Nov. 9, 1943. E. T. PETERSON 2,334,026

TILTING TABLE

Filed March 5, 1942 4 Sheets-Sheet 1

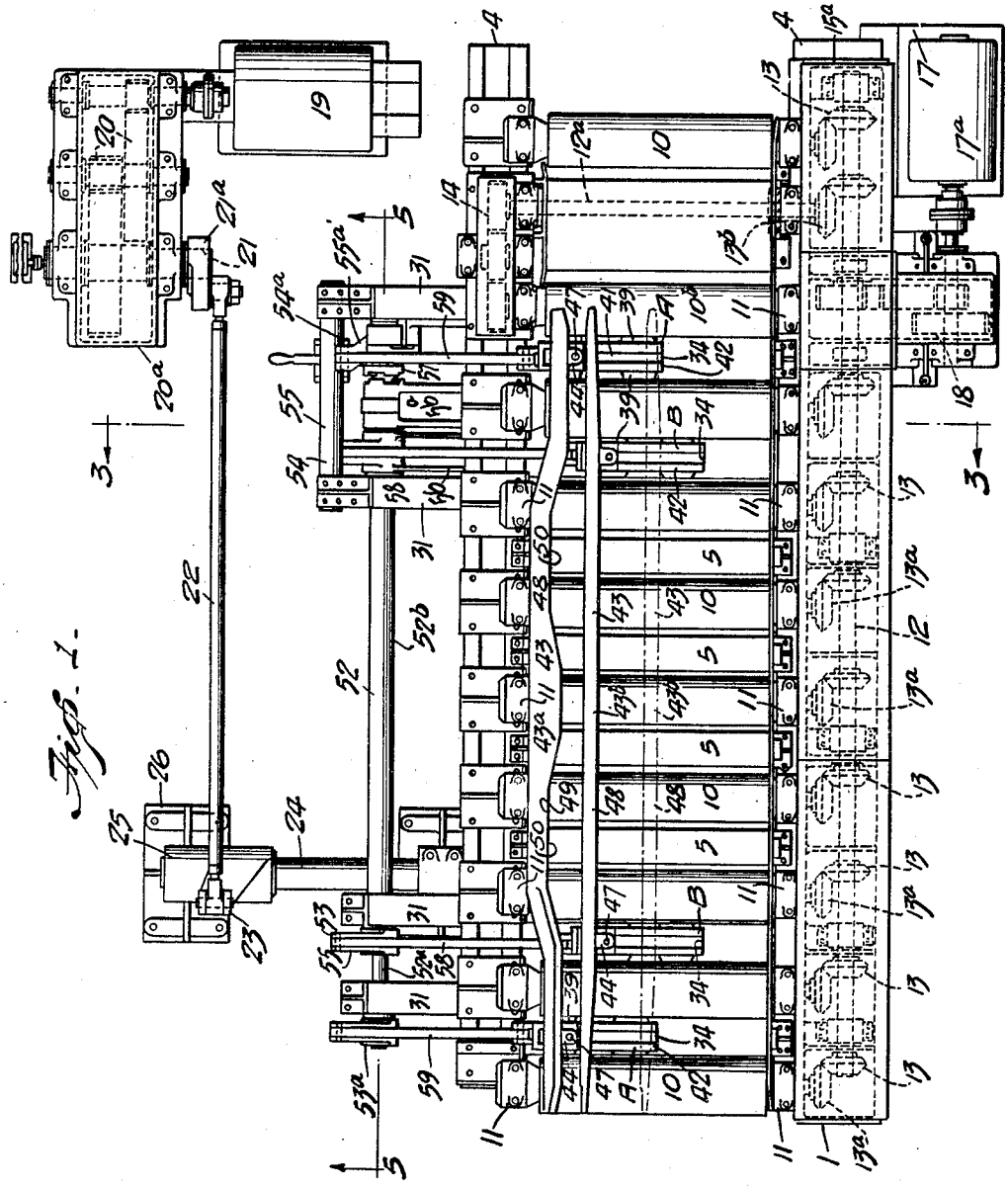

Fig. 1.

