

June 10, 1930.

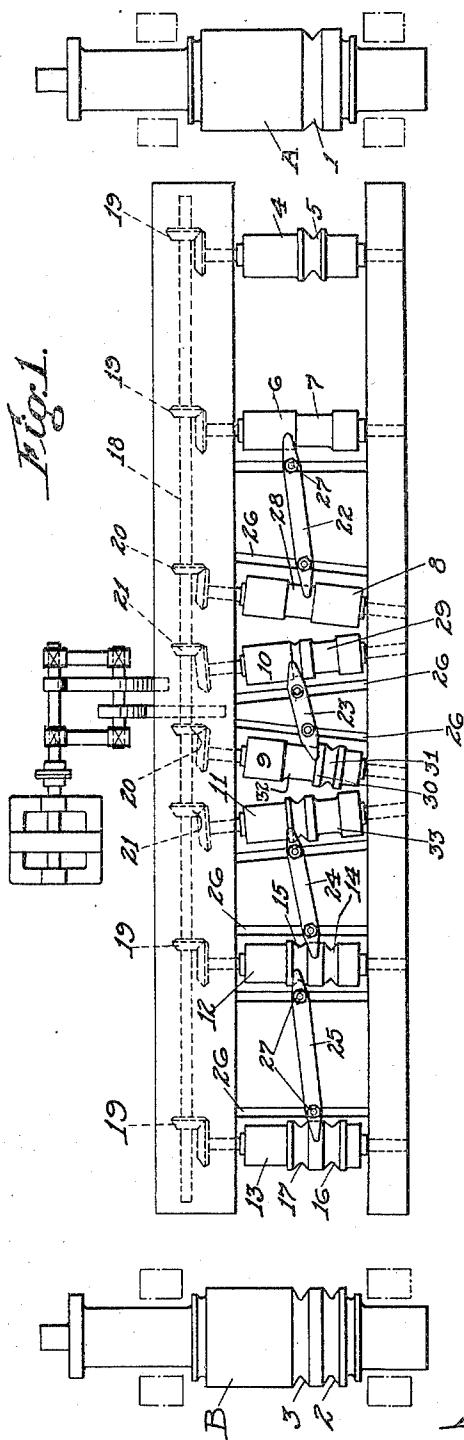
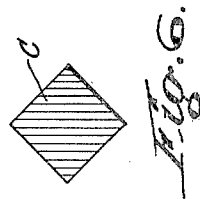
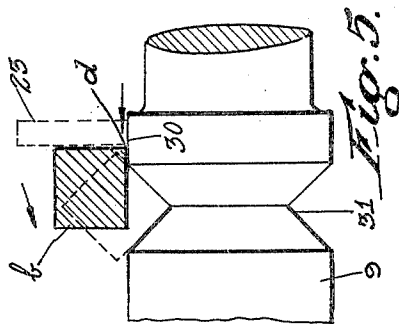
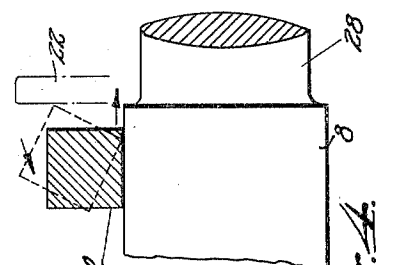
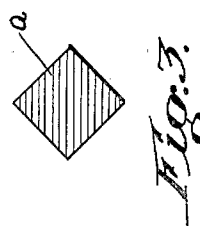
E. J. QUINN

