVANIA.

## ART OF ROLLING METAL STRIPS.

SPECIFICATION forming part of Letters Patent No. 397,693, dated February 12, 1889.

Application filed November 6, 1888. Serial No. 290,132. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD L. CLARK, of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Art of Rolling Metal Strips; and I do hereby declare the following to be a full, clear, and exact description thereof.

The accompanying drawings represent a rolling-mill plant which I have devised for the practice of my improved method, Figure 1 being a plan view thereof; Fig. 2, a vertical longitudinal section on the line *x x* of Fig. 1; and Fig. 3, an enlarged vertical cross-section on the line *y y* of Fig. 1, showing the shears which are employed for cutting the metal strip.

Like symbols of reference indicate like parts.

In the drawings, 2, 3, and 4 represent trains of rolls, which are set with their axes in line with each other, and are driven by a common driving-shaft, 5, which is connected by belts and pulleys 6, or by other suitable gearing, with a driving-engine, 7. In rolling hoop iron or steel the billet from which the strip is to be made is passed back and forth a suitable number of times between the rolls 2 and 3 until it is sufficiently elongated and reduced in thickness and is in condition to be passed through the last pair of the series of rolls, 4. As the strip emerges from the rolls 4 it is received in and guided by a guide trough or channel, 8, which is preferably downwardly inclined and extends throughout a distance about equal to the intended length of the strip. During the completion of the manufacture of the strip it is necessary to pass it through finishing-rolls, in order to impart to it the finish and gloss which is desirable in hoop iron or steel; but as the strip comes from the rolls 4 covered with scale it must be allowed to cool sufficiently to cause the scale to loosen and to enable it to be scraped off before it is capable of taking such fine finish. The greatly-increased length of the strip as it comes from the rolls 4, as compared with the original length of the billet, has in the method of rolling heretofore practiced formed a practical limit to the size of the original billet which may be employed, and consequently to the

output of the mill. The temperature of the ends of the strip in passing through the finishing-rolls must be substantially equal, or otherwise the strip will be unequally reduced by the finishing-rolls and will be of irregular size and gage. This evenness of temperature cannot practically be maintained in passing a long strip continuously through the finishing-rolls, since it necessarily requires considerable time to pass through the same, and if the forward end be of proper temperature in entering the bite of the rolls the rear parts of the strip passing through the rolls some time subsequently thereto are apt to have chilled so much as to cause that irregularity in size which I have noted. For this reason it has been the practice to form the strip from small billets, and as the labor and time necessarily employed in rolling them are almost as great as that employed in rolling billets of large size the improved quality of the product has been attended with diminished output and a consequent loss.

In the use of my improved method this is not the case, and from billets of twice the size of those heretofore commonly used I am enabled to make finished strips of as uniform size as from the small billets in practically the same length of time, and with but little increase in cost of labor. The output of the mill may thus be doubled without sacrificing anything in quality of the product and without proportionately increasing the expense.

To this end I prefer to employ two sets of finishing-rolls, 9 and 10, one of them preferably situated at or near the middle of the guide 8 and the other situated at the end thereof. These rolls are driven by suitable power-connections from an engine, 11, and are arranged at the side of the trough 8. At a place near the rolls 9 is a shearing-machine, 12, the preferable position of which relatively to the trough 8 and the strip *b*, which passes through the trough, is shown in Fig. 3. Suitable guide-troughs, 13 and 14, lead from the delivery sides of the rolls 9 and 10.

The operation of the plant is as follows: The metal strip as it comes from the roll 4 travels through the guide-trough 8, and when it has passed through the trough to its full extent it is lifted by the workmen, and is cut

at the middle of its length into two parts by the shears 12. These parts are held for a time until they have severally reached the proper temperature to cause the scale to  
 5 loosen, the scale is removed, and the parts are passed separately through the rolls 9 and 10 at as nearly the same time as the slight difference in their temperature will permit. The removal of the scale may conveniently be ef-  
 10 fected by scraping the surfaces of the strips during their passage into and through the finishing-rolls by means of scrapers held against the moving strips on the ingoing side of the rolls. Each part of the divided strip  
 15 passes through the rolls forward end first, the forward half of the strip passing through the rolls 10 and the rear half through the rolls 9, and as they pass nearly simultaneously through these rolls the finishing of the parts of  
 20 the entire strip may be done in about the same time as that required in finishing a single strip made from a billet of half the size of the billet which I employ. Besides this practical advantage, there is another advantage which  
 25 results from the fact that the divided sections of the long strip, being separately handled and rolled and being individually no longer than strips made from small billets, do not consume sufficient time in passing through the  
 30 finishing-rolls to cause them to chill and to be unequally reduced; but each section is short enough to maintain its proper temperature in passing through these rolls, and therefore when finished will be of substantially uni-  
 35 form size throughout.

I believe I am the first thus to divide a rolled metal strip of hoop iron or steel after the strip has emerged from the last set of forming or roughing rolls and to pass the di-  
 40 vided sections separately and at about the same time through the finishing roll or rolls.

The advantages of my invention have been already partly indicated. The cost of rolling a large billet in the manner which I have de-  
 45 scribed is but little more than the cost of rolling a small billet, while the enhanced output of the mill, resulting from the fact that I produce two strips of uniform gage in the same time as has hitherto been consumed in roll-  
 50 ing a single strip of the same length and of equal uniformity, renders my invention of great practical value. By duplicating the apparatus and using three or more finishing-rolls and a corresponding number of inter-  
 55 mediate shears to shear the strip into as many pieces as there are finishing-rolls a still larger billet may be rolled.

I claim—

1. The method of rolling metal strips, which consists in forming a strip by rolling and  
 60 elongation of a billet, stopping the progress of the strip, dividing the strip, scaling it, and passing the separated sections through finish-  
 ing-rolls at about the same time, substantially as and for the purposes described. 65

2. The method of rolling metal strips, which consists in forming a strip by rolling and  
 elongation of a billet, stopping the progress of the strip, dividing the strip, scaling it, and  
 70 passing the separated sections forward, ends first, at about the same time through separate sets of finishing-rolls, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 2d day of November, A. D. 1888. 75

EDWARD L. CLARK.

Witnesses:

W. B. CORWIN,  
 THOMAS W. BAKEWELL.