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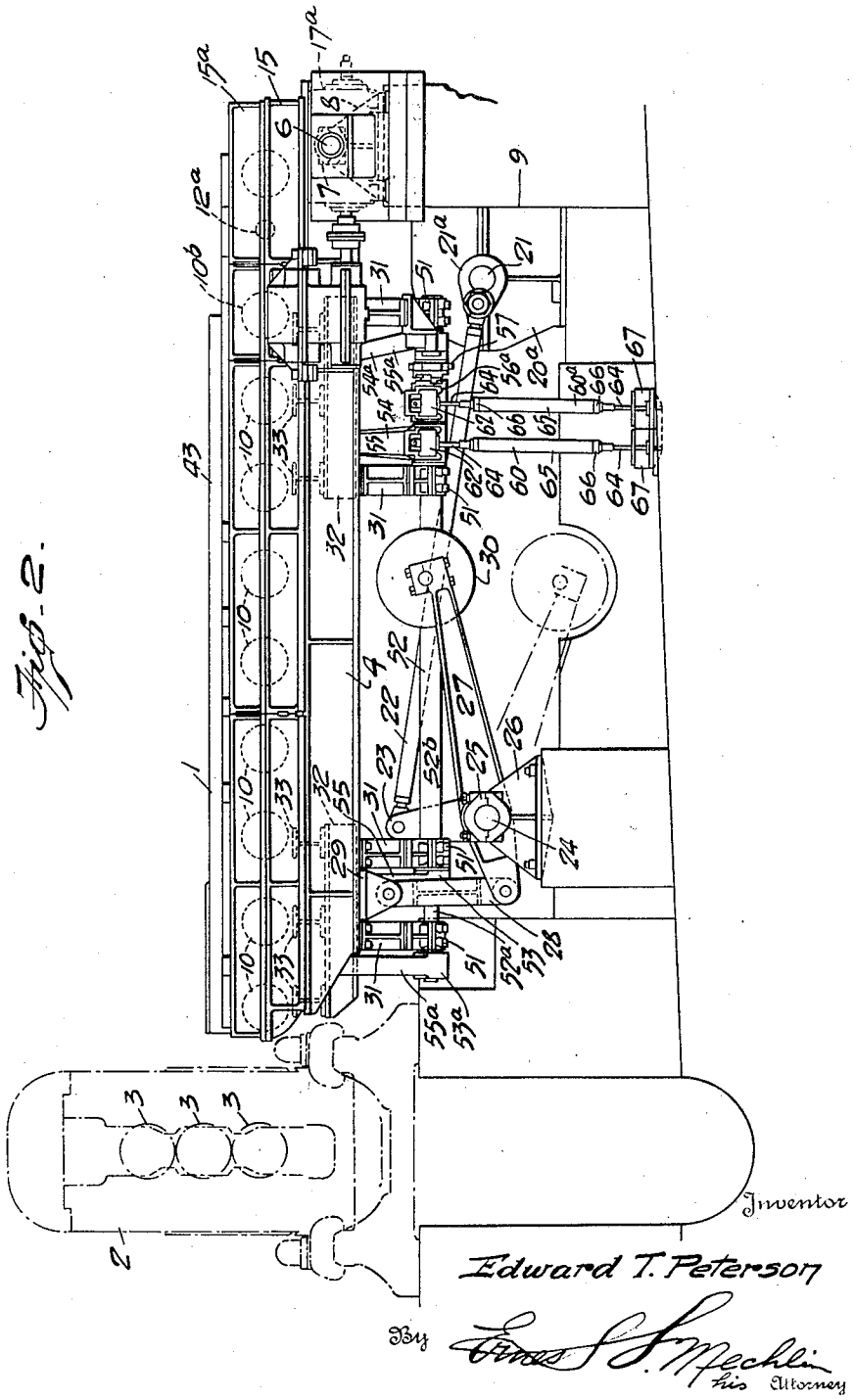
Nov. 9, 1943. E. T. PETERSON 2,334,026

TILTING TABLE

Filed March 5, 1942 4 Sheets-Sheet 2

Fig. 2.



