

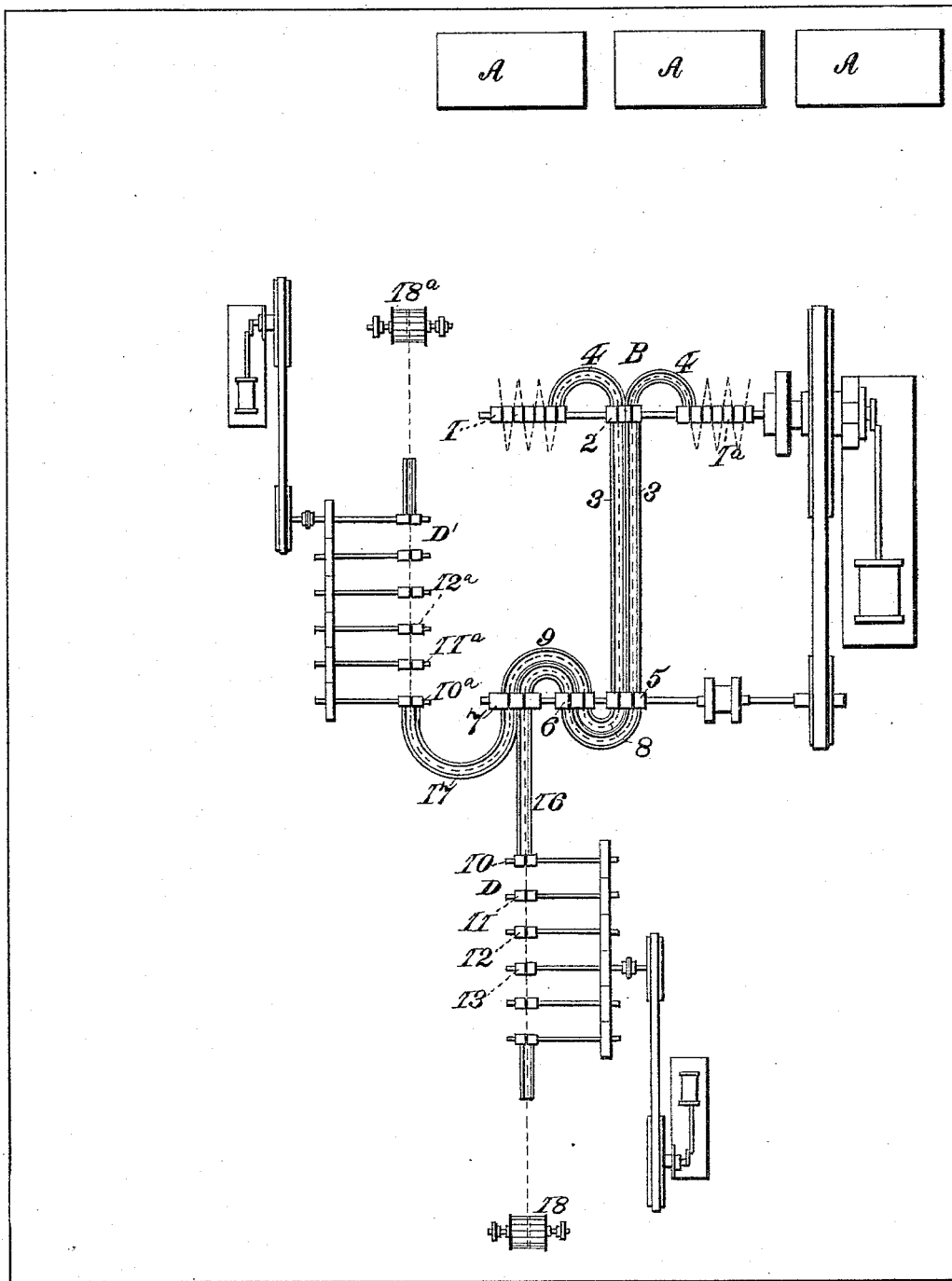
(No Model.)

3 Sheets—Sheet 1.

W. GARRETT & S. T. WELLMAN.
ROLLING MILL PLANT.

No. 381,689.

Patented Apr. 24, 1888.



