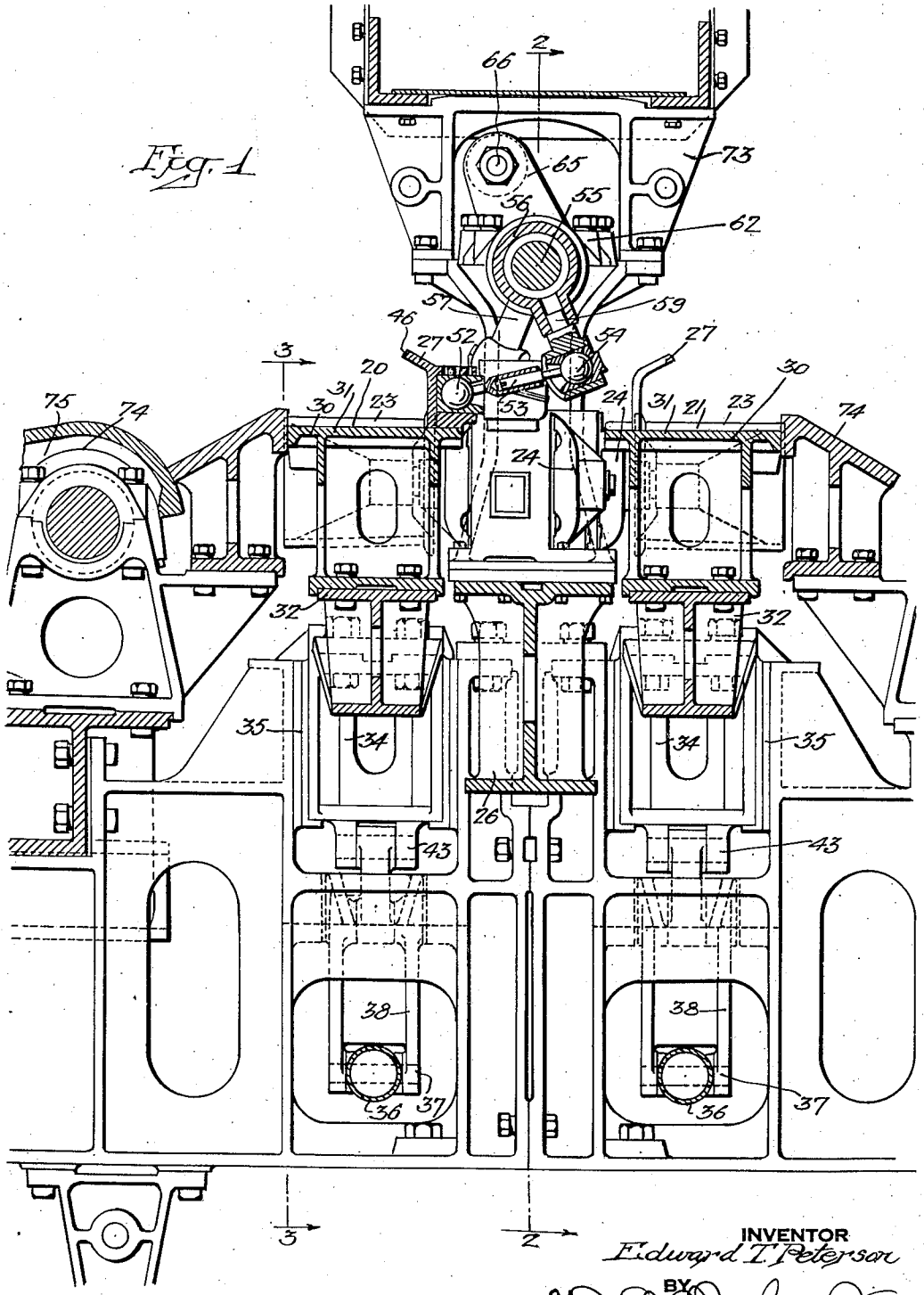
Feb. 21, 1950 E. T. PETERSON 2,498,449

DOUBLE APPROACH TABLE FOR TRANSFER OF METALLIC STOCK

Filed Nov. 26, 1947 4 Sheets-Sheet 1

Fig. 1



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Filed Nov. 26, 1947 4 Sheets-Sheet 2