1,762,307

CONVEYING MECHANISM

Filed April 9, 1927

2 Sheets-Sheet 1



INVENTOR.
Edward J. Quinn
BY *Chas. W. Kennedy*
attorney

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E. J. QUINN

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2 Sheets-Sheet 2

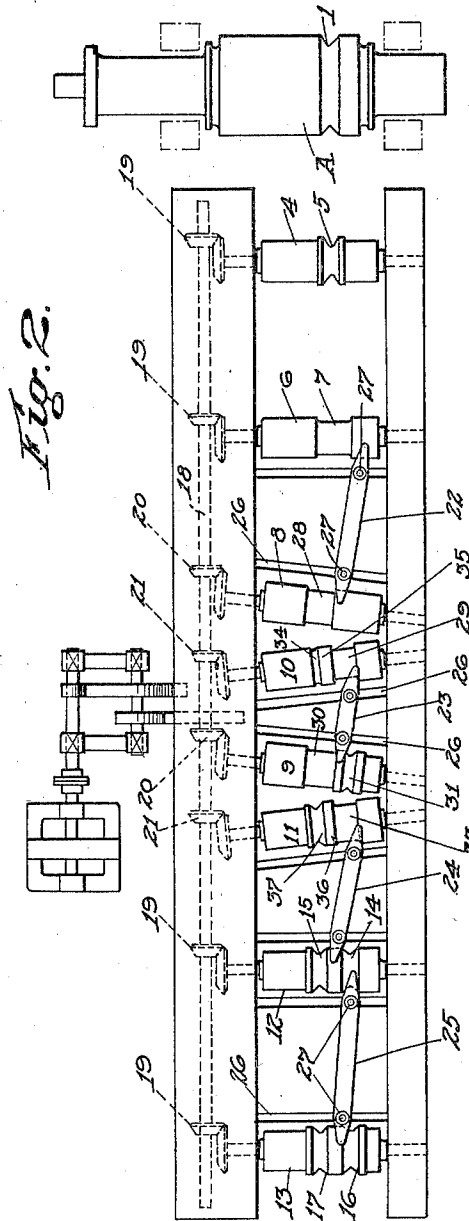


Fig. 2.

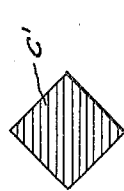


Fig. 10.



Fig. 9.

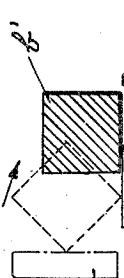


Fig. 8.



Fig. 7.

Inventor:
Edward J. Quinn
By E. W. Kennedy
Attorney

UNITED STATES PATENT OFFICE

EDWARD J. QUINN, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO MORGAN CONSTRUCTION COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

CONVEYING MECHANISM

Application filed April 9, 1927. Serial No. 182,448.

The present invention relates to conveying mechanism, as used particularly for the manipulation of hot steel billets in process of being rolled in a rolling mill. The invention resides in a novel and highly useful interposition, between successive reducing passes of a rolling mill, of certain conveyor rolls adapted, by their construction and arrangement, to impart a definite rotative or angular movement to each billet, in the act of transporting it, longitudinally, between the roll stands that provide said successive reducing passes, without any interruption of its movement.

It is well known that the fiber structure of rolled steel products is improved by presenting for contact, with successive reducing passes, different surfaces of the billet or bar undergoing reduction. To this end, the present invention automatically secures the requisite turning movement of the billet in the entire absence of twist guides, or any deforming influences whatsoever, and at the same time, affords a selective means for determining the direction of rotation, whereby to present the billet to one or the other of a pair of adjacent reducing passes in the stand of rolls to which delivery is made. The various features of the invention are fully pointed out hereinafter, reference being had to the accompanying drawings, in which—

Figs. 1 and 2 are top plan views of mechanism embodying the invention, shown in two different conditions of operation.

Figs. 3, 4, 5 and 6 are cross sectional views illustrating successive positions assumed by the billet in its movement by the arrangement of mechanism shown in Fig. 1.

Figs. 7, 8, 9 and 10 are cross sectional views illustrating successive positions assumed by the billet in its movement by the arrangement of mechanism shown in Fig. 2.

Like reference characters refer to like parts in the different figures.

Figs. 1 and 2 illustrate successive spaced roll stands A and B of a rolling mill. As shown, the stand of rolls A provides a reducing pass 1, of such shape as to produce a billet of substantially square cross section, with said billet emerging from said pass in a diagonal position, as clearly shown at *a*, Figs. 3

and 7. The roll stand B provides two reducing passes 2 and 3, offset slightly on either side from the center line of reducing pass 1; these reducing passes 2 and 3 are shaped similarly to the pass 1, to roll the billet in a diagonal position, and are adapted to roll the billet to a cross section somewhat smaller than that produced by the pass 1.

