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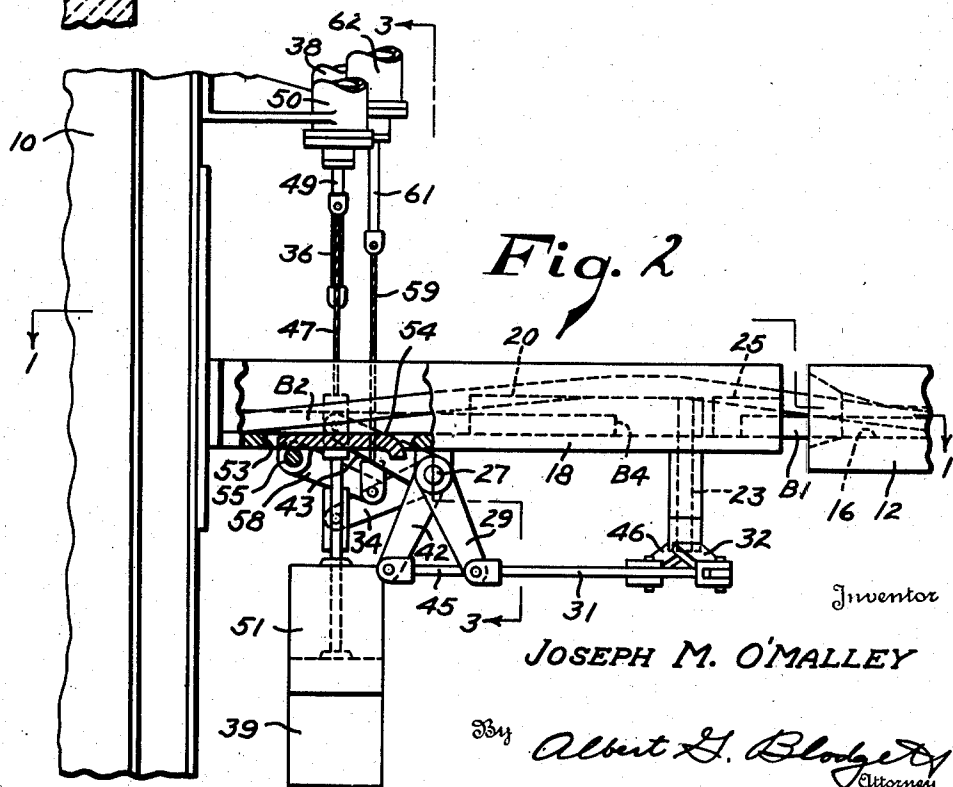
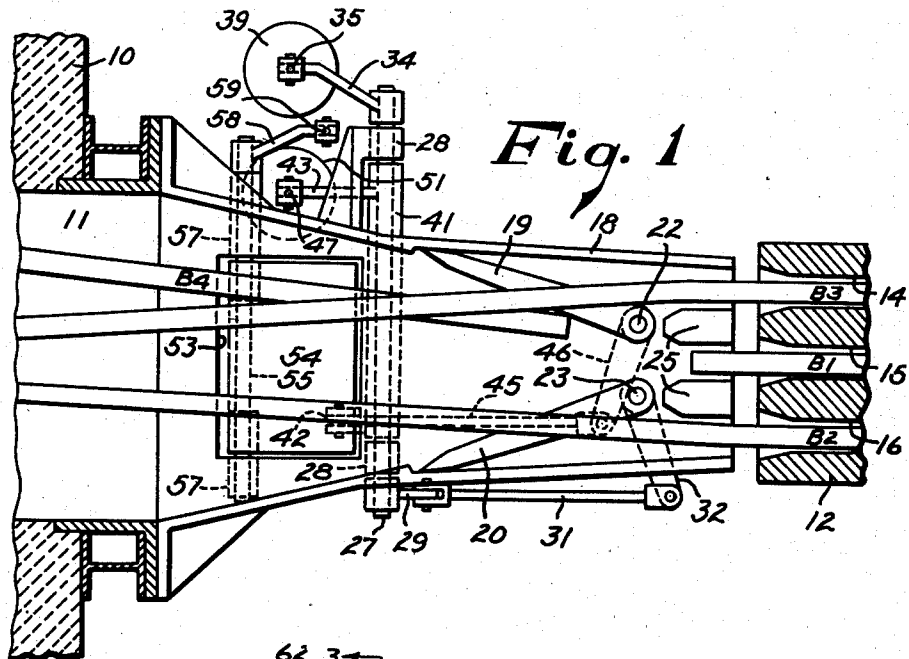
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2,363,079

