(No Model.)

H. A. WILLIAMS.

ROLLS FOR ROLLING WIRE.

No. 446,498. Patented Feb. 17, 1891.

Fig. 1

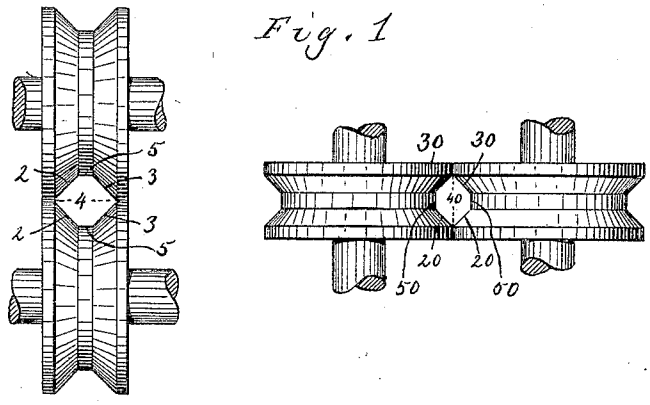


Fig. 2

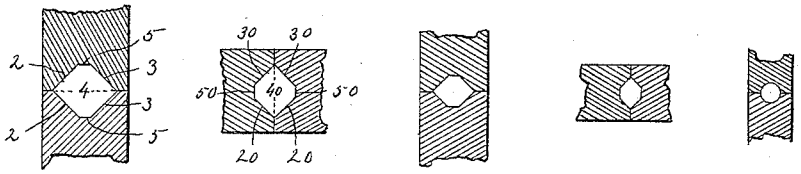
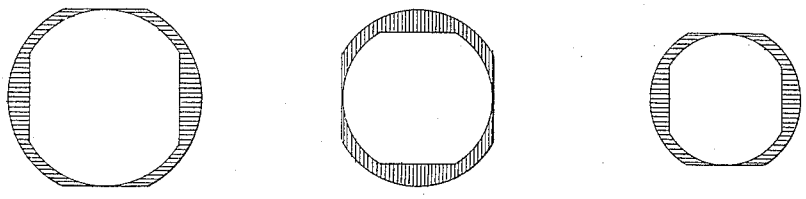


Fig. 3.

Fig. 4.



Witnesses
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UNITED STATES PATENT OFFICE.

HENRY ALEXIS WILLIAMS, OF TAUNTON, MASSACHUSETTS.

ROLL FOR ROLLING WIRE.

SPECIFICATION forming part of Letters Patent No. 446,498, dated February 17, 1891.

Application filed June 23, 1890. Serial No. 356,375. (No model.)

To all whom it may concern:

Be it known that I, HENRY ALEXIS WILLIAMS, of Taunton, county of Bristol, State of Massachusetts, have invented an Improvement in Rolls for Rolling Metal Wire, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention is embodied in rolls for rolling wire, and relates mainly to the construction of the grooves in the periphery of the rolls which act upon the rod to reduce and elongate the same, the object being to produce a different effect in the flow of the metal from that produced by rolls heretofore commonly used in reducing and elongating the rod.

In another application filed herewith I have shown and described a method of rolling wire involving the novel effect in the flow of the metal that is produced by the rolls forming the subject of this invention, the said novel effect being to produce nearly equilateral displacement in all parts of the cross-section of the rod, so that the tendency to elongate is uniform in all parts of the rod, or substantially so.

The rolls heretofore employed for making the successive reductions in sectional area of the rod acted upon have been such as to change the sectional shape of the rod at the point acted upon, certain parts of the rod being displaced to a far greater extent than other parts, giving unequal tendency to elongate in different parts of the rod. In other words, when rolls having a V-shaped groove are used they commonly compress or displace the metal more at the apex of the V or bottom of the groove than near the sides of the groove, where the two rolls of a pair come together. For example, the grooves in each pair of rolls are obtuse angled, and as the plane of each pair of rolls is at right angles to that of the preceding pair, or if the planes are all parallel, the rod is caused to make a quarter-turn in passing from one pair to the next. Each roll of the pair acts upon an acute angle on the rod and compresses it down to an obtuse angle, thus making the intermediate angles acute, which in turn are compressed to an obtuse angle by the next pair of rolls, or if the shapes are rounding instead of rectangular the grooves of the rolls are elliptical instead of circular in shape, each pair acting to compress the rod presented to it on the line of the major axis of the ellipse forming the cross-section of the wire and reducing it so that it becomes the minor axis of the elliptical shape imparted to the rod in passing through the rolls. By this construction of the rolls the lateral displacement of the metal at each reduction is unequal in different parts of the rod, being greatest on those parts which come near the bottoms of the groove and being practically nothing at the tops of the grooves or points where the peripheries of the pairs of rolls touch. Another way of stating the same thing is that the sectional outline or the groove in the roll is not parallel with the sectional outline of the metal presented to it.

The present invention consists in a train or series of pairs of rolls, each pair of which has its plane at right angles to that of the preceding pair, or is otherwise so arranged that the compression of each pair on the rod is at right angles to the compression of the pairs immediately preceding and following it, the acting surfaces of the several pairs being parallel with one another for the greater portion of their extent, so that the sectional outline of the groove is substantially the same as the sectional outline of the metal presented to and acted upon by it. As the space inclosed between the peripheries of each succeeding pairs of rolls is smaller than that between the preceding pairs, there must be a slight departure from the exact parallelism between all parts of the sectional shape of the groove and that of the metal presented to it, which departure is in the form of a slight truncation or filling up of a portion of the bottom of the groove, such that the distance between the truncated portions or bottoms of the grooves of a larger pair of rolls is equal to the width of the top of the grooves in the next smaller pair.

