BILLET OR BAR TURNING MECHANISM

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The invention relates to a billet or bar turning mechanism and more particularly to a device that will receive and progressively turn bars, slabs and/or other similar articles so as to progressively expose and present the various surfaces thereof for inspection or treatment such as scarifying and the like.

The principal object of the invention is the provision of a billet or bar turning mechanism that will automatically progressively turn an elongated cross sectional square billet or bar on its longitudinal axis to present the various surfaces thereof in upright position.

A further object of the invention is the provision of a bar turning mechanism adapted to handle heavy steel billets, bar or slabs and to turn them so that the several surfaces thereof may be inspected and scarfed or otherwise treated if necessary.

A further object of the invention is the provision of a billet or bar turning mechanism that may be positioned adjacent a bar, billet or slab conveyor and act to receive rectilinear billets, bars or slabs therefrom, progressively turning the same to expose each of their surfaces and deliver the same to another conveyor.

A still further object of the invention is the provision of a simple and efficient billet or bar turning mechanism which will operate successfully for the indicated purpose.

The billet or bar turning mechanism disclosed herein is particularly useful in a steel mill where billets or bars generally 22 to 12' square and of any length are handled during inspection and conditioning prior to rolling or on a mill. The turning mechanism will similarly handle slabs of any size. Such billets, bars or slabs often have slag areas in the several surfaces thereof and it is therefore necessary to scarify such slag areas with a torch. Heretofore, this has been done while the slab is held by a crane or progressively turned by a crane so that the workman can have access to the several surfaces thereof.

The scarifying operation must be performed prior to the further rolling and reduction of the billet, bar or slab into other shapes. The present device completely eliminates the use of a crane and its necessary personnel in handling and turning or lifting the various billets, bars or slabs. With the present device, the billets, bars or slabs are picked up and turned one-fourth revolution progressively through a series of turns until all of the surfaces have been exposed and the necessary inspection and/or scarifying completed, whereupon the billets, bars or slabs are delivered from the device.

With the foregoing and other objects in view which will appear hereinafter, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being the intention to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure, which do not constitute departures from the spirit and scope of invention.

The invention is illustrated in the accompanying drawing, wherein:

FIGURE 1 is a front view of the bar turning mechanism.

FIGURE 2 is an end view on line 2--2 of FIGURE 1 with parts in cross section.

FIGURE 3 is an enlarged detail of one of the bar engaging and turning assemblies with broken lines illustrating the positions of a bar or slab thereon as the same is turned thereby.

FIGURE 4 is an enlarged detail of a portion of one of the bar turning assemblies showing the same in different positions from the showing in FIGURE 3 and indicating the action of the several bar engaging members.

By referring to the drawings and FIGURES 1 and 2 in particular, it will be seen that a bar turning mechanism has been disclosed which comprises transverse frame members 10, 10 having a plurality of base members 11, 11 and a power source stand 12 at one side thereof. A motor and gear reduction unit 13 is positioned on the power source stand 12 and a drive shaft 14 extends outwardly therefrom and is journaled in an opening in a primary frame 15 which is vertically positioned and includes journals 16 and 17 in spaced relation to the journal receiving the drive shaft 14 and disposed diagonally of the primary frame 15. Secondary vertically standing and horizontally spaced frame members 18, 18 are interconnected by the transverse frame members 10, 10 and provide horizontally aligned journals for four shafts 19, 20, 21 and 22 respectively. The ends of these shafts extend through the secondary frame members 18 and terminate adjacent the primary frame 15. Pinions 23, 24, 25 and 26 are secured to the shafts 19, 20, 21 and 22 respectively and engaged on gear wheels 27, 28 and 29 respectively positioned on the ends of a stub shaft 30, the drive shaft 14 and a secondary stub shaft 31, the stub shafts 30 and 31 are journaled in the journals 16 and 17 in the primary frame 15. The arrangement of these pinions and gear wheels is best shown in FIGURE 2 of the drawings and it will be observed that rotating motion imparted the drive shaft 14 will revolve the gear wheel 28 and that the motion thereof will be imparted to the pinions 24 and 25 which in turn impart the motion to the gear wheels 27 and 29. The pinions 23 and 26 respectively engage the gear wheels 27 and 29 and therefore all of the gear wheels, all of the pinions and all of the shafts are driven simultaneously.

Each of the shafts 19, 20, 21 and 22 has a plurality of bar engaging members thereon, each of which comprises an angular member having four circumferentially spaced radially extending arms, the portion of the arms engaging and lifting the bars or slabs being flat and the opposite sides thereof being angularly disposed. As best illustrated in FIGURE 3 of the drawings, the shafts 19, 20 and 21 and 22 will be seen to rotatably mount a first set of bar engaging members 32 and 33, 34 and 35 each of which has four radially extending circumferentially spaced arms A, B, C and D respectively thereon. It will be observed that the relative position of the arms A, B, C and D on the several members 32, 33, 34 and 35 are dissimilar as there is approximately 9 degrees difference between the respective positions of any two of the arms.