Interposed between the roll stands A and B is a series of conveyor rolls adapted to receive the billet from the pass 1 and to deliver it either to the pass 2, or the pass 3, as may be desired; these conveyor rolls and their associated devices are so constructed and arranged that in either case said billet, in its longitudinal movement on said conveyor rolls, will roll or tip sidewise to an extent corresponding to a 90° rotation on its axis, thus presenting its surfaces diagonally to the pass 2 or 3, as the case may be, but in a different angular relation from that obtaining in the pass 1.

The first roll of this series of conveyor rolls is a roll 4, whose periphery provides a V-shaped groove 5, the sides of which are substantially alined with the lower portions of reducing pass 1; thus the groove 5 of roll 4, engaged by the billet as it emerges from reducing pass 1, serves to maintain said billet in its diagonal position *a*, Figs. 3 and 7, even after the last end of said billet has been discharged from the pass 1. Beyond the conveyor roll 4 is a second conveyor roll 6, the latter having its billet-engaging surface in the form of a wide shallow groove 7, for a purpose to be hereinafter described.

The next conveyor roll of the series is a roll 8, whose axis is skewed with reference to the line of delivery of the billet from reducing pass 1; a mate to this roll 8 is a similarly skewed roll 9, which latter is spaced forwardly of roll 8, so as to make room for an oppositely skewed roll 10. Said skewed roll 10 has as its mate a similarly skewed roll 11, placed forwardly of the skewed roll 9, and in advance of these two pairs of alternately oppositely skewed rolls 8, 9 and 10, 11 are disposed a pair of rolls 12 and 13, whose axes, like those of rolls 4 and 6, are normal to the line of delivery of the billet from pass

1; said rolls 12 and 13 are provided, respectively, with pairs of V-shaped grooves 14, 15 and 16, 17, alined with each other and with the lower portions of the reducing passes 2 and 3, respectively, of roll stand B.

The rolls 4, 6, 8, 9, 10, 11, 12 and 13 are driven in unison in any suitable manner, as by means of bevel gearing connecting their spindles with a common driving shaft 18, said bevel gearing in the case of the parallel normally disposed rolls 4, 6 and 12, 13 being indicated by the numerals 19, 19, and in the case of the oppositely skewed pairs of rolls 8, 9 and 10, 11, respectively, being indicated by the numerals 20, 20 and 21, 21. As shown in Figs. 1 and 2, suitable adjustable guiding members, here shown as four in number, are provided in the spaces between certain adjacent conveyor rolls of the series, namely the guiding device 22 between the rolls 6 and 8, the guiding device 23 between the rolls 10 and 9, the guiding device 24 between the rolls 11 and 12, and the guiding device 25 between the rolls 12 and 13. These guiding devices may be adjusted, angularly and laterally, with reference to transverse supporting bars 26, 26, to which they are detachably secured by means of bolts 27, 27, or the like; in the position of adjustment shown in Fig. 1, they cooperate with the conveyor rolls, as hereinafter described, to bring about the billet's movement from the reducing pass 1 of stand A to the reducing pass 2 of stand B, with the desired turning of said billet through 90°; in the position of adjustment shown in Fig. 2, said guiding devices, as hereinafter described, cooperate with the conveyor rolls to bring about the movement of the billet from the reducing pass 1 of stand A to the reducing pass 3 of stand B, with a 90° turning movement in the opposite direction.

Referring first to Figs. 1, 3, 4, 5 and 6, each billet, as its last end emerges from the reducing pass 1, has its longitudinal movement continued and its diagonal position maintained by the conveyor rolls 4 and 6, and before the first end of said billet reaches the conveyor roll 8, said first end may be deflected slightly by the guiding device 22, Fig. 1, to keep said first end clear of the roll's wide shallow groove 28, to be hereinafter referred to. Thus the lower corner of the billet section comes onto the roll 8 at an acute angle, due to the skew of said roll and also to the deflection caused by the guiding device 22, and the result of this is to draw said lower corner rapidly toward the groove 28; but, owing to the sidewise contact of the billet with the guiding device 22, which prevents sidewise bodily movement of the billet in response to the action of this roll, the effect of this shifting of the lower corner of the billet section is to tip the billet counterclockwise well toward its flat position *b*, shown

in Fig. 4, even before its last end has emerged from the V-shaped groove 5 of conveyor roll 4.

