(No Model.) 2 Sheets—Sheet 1.

E. S. LENOX.

WIRE ROD ROLLING MILL.

No. 351,840. Patented Nov. 2, 1886.

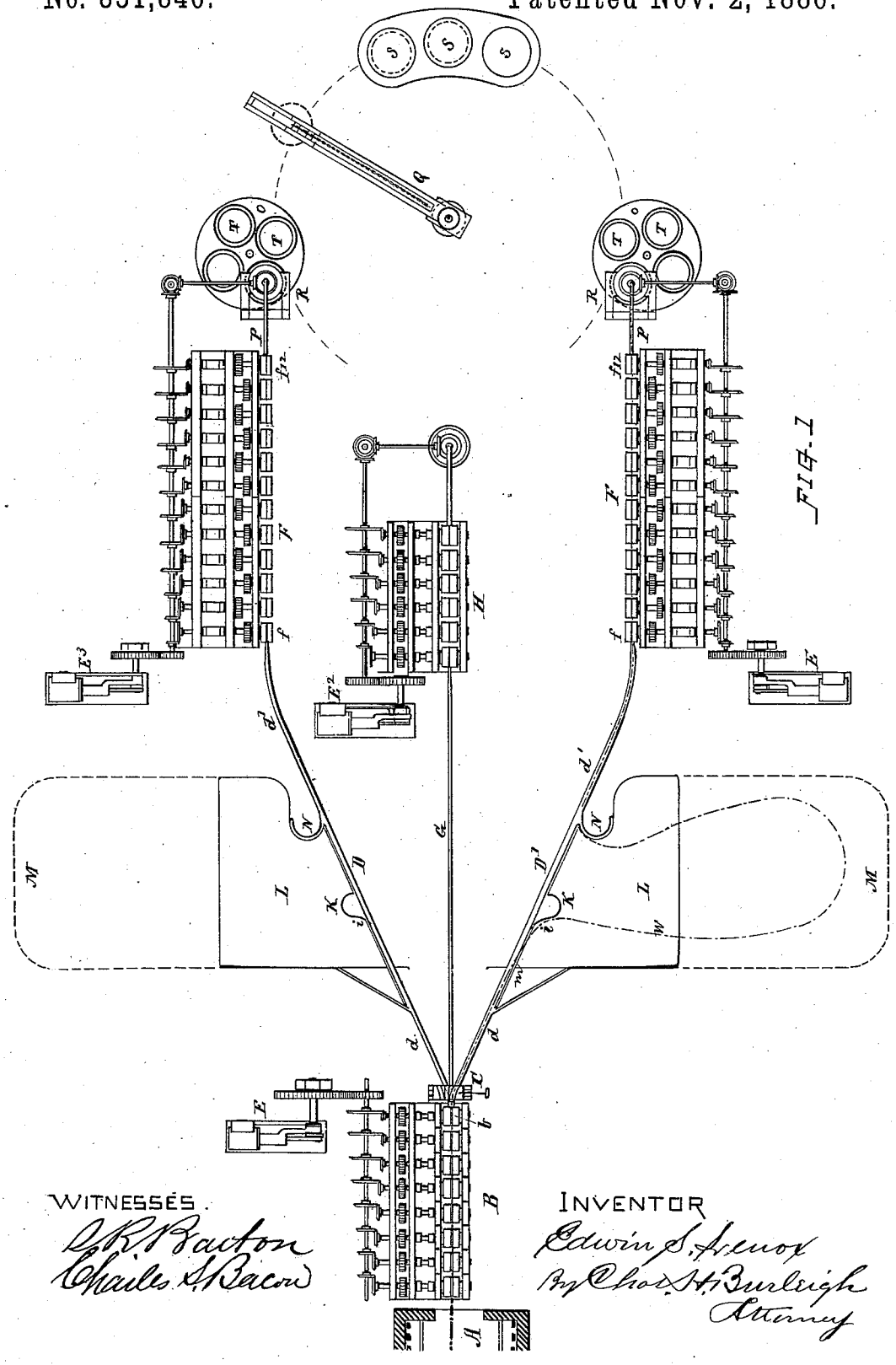


FIG. 1

WITNESSES.