WITNESSES:

R. H. Whittelsey.
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INVENTOR,

William Garrett.
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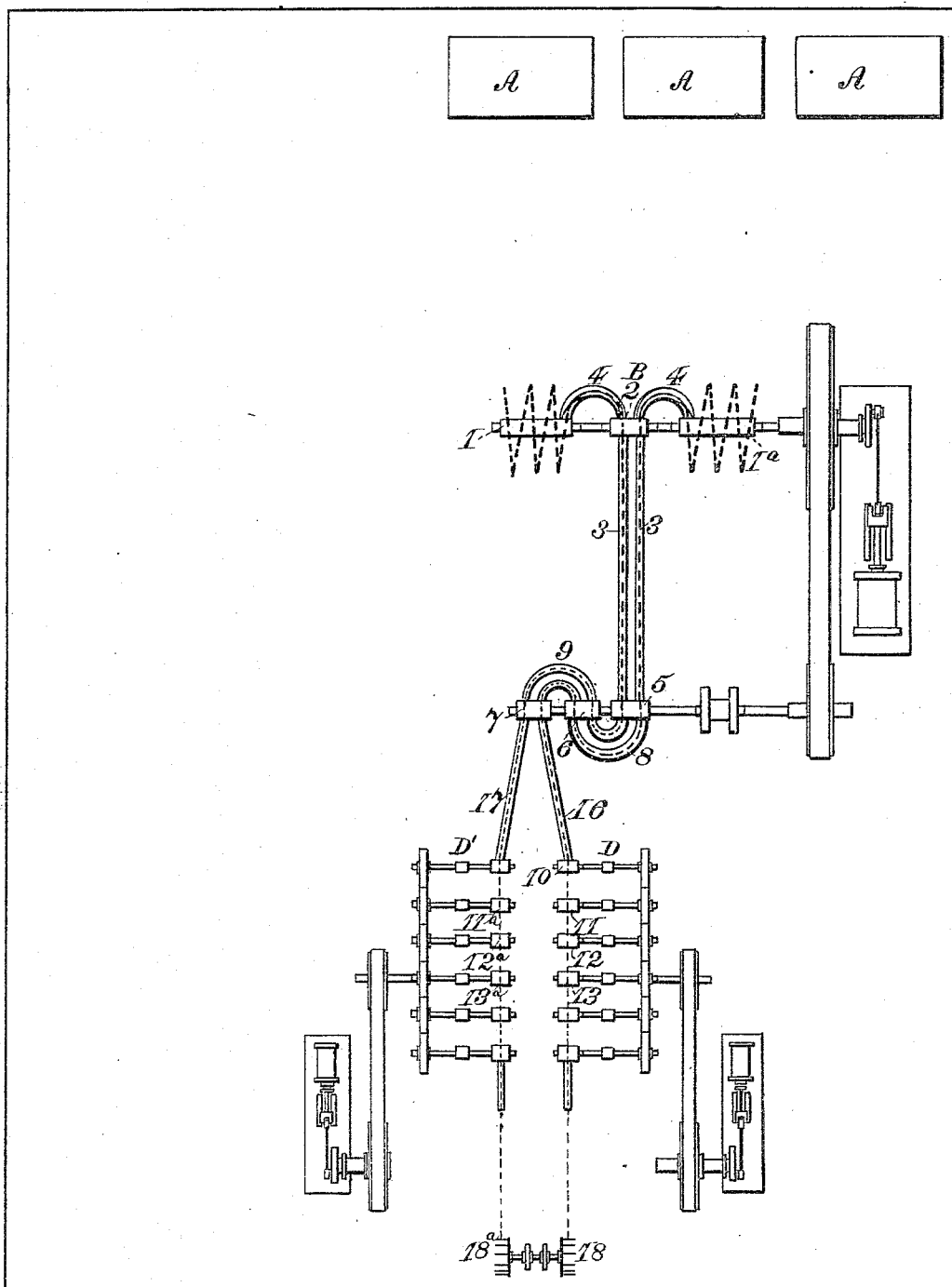
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FIG. 2.

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(No Model.)