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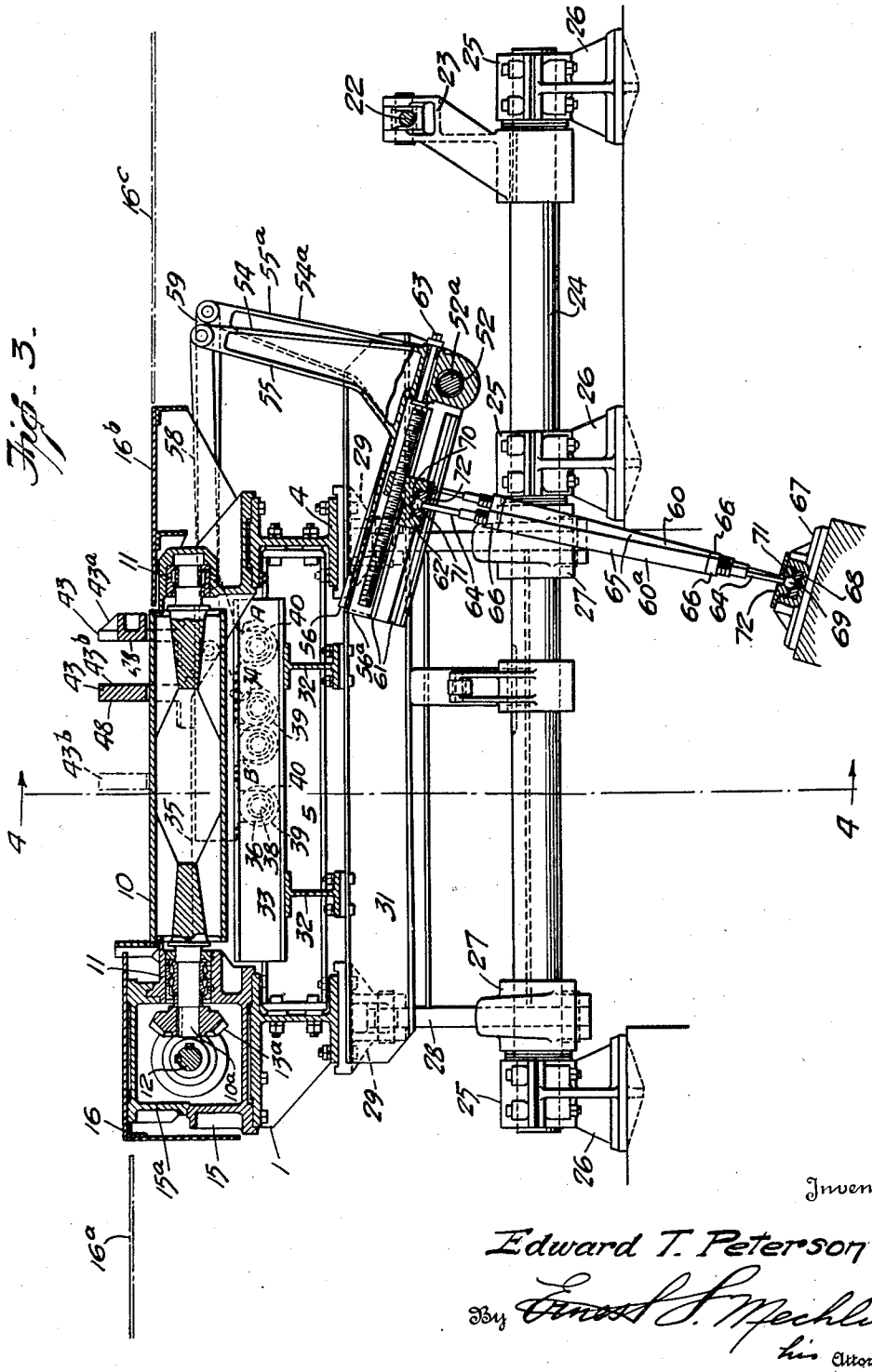
TILTING TABLE

Filed March 5, 1942 4 Sheets-Sheet 3

Fig. 3.