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Charles A. Bacon

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Edwin S. Lenox

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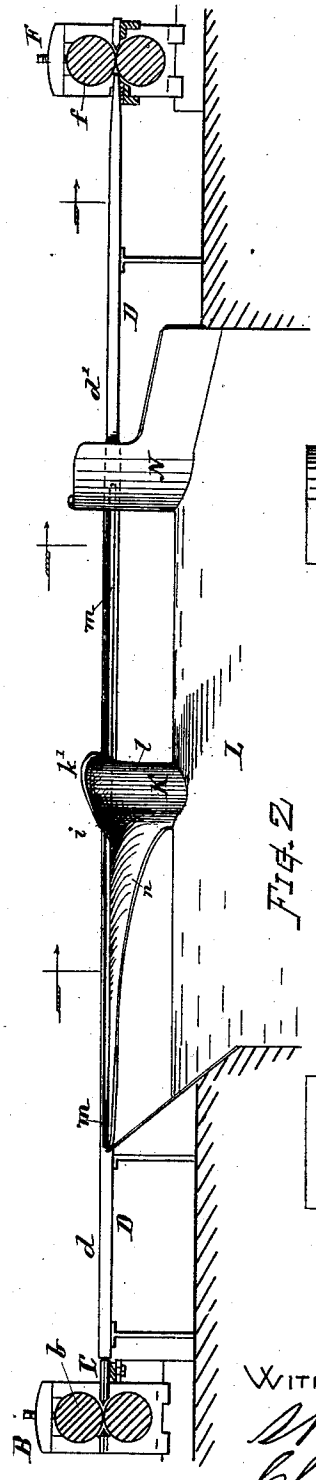


FIG. 2.

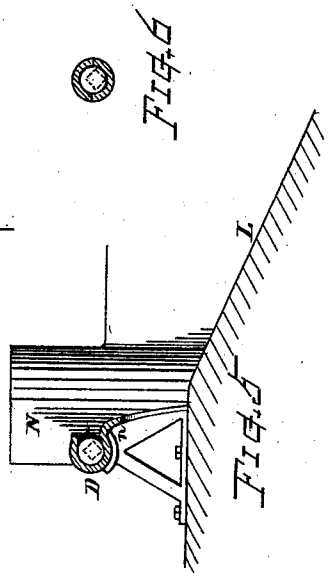


FIG. 5.

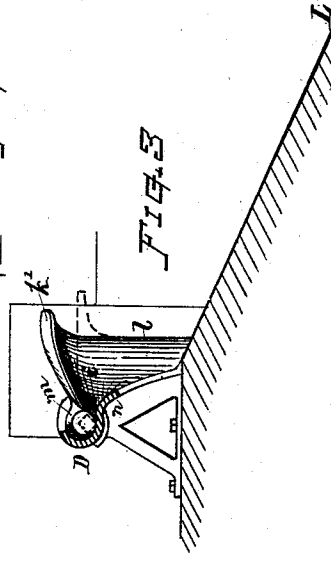


FIG. 3.

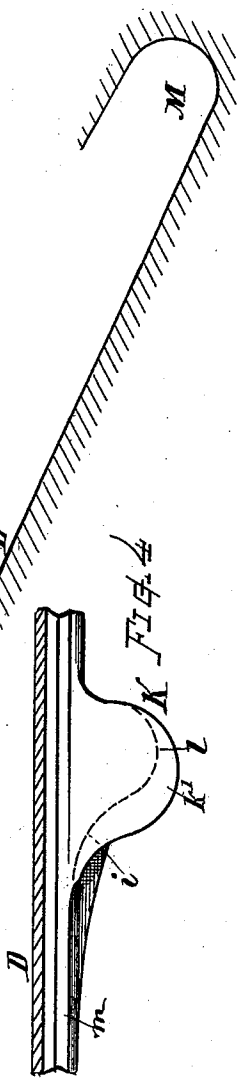


FIG. 4.

WITNESSES.

INVENTOR

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UNITED STATES PATENT OFFICE.

EDWIN S. LENOX, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE WASHBURN & MOEN MANUFACTURING COMPANY, OF SAME PLACE.