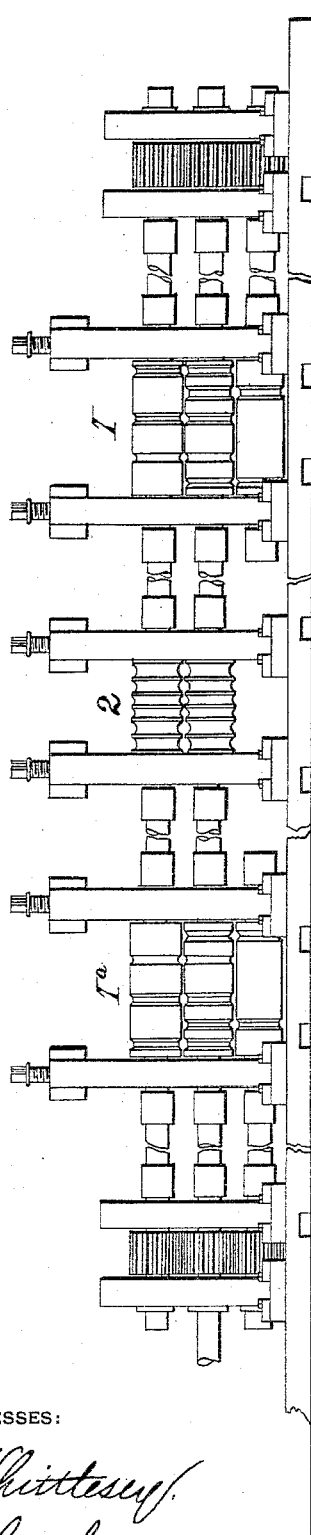
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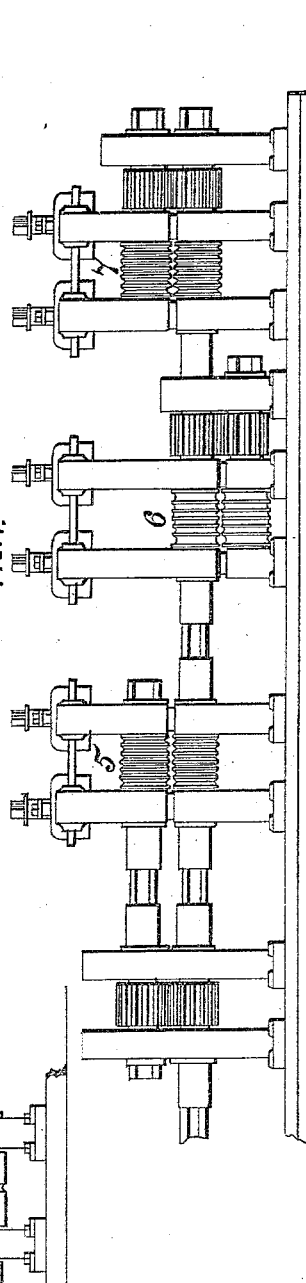
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FIG. 3.



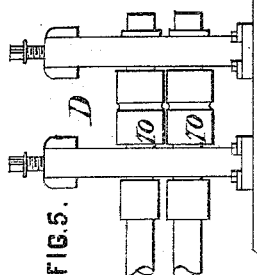
Billet Train, B.

FIG. 4.



Intermediate Train, C.

FIG. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM GARRETT AND SAMUEL T. WELLMAN, OF CLEVELAND, OHIO.

ROLLING-MILL PLANT.

SPECIFICATION forming part of Letters Patent No. 381,689, dated April 24, 1888.

Application filed August 3, 1887. Serial No. 246,029. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM GARRETT and SAMUEL T. WELLMAN, residing at Cleveland, in the county of Cuyahoga and State of Ohio, citizens of the United States, have invented or discovered certain new and useful Improvements in Rolling-Mill Plants, of which improvements the following is a specification.

The invention herein relates to certain improvements in plants for rolling wire rods direct from blooms, which are generally about four inches square in cross-section. This reduction has heretofore been effected by plants consisting of a billet-train, an intermediate train, and a rod-train, the pairs of rolls composing the latter train being arranged with their axes in line with each other, thereby necessitating the employment of a large number of attendants for feeding the rod from one pair of rolls to the next in order of operation, it being practically impossible to employ a turning device for rotating the bar or rod as it passes by a curved guide from a pair of rolls having an oval pass to a pair having a round or square pass, and hence a catcher and feeder must be employed wherever such an arrangement of rolls occurs in the rod-train; and, further, such an arrangement of plant does not permit of any increase in its capacity without a duplication of all the trains, which is frequently impossible on account of the lack of sufficient ground area.

