Dec. 10, 1935. W. R. CARROLL 2,023,913

ROD MILL

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Fig.1.

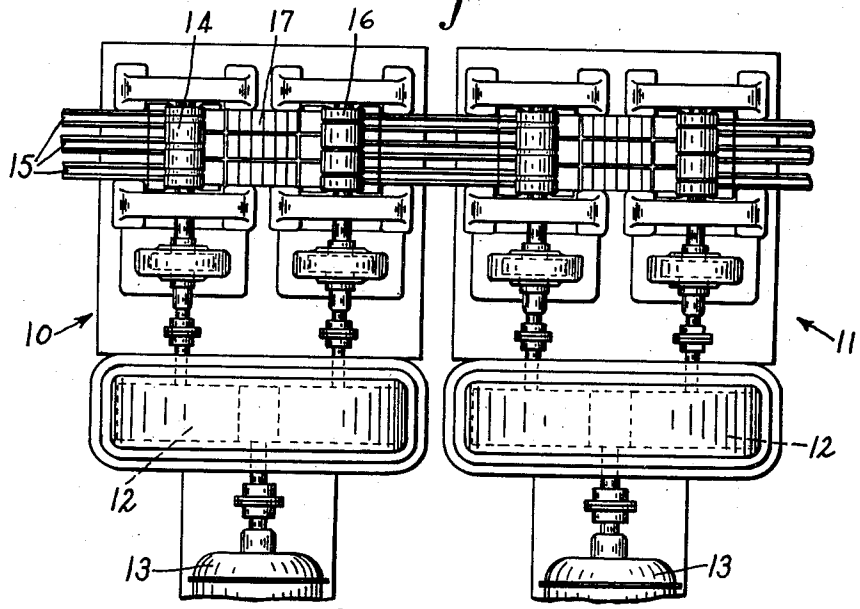


Fig.2.

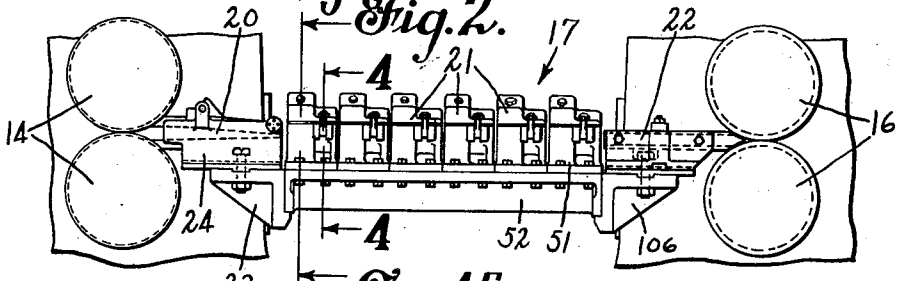


Fig.15.

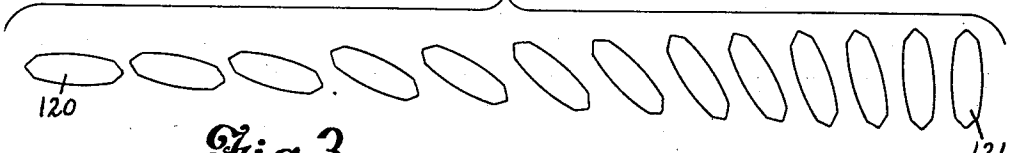
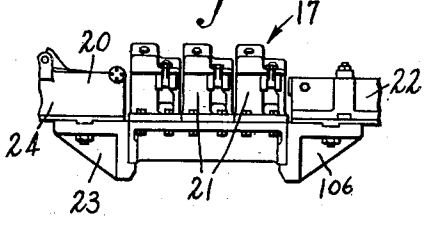


Fig.3.



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Fig. 4.

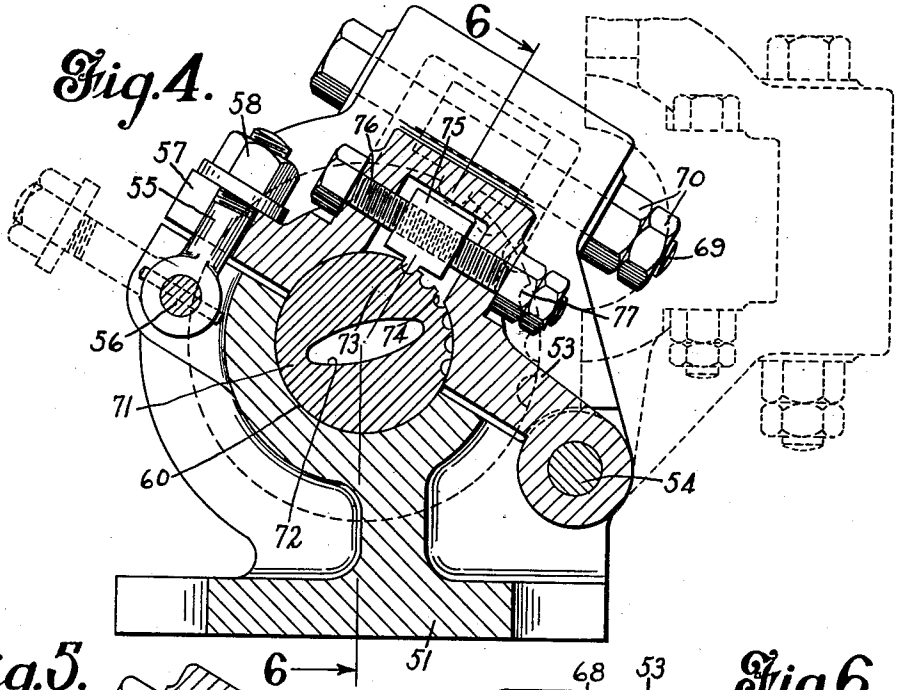


Fig. 5.

