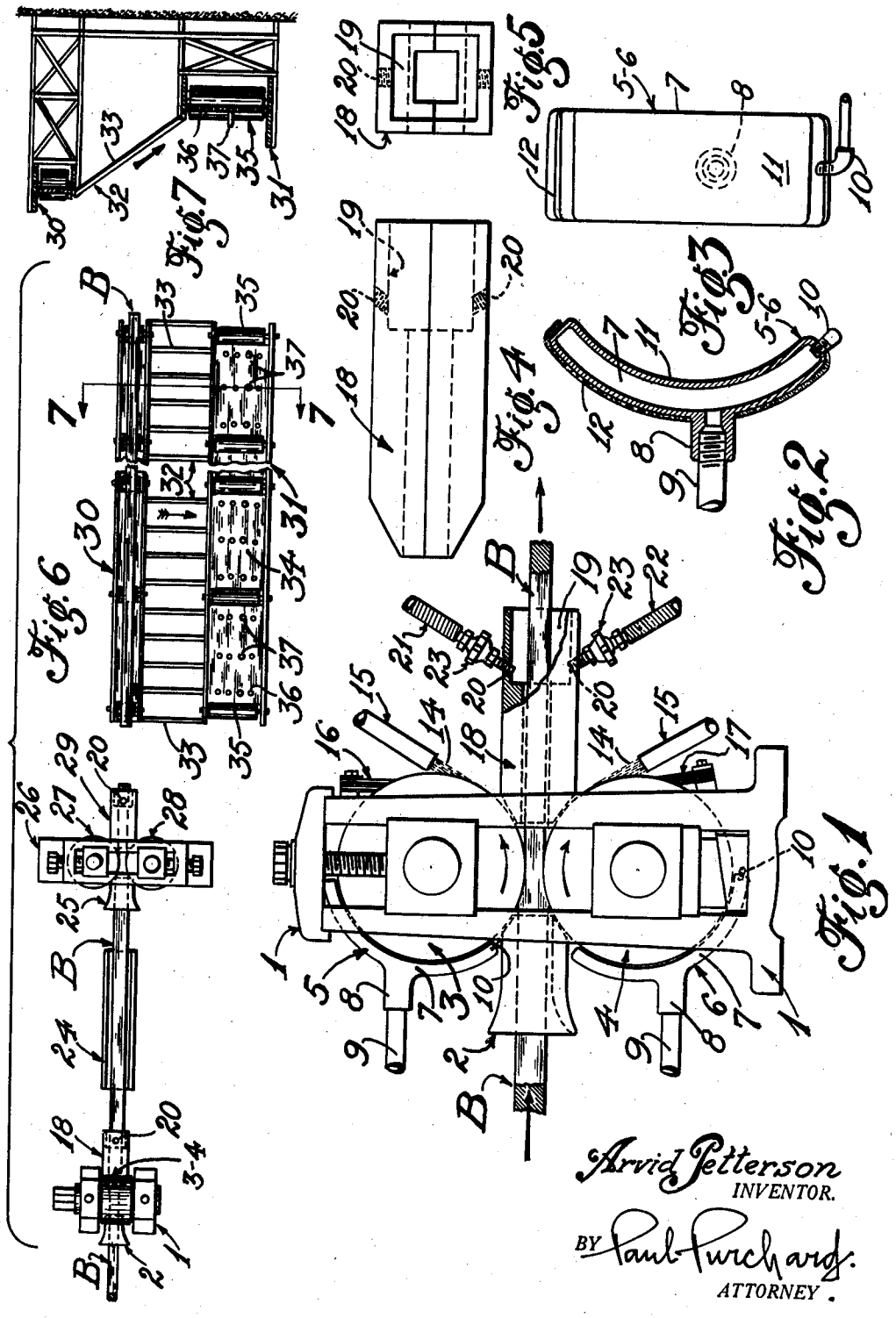
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METHOD AND MEANS FOR DESCALING BILLETS

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METHOD AND MEANS FOR DESCALING BILLETS

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7 Claims. (Cl. 29—81)

This invention relates to the art of rolling steel and iron, and more in particular to methods and means for removing scale from heated steel or iron billets before they are run through the continuous rolling mills to be transformed into bar stock of any desired cross-section; which bar stock may be sold to the trade or else further treated into cold drawn bar stock.

It is well known in the steel industry that the surface appearance of the final product of steel rolling, such as bar stock, is to a great extent determined by the surface smoothness of the billets from which the material is rolled, and that scale on said billets will produce on the final product surface pits or grooves which greatly affect the value and salability of the product and quite often require its rejection at the plant proper. This is especially true when the rolled stock is to be further treated into relatively costly "cold-drawn" bar stock, the prime requisite of which is that its surface be as smooth and polished as possible in order to justify its greater market price and its application on expensive machinery, etc.

One of the primary objects of this invention is to provide means whereby the scale on a heated billet may be removed prior to the billet being run through the continuous mills where it is rolled into the finished product.

