Jan. 23, 1962 L. C. PIETSCH 3,017,983

MILL HOTBED

Filed March 31, 1959 4 Sheets-Sheet 1

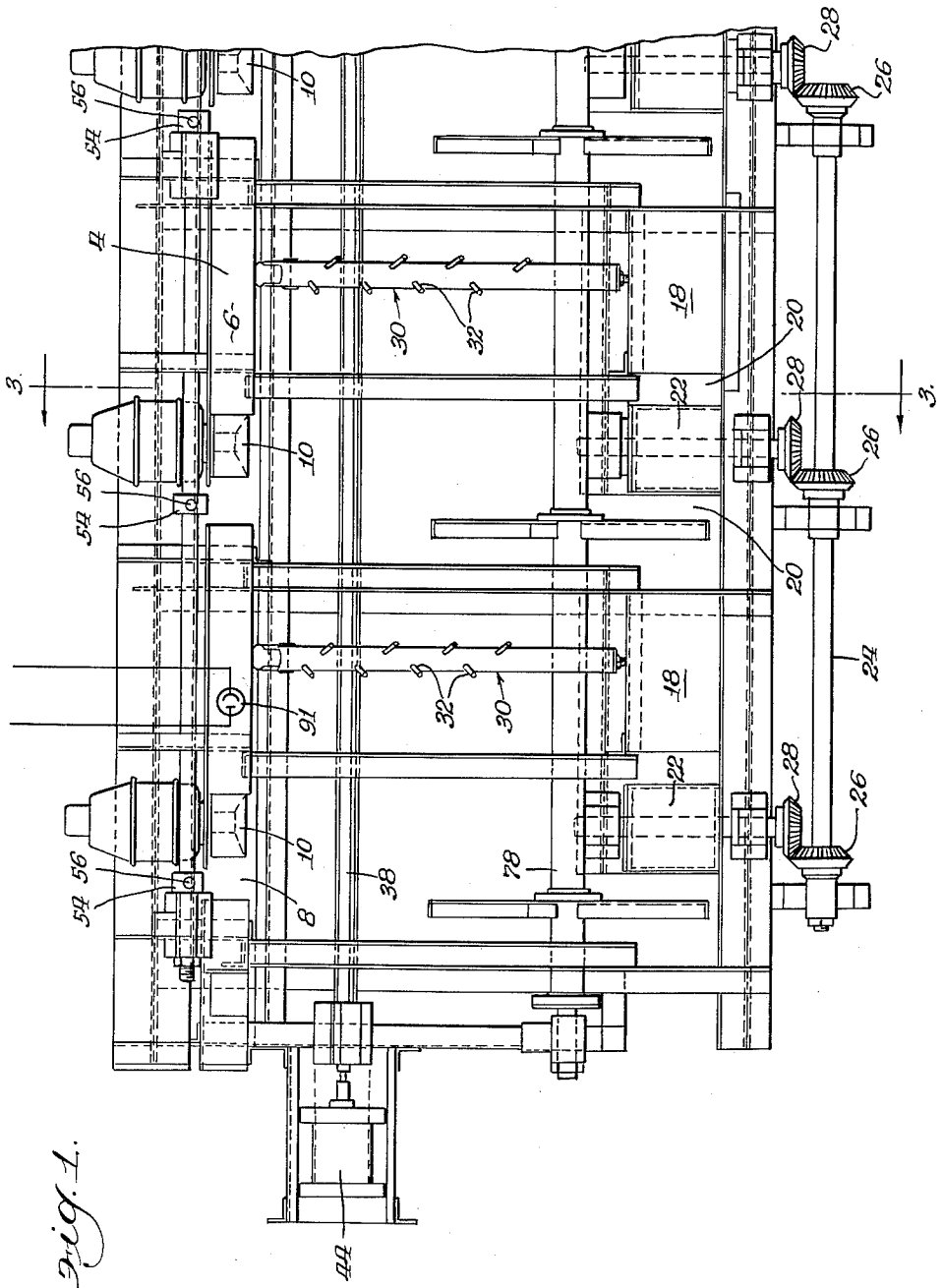


Fig. 1.