WIRE-ROD-ROLLING MILL.

SPECIFICATION forming part of Letters Patent No. 351,840, dated November 2, 1886.

Application filed January 6, 1886. Serial No. 187,755. (No model.)

To all whom it may concern:

Be it known that I, EDWIN S. LENOX, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Rolling-Mill Plants for Making Wire Rods by Continuous Operation; and I declare the following to be a description of my said invention sufficiently full, clear, and exact to enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

The object of my present invention is to provide an improved rolling-mill plant for making wire rods by continuous operation, whereby rods of small size can be produced and automatically coiled in a practical and expeditious manner.

My invention contemplates the primary reduction of the bars, billets, or blooms from their ordinary size to partially-formed rods of about one-half inch diameter by a continuously-operating train of rolls consisting of eight pairs, (more or less;) then automatically conducting them alternately to one of two secondary trains of continuously-operating rolls differently speeded from the primary train and comprising some twelve passes (more or less) by means of peculiarly-constructed guiding-conductors having arranged in connection therewith apparatus adapted for automatically taking care of the overfeed, as hereinafter more fully explained; then automatically depositing the rod in coils within a portable tub or receiver, within which it can be cooled gradually, so that the rod will be left in a comparatively soft condition; also, in providing an auxiliary secondary train and guiding apparatus for receiving the partially-formed rods from the primary train and reducing them to rods of about No. 6 gage, (more or less,) in case either of the regular secondary trains should become accidentally disabled or is for other reason stopped. The constructions and combinations appertaining exclusively to the improved automatic reel I have reserved to be made the subject of a separate application for Letters Patent.

The features of invention appertaining to the rolling-mill plant, and which form the subject-matter of my present application, are hereinafter definitely specified.

In the drawings, Figure 1 is a plan diagram of a rolling-mill plant, illustrating the nature of my invention. Fig. 2 is a side view of the guiding and overfeed distributing apparatus employed intermediate between the primary and secondary sets of rolls. Fig. 3 is a section (on larger scale) at line *w*, Fig. 2, showing the front of the deflecting device. Fig. 4 is a sectional plan of the guide and deflecting device. Fig. 5 is a vertical section at line *x*, Fig. 2, showing the front of the re-entrance guard. Fig. 6 is a vertical section at line *y*, Fig. 2.

In referring to parts, A denotes the heating-furnace, which may be of ordinary kind.

B indicates the primary train of reducing-rolls, preferably comprising eight passes, and adapted for reducing the heated bar or billet from its original size to a bar or rod of one-half inch square, or other section of about that dimension, as it issues from the pass of the latter rolls, *b*. The train of rolls B may be mounted, geared, and operated substantially as in an ordinary continuous rolling-mill and driven by a suitable engine at E. The guides between the several rolls or passes may be of ordinary construction and arrangement.

D indicates the guides for conducting rods to the secondary trains F, which are located at a distance of about thirty-five feet (more or less) away from the primary train B, and at convenient distance apart from each other, the guides inclining to the right and the left as they recede from the primary train.

G indicates a supplemental guide or conductor leading from the primary train B to a supplementary train or set of rolls, H, comprising, preferably, six passes or pairs of rolls adapted for operating in continuous order and for reducing the rod from a half-inch square to a No. 6 round rod, (or other convenient-sized wire rod.) Said supplementary train H is, in the present instance, located between the trains F, and may be driven by a suitable engine at E^2 at a speed correspondingly proportional to that of the primary train B, or so that the rod would pass such supplementary train H as rapidly, or substantially so, as delivered from the primary train B.

C indicates a switching-guide for shunting the rods from the latter rolls of the primary train into either of the guides D or G or D′, as desired.

