(No Model.)

F. H. DANIELS.

ROLLING MILL.

No. 429,425. Patented June 3, 1890.

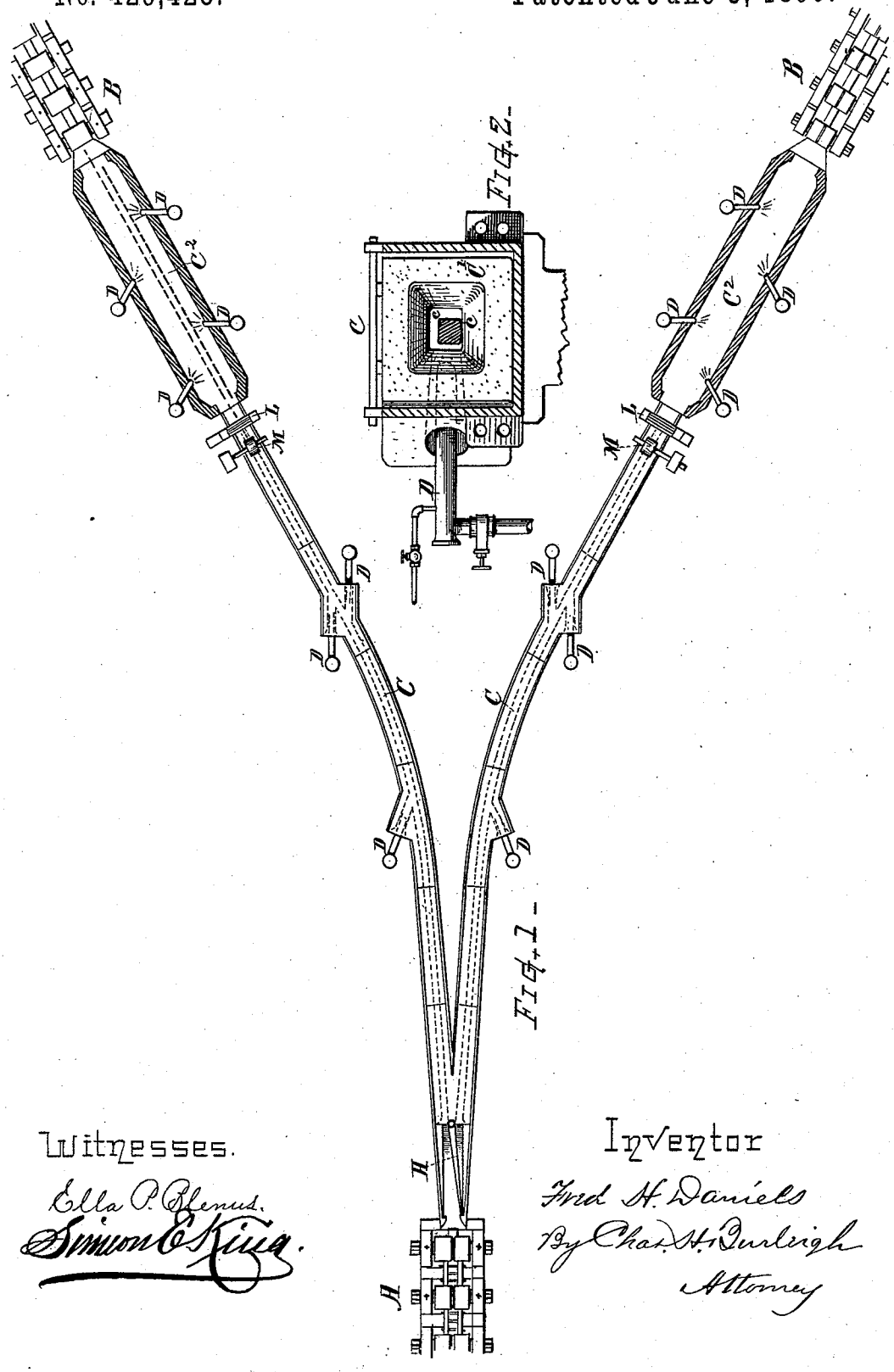


Fig. 2.

Fig. 1.

Witnesses.

Ella P. Glenus.

Simon E. Kiva.

Inventor

Fred H. Daniels

By Chas. H. Burleigh

Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRED H. DANIELS, OF WORCESTER, MASSACHUSETTS.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 429,425, dated June 3, 1890.

Application filed January 9, 1890. Serial No. 336,394. (No model.)