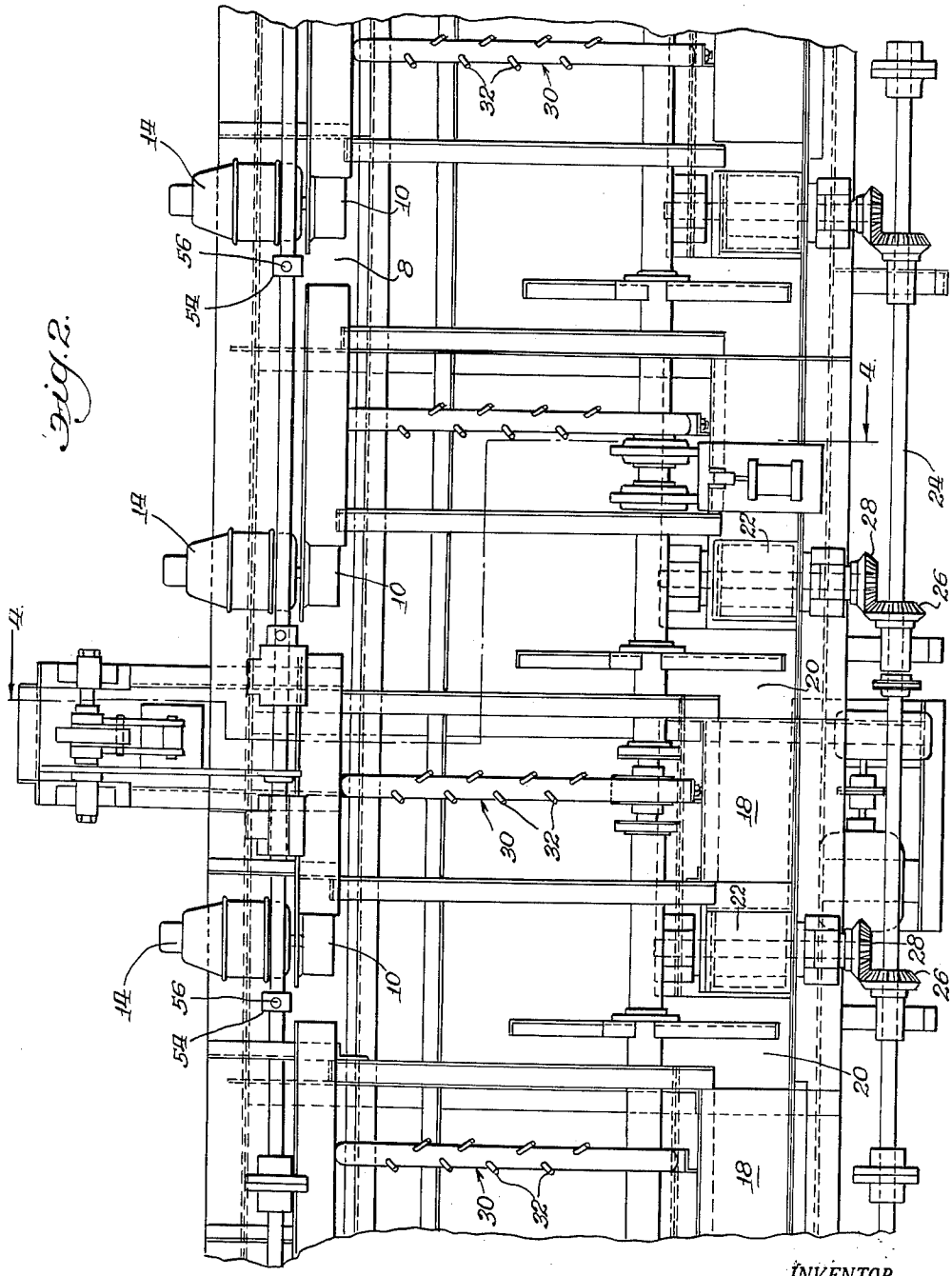
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Fig. 2.