The guides D and D′ are of similar construction, one right-hand and the other left-hand. The guide is of tubular construction, its respective ends being fitted, one for receiving the rod and the other for delivering it to the secondary rolls, and with a channel or hollow through its length, so that the rod can shoot automatically from the rolls *b* through or along the channel of the guide and into the pass of the rolls *f*, whence it continues through the train F. Along the side of the guide, between the complete tubular end portions, *d d′*, is a slot or long aperture opening laterally, or substantially so, and of a size sufficient to allow the rod to loop out. Rounded or curved lips *n* may be formed on the guide D below the slot *m*, to avoid sharp angles in contact with the rod. Combined with the guide is a deflecting device, K, constructed substantially as indicated in Figs. 2, 3, and 4, with a curved front, *i*, of suitable form for directing the rod off to one side, and an overhanging head, *k′*, the top surface of which extends outward from the slot in the guide, so as to permit of the loop of the rod sliding out in a gradual and easy manner along said top surface and dropping therefrom below the overhanging head *k′*. The outer portion of the deflector is rounded, as at *l*, and extends down to the floor L, which latter is made with a downward and outward inclination extending for the required distance, and forming a pit or pocket, M, for receiving the loop of the rod. The extent of this inclined pocket M is some thirty feet, (more or less,) and its top is preferably covered over for the greater portion, or, if desired, the entire extent of its surface, so as to confine the heat of the rod. The curved lip *n* may be carried down to meet the surface of the deflector and floor L, as indicated in Fig. 2. At the farther end of the slot *m* there is a fender or guard, N, around which the loop of the rod is drawn as it reenters the tubular portion *d′* of the guide. This fender may be formed of a semi-cylindrical sheet extending from the inclined floor of the pocket L up past the guide, or connecting with said guide by a suitable bell-mouth or curved surface that will direct the rod into the slot or opening *m* with an easy and free running curve.

The secondary or finishing trains F, which are operated by separate engines E^3 E^4, are preferably driven at a different speed from the roughing or primary train B, so that the leading-rolls *f* of said train F take in the rod at less speed than that at which it issues from the latter rolls *b* of the primary train. This is to avoid too high speed at the finishing-rolls f^{12}. The secondary trains are preferably made with overhanging rolls, as illustrated in Fig. 1; but I do not confine myself to such construction or style of mounting the rolls, as the usual construction and gearing of continuous mills may be employed for the secondary trains F, as well as for the primary train B.

At the end of each of the primary trains F there is an automatic reeling apparatus, R, with a guide, P, for conducting the rod from the finish-rolls f^{12} into said reel. The reeling apparatus is preferably arranged for coiling the rod into tubs T as fast as it issues from the rolls. The tubs are supported on rotating platforms *o*, by which they are moved into and out of the position for receiving the rods; and Q indicates a crane for swinging the tubs containing the coiled rods from the reeling apparatus and depositing them in soaking-pits S, where they can be stacked one above another, to remain for slowly cooling off the rods.

In the operation of my improved rolling-mill plant the bars or billets of ordinary size are heated in the furnace A in ordinary manner, and are withdrawn and run through the primary or roughing train B. The eight passes in this train (which may comprise four ovals and four squares) reduce the rod to a square (other form may be used, if preferred) of about one-half inch each way. The end of the rod, by its force of issue from rolls *b*, is caused to run along the hollow of the guide D and automatically enter and pass through one of the secondary trains, either the right or left, accordingly as the switch C is placed, and from said secondary train to run into and be automatically coiled by the reeling apparatus into the portable tub T. When the end of the rod has been taken by the rolls *f*, the speed of issue at rolls *b* being greater than that at which it is drawn in by said rolls, the rod is caused to bow or buckle at some place between said rolls *b* and *f*, and as it is closely confined in the portions *d* and *d′* of the guide, the bowing is forced to take place through the side slot, *m*, and as the bowing of the rod increases it extends out upon the top surface of the deflecting device K and falls over the edge of the overhanging head *k′*. This causes the rod to be forced against the outwardly curved or inclined front surface, *i*, whereby the rod is directed downward and outward, thereby causing it to run out as the overfeed increases in a long loop, which slides down the inclined floor L within the pocket M, as indicated by dotted line *w* on Fig. 1. While the rod is being thus run out upon the floor L the opposite end is being taken into the guide around the fender or guard-plate. The action of the deflector and inclined floor L is to keep the overfeed expanded in a single increasing loop and prevent the rod from becoming crossed at any portion of the loop while the rod, which is constantly running forward at a high rate of speed, distributes itself within the pocket M as the loop grows longer. The rods are alternately sent to the right and left guides and finishing-trains F by the switch C, which can be operated in any suitable convenient manner. When required, the switch C may be set to let the rod

run into the guide G. The supplemental train H may be brought into action for rolling rods to size No. 6 either alternately with one of the trains F or for taking the entire output of the primary train B. This supplemental train H is of much practical utility in that it avoids the stopping of the roughing-trains B and holding of the bars in the furnace in case one of the trains F has to be temporarily stopped for adjustment, repair, or other cause.