SWITCHING APPARATUS

Filed June 16, 1943

3 Sheets-Sheet 1



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SWITCHING APPARATUS

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3 Sheets-Sheet 2

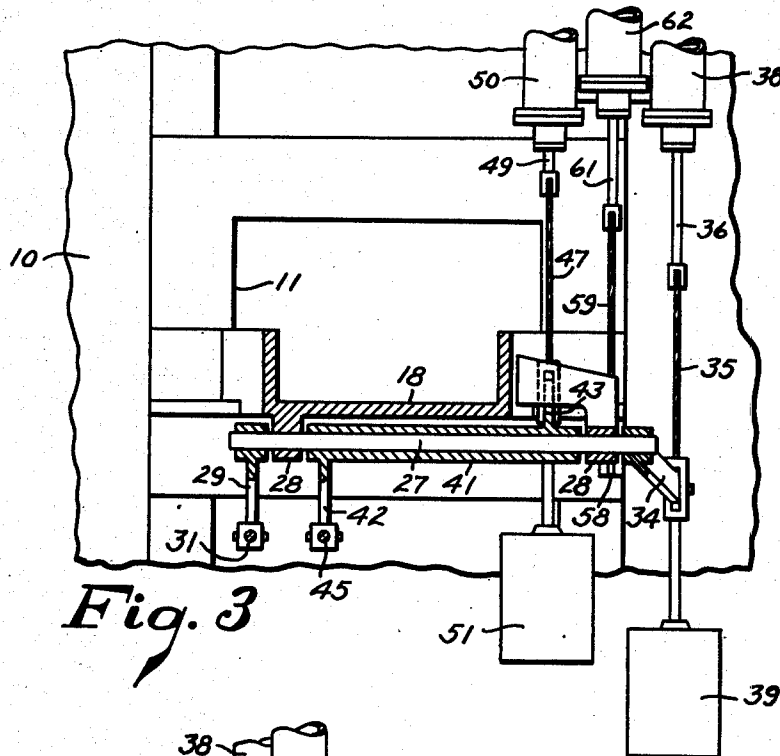


Fig. 3

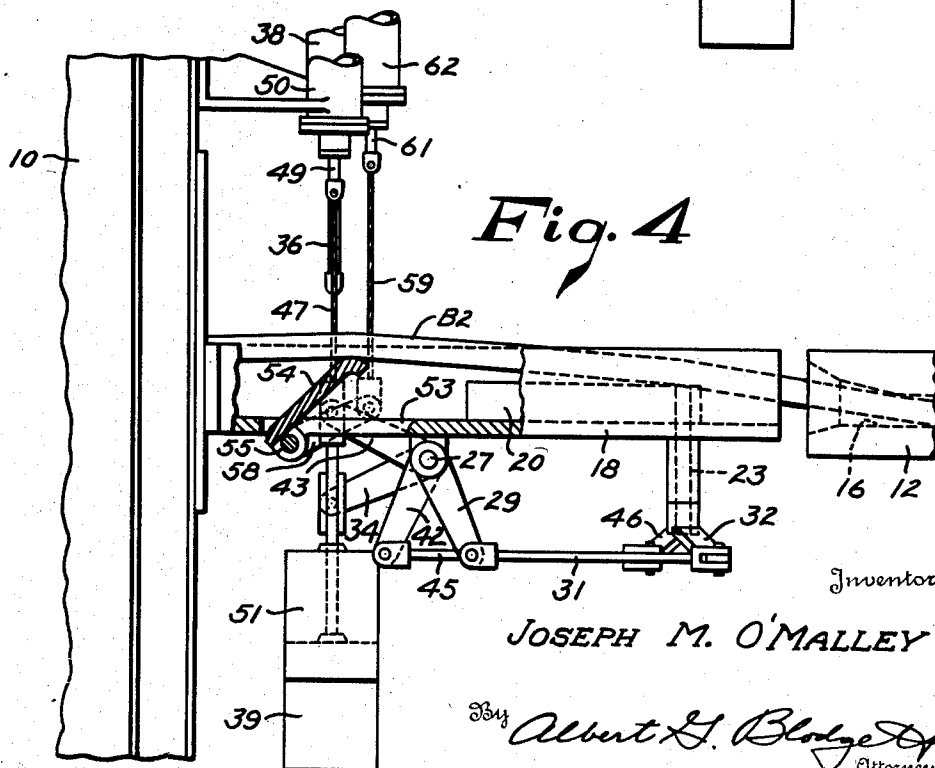