To all whom it may concern:

Be it known that I, FRED H. DANIELS, 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-Mills for for Making Wire Rods or other Analogous Products from Heated Metal, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

This invention relates more especially to rolling-mill apparatus of that class employed for making wire rods or other small shapes from heavy blooms, wherein several separate sets or trains of reducing-rolls, located at comparatively long distances apart, are employed for operating upon the metal and effecting its reduction at different stages, and whereby a primary partial reduction of the bloom is first effected, and the partially-reduced product or billet then carried or directed by an inclosed guide or heat-retaining passway, that supports and conducts the billet without overfeed or buckling, from the place where it is delivered from the first set of rolls to a position for feeding it into a second train or set of rolls, wherein it receives further treatment and reduction without allowing the product to cool below the required working temperature during the process of manufacture, from the first heating of the bloom to the final reduction or finishing of the wire rod or other product.

The object of my present invention is to provide, in a rolling-mill plant for making a product of the class named, a simple and economical arrangement of reducing-rolls, guides, and mechanism affording convenient and efficient means for sustaining, directing, and advancing the product, and having appliances for maintaining or augmenting the heat of the bar, billet, or rod within the long guides or supporting-conductors as it passes from one to another of the trains of rolls or at any intermediate stage of its reduction or working; also, to afford, for the purpose above named, facilities of such nature that the heat within the guiding-conductor or storage-receptacle can be conveniently, quickly, and successfully regulated to give sufficient, but not excessive, temperature therein, as required. I attain these objects by means such as illustrated and described, the subject-matter claimed as of my invention being hereinafter definitely specified, and particularly recited in the summary at the close of this specification.

In the drawings, Figure 1 is a plan view of a rolling-mill plant, showing portions of a billet-mill or primary train of rolls and two secondary sets or trains of reducing-rolls, an intervening guide or conductor having guiding and controlling walls for supporting and directing the billet or partially-reduced product, with feed-rolls and shears in the line of said conductor, together with a storage-receptacle and facilities for introducing heat to the same for maintaining or augmenting the heat of the product while contained therein. Fig. 2 is a view showing an end section of the guides or conductor, formed of refractory material, as employed in Fig 1.

Referring to parts, A denotes the billet-mill or primary set of rolls for partially reducing the metal bars — as, for instance, a train of rolls having grooves in the consecutive pairs that will reduce a four-inch by four-inch bloom from its original size down to a billet of about one inch diameter, more or less.

B B denote the rod-mills or second sets or trainss of roll for continuing the reduction. The pairs of rolls in the respective rolling-trains can be supported and operated in the usual well-known manner. The driving-gears and accompanying mechanism for the roll-trains are not therefore herein shown.

C C indicate the long conductors or guide-ways for directing and supporting the billet or partially-reduced product as it passes from the primary to the secondary train of rolls. Said conductor is made with a passway, trough, or guiding-channel *c*, (one or more,) adapted for supporting and directing the billet without buckling or overfeeding and in its full extended length as turned out from the billet-mill. The conductor is preferably of a hard refractory substance, or made with an inclosing casing or wall C′, of fire-brick or equivalent non-radiating refractory material, that surrounds a conducting-way or the trough *c*,

the interior being fitted in a manner to leave a limited space or chamber about the billet or through the hollow in which the billet runs. The whole conductor is upheld by a suitable foundation or by standards. Removable top plates may be provided for covering the inclosed conducting-space, or, if preferred, the conductor may be formed of tubular sections of fire-brick.

C^2 indicates a storage-receptacle, chamber, or an enlargement in the line of the conductor, within which a number of billets can be assembled or retained in heated condition in case of any delay in the operation of the secondary train of rolls B. In the regular operation of the plant the billets are fed from the conductor directly forward into the secondary train of rolls; but if from any reason it occurs that the secondary train cannot immediately take the billet then it is cut off and allowed to lie in the receptacle C^2 to be drawn out later and reduced in the secondary train. The chamber or storage-receptacle C^2 may in some instances be omitted, if desired, the conductor extending to the secondary rolling-train without such enlargement.

D D indicate hydrocarbon injector-nozzles or blast-burners disposed through the wall or casing of the conductor C and receptacle C^2 and connected in suitable manner for introducing petroleum or a blast of hydrocarbon liquid with air into the chamber or interior of the conducting-way around the hot-metal billet contained therein and into the storage-receptacle C^2. The construction of the injectors or burners D can be of such suitable form as will serve for introducing petroleum or injecting hydrocarbon and an air-blast to the interior of the conductor (preferably a blast of hot air) by any suitable blowing mechanism, the blast-supply pipes and the oil-pipes for feeding hydrocarbon to the injector-burners D being controlled by stop-cocks therein provided for regulating the action of the burners or blast-nozzles, as required, to give greater or less heat-producing power and for closing off the feed and blast.

Any desired number of the injectors or burners may be employed for a single conductor or in the receptacles C^2, and the capacity of the burners can be varied to meet the requirements of any particular apparatus.