By referring now to FIGURE 2 of the drawings, it will be seen that the arm A on member 32 is in horizontal position; that is, the upper flat portion thereof is in horizontal position while the lower or opposite side of the arm A is diagonally disposed and it will be seen that broken lines indicate the cross sectional shape of an elongated steel bar or other workpiece W, the same having been moved into position thereon as by a conveyor mechanism (not shown).

By referring now to FIGURE 3 of the drawings, a schematic illustration of the four members 32, 33 and 34, 35 of the first group which are positioned on either side of one of the secondary frames 18 are shown in the next sequence position and as having rotated approximately one-fourth revolution whereby the bar or workpiece W has been delivered onto the substantially horizontal flat surfaces of the arm A of the member 33. In the next operation, the arm A of the member 35 delivers the bar or workpiece W to the arm A of the member 34 and subsequently the same transfer occurs with respect to the arm A of the member 35. It will be
observed by referring again to FIGURE 1 of the drawings that when the bar or workpiece W is in initial position on the machine resting on the arms A and on the comparable arms of each of the several similar members 32, 32A and 32B arranged in horizontally spaced groups on the shaft 19 as seen in FIGURE 1, the uppermost surface thereof is in a position to be inspected and scarfed. When the machine has operated to move the bar or workpiece W from the first position to its second position 33 on the member 33 and the similar arms on the other members 33A and 33B in the machine, the bar or workpiece W is received by the arm A and it will be observed that it has been turned one-fourth revolution so that another surface thereof is presented horizontally for inspection and scarifying. The next operation of the machine elevates and turns the bar or workpiece W so that it is received on the arm A of the member 34 and the similar arms on the members 34A and 34B and the final positioning occurs when it is delivered to the arm A of the member 35 and the similar arms on the members 35A and 35B. The bar or workpiece W is turned one-fourth turn each time it moves from the arms of one set of the members 32 to the arms of the next set 33 or from the arms of the members 33 to the arms of the members 34, etc. It will thus be seen that it is necessary that the bar lifting and turning members 32, 33, 34 and 35 of each group, and there are as many groups as are necessary to handle the elongated bar or slabs, are alternately on the opposite sides of the secondary frame 18 so that the several arms A, B, C and D will not engage one another as they are separated sidewardly as best shown in FIGURE 1 of the drawings.

By referring to FIGURE 4 of the drawings, a detail of the bar engaging and turning members 32, 33 and 34 may be seen with arrows indicating the direction of rotation thereof and solid and broken lines indicating the relative position of the bar or workpiece W as the same is handled by the device. The difference in angular positioning of the arms is emphasized in this illustration so that the manner in which the initial lifting arm acts to push the bar or workpiece W onto the lifting arm of the next set may be seen. As illustrated in FIGURE 1 of the drawings, the bar turning machine incorporates three groups of bar lifting and turning members 32, 33, 34 and 35 the second and third groups being indicated by the same numerals with a and b suffixes. The diagonal shaping of the bottom of each of the arms A, B, C and D on each of the bar lifting and turning members facilitates the positioning of the bar thereon and in the final position helps the bar slide therefrom as it leaves the mechanism. While the foregoing description relates to turning and moving billets, bars or slabs upwardly, it will occur to those skilled in the art that the mechanism will work just as effectively in turning the same downwardly.

It will thus be seen that a bar turning mechanism has been disclosed which meets the several objects of the invention and having thus described my invention, what I claim is:

A bar lifting and turning mechanism for progressively lifting and turning a bar having a substantially square cross sectional configuration to present various surfaces of the bar in upright position, comprising a frame means, a plurality of substantially horizontally disposed elongated shafts rotatably supported by said frame means and being positioned in horizontally and vertically spaced parallel relationship to one another, drive means for rotating all of said shafts simultaneously and in the same direction, a plurality of bar engaging members rigidly secured to spaced portions of each of said shafts, the bar engaging members on adjacent shafts being offset longitudinally of the shafts to provide clearance for the bar engaging members, each of said bar engaging members having four substantially equally spaced radially extending arms positioned such that the arms on the bar engaging members of the shafts are adapted to receive a bar from the arms on the bar engaging members of an adjacent shaft, the side of each of said arms facing in the direction of rotation of the shafts and engaging and lifting a bar being substantially flat, the opposite side of each of said arms being angularly disposed, the relative position of the arms on the bar engaging members on different shafts being dissimilar such that the flat sides of the arms on the bar engaging members on adjacent shafts considered progressively from one side of the apparatus to the other side thereof are progressively angularly advanced in the direction of rotation of said shafts so that the lifting arms on the bar engaging members of one shaft act to push a bar onto the lifting arms of the bar engaging members of the next adjacent shaft, whereby during rotation of said shafts, a bar is turned approximately one-fourth a revolution each time it moves from the arms of the bar engaging members on one shaft to the arms of the bar engaging members on an adjacent shaft.

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