Fig. 4

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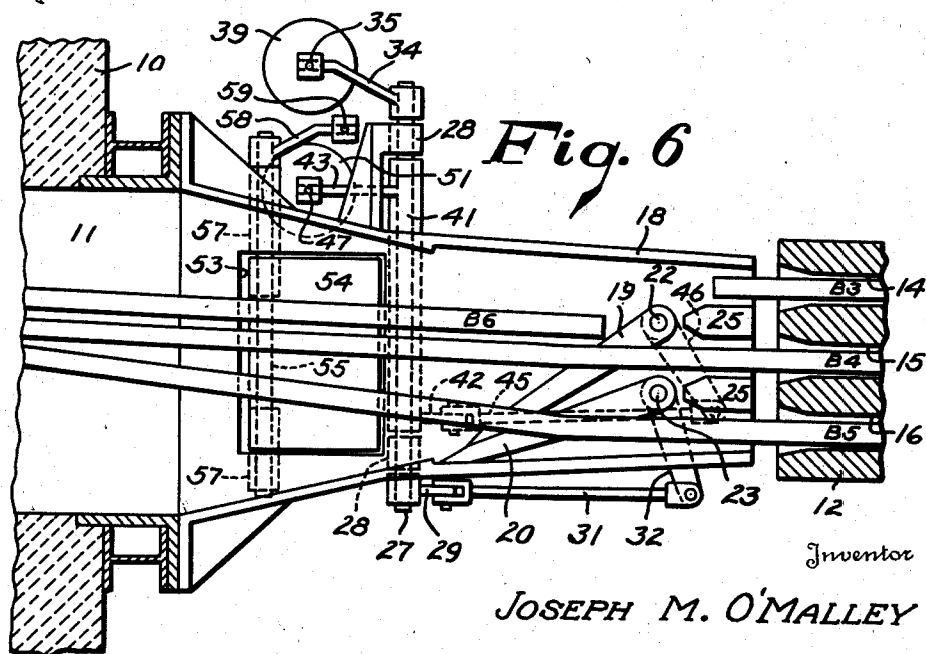
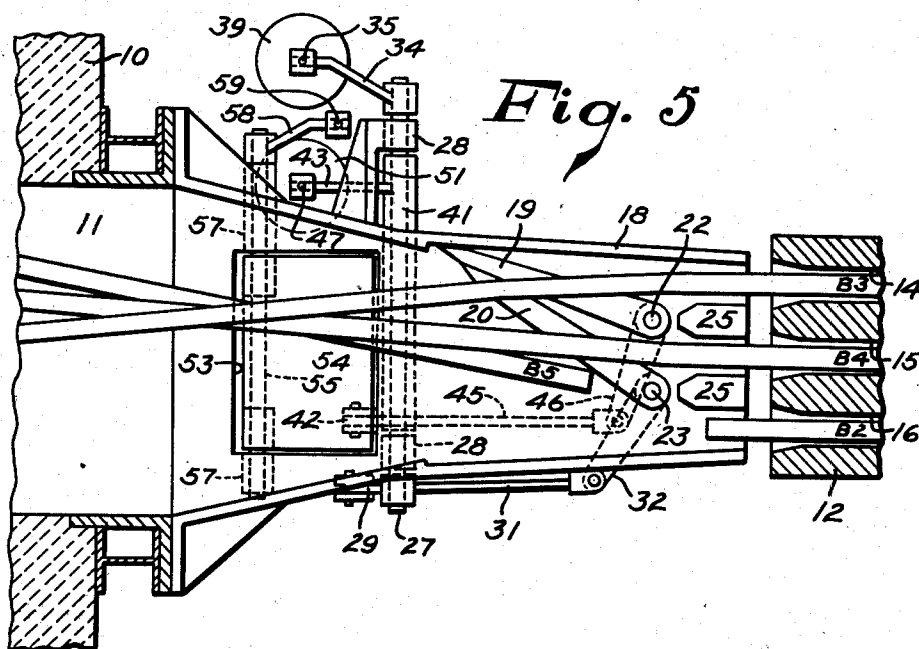
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SWITCHING APPARATUS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,363,079

