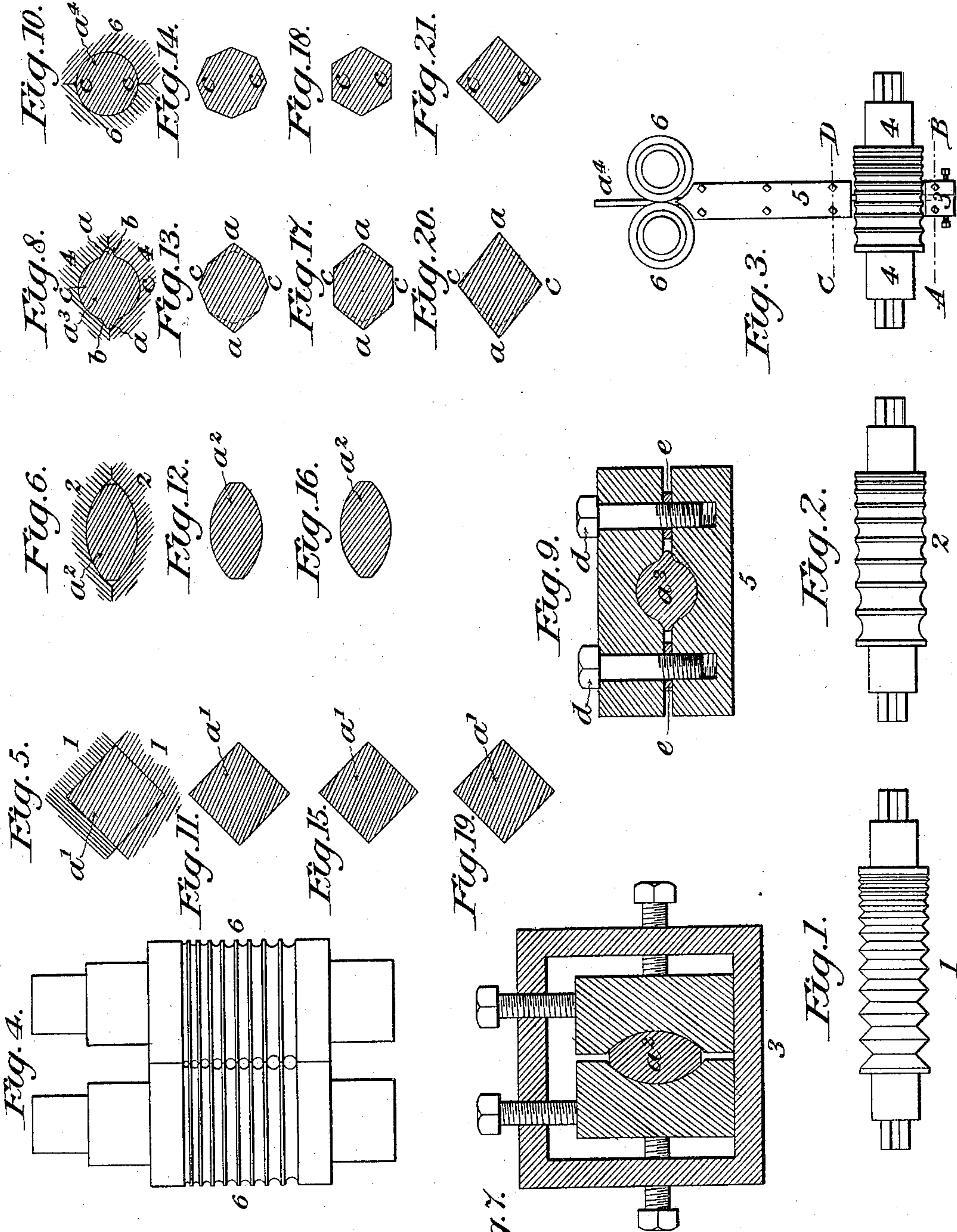


C. A. NIGHMAN.
METHOD OF ROLLING RODS.

(Application filed Jan. 2, 1902.)

(No Model.)



WITNESSES:

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METHOD OF ROLLING RODS.

SPECIFICATION forming part of Letters Patent No. 706,994, dated August 12, 1902.

Application filed January 2, 1902. Serial No. 88,096. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. NIGHMAN, a citizen of the United States of America, and a resident of Jersey City, in the State of New Jersey, have invented a new and useful Improvement in Methods of Rolling Rods, of which the following is a specification.

