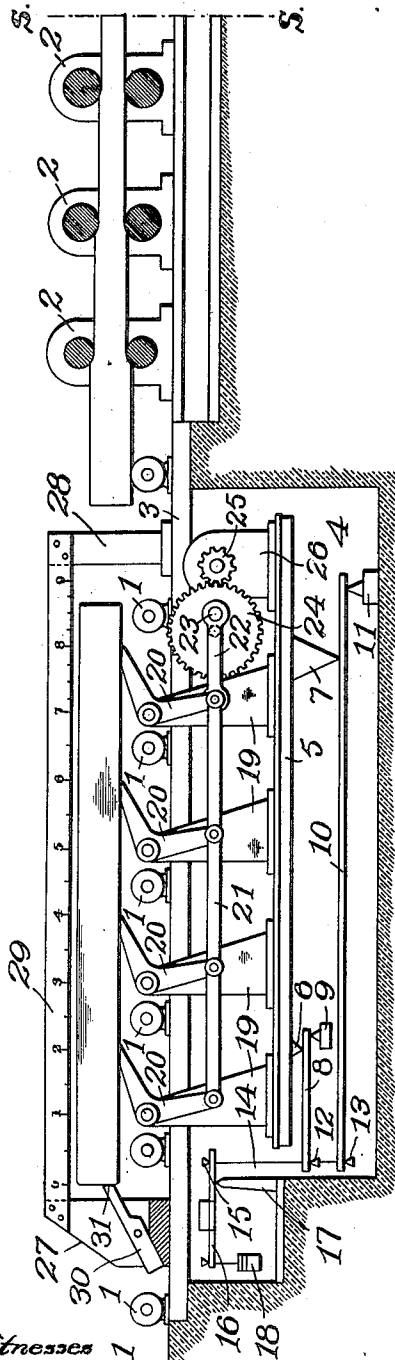
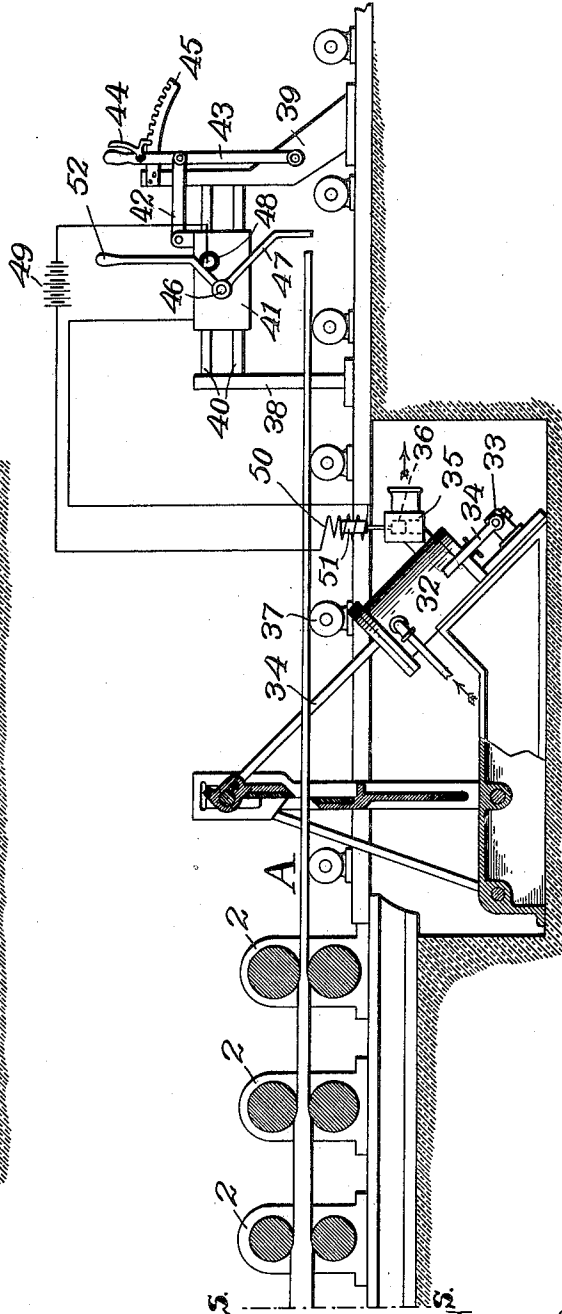


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 ROLLING MILL PLANT.  
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# UNITED STATES PATENT OFFICE.