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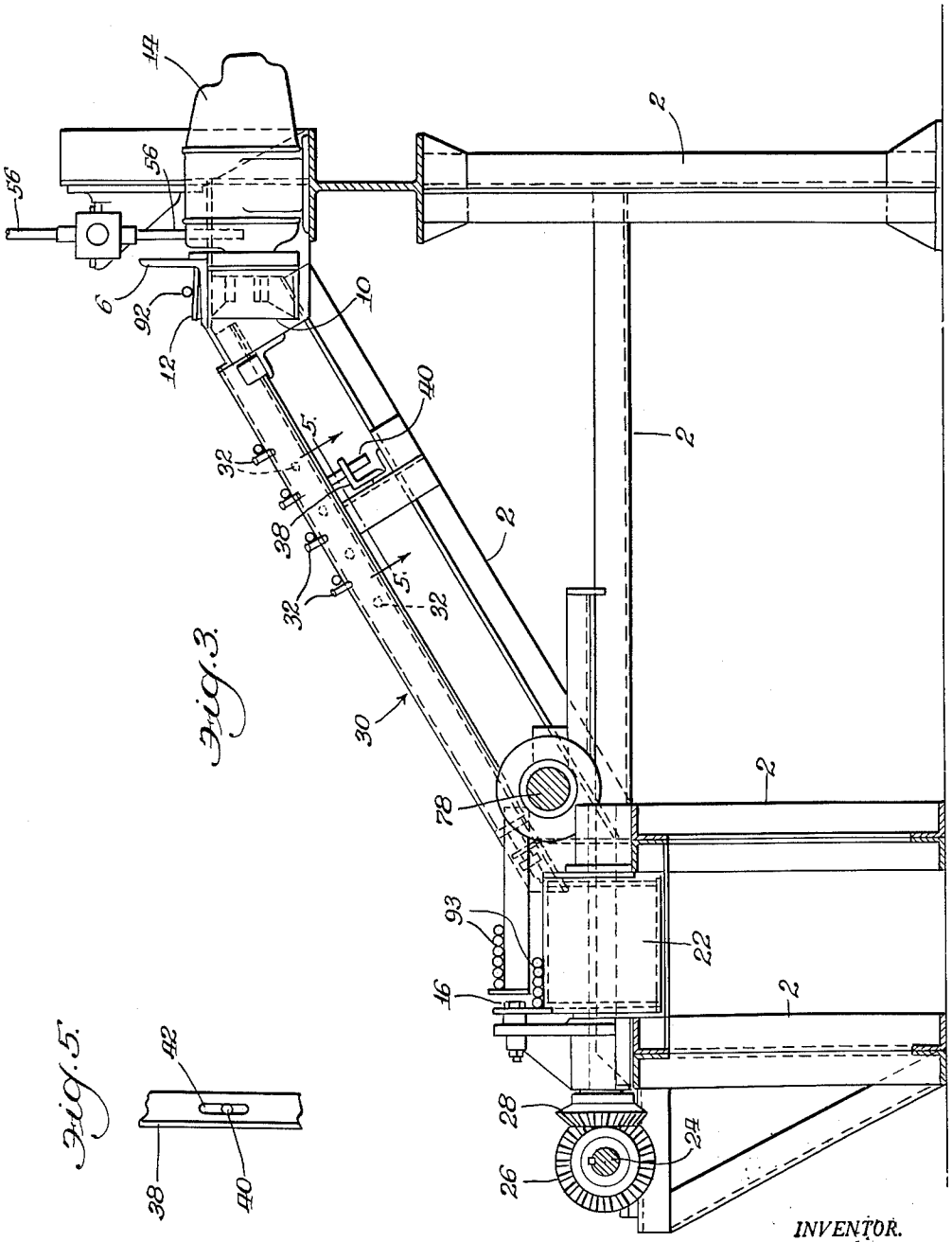


Fig. 3.

Fig. 5.