SWITCHING APPARATUS

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Application June 16, 1943, Serial No. 491,011

7 Claims. (Cl. 193—39)

This invention relates to switching apparatus, and more particularly to apparatus whereby elongated bars of stock, which are delivered endwise successively in an overlapped relationship, may be directed selectively into any one of a plurality of paths or channels arranged to receive such bars.

While the invention is applicable to a variety of uses, it is particularly adapted for installation between a billet heating furnace and a multi-strand rolling mill. Such a rolling mill has a plurality of parallel pass lines into each of which billets must be delivered successively in order to maintain the mill in operation at its full capacity. When the front end of each billet is first gripped by the rolls, a considerable portion of the billet is still within the furnace and in overlapped relationship with the following billet. Consequently a difficult problem is involved in directing the billets into the desired pass line of the mill without interference with the other billets which have already entered the mill and are in the process of being rolled.

It is accordingly one object of the invention to provide a comparatively simple and dependable apparatus capable of directing successively delivered bars into selected paths of travel.

It is a further object of the invention to provide a switching apparatus particularly adapted for controlling hot metal billets as they travel endwise from a heating furnace to a rolling mill.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings illustrating one embodiment of the invention and in which like reference numerals indicate like parts,

Fig. 1 is a plan view of a switching apparatus, with certain parts shown in section on the line 1—1 of Fig. 2;

Fig. 2 is a side elevation of the apparatus, with certain parts broken away for clearness of illustration;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is a side elevation similar to Fig. 2 but showing the parts in a different operating phase;

Fig. 5 is a plan view similar to Fig. 1 but showing the switch blades in different positions; and

Fig. 6 is a view similar to Fig. 5 but showing the switch blades in still different positions.

The embodiment illustrated comprises a billet-heating furnace 10 of a conventional type having the usual discharge opening 11. The billets

B1, B2, B3, B4, etc. travel through such a furnace broadside in a row, and as they arrive opposite the opening 11 they are pushed endwise outwardly therethrough successively in a well-known manner. A structure 12 is located in alignment with the opening 11 and spaced therefrom, this structure providing three openings or channels 14, 15 and 16 arranged in a horizontal row and forming the entrance guides for the first stand of rolls of a multi-strand rolling mill. The number of these entrance guides will of course depend upon the design of the mill. The invention provides means for directing each billet, as it issues from the opening 11, into any one of the entrances 14, 15 and 16 which the operator may select, without interference with the previously delivered billets which are being drawn through the other entrances by the action of the rolls.