Thus initially, through the cooperation of skewed roll 8 and guiding device 22, a counterclockwise rocking of the billet through 45° into its flat position *b*, Fig. 4, is secured, and in this flat position, said billet passes over the roll 10 unaffected by the latter, because of overlying the wide shallow groove 29 of said roll 10. Beyond the roll 10, the billet encounters guiding device 23 and the surface 30 of skewed roll 9, the latter being skewed in the same direction as roll 8, and this surface 30 lying between a V-shaped groove 31 and a wide shallow depression 32 of said roll 9. Surface 30 and guide 23 simply insure the accomplishment of the initial tipping of the billet into flat position by performing simultaneously, at another point, the same action as the roll 8 and guide 22 above described; some billets, especially short ones, would not require this additional influence to make them tip over through 45° from a diagonal into a flat position, while other billets, especially longer ones would require it. In any event, the skewed rolls 8 and 9 and the guides 22 and 23 will invariably produce the desired result, since the last end of the billet leaves the groove 5, and the deflection above described, as accomplished by said guides 22 and 23, will be permitted, because the groove 7 of roll 6 is wide enough to leave said last end free to move laterally in either direction.

Beyond the skewed roll 9, the billet, traveling flatwise, passes unaffected over roll 11, skewed in the same direction as roll 10, because said billet overlies the wide shallow groove 33 of said roll 11, which groove 33 corresponds to the groove 29 of roll 10; both rolls 10 and 11 thus are wholly inoperative on the billet during the entire phase of the operation of the apparatus as illustrated by the arrangement of parts shown in Fig. 1. As the billet supported flatwise is carried forward on the rolls 8 and 9, it encounters successively the guiding devices 24 and 25, which effectively resist any tendency for it to move sidewise inwardly of the apparatus, and instead direct it onto the rolls 12 and 13 in such a manner as to cause it, while hugging said guides, to overlie the V-shaped grooves 14 and 16, respectively, of said rolls. In the same way, the guide 23 maintains another portion of the billet in overlying relation to the V-shaped groove 31 of skewed roll 9, as shown in Fig. 5, and finally, as the last end of the billet, moving flatwise on the surface of roll 8, leaves said roll, the billet, throughout its whole length, has been thrust so far outwardly by the guides 23, 24 and 25 that it overbalances and topples counterclockwise into substantially alined V-shaped grooves 31, 14 and 16, from posi-

tion *b* to position *c*, Fig. 5, thus completing another turning movement of 45°, to aline the front end of the billet, for entrance diagonally to the diagonal reducing pass 2 of the stand of reducing rolls B, as shown in Fig. 6.

Referring now to Fig. 2, the guides 22, 23, 24 and 25 are shown in that position of adjustment, relative to their supporting bars 26, 26, which will effect delivery of a billet to the reducing pass 3 of roll stand B, with a 90° clockwise turning movement of the billet, accomplished in two stages or steps of 45° each. Under these conditions, the billet, as it emerges from reducing pass 1, has its diagonal position maintained as before by the V-shaped groove 5 of conveyor roll 4, and the guide 22 produces sufficient inward deflection of the front end of said billet to direct it unaffected across the wide groove 28 of skewed roll 8, and onto the cylindrical surface 35 of the oppositely skewed roll 10. Said surface 35 has adjacent thereto a V-shaped groove 34, for a purpose to be hereinafter described; in this particular phase of the operation of the apparatus, the skewed rolls 10 and 11, in cooperation with the guiding devices 22, 23, 24 and 25, secure the desired turning movement of the billet, while the other oppositely skewed rolls 8 and 9, by virtue of their wide grooves 28 and 30, underlying the billet, remain wholly inoperative.

While I have shown and described the apparatus of the invention in connection with the handling and turning of stock of square cross section, it is to be understood that this is merely illustrative, and that stock of various other sections is readily susceptible of the same handling and turning, in the course of its forward movement on conveyor rolls, without departing from the principles of the invention as set forth in the following claims.

I claim:

1. Conveying mechanism, comprising a series of conveyor rolls, for continuously forwarding to one stand of rolls of a rolling mill the stock received from a preceding stand of rolls of said mill, in combination with guiding means for cooperation with said conveyor rolls to procure, simultaneously with the forwarding of said stock, a predetermined turning movement of said stock about its own axis, said guiding means being shiftable from one position to another to initiate said turning movement in one direction or the other, thereby to aline said stock with one or the other of a pair of reducing passes in said first-mentioned stand of rolls.