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## ROLLING-MILL PLANT.

1,104,349.

Specification of Letters Patent.

Patented July 21, 1914.

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*To all whom it may concern:*

Be it known that I, VICTOR E. EDWARDS, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Rolling-Mill Plants, of which the following description, taken in connection with the accompanying drawing, is a specification.

The present invention relates to apparatus adapted for the uninterrupted rolling of a large ingot or bloom into a finished product of greatly reduced cross sectional area, and the cutting of the latter into pieces of equal and convenient length.

Heretofore it has been the practice to introduce each bloom or ingot, to a continuous series of reducing rolls, and to cut by means of a suitable shearing mechanism, the product emerging from the last finishing rolls into pieces of equal length, as determined by a previous and wholly arbitrary adjustment of the shearing mechanism.

Owing to the difference in the amount of metal contained in the blooms, which are found sometimes to vary several hundred pounds in weight, it has heretofore been impracticable to produce a number of pieces from a single bloom without having a remainder, of less length than one of said pieces, known as a "short", which frequently represents waste material; and in a mill of even an ordinary capacity the daily waste occasioned by the formation of these "shorts" is considerable.

It is the purpose of the present invention to practically eliminate the formation of "shorts" by cutting the pieces of such a length that the metal of the bloom will substantially all be used when the last piece is cut.

To this end the present invention contemplates the interposition of means, in front of the reducing rolls, for ascertaining the amount of metal in each bloom, so that the length to which the product of such bloom can be cut, without the formation of a short, can be obtained from a table, or readily computed, and the shearing mechanism adjusted accordingly.

In the accompanying drawing, the figure,

which represents one embodiment of my invention, is a diagrammatic side elevation, partly in section, of the apparatus, the same being divided for convenience, on the broken line S—S.

The numerals 1, 1, represent rolls for moving the bloom from the blooming mill or heating furnace, not shown, to a series of sets of reducing rolls 2, 2, constituting a billet mill, said rolls 2 being provided in sufficient numbers and in properly graded diameters to gradually reduce the diameter of the bloom from the first to the last set of rolls, from which latter there emerges, as a product, in the present instance, a continuous billet of the desired cross section. A number of the conveyer rolls 1 are supported on a framework 3, beneath which a pit 4 is provided for the reception of apparatus adapted to ascertain the amount of metal in the bloom, prior to its passage to the reducing rolls. This apparatus takes the form of a scale, the platform of which is embodied in a table 5, having knife edges 6 and 7 projecting from its under side. The knife edge 6 rests on a lever 8 which is supported at one end on a fixed knife edge 9. The knife edge 7 rests on a lever 10 which is supported at one end on a fixed knife edge 11. The other ends of the levers 8 and 10 are supported on knife edges 12 and 13 carried by a link 14 having an oppositely facing knife edge 15 bearing against the upper edge of a scale beam 16, which is pivoted on a knife edge 17 and carries the usual slidable weight indicating balance 18.

The table 5 carries a plurality of spaced upright standards 19, the upper ends of which project through the framework 3 and lie in alternating relation to the conveyer rolls 1 supported thereon. Each standard 19 has pivoted to its upper end a bell crank lever 20, the depending arms of all of said bell cranks being pivotally connected to a common actuating link 21, lying in a horizontal plane parallel to the table 5. In the normal position of the apparatus, the bell cranks are rocked from the position shown in the figure, the end of each of the upper arms being adapted to lie below the upper surfaces of the conveyer rolls 1.

The forward end of the link 21 is pivotally attached to a connecting rod 22, which is actuated by a crank pin 23 on the face of a large gear wheel 24, suitably journaled on and carried by the table 5. The gear wheel 24 meshes with and is driven by a pinion 25 on the shaft of an electric motor 26 also supported by said table.

The framework 3 carries upright standards 27 and 28 at each end, between which is secured a linear scale 29, adapted to indicate the length of a bloom, as hereinafter described.