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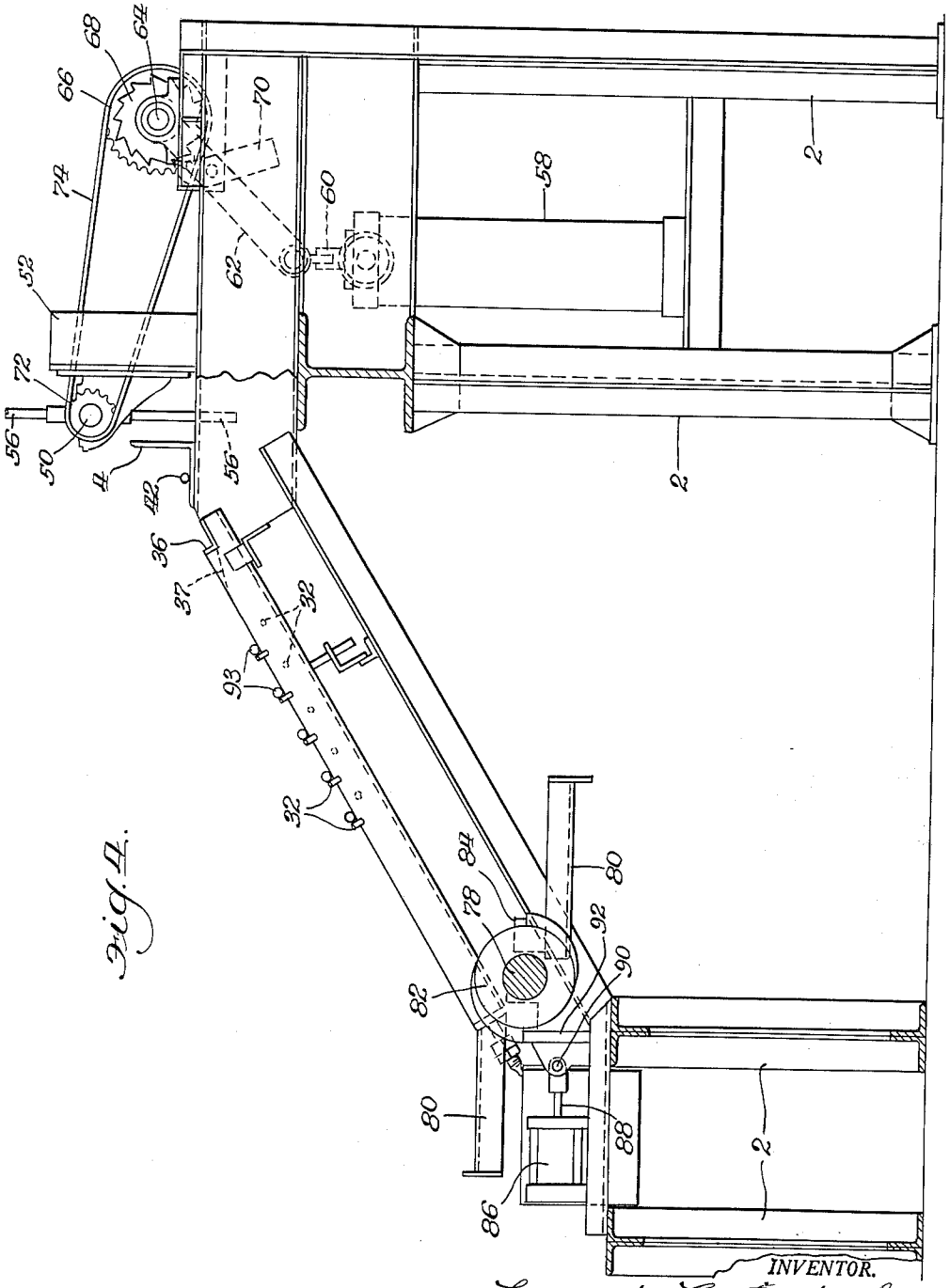


Fig. 4.

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3,017,983

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The invention relates to a mill hotbed, having particular utility when used in operative association with the repeater bar mill or the like and to receive therefrom hot formed bars for cooling to a desired temperature level prior to shearing to desired length or other mechanical forming operations.

Considering as an example, a repeater mill for use in forming reinforcing bars and the like, it will be understood by those skilled in the art that the mill takes a comparatively small size stick billet which has been heated to a plastic temperature, and thereafter by performing a series of forming operations thereon the billet is reduced in cross sectional area, reformed and linearly elongated. The linearly elongated and still hot rod is then fed to a hotbed of sufficient length to accommodate the entire rod length. The bed is designed to accommodate a plurality of formed bars, and to maintain each of said bars in spaced relation to the other until each bar has cooled sufficiently to be ready for subsequent operations, such as shearing to length. It is with a hotbed having unique design and operating features that this invention is concerned.

Accordingly, it is a primary object of the invention to provide a hotbed arrangement having unique operating characteristics which improve capacity and readily accommodate the production of a modern mill.

It is a further object of the invention to provide a hotbed arrangement of the type described, automatically operative.