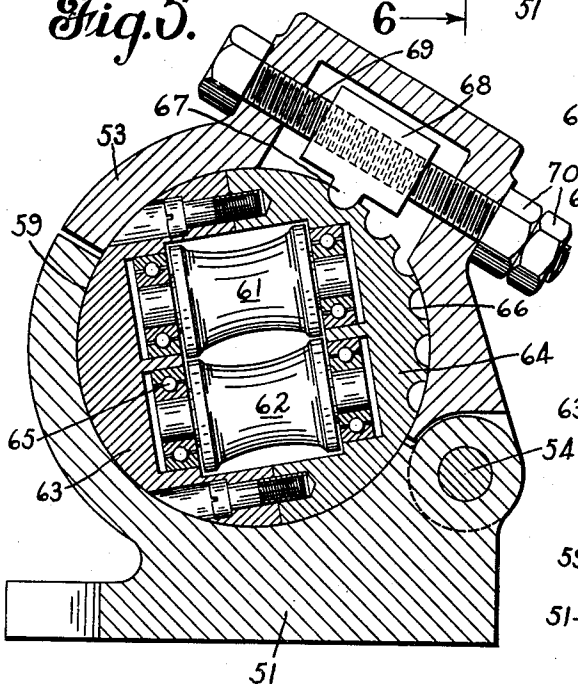
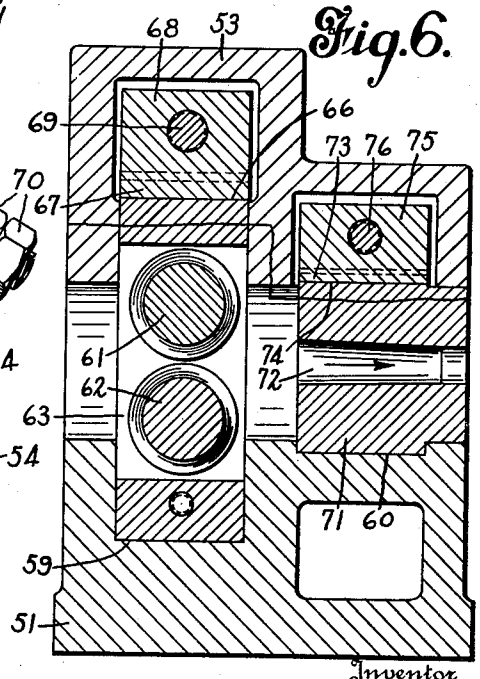


Fig. 6.



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ROD MILL

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Fig. 7.

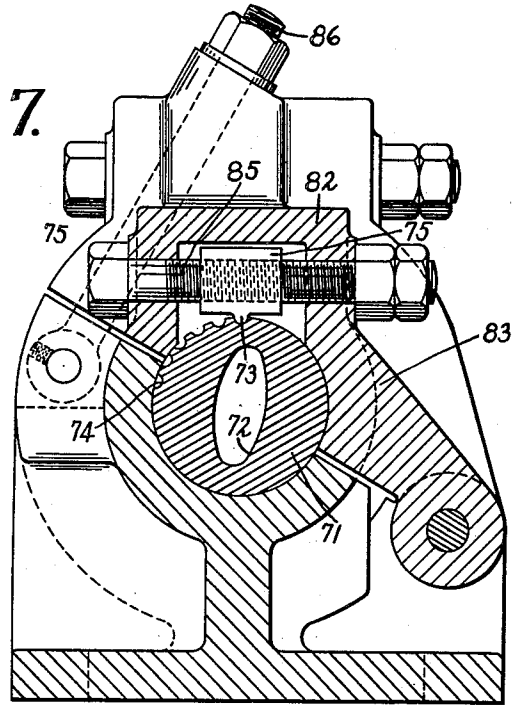


Fig. 16.

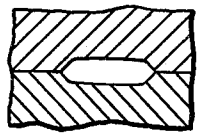


Fig. 17.

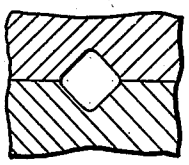


Fig. 8.