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TILTING TABLE

Filed March 5, 1942 4 Sheets-Sheet 4

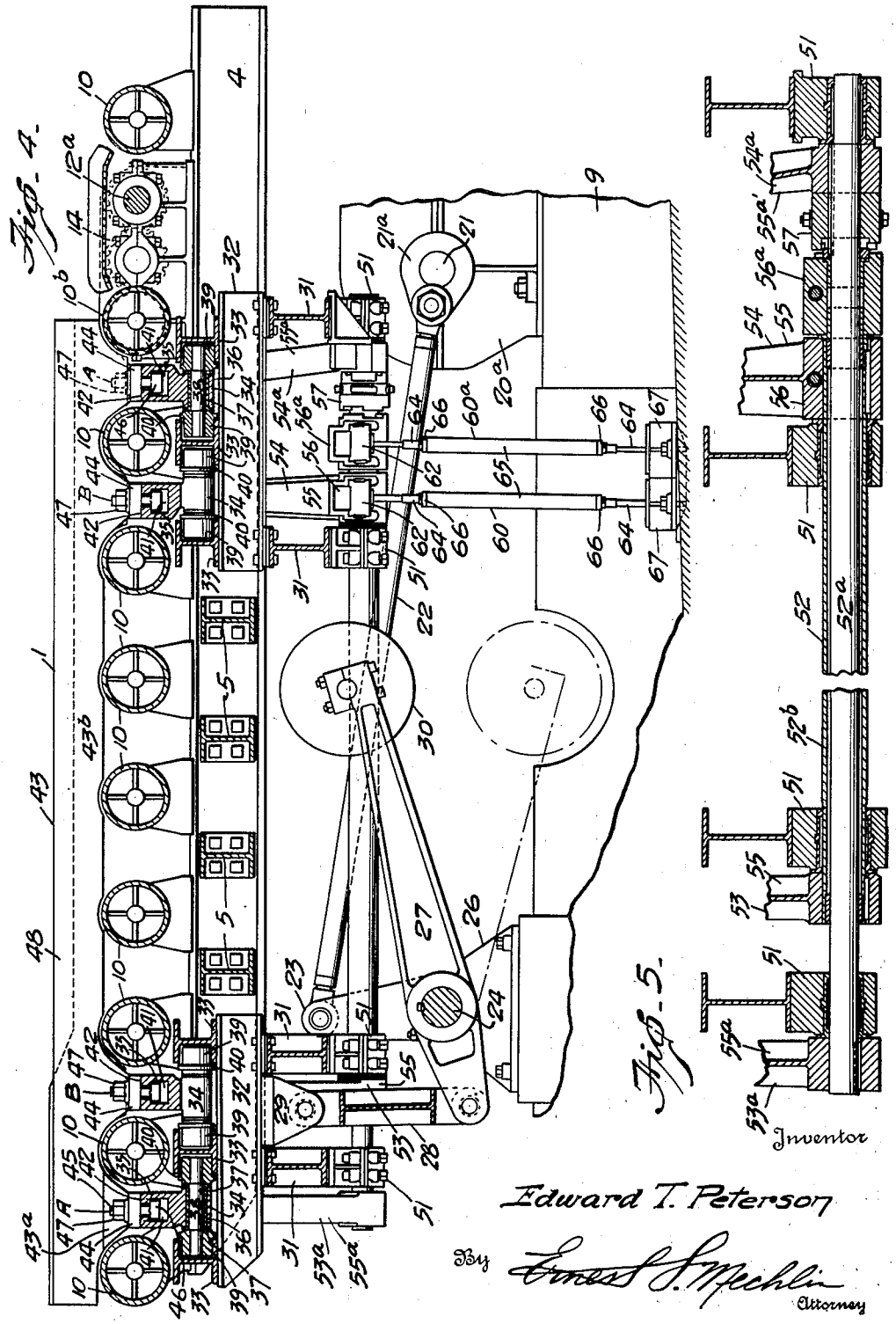

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE

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TILTING TABLE

Edward T. Peterson, Reading, Pa.

Application March 5, 1942, Serial No. 433,521

5 claims. (Cl. 80—48)

The invention relates to a tilting table employed in a steel mill incident to the formation or fabrication of metallic elements or shapes from billets or slabs.

Tilting tables of the present type are employed in steel mills as a transfer medium through which metallic elements such as billets, slabs, etc., are, upon being emitted from between two vertically spaced rolls, for instance, of a three-high mill, raised or lowered vertically so as to be placed in a position to enter, or be admitted between one of the previously mentioned rolls and an adjacent, or another vertically spaced roll, in the process of forming or working billets or slabs into the ultimate or desired configuration.