In its preferred form the invention includes a substantially horizontal trough 18 located between the furnace discharge opening 11 and the entrance guide structure 12. This trough preferably converges in the direction of forward travel of the stock. Within the trough there are mounted two switch blades 19 and 20, one less in number than the entrance guides. The blade 19 is located between the entrances 14 and 15, whereas the blade 20 is located between the entrances 15 and 16. These blades are keyed or otherwise secured at their front ends to vertical pins 22 and 23 respectively which are rotatably mounted in the bottom of the trough. This provides a pivotal support for each blade, so that the blades can be swung toward either side of the trough. These blades are somewhat greater in height than the billets. Preferably a lug or block 25 projects upwardly from the bottom of the trough directly beyond each blade.

Power means is provided for swinging the switch blades into the desired positions. For this purpose a transverse horizontal shaft 27 is rotatably supported beneath the trough 18 by two spaced bearings 28—28. An arm 29 extends downwardly from one end of this shaft, and this arm is connected by a link 31 to an arm 32 on the lower end of the pin 23. On the other end of the shaft 27 there is mounted an arm 34 which is connected by a vertical cable 35 to the vertical piston rod 36 of a fluid motor 38. A weight 39 is suspended from the arm 34. The intermediate portion of the shaft 27 is surrounded by a sleeve 41 which is rotatably supported thereon, this sleeve having two projecting arms 42 and 43. The arm 42 is connected by a link 45 to an arm 46 on the lower end of the pin 22.

The arm 43 is connected by a vertical cable 47 to the vertical piston rod 49 of the fluid motor 50. A weight 51 is suspended from the arm 43. The motors 38 and 50 will be provided with suitable and well-known manually operable pilot valves (not shown), so that the weights 39 and 51 can be raised or lowered as desired, thereby swinging the switch blades to either side of the trough.

The billets traveling along the trough 18 tend to interfere with the lateral swinging of the switch blades, and in order to prevent such interference when the blades are to be adjusted I provide means to lift the billets above the blades so that the blades may swing beneath them. For this purpose a rectangular opening 53 is formed in the bottom of the trough 18 somewhat anterior to the free ends of the switch blades, and within this opening a plate 54 is mounted. This plate is secured to a transverse horizontal shaft 55 extending beneath the opening 53 and rotatably supported in two spaced bearings 57-57. On one end of this shaft there is mounted an arm 58 which is connected by a vertical cable 59 to the piston rod 61 of a fluid motor 62. These parts are so arranged that by admitting pressure fluid to the motor 62 through a suitable manually operable pilot valve (not shown) the edge of the plate 54 adjacent the switch blades can be swung upwardly as shown in Fig. 4. This will raise the billets which are traveling across the plate and thus allow the switch blades to be moved beneath the billets to the positions desired, whereupon the plate will be lowered to its original position as shown in Fig. 2.

The operation of the invention will now be apparent from the above disclosure. Assume that as shown in Fig. 1, billets B1, B2 and B3 have been delivered successively to the entrances 15, 16 and 14. The tail end of billet B1 is about to leave the trough, and the operator accordingly will wish to deliver the next billet B4 into the middle entrance 15 to follow closely behind billet B1 and keep this pass line of the rolling mill filled. In preparation for this, the switch blades 19 and 20 have been swung apart, the billets B3 and B2 traveling over the tops of these blades. As the billet B4 is pushed out of the furnace opening and into the trough, the front end of this billet will engage the blade 19 and thereby be deflected under the billet B3 and into the entrance 15. After this billet B4 has been gripped by the rolls, the operator will raise the plate 54, as shown in Fig. 4, and swing the switch blade 20 over into contact with the blade 19, as shown in Fig. 5, thereupon lowering the plate. Then when the next billet B5 is delivered, it will be deflected by the blade 20 beneath the billets B3 and B4 and into the entrance 16 to follow behind the billet B2. After billet B5 has been gripped by the rolls, the plate 24 will again be raised and both switch blades will be swung over to the opposite side of the trough, as shown in Fig. 6, the plate 24 then being lowered. The next billet B6 will thereupon be deflected by the blade 19 into the entrance 14 to follow behind the billet B3. In this manner the operator can continue to direct successive billets into selected entrances and keep all the pass lines of the rolling mill filled, so that the mill may operate at its full capacity.