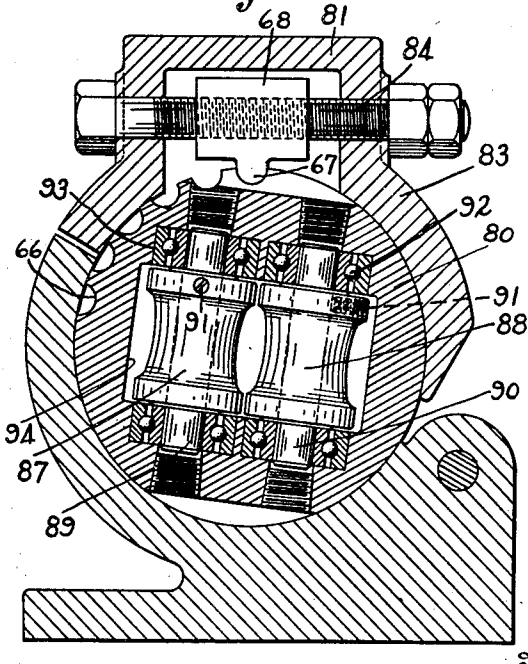
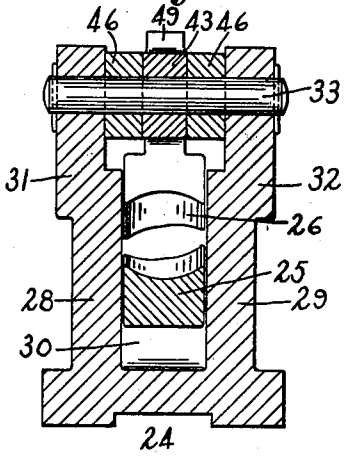


Fig. 10.



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Fig. 9.

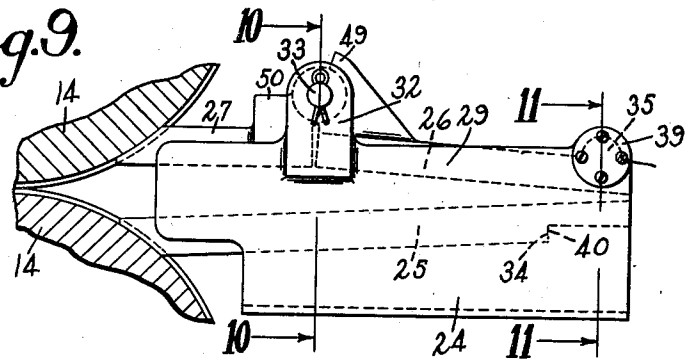


Fig. 12.

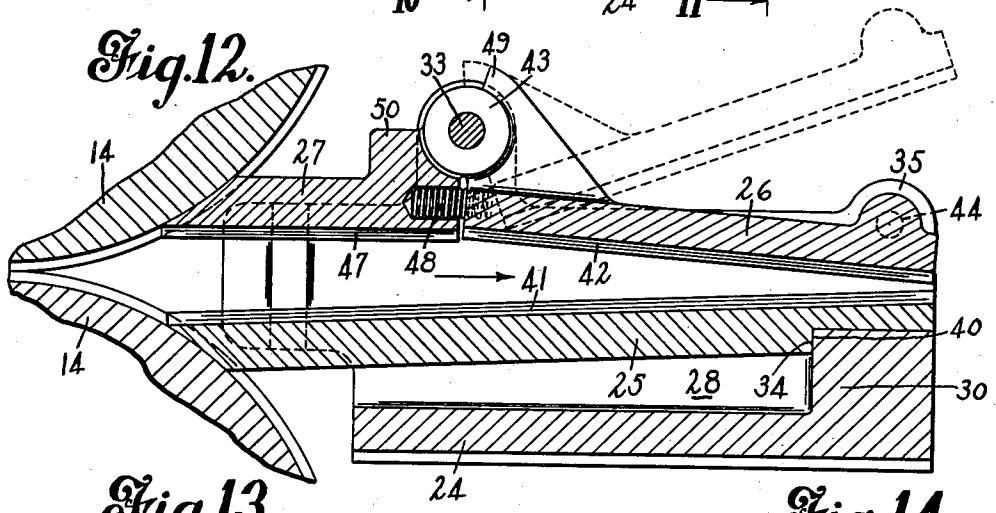


Fig. 13.

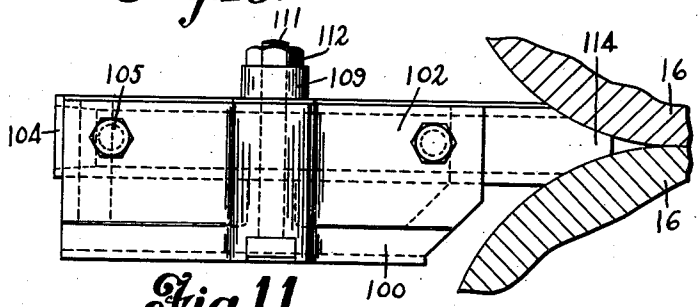


Fig. 14.

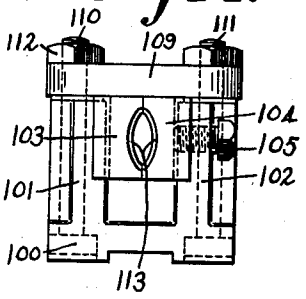
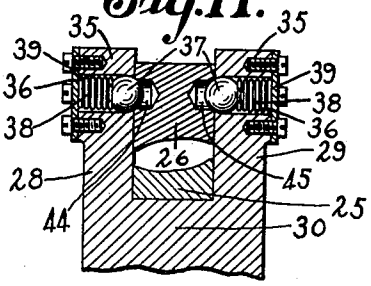


Fig. 11.