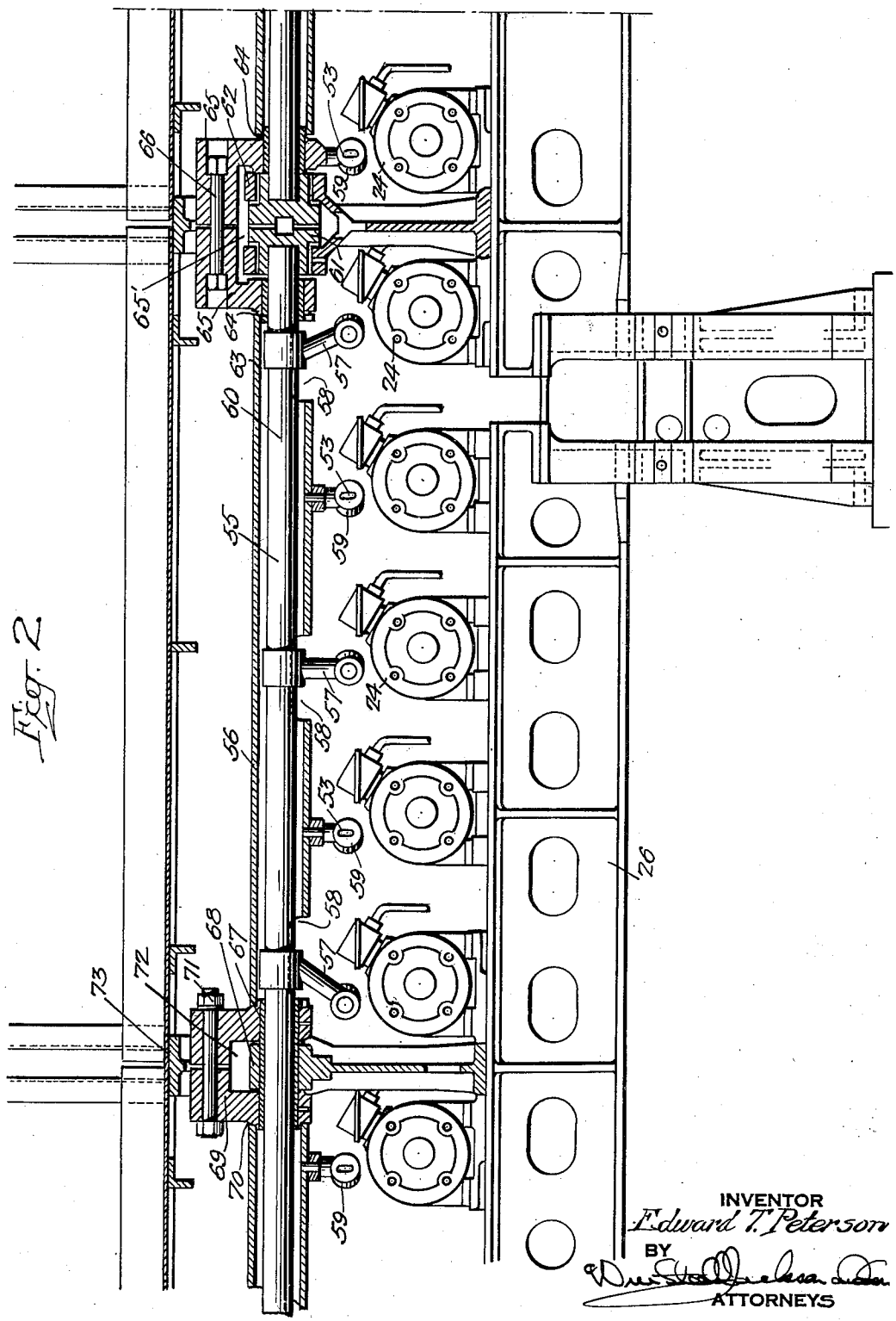

Fig. 2

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