The guiding and overfeed apparatus, as described, can be employed in combination with primary and secondary rolling apparatus without the supplemental set or train H, when desired. The supplemental train H may be disposed in other relation to the trains B and F, if preferred—as, for instance, at one side, instead of between the two trains F F.

It will be understood that I do not herein make claim, broadly, to the feature of using two secondary trains for alternately working rods partially reduced in a single roughing or primary train, nor to the employment of a switch and guides for directing rods alternately to right and left for automatically shooting them into the leading-pass of said secondary trains, as I am aware that such features are exhibited in patents heretofore granted.

What I claim as of my invention, and desire to secure by Letters Patent, is—

1. In a wire-rod-rolling mill, a guide-pipe having a conducting-channel throughout its length and a slot or opening in its side, through which the rod can loop out, and provided at a position between the extremities of said slot with a device for deflecting the rod outward from said guide after the loop of overfeed has become sufficiently large to leave said conducting-channel, substantially as hereinbefore set forth.

2. In a rolling-mill for making wire rods, the combination, with primary and secondary reducing-rolls, of a guide-pipe having a side slot and provided with a deflecting device to direct the slack or overfeed of the rod outward from said guide in a single loop, substantially as set forth.

3. In a rolling-mill for making wire rods, the combination of a tubular guide having a slot in its side, a projecting deflecting-guard to throw the loop of the rod laterally away from the guide, and a fender for directing the rod again into the tubular guide, substantially as set forth.

4. The combination, substantially as described, of a primary train of reducing-rolls, a secondary train of reducing rolls, an intermediately-located guiding-tube having a side slot, an inclined floor adjacent to the slotted portion of said guide, over which the overfeed falls, and a deflecting device at the side of said guide, by which the rod is directed outward along said floor, for the purpose set forth.

5. The combination, substantially as described, of the guiding-tube having a continuous bottom channel and an open slot in its side, the deflector having an overhanging cap, with its top surface projecting from the lower edge of the side slot on said guide, the curved fender at the termination of said slot in the guide, and the inclined floor adjacent thereto, for the purposes set forth.

6. The combination, substantially as described, of the primary train of rolls, the secondary train of rolls, the intermediate tubular guide having a slot in its side, and the inclined floor adjacent thereto and covered over to form a pocket or pit to receive the overfeed of the rod, for the purpose set forth.

7. In combination with a rod-guiding conductor located between primary and secondary sets of reducing-rolls, a deflecting device having an overhanging cap, the top of which projects from the side of the guide-channel and forms a flush surface therewith, upon which the loop of the rod runs out to fall over the edge of said cap, and having a curved front that deflects the rod laterally from the guide after its loop has dropped beneath the projection of the head, substantially as set forth.

8. In a rod-rolling mill, the combination of a primary train of reducing-rolls, two secondary-trains of reducing-rolls, right and left intermediate guides provided with side openings and deflecting devices, loop-receiving pockets having inclined floors, and automatical reeling mechanism adapted for coiling the finished rods into portable tubs, substantially as set forth.

9. In a rod rolling plant, the primary train of reducing-rolls B, two secondary or finishing trains, F F, an auxiliary set of rolls, H, supplemental to said primary train, guides D, D′, and G, and a switch, C, substantially as and for the purposes set forth.

10. In a rod-rolling plant, the combination of the primary train B, secondary trains F F, auxiliary train H, guides D D′, with deflectors and fenders N, covered inclined floors L, guide G, switch C, and guides and automatic reels, substantially as and for the purposes set forth.

Witness my hand this 1st day of January, A. D. 1886.

EDWIN S. LENOX.

Witnesses:
CHAS. H. BURLEIGH,
S. R. BARTON.