This invention relates to the production of steel or iron rods by hot rolling; and it consists in a novel method or process and a novel sub-process or improvement hereinafter described and claimed.

The objects of the invention are to prevent the formation on the rods of fins, which, owing to the rapidity with which they chill, cannot be perfectly rolled in, to prevent any twisting or torsional displacement of the rod in its passage from the next to the last pass to the finishing-pass, and to insure perfectly filling the finishing-pass and the production of uniform and perfect rods at increased speed and reduced cost. The final product may be of round, octagonal, hexagonal, or square cross-section and of any size.

A sheet of drawings accompanies this specification as part thereof.

Referring to the drawings, Figures 1, 2, and 3 together represent diagrammatically a line-train of rod-rolls, with additions thereto, as means for carrying the present process into effect as applied to the production of round rods. Fig. 4 represents an elevation of the finishing-rolls shown at the top in Fig. 3 enlarged one diameter. Fig. 5 represents a cross-section through the rod in the final pass of the breaking-down rolls, Fig. 1, illustrating the product of said rolls. Fig. 6 represents a cross-section through the rod in the corresponding pass of the "oval" rolls, Fig. 2, illustrating the product of these rolls. Fig. 7 represents a cross-section on the line A B, Fig. 3, showing the oval rod in its guide. Fig. 8 represents a cross-section through the ribbed rod in the corresponding pass of the next to the last rolls, as shown at the bottom in Fig. 3, illustrating the round-rod product of the "rib" rolls. Fig. 9 represents a cross-section on the line C D, Fig. 3, showing the ribbed rod in its guide. Fig. 10 represents a cross-section through the rod in the corresponding pass of the finishing-rolls, Fig. 4, as adapted to produce round rods. Figs. 11,

12, 13, and 14 represent successive cross-sections of the rod, illustrating the production of octagonal rods by the same process. Figs. 15 to 18, inclusive, illustrate in like manner the production of hexagonal rods by the same process; and Figs. 19 to 21, inclusive, illustrate in like manner the production of square rods by the same process in part. Figs. 5 to 21, inclusive, are enlarged seven diameters from Figs. 1, 2, and 3.

Like reference letters and numbers indicate like parts in all the figures.

In the production of round rods according to said process I preferably and conveniently reduce the ingot—say four inches square in cross-section—to the proper size for a given diameter of rod—say to one and three-sixteenth inches for a one-inch rod—by the successive passes of a three-high set of breaking-down rolls 1 in a customary manner. The square product a' is then passed once through said oval rolls 2. This preferred method of reducing the ingot to a square rod of suitable size and then giving it an oval shape is common practice and is not to be understood as constituting part of the novelty upon which the appended claims are based. The oval product a^2 is immediately introduced with a quarter-turn through a guide 3 into the corresponding pass of said rib-rolls 4, where the rod a^3 is provided with laterally-projecting ribs $a a$, Fig. 8, by corresponding lateral enlargements $b b$ of the pass. Otherwise this pass is of the same shape and dimensions as the corresponding pass of the finishing-rolls 6 and as the final product a^4 . In other words, it corresponds in shape with the final product at two diametrically opposite points $c c$ and between these points is of full size, so as to require no change of shape at these points in the finishing-rolls. The ribs a so produced on the rod differ from "fins" in that they are not accidental, and are not formed between the collars by the escape of metal at the sides of the passes, and are not confined to the ends of the rod or situated at irregular intervals or of uncertain shape, and are not of such proportions as to render them liable to quickly chill; but they are purposely formed by lateral enlargements of the pass and extend uniformly the entire length of the rod and are adapted to retain sufficient heat to fully dis-