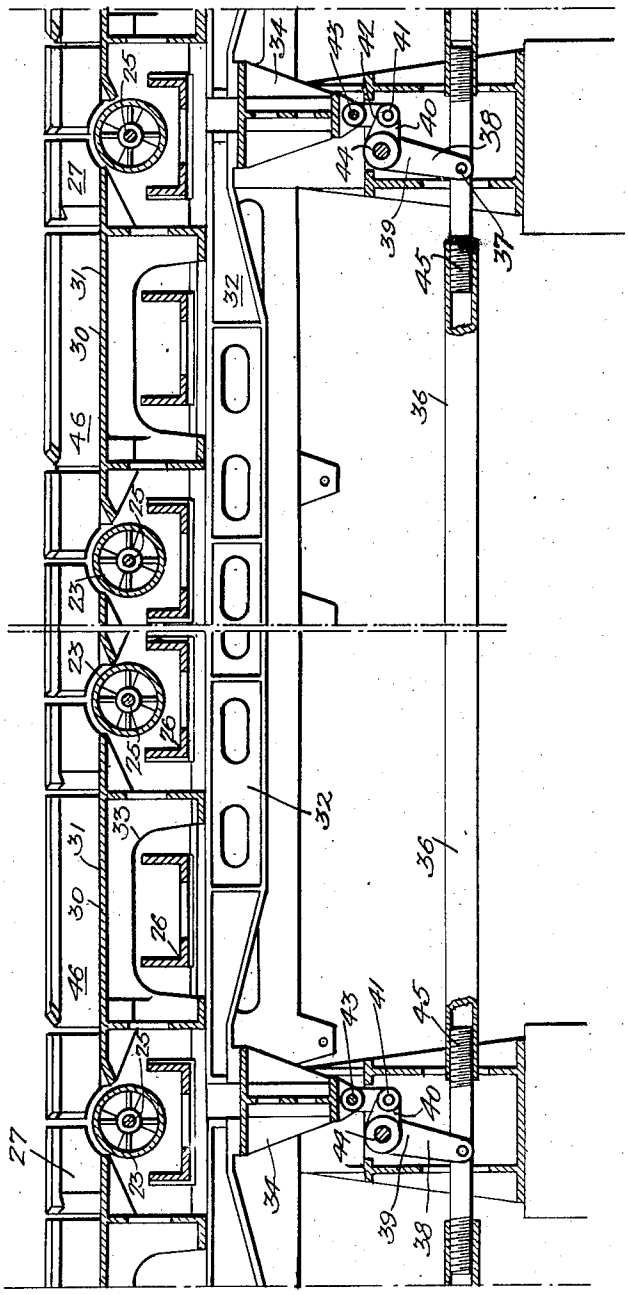

Fig. 3.