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Patented Dec. 10, 1935 2,023,913

UNITED STATES PATENT OFFICE

2,023,913

ROD MILL

Willard R. Carroll, New Haven, Conn., assignor to Farrel-Birmingham Company, Incorporated, Ansonia, Conn.

Application December 5, 1929, Serial No. 411,826

28 Claims. (Cl. 80—53)

This invention relates to rod mills of the type wherein a billet of metal of comparatively large diameter is passed between a series of rolls, and reduced in diameter to form a rod or bar of relatively small diameter. In mills of this type, the material is generally broken down gradually in steps during which the bar varies in the form of its cross section. This invention pertains particularly to a series of steps in the rolling of rods where the material is given an elongated cross section as it passes through one set of rolls, and is then given a cross section of substantially square shape as it passes through the next succeeding set of rolls. In order to operate efficiently, it is desirable that means be provided between these sets of rolls whereby the flattened bar is turned substantially at right angles before it enters the rolls that give it a square shape.

One object of this invention is to provide an improved rod mill that will be especially efficient in use and which, due to its structure, will permit adjacent sets of rolls to be disposed closely adjacent each other whereby each tandem so formed will require but a minimum amount of floor space.

Another object is to provide a rod mill with guide mechanism for the material being rolled, whereby the efficiency of the mill will be greatly increased.

Still another object is to provide a tandem mill comprising two sets of rolls with a guiding mechanism for the material being rolled thereby and passing therebetween, that will receive the material from one set of rolls and turn it during its passage between these sets of rolls into the proper position to be received into the other set of rolls.

A further object is to provide a guiding mechanism for a rod mill, that is adapted to readily permit the material being passed therethrough to be released therefrom.

A still further object of this invention is to provide a guiding mechanism for the rod mill, that is adapted to permit the material passing therethrough to escape therefrom should its passage be blocked or interrupted between the sets of rolls through which it is passing.

To these and other ends, the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a plan view of a portion of a rod mill embodying the features of this invention;

Fig. 2 is a side view of the same;

Fig. 3 is a side view showing a slightly modified arrangement of parts;

Fig. 4 is an enlarged sectional view taken on line 4—4 of Fig. 2, of one of the rod turning guides;

Fig. 5 is an enlarged sectional view taken on line 5—5 of Fig. 2, of the same rod turning guide;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 4;

Fig. 7 is a view similar to Fig. 4, but showing a rod turning guide of slightly modified form;

Fig. 8 is a sectional view similar to Fig. 5, of the same rod turning guide as shown in Fig. 7;

Fig. 9 is an enlarged side view of the receiving end of a rod guiding mechanism;

Fig. 10 is a sectional view taken on line 10—10 of Fig. 9;

Fig. 11 is a sectional view taken on line 11—11 of Fig. 9;

Fig. 12 is an enlarged longitudinal section of the portion of the rod guiding mechanism shown in Fig. 9;

Fig. 13 is a side view of the delivery end of the rod guiding mechanism;

Fig. 14 is an end view of the same;

Fig. 15 is a diagrammatic view showing the various positions of a rod or bar during its passage through the guiding mechanism from one set of rolls to another; and

Figs. 16 and 17 are sectional views of the passes of the receiving and discharging rolls, respectively, of a dual roll set.

The rod mill selected to illustrate the features of this invention generally comprises sets of rolls arranged in tandem. Two dual sets 10 and 11 of rolls are shown in Fig. 1, but this particular number of sets is not of any significance. Through suitable gearing 12 each set of four rolls is driven by an electric motor 13. The rods or bars being rolled enter the first pair of rolls 14 of set or unit 10, from guideways 15, after having been acted upon by a plurality of preceding sets of rolls (not shown). After passing through the rolls 14 the rods are directed toward and into the other pair of rolls 16 of the unit 10. After passing through the unit 10, the rods pass through the unit 11 and in some cases through following units. The rods or bars being rolled from a billet of metal are preferably alternately formed during the reduction thereof into elongated cross sectional shape with tapering side edges and into square shape by the respective pairs of rolls of each set. In the arrangement illustrated, an elongated form is produced by the first pair of rolls of a unit, such as rolls 14, and the square shape by the second pair 16 of said unit. In rolling an elongated shape, the major axis is horizontal, preferably, and in rolling that form into a square it is desirable to have the bar enter the rolls (16) with the longer dimension of the cross section vertically disposed. It is necessary, therefore, to twist or turn the flattened rod or bar substantially 90° before it is presented to the bite of the square-forming rolls.

An improved guiding device 17 that will effi-

ciently twist or turn the bars the required amount in order to properly present the same to the square-shaped forming rolls 16, and which will do this without unduly straining or otherwise affecting the material of the rods, and which is readily adjustable to suit conditions in the rolling operations, is provided between the sets of rolls 14 and 16 of each tandem. Three of these guiding devices or mechanisms are shown in Fig. 1, disposed between rolls 14 and 16, the latter being, in this instance, adapted to roll three rods or bars simultaneously. As these guiding mechanisms are similar in structure and operation, only one will be described in detail.

The guiding mechanism 17 generally comprises a receiving guide 20, a plurality of turning guides 21, and a delivering guide 22. In Figs. 1 and 2, a set of six turning guides 21 is shown, while in Fig. 3 a set of only three is illustrated. The number of turning guides may vary, it being necessary to provide only a sufficient number to meet the requirements of the size of the rod or bar, the material thereof, and other similar conditions.