The standard 27 has pivoted thereto a latch 30 disposed in the path of the bloom, which normally assumes the position shown in the figure, owing to the predominating weight of its left hand end, but which is capable of rocking in a clockwise direction to permit the passage of a bloom thereover from the furnace to the weighing mechanism. After the bloom is moved past the latch, the latter resumes its normal position, with the edge of its end 31 in alinement with the zero mark on the scale 29, as shown in the figure.

The character A on the drawing represents, as a whole, a "flying shear" located immediately beyond the last reducing or finishing roll 2. The operative parts of this mechanism are shown in section for the sake of clearness. Their particular construction forms no part of the present invention, the shear shown in the drawing being essentially identical with that disclosed in Letters Patent No. 505,512, granted to me September 26, 1893, although any other form of flying shear, well known in the art, might be used. I have also shown diagrammatically, mechanism for operating the shear, preferably a steam cylinder 32 containing a piston adapted to impart a reciprocating movement to a cross head 33, which latter is connected by connecting rods 34 with the reciprocating shear blade of the flying shear A, in the manner described in my aforesaid Letters Patent.

For effecting a downward movement of the piston to operate the flying shear, and a return movement thereof after the shearing operation is completed, I prefer to control the exhaust and inflow of steam as indicated by arrows leading to and from said cylinder, by means of the valve mechanism disclosed in the patent to Elbert H. Carroll, No. 787,324, granted April 11, 1905, although any suitable valve mechanism may be used, since the particular type of valve mechanism employed forms no part of the present invention. I have indicated this valve mechanism diagrammatically at 35, adjacent the steam cylinder 32, and have shown in dotted lines a valve 36, adapted when moved in one direction to exhaust steam from the cylinder below the piston,

and adapted when returned to its initial position, to restore the steam pressure below the piston, causing the latter to move back to its original position, such a valve, operating in the above described manner, being disclosed in the aforesaid Letters Patent to Carroll.

The mechanism for operating the valve 36 will now be described. At a suitable distance beyond the shearing mechanism and substantially in the path of the finished product as it emerges from the final finishing rolls 2 onto an additional series of conveyer rolls 37, is located a pair of standards 38, 39, supporting between them the longitudinal guides 40 for a slidable block 41. The block 41 is connected by a link 42 with a hand lever 43, pivoted on the standard 39, and having at its upper end a catch 44 adapted to engage the notches in a segmental guide plate 45, projecting from the standard 39. The longitudinal position of the block 41 on its guides 40 is controlled by the position into which the lever is locked by the catch 44, as will be readily apparent.

Pivoted at 46, on the side of the block 41, is a trigger 47, which takes the form of a bell crank lever having bent arms. The lower arm of the trigger extends directly into the path of the finished rod as it emerges from the reducing rolls 2 and is carried forward by the conveyer rolls 37, and the shape of the trigger is such that the weight of its lower arm normally maintains its upper arm in abutting relation to a stop 48, carried on the side of the block 41 and electrically insulated therefrom. The contact of the trigger 47 with the stop 48 completes an electrical circuit, as indicated in the drawing, which includes a battery 49 and a solenoid 50. One wire of the circuit is led to the insulated stop 48, and the other is in electrical connection with the trigger 47, so that with the trigger in contact with the stop, as shown, the solenoid is kept energized. The solenoid has a core 51, to which is attached the stem of the valve 36. When the end of the finished rod strikes the lower end of the trigger the circuit is broken owing to the movement of the trigger away from the stop, and the consequent deenergization of the solenoid permits the operation of the valve 36 by gravity to exhaust the steam from below the piston in the cylinder 32, as described in the aforesaid Letters Patent to Carroll, thereby causing the shear to operate in the manner described in my aforesaid Letters Patent. The lateral removal of the sheared-off rod permits the trigger to resume its normal position, again closing the circuit and energizing the solenoid, which acts on its core 51 to return the valve 36 to its initial position, thereby admitting steam below

the piston and returning the shear in position to cut off the next rod.