It is a specific object of the invention to provide a hotbed arrangement incorporating a feeder track, a second or disposing track, a plurality of bar cooling stages intermediate the tracks, bar collecting means operatively associated with the stages, and means to automatically advance the bars through the cooling stages to the collecting means.

These and other objects of the invention will become apparent in the course of the following description, and from an examination of the associated drawings, wherein:

FIGURE 1 is a partial plan view of the new hotbed arrangement, illustrating one end thereof,

FIGURE 2 is a partial plan view of the hotbed arrangement incorporating the invention, and illustrating another end thereof,

FIGURE 3 is a sectional view taken approximately along lines 3—3 of FIGURE 1,

FIGURE 4 is a sectional view taken along lines 4—4 of FIGURE 2, and

FIGURE 5 is a detailed sectional view taken along line 5—5 of FIGURE 3.

Describing the invention in detail, attention is first directed to FIGURES 1 and 3 wherein it will be seen that the numeral 2 indicates supporting bars and structure designed in any conventional manner to provide a rigid base or frame for the structure subsequently described. At the upper end of the bed arrangement, as seen in elevational view, a first track 4 is provided. The track 4 comprises a plurality of linearly aligned angles 6, said angles 6 having interruptions 8 therein which receive rollers 10 so that the upper surface of the rollers 10 project slightly above the floor of the track 4, as is best seen in FIGURE 3 at 12. The rollers 10 are powered for continuous rotation in any conventional manner such as,

for example, by individual motors 14 which have the rollers 10 affixed to their projecting shafts.

In connection with FIGURES 1 and 2, it will be clearly understood that they are fragmentary views illustrating opposed ends of the elongated hotbed. It will further be understood by those skilled in the art that the hotbed may be of any desired length, and that structure similar to that shown in FIGURES 1 and 2 interconnects the structures shown to form the continuous bed. In view of the fact that the structure illustrated is duplicated to provide the full bed length, it was deemed not necessary to show the entire arrangement.

Considering the other side of the hotbed arrangement, it will be seen that a second track 16 is there provided in parallel relationship to the first track 4, spaced therefrom and located at a lower elevation as seen in side elevational view. The second track 16 again comprises a plurality of plates 18 having interruptions 20 therein accommodating reception of the upper surfaces of a plurality of rollers 22. The rollers 22 are journalled for rotation in the frame members 2 so that the upper surface thereof projects slightly above the surface of the track 16. The rollers 22 may be rotated in any conventional manner as, for example, by providing an elongated parallel drive shaft 24 journalled for rotation in the frame members 2 and having beveled gears 26 mounted thereon, said beveled gears being in operative engagement with mating gears 28 which in turn are keyed to the projecting shafts of the rollers 22. The drive shaft 24 may be powered or driven by any suitable power source, such as a motor (not shown), so that a uniform rotation is imparted to the rollers 22. A plurality of rocker bars, indicated generally at 30, operatively interconnect the tracks 4 and 16. Considering FIGURE 3, it will be noted that the rocker bars angle upwardly from the track 16 to the track 4 to provide for gravity disposition and advancement of the hot bars, as will hereinafter be described in detail. A plurality of abutments, 32, 32 project from the surface of each rocker bar 30. It will be noted that the abutments 32 are longitudinally spaced from each other over the length of the related rocker bar, and that the adjacent abutments 32 are additionally angularly spaced from each other around the surface of the rocker bar 30. As best seen in FIGURE 3, each rocker bar is provided with a longitudinal, angularly milled flat 34 adjacent the upper edge thereof. In this manner, a first abutment 36 is provided at the upper end of each rocker bar 30.

A reciprocable rocker bar actuating lever or bar 38 is arranged to immediately underlie the parallel rocker bars as seen in elevational view. Each rocker bar 30 has projecting from the underside thereof a pin 40, each pin 40 being in pin-and-slot reception as at 42 with an adjacent portion of the reciprocable bar 38, as best seen in FIGURE 5. Power means to induce reciprocation of the bar 38 are provided, and are here illustrated by an air cylinder 44 mounted to the frame members 2 adjacent one end of the hotbed arrangement, and having a direct connection to the bar 38. While it will be understood that bar reciprocation may be provided in any conventional manner, the air cylinder 44 is of the double-ended type connected to an appropriate multi-port valve arrangement (not shown) which upon actuation will move the bar 38 as determined stroke or distance to the right, and thereafter sequentially return the bar to the left an equal stroke or distance. Because of the pin-and-slot engagement between each rocker bar 30 and the reciprocable bar 38, it will be apparent to those skilled in the art that each rocker bar will be pivoted about its long axis a distance responsive to the stroke of the air cylinder 44 in first one direction, and then reversed and pivoted about its longitudinal axis to its original position and in the

other direction. In effect, under the action of the air cylinder 44, each bar 30 is rocked about appropriate journal mountings to the frame 2. This action will be described in detail subsequently in this specification.