The receiving guide 20, shown more particularly in Figs. 2 and 9 to 12 inclusive, comprises a base 24, which is mounted upon a bracket 23, that is secured to the supporting frame for the rolls 14, a lower guide member 25 and an upper guide member, the last in this instance being formed in two parts, 26 and 27. The base 24 is provided with parallel longitudinally extending side plates 28 and 29, a partially closed end 30, and a pair of opposed uprights 31 and 32, one of which extends upwardly from each side plate 28 and 29 and forms bearings for a pivot pin 33. An internally directed shoulder 34 is provided on the end portion 30. One of a pair of opposed ears 35 is formed upon an end of each of the side plates 28 and 29, adjacent and above the end portion 30. Each of the ears 35 is provided with a transversely directed opening 36, which is slightly reduced in diameter at the opposed interior sides of the ears sufficiently to prevent a plunger 37 from passing therethrough. The plunger 37, in this instance, is in the form of a ball and is constantly urged toward the reduced portion of the opening 36 by a spring 38, so that a portion of the plunger protrudes through the opening for a purpose to be hereinafter described. The spring 38 and plunger 37 are retained in place by a plate 39, secured upon the outer side of each of the ears 35.

The lower guide member 25 fits between the side plates 28 and 29, and is provided with a shoulder 40 upon its under surface adjacent one of its ends. The shoulder 40 is adapted to abut against the shoulder 34, whereby the member 25 is retained against longitudinal movement in one direction and away from the rolls 14. The other end of the member 25 is formed to fit the lower one of the rolls 14 and to receive and guide the rolled bar upon its upper surface in a groove 41 provided therein. The groove 41 is shaped to have substantially the same contour as that of the bar emerging from between rolls 14. The upper guide member 26 is provided with a similarly formed groove 42 upon its under surface which cooperates with the groove 41 to form a passageway through which the bar may readily pass. One end of the member 26 is provided with an ear 43, that is journaled on the pivot pin 33, whereby the member 26 is hinged to the base 24 and may swing relatively thereto. The other end of member 26 is provided with transversely directed recesses 44 and 45, one on either side thereof. The recesses 44 and 45 are so disposed that the afore-mentioned protruding portions of the plungers 37 will be received therein when the member 26 is in proper bar guiding position, relatively to the member 25. The members 25 and 26 when in proper bar guiding position with respect to each other, as shown in Fig. 12, are relatively close together at one end and are spaced apart at the other, whereby a passageway is formed for the bar that gradually diminishes in depth toward the delivering end of the guide member 20, whereat the aligned grooves 41 and 42 of the converging upper and lower guideways form a restricted passageway to properly direct the bar toward the turning guides 21. Preferably the laterally elongated pass formed between grooves 41 and 42 is tipped transversely at a slight angle to the horizontal adjacent the delivering end of the guide member 20, as shown in Figs. 10 and 11, whereas the long axis of the pass is substantially horizontal adjacent the rolls 14.

A member 27 forming part of the upper guideway is also pivoted to the pivot pin 33, which passes through ears 46 formed on one end of this member. (Fig. 10.) The other end of member 27 is formed to fit the upper one of the rolls 14. The member 27 is also provided with a longitudinally extending groove 47, which is disposed with its longer lateral dimension horizontal to cooperate with the portion of groove 41 that is adjacent the lower roll 14. The ends of members 26 and 27 are disposed closely adjacent each other in opposed relation and adjacent and below the pivot pin 33. A spring 48 is disposed between the opposed ends of said members to urge the same apart. The tendency of spring 48 to urge these members apart insures the engagement of the rollward end of member 27 with the upper roll 14. Cooperating stop lugs 49 and 50 provided on members 26 and 27 respectively, are provided to limit the vertical swinging movement of member 26 about the pivot pin 33.

Each bar turning guide 21 includes a frame member 51, all of these frames being supported upon a common bracket 52 that extends between the frames in which the rolls 14 and 16 are journaled. Each frame member 51 is provided with a cover 53, which is hingedly secured thereto by a pivot pin 54 (Figs. 4 and 5) and may be secured in closed position by means of a swingable bolt 55, pivoted at 56, to the frame 51, and which is adapted to swing into a notch 57 formed in the cover 53, being retained therein by a nut 58. A comparatively large, round and longitudinally extending opening 59 is provided in each of the turning guides 21, adjacent the receiving end thereof, which opening is formed partially in the frame 51 and partially in the cover 53. Communicating with the opening 59 is a smaller one 60, which is likewise partially formed in both frame 51 and cover 53.

A pair of bar engaging rollers 61 and 62 are journaled in secured-together portions of a cylindrically formed member, which fits within the opening 59 in the frame 51 and cover 53, as shown in Fig. 5. The rollers 61 and 62 have their peripheries grooved to conform to the contour of the bar passing therethrough and are freely rotatable, being provided with ball bearings 65. The cylindrical member, which in this instance, is formed of portions 63 and 64, is provided with axially directed notches 66 that traverse the periphery of portion 64 and are equally spaced

part peripherally thereabout. A lug 67 is provided upon a transversely slidable adjusting block 68, which is housed in a part of the cover 53. The lug 67 is adapted to be received in any one of the notches 66, which are so arranged with respect to the axes of the rollers 61 and 62 that these rollers may be positioned with the major axis of the opening formed therebetween disposed at varying angles from the horizontal.