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DOUBLE APPROACH TABLE FOR TRANSFER OF METALLIC STOCK

Filed Nov. 26, 1947 4 Sheets-Sheet 4

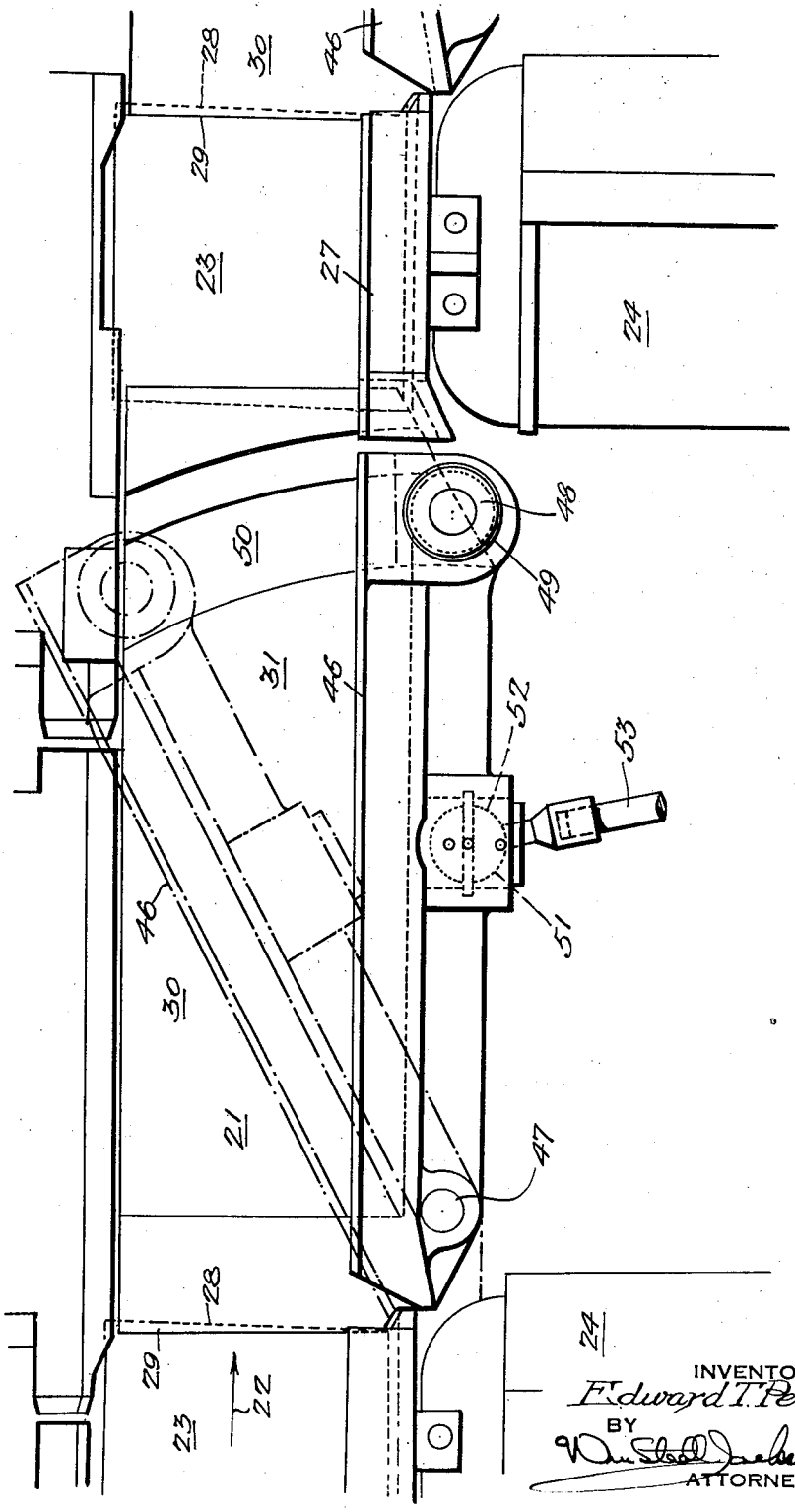

Fig. 4.

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UNITED STATES PATENT OFFICE

2,498,449

DOUBLE APPROACH TABLE FOR TRANSFER OF METALLIC STOCK

Edward T. Peterson, Reading, Pa.

Application November 26, 1947, Serial No. 788,271

7 Claims. (Cl. 198—24)

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My invention relates to approach tables of the character which are employed for transfer of travelling stock in connection with rolling mills, cooling beds and similar equipment.

A purpose of my invention is to simplify the kick-off mechanism necessary when employing adjoining approach tables in pairs, and avoid the necessity of wasteful spacing of the approach tables.

A further purpose is to design and construct the operating kick-off mechanism on twin approach tables so that extreme compactness is possible without loss of accessibility for purposes of maintenance.

A further purpose is to simplify and cheapen the bearing support of long shafts necessary for kick-off on twin approach tables.

Further purposes appear in the specification and in the claims.

In the drawings I have endeavored to illustrate one only of the embodiments in which my invention may appear, choosing the form shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a vertical transverse section of twin approach tables and kick-offs in accordance with my invention, with a fragmentary showing of associated cooling bed structure.

Figure 2 is a central vertical section of Figure 1 on the line 2—2.

Figure 3 is a fragmentary reduced scale longitudinal section of one of the approach tables taken on the line 3—3 of Figure 1, and omitting kick-off structure above the kick-off arms.

Figure 4 is an enlarged fragmentary top plan view of one of the approach tables shown in Figure 1.

In the drawings, like numerals refer to like parts.