The object of the invention herein is to provide for the reduction of a bloom to a wire rod at one heat by combining with a continuous mill such an arrangement and construction of additional trains of rolls as will avoid a reheating of the billet—a step now necessary when employing a continuous train for this purpose; and it is a further object of the invention herein to provide for an increase in the capacity or output of the plant, and at the same time avoiding a duplication of the entire plant.

In general terms, the invention consists in the construction and relative arrangement of parts, substantially as hereinafter described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a diagrammatic view illustrative of our invention. Fig. 2 is a similar view of a modified form of

plant. Figs. 3, 4, and 5 are views in front elevation of the billet intermediate and one of the continuous trains forming our plant.

Within convenient proximity of the heating-furnaces A are arranged the two pairs of roughing-rolls 1 and 1^a and the finishing-rolls 2, forming the billet-train C. The finishing-rolls 2 are arranged between the two pairs of roughing-rolls, the axes of the several pairs of rolls composing the train being in line, or approximately in line, with each other. The roughing-rolls are constructed to permit of repeated back and forth end passes of the bloom, said passes being constructed in accordance with rules well known in the art and sufficient in number to reduce the blooms to billets, said passes in the rolls 1 decreasing in size from the right to the left hand, and vice versa, as regards the rolls 1^a. The finishing-rolls 2 are provided with two sets of grooves or passes similar in size and shape, and adapted to receive the billets as they come from the last passes of the roughing-rolls 1 and 1^a. In case the reduction effected in the roughing-rolls 1 or 1^a has been sufficient to permit of the billets being bent so as to be fed by "looping in," as distinguished from end feeding, we employ repeaters or curved guide-troughs 4 for guiding the billets from the last passes of the roughing-rolls to the passes in the finishing-rolls, as indicated in dotted lines. The two pairs or sets of roughing-rolls and the finishing-rolls are driven by an engine, (indicated at E,) the several rolls composing the train being connected to the engine in the manner well known in the art.

From the passes in the finishing-rolls 2 the billets are guided by one of the troughs 3 to the passes of the first pair of rolls 5 of the intermediate train, C; thence by repeaters 8 to the passes of the rolls 6, and, finally, by the repeaters 9 to the grooves or passes of the rolls 7, forming the last pair of rolls in the intermediate train. The grooves or passes in the rolls 5, 6, and 7 of the intermediate train, B, are so constructed as regards size and shape as to reduce and change the shape of the billet in cross-section as it comes from the finishing-rolls 2 of the billet-train, and also as it passes through the several rolls of the intermediate train—that is, if the grooves in the finishing-

rolls 2 are oval, those in the first pair 5 of the intermediate train will be square or round, preferably the former, and the grooves of the rolls 6 will be oval and those of the rolls 7 square or round. (See Fig. 4.)

Each pair of rolls 5, 6, and 7 of the intermediate train, C, is provided with two sets of grooves or passes corresponding to those of the finishing-rolls 2, proportioned as to size in accordance with well-known rules in the art for the gradual reduction of the billet as it comes from the rolls 2 to such a size in cross-section as to permit of its entrance into and reduction by one or the other of the continuous rod-trains D or D'. The continuous trains D D' consist of a series of rolls, 10, 11, 12, &c., sufficient in number and having the grooves or passes so proportioned as to reduce the bar or rod as it comes from the last pair of rolls 7 of the intermediate train to the size required—say a No. 4 or 5 wire rod. One of the continuous trains, as D, is located in a common line of feed with the last pair of rolls 7 of the intermediate train, C, and the bar or rod is guided from the rolls 7 to the first pair of rolls 10 of the continuous train by a straight trough, 16. The train D' is arranged with the axes of its first pair of rolls 10^a in line with the axes of the rolls composing the intermediate train, C, or approximately so, the succeeding rolls of the train extending toward the billet-train B, or in a direction substantially opposite to that in which the rolls composing the train D are arranged. The bar or rod, as it comes from the rolls 7, is guided to the rolls 10^a by the repeater or curved trough 17. The continuous trains D and D' are similar and of the usual form and construction.