appear in the body of the finished product and to fill out and improve said finished product. The rod a^3 passes from said rib-rolls 4 into a guide 5, having a passage-way of corresponding shape adjusted as to size by screw-bolts d and washers e , as shown in Fig. 9, and is automatically delivered by said guide 5, with said ribs a , perpendicular to the grooves, forming the corresponding pass of the finishing-rolls 6. (Compare Figs. 8, 9, and 10.) Any twisting or torsional displacement of the rod is precluded by said guides 3 and 5, and these or equivalent means for mechanically controlling and guiding the rod are considered essential. Such guiding is especially important between the rib-rolls and the finishing-rolls, and at this point the continuous ribs a cooperate with matching lateral enlargements of the passage within said guide 5 to insure the introduction of the ribs a into the last pass at right angles to the parting of the finishing-rolls or perpendicular to the grooves of these rolls, as before described. Within said pass of the finishing-rolls 6 the surplus metal contained in said ribs a being still sufficiently hot, owing to the shape and proportions of such ribs, is forced into the rod, causing every portion of the circumference of the rod to be equally filled out. This is accompanied by a slight elongation, which aids in giving the rod a perfect finish. Reduction in the finishing-pass being confined to the relatively minute ribs a , it is easy to keep the collars of the finishing-rolls 6 in perfect contact, and any escape of metal between them is precluded. Guiding the rod into the finishing-pass by means of said ribs a and their final utilization in the manner above described distinguish them from ribs heretofore formed on rolled tubes in the process of manufacture as means for expanding the tube at several points to facilitate its escape from the mandrel. In the production of octagonal rods, Fig. 14, according to said process, as illustrated by Figs. 11 to 14, inclusive, I proceed in precisely the same manner, and the only change in the apparatus is the modification of the passes of the rib-rolls 4 and the passage of the succeeding guide 5 to make them correspond in shape with Fig. 13 and the passes of the finishing-rolls 6 to make them correspond in shape with Fig. 14. Hexagonal rods, Fig. 18, are produced in the same manner, as illustrated by Figs. 15 to 18, inclusive, and square rods, Fig. 21, by the same process in part, as illustrated by Figs. 19 to 21, inclusive, the square rod a' being fed directly into the rib-rolls 4 with or without the aid of a guide 3. In producing all said angular shapes the laterally-projecting longitudinal ribs a are made of angular forms best suited to disappear perfectly in the finished rods, as illustrated by Figs. 13, 17, and 20; but in all cases the functions of said ribs are the same—namely, to prevent any torsional displacement or twisting of the rod between the rib-rolls 4 and the finishing-rolls 6, to supply surplus metal for filling out and

perfecting the rod in the finishing-pass in a form and at a heat that will insure its incorporation into the body of the rod, and to prevent the formation of fins in the finishing-passes. In all cases, moreover, two portions cc of the circumference, midway between said ribs a , are given their final shape in the next to the last pass. In producing round rods a^4 , Fig. 10, such portions $c c$ are segments of a cylinder. In producing octagonal rods they constitute four of the eight sides. In producing hexagonal rods they constitute two of the six sides, and in the production of square rods they constitute two of the four angles. The process is therefore considered one and the same invention, whether applied to the production of one or another of said shapes of rods. Other polygonal shapes having an equal number of sides may be produced in like manner.

The apparatus shown in the drawings by way of illustration forms no part of my present process invention, but is claimed in a companion specification of even date herewith, forming part of my application for patent for improvement in rod-rolling mills, filed in the United States Patent Office the 2d day of January, 1902, Serial No. 88,095.

The oval rolls 2, rib-rolls 4, and finishing-rolls 6 are each preferably provided with a number of passes of graduated sizes, as shown, although but one pass of each set of said rolls is used in my process at a given operation. The different grooves are used, as in some other processes, for rolling rods of different sizes, and thus obviate frequent changes of the rolls. Such details of the rolls as of the guides 3 and 5 are not, however, in any sense essential to my process. The number and arrangement of the sets of rolls may also be varied without departing from this invention. For example, the rib-rolls might be vertical and the finishing-rolls horizontal without material change of effect.

The oval rod-guide 3, Figs. 3 and 7, is of known construction and is not, therefore, more particularly described.

Having thus described said improvement, I claim as my invention and desire to patent under this specification—

1. The method of producing steel or iron rods by hot rolling which consists in breaking down an ingot into a square rod of suitable size, rolling said square rod into an oval shape, rolling such oval rod into a rod, partly of the final shape and size, having continuous laterally-projecting longitudinal ribs of uniform shape and of sufficient proportions to retain the rolling heat, guiding the ribbed rod and keeping it from twisting by means of said ribs, and finishing the product by rolling said ribs into the body of the rod, and thereby filling out and perfecting the rod.

2. In the method of producing steel or iron rods by hot rolling the improvement which consists in rolling the rod into a shape and size which are partly those of the final prod-

uct, providing it from end to end at the same
operation with laterally-projecting longitudi-
nal ribs of uniform shape and of sufficient
proportions to retain the rolling heat, guid-
5 ing the ribbed rod and keeping it from twist-
ing by means of said ribs, and finishing the
rod by rolling said ribs into the body of the
rod, and thereby filling out and perfecting the
rod, substantially as hereinbefore specified.

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Witnesses:

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