A further object of this invention is to effect great economies in the rolling of bar stock and the like, owing to the fact that the rejections due to imperfect, i. e., pitted or grooved, surface appearance on the finished product will be reduced to a minimum.

Still another object of this invention is to reduce what is called in the art surface shearing or scuffing on the billet due to the passage thereof through the billet boxes and guides of the rolling mills without proper guidance.

Additional features and advantages of this invention will appear in the following description considered in connection with the accompanying drawing forming part of this application.

In the drawing—

Fig. 1 is a side elevation showing schematically a special scale rolling mill, of the horizontal type, used in the process forming the subject matter of this application.

Fig. 2 is a sectional view through a steam heated heating-shoe used on the feeding side of the rolls of the scale mill, for a purpose described hereinbelow.

Fig. 3 is an elevational view of the concave side of the heating-shoe.

Fig. 4 is a side elevation of a special billet-guide used in this invention.

Fig. 5 is an end view of Fig. 4.

Fig. 6 is a top plan view showing diagrammatically a complete installation for removing the scale from heated billets, before they are run through the continuous mill which reduces said billets to the desired shape.

Fig. 7 shows a cross-section, on an enlarged scale, taken substantially on line 7—7 in Fig. 6.

Reference being had to the drawing, the billet "B", of rectangular or square cross-section, after having been heated to the desired temperature in a suitable billet heating furnace (not shown), is conveyed by suitable means (not shown) to the scale-mill 1, passing first through the billet box 2, of conventional design and supported in a manner well known in the art, in proper position to lead the billet between the upper horizontal roll 3 and the lower roll 4 of said mill. These rolls are smooth and are of relatively large diameter in order to reduce their speed of rotation, for a given longitudinal feeding speed of the billets.

These billets are reduced only an amount necessary to loosen and break up the scale thereon, in order to reduce the power required to operate the scale-mill, as well as its structural dimentions, the proper rolling of the billets into bar-stock being confined exclusively to the continuous mills.

I have observed, by actual experience in steel mill work, that scale will adhere more readily to absolutely dry and hot rolls than to such the surface of which may be wet, or even slightly damp. Therefore, in order to practically concentrate all the loosened scale onto the rolls, and thus reduce the amount of scale that may still adhere to the billets proper in size and amount, I propose to heat as much of the feeding sides of the rolls as possible in order to insure their complete dryness and proper temperature.

Referring especially to Fig. 1, the directional arrows shown therein indicate that the feeding sides of the rolls are at the left and the delivery sides at the right of the vertical center line of the scale-mill. The feeding side of the upper roll is heated and dried by means of an arcuate heating-shoe 5, whereas the corresponding side of the lower roll is heated and dried by a heating-shoe 6, both of which are placed concentric with the rolls and fit as closely as practical about the circumference thereof. The heating-shoes are, of course, supported by any desired and suitable means (not shown) in proper position relative to

the rolls and may be heated either by steam, gas or electricity.

In the embodiment shown, steam heating has been assumed. In this case each heating-shoe comprises an arcuate hollow body portion 7 having a hub 8 to which a steam supply pipe 9 may be connected to supply steam into the body. A bleeder connection 10 is preferably placed at the lowermost point of each shoe to drain the water of condensation. It is also desirable to concentrate the heat on the concave side 11 of the shoe, so as to get the greatest benefit from the heat. This may be done by insulating the outer parts of the shoe with asbestos or other suitable material, as suggested at 12, Fig. 2.

Regardless of the means used for heating the heating-shoes, suitable and conventional means (not shown) are preferably introduced in the system to regulate the temperature of the shoes.

As a hot billet passes between the rolls, it will first be engaged by the heated and dried feeding sides thereof and reduced an amount just sufficient to break up and loosen the scale. Practically all of the scale will adhere to the dry portions of the rolls, rather than to the billet proper. As the scale on the rolls reaches the delivery sides thereof, it is subjected to strong jets of water 14 delivered through pipes 15, substantially in a direction tangent to the rolls and opposed to their sense of rotation, to force the scale away.

The supply and pressure of the water may be regulated by means of valves (not shown), suitably located in the pipe lines.

The water clinging to the rolls is wiped off by means of so-called water-brushes 16 and 17, positioned rearwardly of the water jets and secured in any desired manner to the housing of the scale-mill. As the rolls proceed in their rotation, whatever humidity remains on them will be evaporated by the heating-shoes, so that only dry portions of the rolls will at all times engage the hot billets. Because of the relatively large arcuate envelopment of the rolls by the heating-shoes, the rather moderate speed of rotation of the rolls, and the great heat produceable in said shoes, it is an easy matter to insure absolute dryness of the feeding side of each roll.

After passing through the horizontal rolls, the substantially scale-free and reduced billet "B" enters the billet-guide 18 which fits as closely as possible between the rolls and is split longitudinally. This guide differs from conventional guides in that its outer end is hollowed out to produce a chamber 19 and is provided at the top and bottom with threaded holes 20 for connecting two high pressure air hoses 21 and 22, preferably by means of flexible joints 23. This air impinges with great force against the sides of the billet which have just been engaged by the rolls and blow the last particles of scale away that failed to adhere to the rolls.