In operating our improved plant the blooms are properly heated in the furnaces A and then rolled, preferably, to such an extent as to permit their being fed to the finishing-rolls 2 by looping in, as above described, the trough being used for that purpose. From the finishing-rolls 2 the billet is conducted by one or the other of the troughs 3 to the rolls 5 of the intermediate train, C, and thence by the repeater 8 to the rolls 6 and from the rolls 6 to the rolls 7 by the repeater 9. From the rolls 7 of the intermediate train the rod or bar is guided by the trough 16 of the repeater 17 to the rolls 10 or 10^a of the continuous train D or D'.

Suitably-driven reels, 18 and 18^a, are arranged within convenient proximity of the last pair of rolls of the continuous trains D and D', respectively, for coiling up the wire rods as they emerge from said trains.

The two sets or pairs of roughing-rolls 1 and 1^a, the two continuous trains, and the duplication of grooves in the finishing-rolls 2 and in the rolls 5, 6, and 7 of the intermediate train permit of the simultaneous reduction of two blooms to wire rods, the several trains and auxiliary parts of the plants being so constructed and arranged as to permit of their simultaneous operation on two blooms; and,

further, the above construction and arrangement of plant permit of the continued operation of the plant, even though one of the trains should become disabled—as, for example, if one of the continuous trains or roughing-rolls should need repair the other train or pair of roughing-rolls can be operated, the two trains and roughing-rolls being so arranged with reference to each other and the intermediate train that repairs can be effected on one of the trains or rolls without interference with the operation of the other or endangering the workmen engaged in such repairs.

It will be understood that the intermediate train, C, is located at such a distance from the billet-train as to permit of the end feeding of the billet back and forth through the roughing-rolls.

If desired, the train D' may be arranged alongside of the train D, as shown in Fig. 2, in which case they are located so that the divergence of the guide-troughs 16 and 17 of both trains from the direct line of feed shall be the same.

Plants for the progressive and continuous reduction of blooms or billets to wire rods as heretofore constructed consisted of a billet-train of one or more pairs of rolls having a series of passes, an intermediate train of one or more pairs of rolls having a series of passes, said pairs of rolls being arranged either with their axes in line with each other or in a common line of feed, and a rod-train of a series of rolls arranged with their axes in line with each other, thereby necessitating the employment of catchers and feeders on one side of said train and of repeaters on the opposite side for the feeding of the rod from one pair of rolls to the next. The employment of catchers and feeders is required for the reason that a turning device cannot be employed in a curved repeater connecting a pair of rolls having an oval pass with a pair having a round or square pass. Our improvement, however, contemplates avoiding the use of curved guides or repeaters, which require constant attention and adjustment, as well as the employment of catchers and feeders. The arrangement of the several pairs of rolls forming the rod-train in a direct line of feed permits of the use of straight guides wherein rod-turning devices can be readily employed.

We claim herein as our invention—

1. A rolling-mill plant having, in combination, a billet-train, an intermediate train, the pairs of rolls forming such train having their axes in line with each other, and a rod-train, the receiving-rolls of the intermediate train being arranged in the line of feed of the delivery-rolls of the billet-train, and the delivery-rolls of the intermediate train and the several pairs of rolls of the rod-train being arranged in a common line of feed, or approximately so, and connected by guides or troughs, substantially as set forth.

2. A rolling-mill plant having, in combination, a billet-train composed of two sets of

roughing-rolls and a pair of finishing-rolls, an intermediate train, and two continuous rod-trains, the receiving-rolls of the intermediate train being arranged in the line of feed of the
5 finishing-rolls, and the receiving-rolls of one continuous train being arranged in the line of feed of the delivery-rolls of the intermediate train, while the receiving-rolls of the other continuous train have their axes in line with the
10 axes of the rolls of the intermediate train, or approximately so, substantially as set forth.

3. A rolling-mill plant having, in combination, two pairs of roughing-rolls and a pair of

finishing-rolls, the roughing-rolls being arranged on opposite sides of the finishing-rolls 15 and with their axes in line with the axes of the finishing-rolls, or approximately so, substantially as set forth.

In testimony whereof we have hereunto set our hands.

WILLIAM GARRETT.
SAMUEL T. WELLMAN.

Witnesses:

THOS. H. BROOKS,
W. H. SHEPARD.