Attention is now directed to the track 4, and particularly to the showing illustrated in FIGURES 1, 2 and 4. It will be noted that another drive bar 50 is arranged to extend longitudinally paralleling the track 4, and is journally mounted as at 52 to the frame members 2. Collars 54, 54 are keyed or affixed to the drive shaft 50 at spaced intervals thereon, said collars carrying opposed kick arms 56, 56, said arms 56 being vertically aligned with the interruptions or apertures 8 in the track 4. Considering FIGURE 4, it will be noted that an air cylinder 58 is shown mounted to the frame members 2. The cylinder 58 is provided with an upwardly extending connecting rod 60 which connects to one end of a lever 62 having its other end pivotally affixed to a shaft 64. A gear 66 having affixed thereto a ratchet 68 is also pivotally mounted on the shaft 64. The lever 62 carries a weighted ratchet dog 70 operatively associated with the ratchet 68. A second gear 72 is fixedly carried by the shaft 50, and a gear drive or chain arrangement 74 interconnects the gears 72 and 66. Upon actuation of the air cylinder 58, and upward movement of the lever 62, it will be apparent that the dog-ratchet engagement just described will induce a rotation of the gear 66 and responsive rotation of the shaft 50. The rotation under this action will be clockwise, as seen in FIGURE 4, causing the lower kick arm 56 to pass through the related aperture 8 in the track 8. The weighted dog 70 will accommodate return of the lever 62 and connecting rod 60 to the position illustrated without imparting motion to the gear 66. The action just described induces a 180° rotation of the kick arm 56. Again, it will be understood that the air cylinder 58 is conventionally connected to a source of air supply (not shown), which in turn may be controlled by conventional solenoid-operated valve (not shown). The purpose of the structure described immediately above will be subsequently considered.

Directing attention to that part of the arrangement adjacent the track 16, it will be seen that another drive shaft 78 is longitudinally mounted in the bed arrangement and appropriately journalled in the frame 2 for rotatable movement relative thereto. The shaft 78 carries a plurality of paired and opposed bar collecting arms 80, 80, said arms 80 being mounted adjacent interruptions or apertures 20 in the track 16 for rotatable movement therethrough. A cam 82 having locking surfaces 84, 84 in determined alignment with the collecting bars 80 is also affixed to the shaft 78. An air cylinder 86 is carried by the frame members 21 adjacent the cam 82. The air cylinder 86 has its rod 88 connected via the pin-and-slot connection 90, to a pivoted locking pin 92. Under the action of the air cylinder 86, the locking pin 92 will pivot in and out of interfering or abutting relationship with the locking surfaces 84 of the cam 82.

Considering the operation of the arrangement, it will be understood that a photoelectric cell 91 or other suitable switch-actuating means will be provided in operative relation to the track 4 and adjacent to an end thereof. A hot glowing formed bar from a mill, such as a repeater mill, is fed onto the track 2 and under the action of roller 10, its motion therealong is continuous. For illustrative purposes, typical bars are illustrated in FIGURE 3 at 93. As the bar end passes the switch means 91, the switch is actuated which in turn is operatively and conventionally connected (not shown) to a valving arrangement (not shown) to actuate the air cylinder 58. At this point, the bar is completely in the track 4 and on the hotbed arrangement. Upon actuation of the air cylinder 58, the kick arms 56 are urged to rotate 180° through the apertures 8 of the track 4. The kick arms 56, of course, engage the bars 93, urging same from the track 2 and into abutting relationship with the first abtument 36 on each of the rocker bars 30. After a suitable time delay, which may be provided by conventional electrical circuitry such as an appropriate time delay relay (not shown), the air cylinder 44 is actuated inducing leftward movement of the reciprocable bar 38. Because of the operative connection between the bar 38 and the rocker bars 30, a rotation to the right of the rocker bars is produced. Thus, the abutments 32 which had formerly been upright are rotated out of intersection with the plane forming the upper surface of the rocker bars 32; while the other pins 32, on the left as viewed in FIGURE 1, will now be brought into perpendicular relationship with said plane. Additionally, the mill flat 34 will be brought into alignment with the feeding plane from the track 4, and the abutment 36 will be brought out of interfering relationship therewith. When the air cylinder 44 reaches it maximum stroke, the action is reversed and the reciprocable bar 38 is moved to the right (as seen in FIGURE 1) and the operatively connected rocker bars 30 are returned to their original position.