Figure 1 is an elevation on a plane parallel to the axes of two consecutive pairs of rolls of a train of rolls embodying this invention. Fig. 2 is a diagram showing the outline of the grooves of the several successive pairs of rolls of a train embodying this invention, being partial sections in the planes of the axes of the pairs of rolls; Fig. 3, a diagram show-

ing the sectional outlines of the rod or wire at the successive passes, each figure showing the shape of the wire as it approaches a given pair of rolls, and also the shape imparted to it after passing through the said pair of rolls, the shaded lines between the two outlines showing the direction of compression; Fig. 4, a similar diagram showing the shape imparted by rolls having grooves of different shape from those used to produce the shapes shown in Fig. 3, but having substantially the same results and producing substantially the same conditions as to flow of metal and compression and elongation of the rod.

In the construction represented in Figs. 1 and 2 the rolls have V-shaped grooves; but instead of being obtuse angled, as has heretofore been the case in rolling-mills having V-shaped grooves, the inclination of the sides of the grooves to the plane of the rolls is forty-five degrees, so that the sides 2 3 of the grooves are at right angles to one another, and the sides 20 30 of the grooves in a following pair of rolls are exactly parallel to the sides 2 3 of the next preceding pair. As the width of the groove on the line 40 in a following pair must be less than the width on the corresponding line 4 of the preceding pair, in order to provide for the successive reductions of the metal, it is evident that if the grooves were complete V's, so that if the rod left them with a complete rectangular cross-section there would be portions of the rod that would come between the peripheries of the following pair of rolls outside of their grooves, which portion would not be acted upon by the faces of the grooves, but would either be sheared off or rolled out into a fin by the peripheries of the rolls outside the grooves, and it is to obviate this effect that the grooves have heretofore been made obtuse angled, the longest diagonal of the space inclosed by the grooves of the following pair being equal to the shortest diagonal of the space inclosed by the grooves of the preceding pair.

In order to obviate the finning or shearing off of a portion of the rod while retaining the rectangular shape of the groove in accordance with this invention, the grooves are truncated, or, as it were, filled up for a short distance from the bottom of the V, so that they terminate in a cylindrical portion 5 50, which is proportioned to the amount of reduction to be given to the metal in such manner that the width of the space inclosed by the grooves between the bottoms 5 of the preceding pair is equal to the width of the tops of the groove on the line 40 of the next following pair, and so on. From this construction it follows that, except for the slight additional reduction produced by the cylindrical bottoms 5 50 of the grooves, the lateral displacement or reduction is substantially uniform and equal on the entire surface of the rod presented to the rolls, as is clearly shown in Fig. 3, in which the shaded space shows the reduction at each pass, from which it results that the tendency to elongate is about uniform in all parts of the cross-section of the rod, which is thus elongated without internal strain, while with the construction heretofore adopted the lateral displacement is far greater in the portion of the rod acted upon by the bottoms of the grooves than that acted upon near the tops of the groove, producing unequal tendencies to elongate in different portions of the rod, so that the reduction and elongation are attended with severe internal strains upon the metal, which are so great that it is practically impossible to roll the metal down to a small wire or to roll it except when heated so as to diminish the cohesion and admit of an internal movement of some parts relative to others.

By rolls constructed in accordance with the present invention the rod may be reduced to almost any degree required and may be rolled cold without causing it to become brittle or to split, as invariably takes place when attempt is made to roll metal cold with rolls constructed on the plan heretofore adopted.

The invention is not limited to the specific truncated rectangular shape of the grooves shown in Figs. 1 and 2, although it is believed to be the best for practical use. A train of rolls the grooves of which have substantially the same working relations to one another that have been described may be made of other shapes—as, for example, as illustrated by diagram Fig. 4, in which the grooves are substantially semicircular in shape, except for the truncation or filling up of a portion of the bottoms of the grooves. In this construction the spaces inclosed by the grooves of the several successive pairs of rolls are all circular and concentric to one another, except for the flattened portions, and the diameter of each larger pair measured between the flattened portion is equal to the full diameter of the next following pair. With this construction the successive reductions in the rod are made without change in its sectional shape, except for the slight flattening or increased reduction which takes place, first, in the ends of one diagonal or diameter, and next at the ends of the diagonal or diameter at right angles thereto; or, in other words, except for this flattening, the faces of the rod emerging from a given pair of rolls are exactly parallel with the same faces as they enter the said pair.

After the desired reduction has been made by the train of rolls, constructed as described, the reduced wire may have any desired sectional shape imparted to it by a final pair of rolls, the grooves of which are shaped to correspond with the sectional shape it is desired to impart, and which act with merely a sufficient reduction to impart the desired shape to the wire without producing any great amount of elongation thereof.

I claim—

A train of rolls the grooves of which have

their surfaces substantially parallel throughout the train, the bottom of the grooves in each pair terminating in a flattened or truncated portion, whereby the width of the space included between the pair of rolls is less measured between the bottoms of the grooves than the width at the tops of the grooves, the width between the bottoms of the grooves of a given pair being equal to the width at the tops of the grooves in the next following pair, substantially as and for the purpose described.

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

HENRY ALEXIS WILLIAMS.

Witnesses:

JOS. P. LIVERMORE,

M. E. HILL.