An object of the invention is the provision, in a tilting table, of a guide means for moving metallic elements transversely of the table, and having actuating means responsive to the tilting action or movement of the table.

Another object of the invention is the provision, in a tilting table, of an arrangement of elements for moving a side guard or guide bar transversely of a tilting table with the elements being adjustable so that the distance through which the side guard or guide bar may move can be definitely determined.

A further object of the invention is to provide, in a tilting table, a plurality of guide bars arranged to move transversely of the table with means associated with one of the guide bars for selectively rendering it inoperative.

The above, as well as numerous other objects of the invention, will become apparent from the succeeding description and from an inspection of the accompanying drawings which, in several views thereof, show an exemplified form of the invention and wherein:

Figure 1 is a plan view of a tilting table embodying a form of the present invention;

Figure 2 is a side elevational view of the tilting table shown in Figure 1;

Figure 3 is a transverse sectional view taken along the lines 3—3 of Figure 1 looking in the direction of the arrows;

Figure 4 is a vertical sectional view taken along the lines 4—4 of Figure 3 looking in the direction of the arrows;

Figure 5 is a longitudinal view taken along the lines 5—5 of Figure 1 looking in the direction of the arrows.

Referring now to the drawings in detail, wherein like reference characters indicate like parts, the numeral 1 is employed to designate, in a somewhat general manner, a tilting table positioned adjacent a three-high rolling mill indicated diagrammatically as at 2 and comprising vertically spaced rolls 3. The table is arranged to receive billets, slabs or any metallic elements (not shown) from certain passes of the lower or upper two adjacent or bank of rolls, and then shift the thus far processed elements so as to be delivered to certain passes of or between the other two adjacent or bank of rolls so that, by being moved through consecutive passes of the rolls, the billets or slabs will be ultimately processed to their desired shape or configuration.

The table comprises a pair of transversely spaced, longitudinally extending, main or foundation beams of sills 4 which project horizontally for a distance substantially equal to the length of the table and form the primary structural members of the table. Positioned at desirable intervals longitudinally of the table are separators or cross barriers 5, preferably in the horizontal plane or vertical confines of the main beams and secured thereto in order to present a rigid, rugged framework. Outstanding from one or adjacent extremities of the sills are a plurality of oppositely directed axles 6 journaled in accommodating bearings 7 which pivotally support or carry one end of the table and are, in turn, supported in an elevated position by means of bearing stands 8. The bearing stands are superimposed upon a monolithic or other type of subjacent base or foundation 9 and secured thereto by any means desired.

Forming movable or rotatable means for the table so as to carry the billets, slabs, etc., away from the rolls as they emerge from certain passes thereof and to carry or move the thus formed metallic elements toward the rolls to be admitted to other passes thereof, are a plurality of rollers 10 extending transversely of the table and journaled in suitable bearings 11 carried by the main beams. The rollers are in upwardly or vertically spaced relation when considering the main beams so as to be free to receive and deliver metallic elements from and to the rolls of the mill.

Driving mechanism is introduced into the table to actuate the rollers and, as exemplary of such a mechanism, there is provided, extending longitudinally adjacent one side of the table, a line shaft 12 having intermittently positioned miter gears 13 secured thereto and meshing with miter gears 13a fixed to the associated extremities of roller shafts 10a. Due to the proximity of associated structure to be hereinafter described, the roller 10b is driven by a series of gears 14 positioned on a side of the table opposite from the

line shaft and which are connected to the line shaft through an axle 12a and the miter gear 13b. A gear case 15 and cover 15a form a housing for the reception of the line shaft and associated miter gears and, overlying the cover in supported relation therewith, is a platform plate 16 forming a walk-way for the accommodation of workmen or operators and which is disposed a slight distance above a floor line indicated diagrammatically as at 16a. The side of the table opposite from the line shaft is also provided with a platform plate 16b carried by the subjacent main beam through suitable brackets and preferably disposed in alignment with the floor level 16c. Attached to one of the beams at or adjacent the pivoted extremity thereof is a bracket 17 forming a support for a reversible motor 17a which forms the power means for driving the line shaft through a series of intermeshed gears 18. By a manipulation of the motor 17a, the rollers may be driven in either a clockwise or counterclockwise direction, when considering Figure 2 or 4, to receive or deliver metallic elements from or to the rolls of the mill.