In the rolling of metallic stock, especially iron and steel bars, rods, shapes, or other forms having substantial length, it is common practice to transfer semifinished stock from the rolls of the rolling mill to a cooling bed, sometimes known as a hot bed, or other structure for further processing or controlling the cooling of the stock, or to a flying shear for cutting the stock into lengths, or to straightening mechanism, by moving the stock longitudinally along the rollers of an approach table, and then kicking off the stock laterally from the approach table. While my invention has application in other related fields, it is considered that the best application is to transfer to a cooling bed, and accordingly the description is being directed to this form.

It has been the practice in some instances to place two cooling beds side by side and to supply stock to the cooling beds by twin approach tables arranged side by side and kicking off oppositely

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to their respective cooling beds. Difficulty has been encountered in constructing such transfer tables in pairs due to the fact that the kick-off mechanisms must be capable of independent action, since the time to kick-off on one transfer table will not necessarily coincide with that on the other transfer table, and the space necessary to house wholly independent kick-off mechanism and to allow for the requisite throws of the operating parts and access for maintenance has greatly increased the bulk of the twin approach tables and reduced the space efficiency of the installation.

In accordance with the present invention it is possible to obtain thoroughly effective and independent operation of the kick-offs and convenient access for maintenance without complexity in the mechanism and with avoidance of waste space and close lateral placement of the transfer tables.

As best seen in Figure 1, the mechanism comprises twin approach tables 20 and 21, which are effectively opposite counterparts as shown, and receive stock moving in the direction of the arrow 22 (Figure 4) or toward the observer in Figure 1. Each approach table comprises a set of rollers 23 on horizontal axes individually driven by separate electric motors 24 having shafts 25. The motors as best seen in Figure 2 are supported on the frame 26, and they are staggered so that one motor drives a roller of one approach table and the next motor drives the roller of the opposite approach table throughout the length of the structure. As best seen in Figure 4, the rollers are not on axes directly transverse to the lengths of the approach tables, but the axes are slightly forwardly inclined at the sides opposite to the guards 27 (the forward inclination being at the side toward which kick-off will take place). This is indicated by the angle between the lines 28 for the forward edges of the rollers and the lines 29 for the apron structure transverse to the lengths of the approach tables.

Interspersed between each pair of rollers of each approach table are apron plates 30 of aprons 31, which in the inactive position of the kick-off remains below the levels of the rollers 23 as shown in Figure 1.

The apron plates of each approach table are supported on an apron frame 32. It will be noted that the apron plates as shown in Figure 3 are recessed at 33 to clear from transverse elements of the stationary frame 26, during vertical motion of the apron to be described.

Each apron frame 32 at intervals along its length is supported by vertically sliding supports 34 which are guided by guideways 35 mounted on the frame 26. The various supports 34 along the length of each frame 32 are vertically moved in unison by a reciprocating connecting rod 36

running longitudinally of each approach table, and at each support making pivotal connection at 37 with an arm 38 of a bellcrank 39 whose opposite arm 40 makes pivotal connection at 41 with a link 42 pivotally connected at 43 to the lower part of each sliding support 34. The bellcranks have fixed pivotal mounting at 44. Adjustment is provided in the lengths of the connecting rod components at 45. The connecting rod may be suitably operated and counterweighted by means not shown.

The detail of the mechanism by which the approach table apron is raised is not claimed in the present patent application per se but as such forms part of the subject matter of my copending application Serial No. 728,429, filed February 14, 1947, for Approach table.

Forming part of the guard 27 when in inactive position and mounted on the aprons, kick-off arms 46 are provided at intervals between the pairs of approach table rollers. It will be understood that whereas the portions of the guard located between the kick-off arms may be conveniently supported on stationary structure as shown, the kick-off arms move up and down with the corresponding apron plate.

Each kick-off arm lies above the corresponding apron plate and is at its trailing end (with respect to the motion of the stock) pivoted at 47 on a vertical axis from the apron. At the forward end with respect to the motion of the stock the kick-off arms are conveniently provided with wear inserts 48 engaging in sockets 49 and replaceable and turnable to take the wear from engagement with the stock during kick-off. The lower ends of these inserts are conveniently extended downward into arcuate slots 50 in the apron plates, to avoid the possiblity of stock of small vertical cross section avoiding kick-off through the kick-off arms passing over such stock. The features relating to such inserts are claimed in my copending application above referred to.