The billet issuing from said guide is now led through a trough 24, Fig. 6, and thence into a second box 25 placed in guiding relation to the scaling-mill 26, of the vertical roll-type of usual design, the vertical rolls 27 and 28 being adjustable as to spacing. In this second mill the other two sides of the billets are submitted to slight reduction to break up and loosen the scale therefrom. This mill is also provided with heating-shoes and water jets similarly disposed and performing the same functions as those of the first, horizontal, scale-mill.

The reduced billet now passes through a second guide 29 of identical construction as the first billet-guide 18. The billet having now been descaled on all four sides runs onto a horizontal roll-conveyor 30 of suitable length to receive the whole billet. Parallel to this conveyor and suitably spaced therefrom, is a second roll-conveyor 31 which is placed at a lower level and onto which each billet is dumped by special workmen. A ramp or chute 32, preferably made of spaced parallel bars 33, spans the gap between both conveyors. The purpose of dropping each billet onto the second conveyor is to remove whatever thin scale may have formed on the billet during the short time since it has left the rolls and guides of the scaling-mills. The second conveyor is much wider than the first, its width being equal or greater than the width of the grooved rolls of the first stand of the co-axially disposed continuous mill (not shown), so that the billet may be guided straight into the desired set of grooves in said rolls. To properly place the billet on the lower, or second, conveyor 31, the bottom 34, placed between the rollers 35, is provided with suitably spaced apertures 36 arranged in parallel rows and into which guide or stop pins 37 may be inserted to direct the billets into line with the proper grooves of the rolls of the first continuous mill-stand, thus preventing surface shearing, or scuffing, of the billets.

Because of the absence of scale on the billets, the continuous mill will produce bar-stock which is free of surface pits or grooves, and effect considerable economies in time and money, owing to the elimination of rejections due to such causes.

As will be understood, there may be slight changes made in the construction and arrangement of the details or in the method of operation of this invention without departing from the field and scope of the same, and I intend to include all such variations, as fall within the scope of the appended claims, in this application in which only the preferred form only of my invention has been disclosed.

I claim:

1. The process of removing surface scale from a hot steel billet and the like which consists in reducing the sides thereof by passing said billet between flat rolls the feeding sides of which are made hot and free from moisture, thereby causing the scale detached from the billet by the act of rolling to adhere to the rolls; removing said scale by strong jets of water applied to the delivery sides of the rolls, and subsequently submitting said billet to the direct action of strong air-jets to remove therefrom scale not removed by the act of rolling.

2. The process of removing surface scale from a hot billet and the like which consists in reducing the sides thereof by passing said billet between flat rolls the feeding sides of which are made hot and free from moisture thereby causing the scale detached from the billet by the act of rolling to adhere to the rolls, removing said scale by strong jets of water applied to the delivery sides of the rolls, subsequently submitting said billets to the direct action of strong air jets to remove therefrom scale not removed by the act of rolling, and finally subjecting said billet to intense jarring to shake therefrom the remaining scale.

3. The process of removing surface scale from a hot steel billet and the like which consists in reducing the sides thereof by passing said billet between flat rolls the feeding sides of which are

made hot and free from moisture thereby causing the scale detached from the billet by the act of rolling to adhere to the rolls, removing said scale by strong jets of water applied to the delivery sides of the rolls, subsequently submitting the billet to the direct action of strong air-jets to remove therefrom scale not removed by the act of rolling, and finally dropping said billets laterally to jar same and shake therefrom the remaining scale.

4. In a mill for descaling hot billets, the combination of smooth cooperating rolls, water spraying means and wiping means effective on the delivery sides of said rolls to remove therefrom adhering scale, and arcuate heating means effective on the feeding sides of the rolls to dry same and cause the scale to adhere thereto.

5. In a mill for descaling hot billets, the combination of smooth cooperating rolls, water spraying means and wiping means effective on the delivery sides of said rolls to remove therefrom adhering scale, and inwardly heated arcuate means effective on the feeding sides of the rolls to dry same and cause the scale to adhere thereto.

6. In a mill for descaling hot billets, the combination of smooth cooperating rolls, water spraying means and wiping means effective on the delivery sides of said rolls to remove therefrom adhering scale, and individual hollow arcuate heating shoes effective on the feeding sides of the rolls to dry same and cause scale to adhere thereto, and means to introduce heat in said shoes.

7. In a mill for descaling hot billets, the combination of smooth cooperating rolls, water spraying means and wiping means effective on the delivery sides of said rolls to remove therefrom adhering scale, individual hollow arcuate heating shoes effective on the feeding sides of the rolls to dry same and cause scale to adhere thereto, means to introduce heat into said shoes, and means to concentrate the radiation of heat in the sides of said shoes facing the rolls.

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