An adjusting screw 69 threadingly cooperates with block 68 and when rotated moves the block 68 tangentially with respect to the portions 64, which movement, due to the engagement of the lug 67 in one of the notches 66, will swing the cylindrical roller carrying member to finely adjust the angular disposition of the aforesaid bar receiving opening formed between the opposed faces of the rollers 61 and 62. Suitable nuts 70 are provided to lock the screw 69 in position. The cover 53 may be caused to clampingly engage the cylindrical roller supporting member to retain it in its adjusted position, by tightening the nut 58 of the cover securing bolt 55.

A cylindrically formed member 71 is similarly disposed in the opening 60, provided in the frame 51 and cover 53, and is also adapted to be clamped therein by means of the engagement of the cover 53 therewith upon tightening the nut 58 upon the bolt 55. The member 71 is provided with a flared bar receiving opening 72, the larger end of the flared opening being disposed adjacent the rollers 61 and 62, in order to readily permit the entrance of the bar therein. The member 71 is rotatably adjustable within the opening 60, by the cooperation of a lug 73 with peripherally spaced apart notches 74 formed in its periphery. The lug 73 is formed upon a slidable block 75, which is detachably housed in a portion of the cover 53, and is adapted to be moved by means of a screw 76, which is provided with lock nuts 77.

The plurality of notches provided in both of the above described cylindrical members permits the setting of the same to dispose the openings therein at various angles, whereby when a plurality of the bar turning guides 21 are provided between sets of rolls, such as 14 and 16, the bar may be turned gradually from a horizontal position to a vertical one. The provision of the adjusting screws 69 and 76, and cooperating lugs 67 and 73 and notches 66 and 74, permits of a fine adjustment when such is desired. The provision of a readily openable cover 53, permits the removal of the roller supporting member and guide member 71 from the frame 51, either for resetting the lugs in different notches or to replace these members by others when this is desirable.

The slightly modified form of turning guide shown in Figs. 7 and 8, differs in structure from that shown in Figs. 4, 5, and 6, in that the cylindrical member 80 thereof is made in one piece instead of two and in that the portions 81 and 82 of the cover 83, which house the adjusting screws 84 and 85 respectively, are disposed horizontally instead of at an angle to the horizontal. The cover securing bolt 86, due to this difference in disposition of the portions 81 and 82, is, therefore, somewhat longer than the bolt 55, but is adapted to operate in a similar manner.

The provision of a one-piece ring-shaped roller carrying member 80, provides a somewhat more rigid structure and may be more accurately and readily formed during the manufacture thereof. The rollers 87 and 88, in this instance, are separable from their shafts 89 and 90 respectively, being secured thereto by set screws 91. Suitable ball bearings 92 are provided for the shafts 89 and 90. The ball bearings 92 are seated in recess 93 formed in the walls of an opening 94, in which the rollers 87 and 88 are disposed.

The delivery guide 22 comprises a base member 100, between the vertically disposed side portions 101 and 102 of which is clamped a pair of guide blocks 103 and 104, by means of clamp screws 105. (Fig. 14.) The base 100 is supported adjacent rolls 16 upon a bracket 106 that is suitably secured to the machine frame in which the rolls 16 are journaled. The blocks 103 and 104 are retained in place against vertical displacement by means of a strap 109 that is secured to the side portions 101 and 102 by means of bolts 110 and 111 respectively, the nuts 112 of which may be removed to permit the removal of strap 109 and of blocks 103 and 104, when this is desirable. The blocks 103 and 104 are each provided with a groove 113 that substantially conforms to the contour of the bar to be passed therethrough and when in place these grooves are in opposed relation to provide a guideway for this bar. The guideway, so formed, is disposed with its longer dimension substantially vertical. The delivering end 114 of each of the blocks 103 and 104 is formed to fit the peripheral shape of the rolls 16, in order that the bar passing therethrough may be properly guided toward and into the pass of the rolls 16, which pass is in line with the guide passage.

The provision of a releasable upper guide part 26 for the receiving guide 20, permits the bar being rolled to escape in the form of a loop should its travel through the guide mechanism between the rolls 14 and 16 be interfered with or blocked. Due to the latch formed by the spring pressed plungers 37 that engage the recesses 44 and 45 formed in the delivery end of part 26, this part is releasably retained in position but may swing upwardly if sufficient pressure be placed thereon to compress springs 38 to permit the release of plungers 37 from the recesses 44 and 45. Such a condition occasionally arises when rod mills of this type are operated, and without such a provision there is a liability that the machine parts will be seriously damaged. In the present invention, when such a loop forms, the operator's attention is attracted and the mill is immediately shut down. The provision of readily removable guiding rollers and guides, as previously mentioned, together with the readily removable delivery guide blocks, facilitates the removal of the jammed rod or bar material disposed between the rolls 14 and 16 when such a condition arises. Valuable time is saved, due to the features of this invention, in clearing such a condition, inasmuch as the entire train of guide members may be removed simultaneously, together with the bar or rod disposed therein. This may be accomplished by cutting the bar at the receiving guide substantially at the start of the loop so formed, opening all of the covers 53 to permit the removal of the bar-embracing turnable members, removing the strap 109, and after loosening the set screws 105, removing the blocks 103 and 104 and then cutting the bar off adjacent the roll 16. The bar between the rolls 14 and 16 so cut from the remainder may then be lifted out of the mill, together with all of the turnable members (which in this case are cylindrical), which members can be released from the bar piece when convenient. Other cylindrical bar guiding members are preferably on hand to replace those so removed, in order that the lapse

of time between the stopping of the mill and its continuance be reduced to a minimum.