At suitable remote points 51 from the pivots on each kick-off arm, universal joint connection 52 is made to a push rod 53 which at its opposite end makes universal joint connection at 54. In the space between the two approach tables and conveniently above the same, coaxial shafts 55 and 56 are mounted for rotation and extend longitudinally of the approach tables. The inner shaft 55 carries kick-off levers 57 which make universal joint connection at 54 with the push rods attached to the kick-off arms of approach table 21. The outer shaft 56 is recessed at intervals along its length at 58 to pass the kick-off levers 57 from the inner shaft and permit relative movement of the inner shaft and its kick-off levers with respect to the outer shaft.

At intervals corresponding to the positions of the kick-off arms on the opposite approach table 20, the outer shaft 56 carries kick-off levers 59 which make universal joint connection at 54 with the push rods 53 of the kick-off arms on the opposite approach table 20.

Bearings are provided at intervals on the frame 26 as best seen in Figures 1 and 2. The inner shaft 55 is suitably formed of shaft units 60 which are joined by flanges 61 which provide the journal members of bearings 62 mounted on the frame. The outer shaft 56 consists of tubular members 63 which are suitably joined to bearing sleeves 64 which engage L-shaped interlocks 65 secured together at 66, and clearing from the inner shaft at 65'. At intervals along the inner shaft sections 60 where they are not joined to one another,

bearings are provided by interrupting the outer shaft sections 63, extending bearing sleeves 67 across the space free with respect to the inner shafts and surrounding the same, and journalling on the outside of the sleeve at 68 from the frame. The sleeve 67 suitably extends within and journals L-shaped connectors 69 secured to the outer shaft sections 63 at 70 and joined together at 71. The L-shaped connectors are relieved at 72 so as to avoid interference with the journal 68. The bearing structure is braced by overhead construction 73. Since the shafts 55 and 56 turn through a small angle, there is no danger of interference at 65' and 72. The inner and outer kick-off shafts are conveniently operated in any suitable manner as from the ends, terminating the outer shaft before the inner shaft terminates.

In operation, it will be understood that stock will enter on either approach table 20 or 21 and travel in the direction of the arrow 22 in Figure 4, or toward the observator in Figure 1, moving over the approach table rollers which are driven by their individual motors. At this time the apron and apron plates of the particular approach table will be in the lower position, as shown in Figure 1 (below the level of the approach table rollers) and the kick-off arms will be in their inactive position in line with the guards, as shown in solid lines in Figure 4. Due to the slight inclination of the axis of the aproach table rollers forwardly upward the side guard of the approach table, as shown in Figure 4, the stock will be carried toward the guards and will ride along close to the guards and the kick-off arms in their inactive position.

When the stock travel on the approach table has extended far enough to make kick-off desirable, the apron and apron plate will be raised by the mechanism, best seen in Figure 3, through pulling on the connecting rod 36 to operate the bell cranks placed at intervals along the apron frame and thereby raise the apron frame through operation of the links 42 on the apron frame supports 34 suitably guided at 35 (Figure 1). By this means the stock is picked up and supported by the apron plates above the level of the approach table rollers and ceases to move forward since it loses its driving support from the rollers. The stock is ready for kick-off as soon as it has been picked up by the apron plates. If the stock is on approach table 20, kick-off is accomplished by turning the outer shaft 56 in the clockwise direction in Figure 1, causing kick-off levers 59 to operate the push rods 53 and through them to rock the kick-off arms 46 to the dot-and-dash line position of Figure 4. As the kick-off arms swing, the lower ends of the inserts 48 ride in the arcuate slots 50 of the apron plates, thus effectively kicking off even the thinnest stock.

As soon as kick-off is accomplished, the stock is suitably carried laterally on to a cooling bed 74, which may be of any suitable type, although in the particular cooling bed shown packing annealing mechanism 75 of character well known in the art has been suggested.

As soon as kick-off has been accomplished, the kickoff arms are returned to their inactive position by turning outer shaft 56 counterclockwise in Figure 1. The apron is then ready to lower to the position of Figure 1, after which the mechanism is ready for the next cycle of operation.