Elevating means has been incorporated into the table so that when employed with a three-high rolling mill, the table will be capable of tilting or elevating the metallic elements from a plane adjacent the lower bank of rolls to a plane adjacent the upper bank of rolls or vice versa. For the accomplishment of the above, therefore, there is provided a tilting motor means 19 firmly secured to the base 9 by any desired method and positioned adjacent the side of the table removed from the line shaft. Operatively connected to the tilting motor is a series of gears 20 encased in a housing 20a, the latter of which has projecting therefrom a crank shaft 21 with an eccentric or crank arm 21a positioned on the table adjacent the side of the housing 20a and operatively connected to the gears 20. Pivotally attached to the crank arm is a reciprocating rod 22 substantially horizontally disposed and having its outer or free extremity pin-connected to an upright arm 23. The arm 23 is keyed or otherwise secured to an axle 24 which extends horizontally and transversely of the main beams in lower spaced relation thereto, and is journaled in a plurality of suitable and aligned bearings 25 which are supported by stands 26. Transversely spaced, horizontally disposed, tilting levers 27 are secured to the axle in vertical alignment with the main beams and have their outer or free extremities pin-connected to the lower extremities of associated links 28. The links are vertically disposed and pivotally secured to tilting brackets 29 downstanding from the mill adjacent extremities of the main beams to which they are fixed. The tilting levers extend inwardly of the table away from the link-connected extremities so that a counterweight 30 interposed between and secured to the inner extremities of the tilting levers may form a means whereby the mass of the table, carried by the links 28, may be substantially equalized. From the above, therefore, it will be noted that upon an actuation of the lifting motor, the reciprocal rod 22 will be moved toward the right when considering Figures 1, 2 or 4, and impart a clockwise motion to the axle and a vertical movement to the links to cause the mill adjacent extremity of the table to be raised. This action will move the table from a position as illustrated, or capable of receiving metallic elements from the lower bank of rolls, to a tilted position where the metallic elements can be fed to the upper bank of rolls.

An arrangement is provided in the tilting table whereby billets, slabs, etc., moved onto the table from one passage of the rolls, may be shifted transversely of the table to be fed into a passage of different configuration or contour. Toward the accomplishment of this end, therefore, there is secured to the main beams in subjacent relation thereto, a plurality or pair of transversely extending longitudinally spaced supporting beams 31 onto which are secured intermediate I-shaped structural members 32 positioned desirably in the plane of the main beams. Mounted upon the structural members, and securely fastened thereto, are a plurality of carriage guides or tracks 33 grouped preferably in two sets of three tracks adjacent each longitudinal extremity of the table and also of I-shape in vertical cross section so as to present horizontally opening or facing channel ways. The guides or tracks extend to within the close proximity of the main beams for the purpose to be hereinafter apparent. Located between, or within the confines of each pair or adjacent guides, is a carriage frame 34 having a shoulder 35 thereof extending vertically between adjacent rollers. The carriage frame is provided with a plurality of, preferably two, sockets 36 which accommodate suitable bushings 37 and transversely extending rotatably associated axles 38, the latter of which extend to within the limits of the guides. Suitably keyed to each axle extremity is a wheel 39 arranged to bear upon a flange of an adjacent guide and provided with a radially disposed or peripheral rim 40 spaced from, but adapted to contact the guide flanges to maintain the carriage in a predetermined relation with the guides. It will be noted from the above, that the carriages are arranged to move or travel in the tracks or guides in a direction transversely of the table, and that they are grouped in pairs adjacent each end of the table. So as to more clearly identify the carriages, the ones of each pair are designated as A and B with the latter carriages interposed between the former, as clearly indicated in Figures 1 and 4.