The apparatus is simple, rugged and comparatively inexpensive.

Having thus described my invention, what I

claim as new and desire to secure by Letters Patent is:

1. Switching apparatus for operation on successively delivered bars traveling endwise comprising a pair of adjacent entrances, a trough leading to the entrances, a laterally movable switch blade arranged within the trough to deflect each bar toward a selected one of said entrances, and means to lift the bars above the top of the blade to allow lateral movement of the blade without interference therewith.

2. Switching apparatus for operation on successively delivered bars traveling endwise comprising a pair of adjacent entrances, a trough leading to the entrances, a switch blade pivotally mounted within the trough and between the entrances, the blade being arranged to swing laterally to either side so that it may serve to deflect each bar toward a selected one of said entrances, and means to lift the bars above the top of the blade to allow the blade to swing without interference therewith.

3. Switching apparatus for operation on successively delivered bars traveling endwise comprising a pair of adjacent entrances, a trough leading to the entrances, a switch blade pivotally mounted within the trough and between the entrances, the blade being greater in height than the bars so that when one bar is resting on the blade a following bar may travel beneath the first bar, the blade being arranged to swing laterally to either side so that it may serve to deflect each bar toward a selected one of said entrances, and means to lift the bars above the top of the blade to allow the blade to swing without interference therewith.

4. Switching apparatus for operation on successively delivered bars traveling endwise comprising a pair of adjacent entrances, a trough leading to the entrances, a switch blade pivotally mounted within the trough and between the entrances, the blade being arranged to swing laterally to either side so that it may serve to deflect each bar toward a selected one of said entrances, a plate located anterior to the blade and beneath the path of the bars, and means to raise the plate and thereby lift the bars above the top of the blade to allow the blade to swing without interference therewith.

5. Switching apparatus for operation on successively delivered bars traveling endwise comprising a pair of adjacent entrances, a trough leading to the entrances, a switch blade pivotally mounted within the trough and between the entrances, the blade being greater in height than the bars so that when one bar is resting on the blade a following bar may travel beneath the first bar, the blade being arranged to swing laterally to either side so that it may serve to deflect each bar toward a selected one of said entrances, the trough having an opening in its bottom wall anterior to the blade, a plate mounted in the opening, and means to raise the plate and thereby lift the bars above the top of the blade to allow the blade to swing without interference therewith.

6. Switching apparatus for operation on successively delivered bars traveling endwise comprising more than two entrances arranged in a horizontal row, a trough leading to the entrances, switch blades pivotally mounted within the trough and one less in number than the entrances, each blade being located between a pair of adjacent entrances and being greater in height than the bars so that when one bar is resting on the blade

a following bar may travel beneath the first bar, means to swing the blades toward either side of the trough so that they may serve to deflect each bar toward a selected entrance, a plate located anterior to the blades and beneath the path of the bars, and means to raise the plate and thereby lift the bars above the tops of the blades to allow the blades to swing without interference therewith.

7. Switching apparatus for operation on successively delivered bars traveling endwise comprising more than two entrances arranged in a horizontal row, a trough leading to the entrances, switch blades pivotally mounted within the trough and one less in number than the entrances, each

blade being located between a pair of adjacent entrances and being greater in height than the bars so that when one bar is resting on the blade a following bar may travel beneath the first bar, means to swing the blades toward either side of the trough so that they may serve to deflect each bar toward a selected entrance, the trough having an opening in its bottom wall anterior to the blades, a plate pivotally mounted in the opening, and means to swing the plate upwardly and thereby lift the bars above the tops of the blades to allow the blades to swing without interference therewith.

JOSEPH M. O'MALLEY.