H indicates the switch-guide disposed at the head of the conductors for directing the billet as it issues from the billet-mill or first train into either one of the various conductors to be carried thereby to the particular one of the plurality of rod-trains in which it is to be further reduced. A supplemental guide can in some instances be employed in well-known manner for directing the product out upon the floor to a hot-bed when for any reason it is not to be fed to the second roll-train.

M indicates feed-rolls disposed in the lines of the conductors for advancing or retracting the hot billet within the guiding-channel when desired. Said feed-rolls are arranged for gripping and releasing the rod, as heretofore employed in rolling-mill apparatus, by the rise and fall of one roll in each pair under control of an attendant.

L indicates shears or conductors arranged in the line of the conductors for cropping the ends or severing the billets, as desired.

In the present instance I have shown two rod-mills or secondary trains and conductors and receptacles therefor arranged for taking the product from a single billet-mill or primary train; but it will be understood that the plurality of rod-mills and conductors can, when desired, consist of a greater number, all the conductors leading from the switch-guide, so that the product from the billet-mill can be passed to either of the rod-mills.

In the operation the bloom, which has been previously heated, is first reduced in the billet-mill or primary train of rolls A in well-known manner, and the long billet or rod therefrom, extended at full length without overfeed or buckling, is received and supported in the conductor C, to be subsequently passed to the rod-mill or second train of rolls B. The burners or injector-nozzles D introduce into the interior of the conductor-casing a regulated quantity of petroleum liquid or a blast of air and hydrocarbon-oil in a fine spray, which is united and consumed along the interior of the conducting-way, thereby augmenting or maintaining the heat of the billet within the guide-channel, and the degree of temperature can be controlled as required by increasing or diminishing the blast-power and the feed of the injector-burners by means of the valves. With this arrangement of apparatus the metal operated upon may be given a greater or less degree of heat while it is passing through the conductor C, or while delayed in the receptacle C^2, so as to preserve its proper working temperature until the final reduction is accomplished.

In my former Letters Patent, No. 390,285, and application Serial No. 249,114 there are shown and described rolling-mill plants having primary and secondary trains of rolls and a long intermediate conductor for directing and supporting the product as it passes from one train to the next, and also feed-rolls for advancing the billet and shears for severing it where required; hence it will be understood that such features are herein claimed, but as elements in combination with other features or parts of the apparatus.

I claim as my invention herein to be secured by Letters Patent—

1. In a rolling-mill plant, a train of rolls and a plurality of conductors, each being provided with confining and controlling walls, whereby the product is prevented from escaping therefrom or buckling therein, said conductors also being provided with facilities for applying heat to the conductors for maintaining or augmenting the heat of the hot

product therein, a switch-guide arranged to switch the product to either one of the conductors from the train of rolls, and feed-rolls and shears disposed in the line of the conductors.

2. In a rolling-mill plant for making rods from blooms, the combination, with a billet-rolling train and a rod-rolling train, of a guiding-conductor that supports and directs the hot product between said billet-rolling train and said rod-rolling train, said conductor having combined therewith appliances for supplying heat to the guideway for maintaining or augmenting the heat of the hot product therein, and feed-rolls disposed in the line of said conductor between the billet-rolling train and the rod-rolling train.

3. In a rolling-mill plant for making rods from blooms, the combination, with the billet-rolling train and a rod-rolling train, of a guiding-conductor leading to said rod-rolling train from said billet-rolling train, said conductor having appliances for introducing heat to said conductor for maintaining or augmenting the heat of the hot product therein, and feed-rolls and shears disposed in the line of said conductor between the billet-train and the rod-rolling train.

4. In a plant for making rods from blooms or large billets, the combination, with the billet-rolling train and rod-rolling train, of a conductor having guiding and controlling walls that confine the hot product from buckling, and a receptacle for the product before it enters the rod-rolling train, said conductor and receptacle having facilities for introducing heat to same for maintaining or augmenting the heat of the product therein, and feed-rolls disposed in the line of said conductor for carrying the hot product through the conductor into the receptacle.

5. A rolling-mill plant for making rods from blooms or large billets, having a billet-rolling train, a plurality of rod-rolling trains, a plurality of conductors, each having feed-rolls, and a plurality of receptacles for the product between the rolling-trains, and a switch-guide at the entrance to said conductors, whereby the product from the billet-rolling train is switched to any one or the other of the conductors and carried through that conductor by its feed-rolls to one of the receptacles, said conductors and receptacles both having facilities for the introduction of heat thereinto for maintaining or augmenting the heat of the product contained therein.

Witness my hand this 4th day of January, A. D. 1890.

FRED H. DANIELS.

Witnesses:
CHAS. H. BURLEIGH,
ELLA P. BLENUS.