It will thus be apparent that hot bars are fed to the hotbed arrangement and continuously progress through a plurality of cooling stages provided by the rocker bars 34, and thereafter are fed by gravity into supporting relationship with one of the collecting arms 80 provided adjacent the track 16. When the arm 80 has collected a sufficient number of hot bars, a bed operator will cause the air cylinder 86 to be instantaneously energized. The air cylinder 86 causes the pivoted locking pin 92 to move out of engagement with the locking surface 84, and the weight of the reinforcing bars on the collecting arm 80 causes a moment to be developed about the shaft 78, with the result that the shaft 78 rotates in a counterclockwise direction, as seen in FIG. 4. As a result, the collecting arm 80 on which the reinforcing bars are supported is free to move downwardly and rotate in a counterclockwise direction with the shaft 78. Hence, the bars 93 are lowered into engagement with the rollers 22 and are conveyed along the track 16 as described above. It will be appreciated that because of the inertia of the collecting arms 80 and shaft 78, the collecting arms 80 continue to rotate approximately 180 degrees. During the 180 degree rotation of the arms 80, the air cylinder 86 is actuated to move the locking pin 92 back to its operative position so that it interferes with the locking surface 84 of the opposite collecting arm 80, whereby the other collecting arm 80 is positioned at the lower end of the rocker bars 30. Of course, if the inertia developed by the reinforcing bars 93 is not adequate to rotate the collecting arms a full 180 degrees, it will be appreciated that successive reinforcing bars are collected by the other collecting arms 80 and cause its rotation into its horizontal operative position wherein the pin 92 abuts against the locking surface 84.

It will thus be apparent that the invention provides a unique semi-automatically operating hotbed arrangement which may be desirably associated with a high production mill to increase the efficiency of the mill output and overall plant operation.

The invention as shown is by way of illustration and not limitation, and may be subject to modification without departing from the spirit thereof or the scope of the appended claims.

What is claimed is:

1. In a hotbed arrangement for a bar rolling mill, a first track means, a second track means spaced from said first track means, movable bar support means interconnecting said first and second track means, pivotally mounted means for collecting a group of said bars at the lower end of said bar support means and movable from operative positions to inoperative positions, said means being cooperatively related to said second track means to effect the transfer of groups of said bars from said movable bar support means to said second track means, stop means for positioning said collecting means in its operative positions, and means for releasing said stop means to permit said

collecting means to move under the weight of the bars from its operative position to its inoperative position to transfer said group of said bars to said second track means.

2. In a hotbed arrangement for a bar rolling mill, a first track means, a second track means spaced from said first track means, movable bar support means interconnecting said first and second track means, a means located at the lower end of said bar support means for collecting a group of said bars as they leave said movable bar support means, said means including a pivotally supported collecting arm having a stop element, stop means for coacting with said stop element to position said collecting arm in an operative position for collecting said bars, means for actuating said stop means to release said collecting arm and permit said collected rods to effect movement of said collecting arm and deliver said rods to said second track means, said collecting arm being operatively moved as a result of the momentum generated by the collected rods and the inertia of the arm itself.

3. The hotbed arrangement of claim 1, wherein said collecting means comprises a pivotal shaft having a pair

of oppositely extending, laterally displaced collecting arms adapted to move between operative and inoperative positions, said shaft including a pair of stop elements for coacting with said stop means to position either one of said collecting arms in said operative position, said shaft and said arms being fixedly secured together and so related that said group of said bars effecting the movement of its associated collecting arms from its operative to its inoperative position thereby to cause said other collecting arm to move from its inoperative position to its operative position.

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