By means of the adjustable turning guides, a bar may be gradually turned in its passage from a set of rolls 14 to enter the set of rolls 16, without placing undue strain upon the material thereof. This turning of the bar is illustrated in Fig. 15, wherein is shown at 120 the elongated cross-section of a bar shortly after leaving rolls 14, and at 121 the position of the bar as it enters rolls 16, the intermediate views substantially showing various steps in its turning movement during its passage through one of the guide devices 17. In rolling certain material, for instance one that is comparatively soft, the turning of the bar may be effected by the use of only a small number of twister sections 21. Such an arrangement is shown in Fig. 3. These sections, as before, are preferably complete units each having a housing, with chambers therein for the bar guiding members, said housings being closely set in rectilinear relation and individually removable but forming parts of the bar guide housing as a whole.

The provision of rod or bar guiding means such as above described, that comprises the receiving guide 20, turning guides 21, and delivering guide 22, permits the efficient use of tandem mills such as 10 and 11, wherein the pairs or other sets of rolls may be comparatively closely disposed adjacent each other. Such an arrangement permits the use of one motor 13 for two sets of rolls, by the use of reduction gears 12, whereby considerable floor space is saved, as well as equipment cost.

The invention is obviously not limited to a bar guiding device which twists an elongated bar cross-section from a horizontal to a vertical position. In some cases an elongated shape can be turned from a vertical to a horizontal position or from one angular or intermediate position to another or to a vertical or horizontal position, or from a vertical or horizontal position to an angular position. In fact, the invention is not limited in all of its aspects to a bar guiding device which twists the bar, nor to a device for guiding the bar rectilinearly. Neither is it limited in all aspects to use with a bar cross-section such as that shown, the description in this respect being merely by way of example.

I do not claim herein the method of rolling bars as described in my Patent No. 1,968,670, dated July 31, 1934.

While I have shown and described a preferred embodiment of my invention, it is to be understood that it is not to be limited thereto in all of the details shown, but is capable of modification and variation within the spirit of the invention and the scope of the appended claims.

What I claim is:

1. In a rod mill, two sets of rolls, and material guiding mechanism disposed between said sets of rolls, said guiding mechanism comprising aligned rod receiving, rod turning and rod delivering guides, said rod receiving guide being adapted to permit the escape of the rod therefrom and said rod delivering guide being adapted to permit the removal of the rod therefrom in a direction transverse to its longitudinal axis.

2. In a rod mill, two sets of rolls, and material guiding mechanism disposed between said sets of rolls, said guiding mechanism comprising aligned rod receiving, rod turning and rod delivering guides, said rod receiving guide being adapted to permit the escape of the rod therefrom, said rod turning guide being adapted to permit the removal of the rod therefrom in a direction transverse to its longitudinal axis.

3. In a rod mill, two sets of rolls, and material guiding mechanism disposed between said sets of rolls, said guiding mechanism comprising aligned rod receiving, rod turning and rod delivering guides, said rod receiving guide being adapted to permit the escape of the rod therefrom, said rod turning guide and said rod delivering guide being adapted to permit the removal of the rod therefrom in a direction transverse to its longitudinal axis.

4. In a rod mill, rod reducing rolls, a guiding mechanism to receive the rod from said rolls including a pair of rollers having a passageway therebetween, and a member having a rod passageway therein, the axis of which is in alignment with the passageway between said rollers, and means to turn said member about its axis relatively to said rollers.

5. In a rod mill, rod reducing rolls, a guiding mechanism to receive the rod from said rolls including a pair of rollers having a passageway therebetween, and a member having a rod passageway therein, the axis of which is in alignment with the passageway between said rollers, means to turn said rollers about the axis of the passageway therebetween, and means to turn said member about its axis relatively to said rollers.

6. In a rod mill, rod reducing rolls, a guiding mechanism to receive the rod from said rolls including a pair of rollers having a passageway therebetween, and a member having a rod passageway therein, the axis of which is in alignment with the passageway between said rollers, means to turn said rollers about the axis of the passageway therebetween, and means to turn said member about its axis relatively to said rollers, and common means to releasably clamp said member and said rollers in any position to which the same are turned.

7. In a rod mill, a plurality of sets of rod reducing rolls, one set being in alignment with another set, rod guiding mechanism between said sets, said rod guiding mechanism comprising a plurality of adjustable rod turning guide members, said members being adjusted at gradually increasing angles from the horizontal as they progress from one set of rolls to the other.

8. In a rod mill, a plurality of sets of rod reducing rolls, one set being in alignment with another set, rod guiding mechanism between said sets, said rod guiding mechanism comprising a plurality of adjustable rod turning guide members, a support for each of said guide members, and means to individually adjust such supports to set successive guide members at different angles to the horizontal.