2. The combination with a reducing pass of a rolling mill, adapted for the diagonal delivery of stock of rectangular cross section, of a series of conveyor rolls for continuously forwarding said stock to a subsequent reducing pass of said mill, certain of said conveyor rolls in the path of the lower edge or corner of said diagonally delivered stock having their axes at an acute angle to the direction of forward movement of the stock, whereby to initiate sidewise tipping of said stock in a predetermined direction.

3. The combination with a reducing pass of a rolling mill, adapted for the diagonal delivery of stock of rectangular cross section, of a series of conveyor rolls for continuously forwarding said stock to a subsequent reducing pass of said mill, one of said rolls being grooved, to maintain initially a cornerwise support of said stock, and a subsequent roll having its axis at an acute angle to the direction of movement of the stock, so that cornerwise engagement of the stock with its surface will procure sidewise tipping from said position of cornerwise support, in a predetermined direction.

4. Conveying mechanism, comprising a series of conveyor rolls, for continuously forwarding to one stand of rolls of a rolling mill the stock received from a preceding stand of rolls of said mill, certain of said conveyor rolls having their axes skewed to make an acute angle with the direction of forward

The action of skewed rolls 10 and 11 and guides 22 and 23 in the arrangement shown in Fig. 2 is the same as that of the skewed rolls 8 and 9 and said guides in the arrangement shown in Fig. 1,—namely to tip the billet through 45° into a flat position; in this case, from the position *a*, Fig. 7, clockwise, into the position *b'*, Fig. 8. As before, the effect is to draw, toward said guides 22 and 23, the lower corner or edge of the diagonally emerging billet, and owing to the resistance offered by said guides to sidewise movement of the billet, it is inevitable that this drawing action, exerted on the lower corner of the billet, will cause said billet to tip into said flat position. In said flat position, the billet passes unaffected over the grooves or depressions 28 and 30, respectively, of the skewed rolls 8 and 9.

The second stage of clockwise turning movement through an additional 45° is accomplished, the same as before described, by the action of guides 23, 24 and 25 in forcing the billet so far over on the rolls 10, 11, 12 and 13, Fig. 2, that it overbalances and topples clockwise into the substantially alined grooves 34, 37, 15 and 17, respectively, of said rolls, as shown at *c'*, Fig. 9, thus to aline the front end of said billet for entrance diagonally to the diagonal reducing pass 3 of the stand of reducing rolls B, as shown in Fig. 10. The special groove 34 of skewed roll 10 is provided in this instance to offset the fact that said roll is nearer to the reducing

movement of said stock, and guiding means cooperating with said skewed rolls to procure axial turning movement of said stock in a predetermined direction without interruption of its forward movement on said series of rolls.

5. Conveying mechanism, comprising a series of conveyor rolls for the longitudinal movement of stock which is initially delivered onto said rolls longitudinally, with its section unstably supported and free to tip in either direction, certain of said rolls being skewed, with their axes at an acute angle to the direction of movement of the stock, and guiding means cooperating with said skewed rolls to cause the tipping movement of the stock to occur in a predetermined direction.

6. Conveying mechanism, comprising a series of conveyor rolls for the longitudinal movement of stock which is initially delivered onto said rolls longitudinally, with its section unstably supported and free to tip in either direction, certain of said rolls being skewed, with their axes at an acute angle to the direction of movement of the stock, and guiding means adapted to oppose the bodily sidewise movement of the stock by said skewed rolls, thereby to cause the tipping movement of the section to take place in a direction away from said guiding means.

7. The combination with a reducing pass of a rolling mill, from which stock of rectangular cross section is delivered in diagonal or cornerwise-supported position, of a series of conveyor rolls for continuously forwarding said stock to a subsequent reducing pass of said mill, certain of said conveyor rolls being skewed to the line of delivery of said stock, whereby said stock's cornerwise engagement therewith produces lateral shifting and a consequent initial tipping of the stock section, in a predetermined direction, from said diagonal position to a flat position, and means cooperating with certain other of said conveyor rolls to procure a subsequent tipping movement of the stock section in the same direction from said flat position to another diagonal position.

Dated this second day of April, 1927.

EDWARD J. QUINN.