As previously indicated, each carriage frame shoulder extends to within the horizontal limits of the table rollers and is formed with a groove or upwardly opening way 41, as well as a plane horizontal top surface 42. Spanning or bridging identically identified carriages are a pair of guide bars or side guards 43, more specifically designated as an outer guide bar or side guard 43a and an inner guide bar or side guard 43b. The side guards each have spaced feet or pedestals 44 which bear upon the plane top surfaces 42 of the carriage frames and each being removably secured thereto by means of a bolt 45 having a head portion 46 disposed within the associated way 41 and a rotatable element or nut 47 superimposed upon the adjacent pedestal so that a shortening of the effective length of the bolt will bind the foot and subjacent carriage together. The particular attachment of the guards to the carriages lends itself to an adjustment of the guards transversely of the table so as to accommodate the particular passes of the mill rolls employed. Referring particularly to Figure 1, it will be observed that the inner side guard 43b is secured to the carriages B and the outer side guard 43a is attached to the carriages A and, as the main body 48 of the guards extends above the top surface or materially engaging plane of the rollers, the guards are accordingly arranged

to move any metallic element emitted from one set of passes of the mill rolls transversely of the table to be fed to another set of passes in the process of forming the metallic elements in their desired ultimate shape. Attention is directed to the outer side guard 43a which, considered in plan, Figure 1, has a sinuous or convoluted, vertical, inwardly facing surface 49 to present pockets 50 which affords a means for the introduction of a jack bar or any suitable tool between the side guard and billet so as to rotate the latter through a ninety or any degree arc and permit its reentry into the mill in a different position.

The supporting beams 31 are desirably extended transversely of the table beyond the vertical limits of the main beams on one side of the table, preferably the side removed from the roller driving motor and secured to the supporting beams adjacent their overhanging extremities are a plurality of horizontally aligned downstanding shaft supports or bearings 51. Journaled in the shaft supports and extending longitudinally of the table are a pair of telescoping shafts or axles 52, more particularly designated as an inner solid shaft 52a and an outer hollow shaft 52b. Suitably keyed to the hollow or outer shaft is a pair of levers 53 and 54, each having an upstanding arm 55 with the latter identified lever being of the bell crank type and provided with a horizontally disposed arm 56. Also keyed to the inner solid shaft is a lever 53a having a vertically disposed arm 55a and, spaced from this lever, is a multi-part or compound lever 54a forming one of the bell crank type. The compound lever comprises an upstanding arm 55a' arranged to move with the inner shaft, and a horizontally disposed arm 56a adapted to be selectively connected to the associated upstanding arm through the medium of a clutch 57 and keyed to the inner shaft to be capable of being rotated therewith. Pivotally connected to the free or upper extremities of the upstanding arms 55 are a plurality of, preferably two, reciprocating rods 58 which extend from the lever arms and are pin-connected to the carriages B which carries the guide bar 43b or inner side guard. In like manner the free extremities of the vertical arms 55a and 55a' are pivotally connected to a pair of reciprocating rods 59 which, in turn, are flexibly secured to the carriages A carrying the outer side guard or guide bar 43a. By this arrangement, therefore, a counterclockwise motion of all of the upstanding arms, when considering Figure 3 of the drawings, will result in a movement of the side guards in a direction toward the opposite side of the table, carrying with them or shifting transversely of the table any metallic elements deposited on the rollers from the mill to thereby change the location of the elements on the table so that they may be in a position to enter different passes in the rolls from which they had just emerged. It may at times be found resirable merely to employ one or the inner side guard for shifting bars, etc., transversely of the table, due to the rolling of a single shape or one type of element. In such instances, then, the clutch mechanism 57 is actuated so as to be out of contact with the horizontal arm 56a to render the inner shaft inoperative and prevent a transverse movement of the outer side guard.