9. In a rod mill, a plurality of sets of rod reducing rolls, one set being in alignment with another set, rod guiding mechanism between said sets, said rod guiding mechanism comprising a plurality of adjustable rod turning guide members, a support for each of said guide members, and means to individually adjust such supports to set successive guide members at different angles to the horizontal, and means to releasably retain said supports in their adjusted positions.

10. In a rod mill, a plurality of sets of rod rolling means, one set being adjacent another, a plurality of rod turning guides disposed between said sets, each of said rod turning guides being adjustable to dispose the rolled rod with its trans-

verse axis at an angle to the horizontal, successive guides being adjusted to progressively increase the aforesaid angle of the rolled rod from one set of rod rolling means to the other.

11. A bar guiding device having a receiving element, a delivery element, a twisting device interposed between said elements, and means associated with the bar guiding device to permit removal of the bar in a lateral direction from said receiving element, said delivery element and said twisting device.

12. A bar guiding device having a receiving element, a separate delivery element, and a separate intermediate element, all of said elements being provided with movable devices permitting the lateral removal of the bar, one of said elements being constructed to permit outward looping of the bar when it encounters a predetermined amount of resistance to its longitudinal movement.

13. A bar guiding device comprising a receiving element, a delivery element, and a separate twister element interposed between said first named elements and comprising a number of individually removable aligned sections, each section having separately adjustable guides therein.

14. In a bar guiding device, a plurality of individually removable bar twisting sections arranged in a straight line, and an angularly adjustable bar guiding device enclosed in each section, each of said devices being adjusted at a different angle whereby the bar is automatically twisted during its passage through said sections.

15. In a bar guiding device, a plurality of individually removable bar twisting sections, and an angularly adjustable bar guiding device releasably clamped in each section and transversely removable therefrom, each of said devices being adjusted at a different angle whereby the bar is automatically twisted during its passage through said sections.

16. A bar twisting section comprising a housing, and angularly adjustable rolls enclosed in said housing, a part of said housing being hinged to the remainder thereof and being swingable about said hinge to permit the transverse removal of said rolls.

17. A bar twisting section comprising a housing an angularly adjustable bar guiding block enclosed in said housing, and means carried by said housing to engage and angularly adjust said block, a part of said housing being hinged to the remainder thereof and being swingable about said hinge to permit the lateral removal of said bar guiding block.

18. A bar guiding device having a housing, a plurality of pairs of angularly adjustable rolls in said housing, a plurality of angularly adjustable bar embracing and guiding blocks in said housing, said blocks alternating with said pairs of rolls.

19. In a bar guiding device, a twister section comprising a housing having adjacent chambers, a pair of angularly adjustable bar guiding rolls in one of the chambers, and an angularly adjustable bar guiding block in the other chamber.

20. In a bar guiding device, a twister section comprising a housing having adjacent chambers, a pair of angularly adjustable bar guiding rolls in one of the chambers, and an angularly adjustable bar guiding block in the other chamber, said rolls and said block being laterally removable from their respective chambers and from the housing.

21. In a bar guide, a housing, bar guiding elements swingably mounted in said housing each having a bar receiving opening therein, the axes of which are in alignment, means to individually swing each of said elements about its axis to adjust the elements relatively to each other, and means to disconnect said swinging means from said elements and permit their removal from said housing.

22. In a bar guide, a housing, a pair of bar guiding elements swingably mounted in said housing each having a transversely elongated bar receiving opening therein, the axes of which are in alignment, and means mounted in said housing to individually and angularly adjust each of said elements about the axis thereof.

23. A bar guiding device having a guideway therethrough defined by a lower element and an upper element, said upper element being in two parts pivotally secured at their opposing ends to a common pivot, one of said parts being upwardly swingable away from said lower element, and means to releasably retain said swingable part against upwardly swinging movement.

24. A bar guiding device having a guideway therethrough defined by a lower element and an upper element, said upper element being in two parts pivotally secured at their opposing ends to a common pivot, one of said parts being upwardly swingable away from said lower element, means disposed between the opposing ends of said parts of said upper element continuously urging the same apart, and means to releasably retain said swingable part against upwardly swinging movement.

25. In a rolling mill, spaced apart sets of material reducing rolls, material guiding means between said rolls comprising a plurality of pairs of cooperating elements, each pair receiving the rolled material from the preceding pair and turning it about its longitudinal axis part of a total predetermined amount during its passage from one set of rolls to the other, and means to adjust each pair of cooperating elements to vary the turning effect thereof.

26. In a bar guide, an openable housing having a swingable part, a bar guiding element in said housing and engaged by said swingable part, and means, mounted in said swingable part and movable therewith, to rotate said bar guiding element with respect to said housing.

27. A rolling mill guide comprising a stationary guide having a twisting passageway formed therein for initially rotating a rolled bar of metal, and a pair of rotating guides adapted to complete the desired angular rotation of the bar.

28. The combination with a pair of rolls having a pass formed therein, a stationary guide having a twisting passageway formed therein in line with the pass having less twisting angle capacity than the minimum required, roller twisting guides arranged in alignment with the twisting passageway capable of imparting a greater twist angle than required, and means for adjusting the roller twisting guides.

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