The detailed operation of my mechanism is as follows:—The bloom from the blooming mill or furnace is conveyed past the latch 30 onto the rolls 1 carried by the framework 3. The rotation of the conveyer rolls is then reversed, by means of suitable reversing mechanism, not shown, carrying the bloom rearwardly against the projecting end 31 of the latch 30, which stops its rearward movement. If the blooming mill is one in which blooms of uniform section are produced, the amount of metal in each bloom can be readily ascertained by merely measuring on the scale 29 the length of the bloom so held against the latch 30, with one end thereof in vertical alinement with the zero mark on said scale. If, however, the blooms vary in cross section, the motor 26 is operated to turn the gear 24 sufficient to permit the upper arms of the bell cranks 20 to lift the bloom clear of the conveyer rolls, as shown in the figure, in which position its exact weight can be ascertained from the scale beam 16, in any well known manner. By reference to a table, or by a simple calculation, the proper length, ordinarily between 27 and 30 feet, into which the finished rods are to be cut, so as to secure an even division of the metal contained in the bloom, with no remainder or "short" is ascertained, and the lever 43 is set in position to hold the lower end of the trigger 47 at the predetermined distance from the shear. The bloom is then lowered onto the rolls 1 by reversing the rotation of the motor 26, and is forwarded by the said rolls, now rotating in the proper direction, to the reducing rolls 2. The product emerging from the latter is automatically divided into billets of predetermined lengths by the flying shear A, as hereinbefore described. The table of lengths is computed to allow for a predetermined length, say six to ten inches, of the advancing end of the rolled product to be removed or "cropped" before the automatic division of the same into billets of predetermined length is begun. Allowance is also made in computing said table, for a predetermined length to be removed or "cropped" from the rear end of the rolled product. In order to actuate the shear to remove this so called crop end, the upper arm of the trigger 47 is extended to form a handle 52 by means of which the trigger is adapted to be manually thrown forward at the moment when the aforesaid predetermined length at the advancing end of the finished product projects beyond the shear blades. The trigger then returns, by gravity, to its normal position, in readiness to be struck by the advancing end of the first rod to be cut, in the manner previously described.

I claim,

1. In a rolling mill apparatus, the combination of means for ascertaining the amount of metal in a bloom to be rolled, means for rolling said bloom to a predetermined size, and means for cutting the rolled product into equal lengths without remainder, or short, as predetermined by the amount of metal in said bloom. 70

2. In a rolling mill apparatus, means for weighing a bloom, means for rolling said weighed bloom to a predetermined cross section, and means for cutting the rolled product into equal sections of a length proportionate with the weight of the bloom. 75 80

3. In a rolling mill apparatus, means for ascertaining the amount of metal in a bloom, means for continuously rolling said bloom into a product of predetermined cross section, and means for successively cutting said product as it emerges from said rolling means into a plurality of billets of equal length, the amount of metal in all of said billets being equal to the amount of metal in said bloom. 85 90

4. In a rolling mill apparatus, means for weighing a bloom, a series of reducing rolls into which the bloom is introduced after leaving said weighing means, a shearing mechanism for dividing the product emerging from said reducing rolls, and means for operating said shearing mechanism to divide the product into equal lengths without remainder or short. 95

5. In a rolling mill apparatus, means for ascertaining the amount of metal in a bloom, means for rolling said bloom to a predetermined cross section, a shearing mechanism adjusted in accordance with the amount of metal in said bloom to cut the rolled product into billets of equal length, and means, actuated by engagement therewith of the rolled product, for operating said shear. 100 105

6. In a rolling mill apparatus, a series of conveyer rolls for moving a bloom, means for interrupting the passage of said bloom over said conveyer rolls, means for ascertaining the amount of metal in said bloom during said interruption, a series of reducing rolls adapted to receive each bloom from said conveyer rolls, and means for dividing the rolled product of each bloom emerging from said reducing rolls into sections of equal length; said length predetermined from the amount of metal in said bloom. 110 115 120

7. In a rolling mill apparatus, a billet mill, means for conveying a bloom to said billet mill, means for cutting the rolled product into sections of predetermined length as it emerges from said billet mill, and means in the path of said bloom over said conveying means for ascertaining the amount of metal in said bloom prior to its passage from said conveying means to said billet mill. 125 130

8. In a rolling mill apparatus, a series of  
conveyer rolls for delivering a bloom to a  
billet mill, a series of reducing rolls adapted  
to receive said bloom from said conveyer  
5 rolls, means for cutting the rolled product  
of said bloom into sections of predetermined  
length as it emerges from said reducing  
rolls, and means for ascertaining the amount

of metal in said bloom during its passage  
over said conveyer rolls. 10

Dated this ninth day of April, 1914.

VICTOR E. EDWARDS.

Witnesses:

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