The side guards are moved transversely of the table or the telescoping shafts are rotated about their common axis in response to a vertical or tilting action of the table and, as exemplary of a means capable of imparting such a movement to the side guards and shafts, the horizontal arms of the bell cranks have associated therewith anchor means generally designated by the reference characters 60 and 60a; the former of which is connected to the arm 56 and the latter being connected to the arm 56a. To accommodate the anchor means, each horizontal arm is of inverted channel shape in vertical cross section and provided with guide ribs 61. Retained within each horizontal arm and supported by the ribs thereof is a slide or block 62 slidably associated with the lever arm to be capable of being moved to a predetermined position within the arm longitudinally thereof. Each block has threadedly associated therewith a rotatable member or spindle 63 mounted in the toggle and adapted, upon a manipulation thereof, to retain the block in a predetermined position, as well as shift the slide to a different location within the bell crank arm. By altering or changing the effective length of each spindle, the related slide may be moved to any location desired along the length of its supporting arm. The anchor means are employed to retain the horizontal arms in a predetermined position or a point along the length thereof in a position substantially fixed relative to the base or foundation 9 so that, upon a tilting action of the table, the upright arms of the bell cranks may be moved about their respective axes to cause a transverse movement of the carriages and associated side guards. The anchor means corresponding in number with the number of horizontal arms, which in the present instance is two, are each formed by vertically spaced heads or end shanks 64 having their related extremities exteriorly threaded and rotatably associated with a connecting rod or tube 65. This adjustable relationship between the related heads and connecting rod permits a variation or adjustment in the overall or effective length of the anchor means so as to compensate for manufacturing tolerances as well as positively determine the disposition of the vertical arms and the location of the side guards to accommodate the particular passes of the mill employed. Jamb nuts 66 are run along the threaded portion of the end shanks after the proper length of the anchor means has been determined to abut the extremities of the connecting rods and locate the associated elements against relative rotative movement. Spaced below each slide, and desirably in the vertical plane thereof when the table is in lowered position are a plurality of base plates 67 securely fastened to the base or foundation 9 and each being provided with a seat 68 having an upwardly facing concave spherical surface 69. Each block 62 is similarly formed with a concave spherical surface 70 facing downwardly with complementary concave surfaces 69 and 70 presenting sockets for the accommodation of ball-shaped or spherical or convex extremities 71 of the end shanks. The spherical extremities of the heads are locked in their respective sockets by means of a complementary formed nut 72 threadedly associated with the blocks and base plates. The anchor means are therefore articulately, pivotally or flexibly secured to or associated with the blocks and base plates so that no abnormal stresses will be set up in the billet or slab shifting mechanism as the result of the table tilting about an axis extending horizontally and transversely of the table and the telescoping shafts disposed horizontally and longitudinally of the table.

From the above, it will be noted that various alterations and changes may be made to the exemplified form of the hereinabove described and illustrated construction without departing from within the spirit of the invention and the scope of the appended claims.

I claim:

1. In a table, the combination of means for tilting said table, a pair of telescoped shafts carried by said table, a pair of transversely movable side guards extending above a material engaging plane of said table, a lever attached to each of said shafts and connected to an associated side guard, and an adjustable anchored means secured to each lever and fixed with respect to said table for imparting motion to said side guards in response to a tilting movement of said table.

2. In a table, the combination of means for tilting said table, a pair of telescoped shafts carried by said table, a pair of transversely movable side guards extending above a material engaging plane of said table, a lever attached to each of said shafts and connected to an associated side guard, an adjustable anchored means secured to each lever and fixed with respect to said table for imparting motion to said side guards in response to a tilting movement of said table, and clutch mechanism associated with said shafts adapted to render one of said side guards inoperative upon a tilting action of said table.

3. In a table, the combination of means for tilting said table, a pair of telescoped shafts carried by said table, a guide bar movable transversely of said table, a lever mounted on one of said shafts and connected to said guide bar, a spindle associated with said lever, means slidably mounted in said lever and maintained in a predetermined position by said spindle, anchor means universally connected to said first-named means and being adapted to rotate said lever upon a tilting movement of said table, and clutch means carried by one of said shafts and associated with said lever for rendering the latter inoperative upon a tilting movement of said table.

4. In a table, the combination of a plurality of guide bars adapted to move transversely of said table, a plurality of telescoped shafts carried by said table adjacent one side thereof, a lever connected to each shaft and an associated guide bar, rotatable means in each lever, a block carried by each lever and maintained in a predetermined position by an associated rotatable means, and an adjustable anchor means connected to each block and fixed with respect to said table.

5. In a table, the combination of a plurality of transversely movable carriages, a plurality of guide bars secured to said carriages, telescoped shafts carried by said table, levers connected to each shaft, reciprocating rods connecting said levers and carriages, rotatable means in each lever, a block carried by each lever and maintained in a predetermined position by an associated rotatable means, and adjustable anchor means connected to said blocks; and a clutch mechanism related with said shafts so as selectively to render one only of said shafts inoperative upon a tilting action of said table.

EDWARD T. PETERSON.