It will be understood that the apron and apron frame may, if desired, be counterweighted by any suitable means not shown, but preferably ac-

cording to my application Serial No. 728,429 aforesaid.

In case the stock is on approach table **21**, all operations will be the same except that the other apron will be raised, and the kick-off will be operated by turning the shaft **55** counterclockwise in the position of Figure 1 to swing kick-off levers **57** and move push rods **53** forward to swing the apron plates into the dot-and-dash line position of Figure 4. After operation, the kick-off arms will be restored to their inactive position by turning the shaft **55** clockwise in the position of Figure 1.

It will be understood that the various bearings and the related parts are readily accessible for lubrication and that, as shown in Figure 2, in case of requirement for maintenance or repair, a given unit can be readily disassembled as by removing the bolts **66** and **71** and separating the flanged connections between the inner shaft units. Since it is only necessary for each shaft to turn through a comparatively small angle during the kick-off, there is ample room to prevent interference between the kick-off levers **57** of the inner shaft and the outer shaft **56**, whether either kick-off is in the operative or inoperative position when the other equivalent is operated. It will thus be evident that the operations of the two kick-offs may be entirely independent, although they can, of course, operate in unison if desired.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In mechanism for transfer of metallic stock, a pair of approach tables arranged side by side, in combination with kick-off means for the approach tables acting oppositely from the position between the tables and including coaxial kick-off shafts, one of which is hollow and surrounds the other, kick-off levers on the respective shafts and push rods secured to the kick-off levers at one end and the kick-off means at the opposite end.

2. In transfer mechanism for metallic stock, a pair of adjoining approach tables side by side, swingable kick-off arms mounted at the adjoining sides of the respective tables and adapted to swing across the respective tables, an interior shaft extending longitudinally of the tables in the space between the two, kick-off levers mounted on the interior shaft at positions corresponding to the kick-off arms on one of the approach tables, push rods connecting such kick-off levers with the kick-off arms of that approach table for operation of the kick-off arms in response to angular movement of the interior shaft, a hollow exterior shaft surrounding the interior shaft and recessed to permit passage and relative movement of the kick-off levers on the interior shaft, kick-off levers extending from the exterior shaft at positions corresponding to the positions of the kick-off arms on the opposite approach table and push rods operatively connecting the kick-off levers on the exterior shaft with the kick-off arms on the opposite approach table.

3. In transfer mechanism for travelling stock, a plurality of approach tables arranged side by side, each including a set of approach table rollers and an apron having a position below the rollers, in combination with kick-off arms on each approach table at the side adjoining the other approach table, pivotal means mounted on the apron for pivoting the kick-off arms at the ends from which the stock approaches and on vertical axes, means for raising each apron to a position above the level of the rollers of the corresponding approach table and thereby raising the kick-off arms pivoted on the apron and means including coaxial shafts between the approach tables for operating the kick-off arms.

4. In transfer mechanism for travelling stock, a plurality of approach tables arranged side by side, each including a set of approach table rollers and an apron having a position below the rollers, in combination with kick-off arms on each approach table at the side adjoining the other approach table, pivotal means mounted on the apron for pivoting the kick-of arms at the ends from which the stock approaches and on vertical axes, means for raising each apron to a position above the level of the rollers of the corresponding approach table and thereby raising the kick-off arms pivoted on the apron, and means including coaxial shafts one surrounding the other and extending longitudinally in the space between the approach tables for actuating the respective kick-off arms when a given apron is elevated.

5. In transfer mechanism for travelling stock, a plurality of approach tables arranged side by side, each including a set of approach table rollers and an apron having a position below the rollers, in combination with kick-off arms on each approach table at the side adjoining the other approach table, pivotal means mounted on the apron for pivoting the kick-off arms at the ends from which the stock approaches and on vertical axes, means for raising each apron to a position above the level of the rollers of the corresponding approach table and thereby raising the kick-off arms pivoted on the apron, an interior shaft extending longitudinally of the approach tables in the space between the approach tables, kick-off levers mounted on the interior shaft at intervals along its length corresponding to the operating positions of the kick-off arms of one of the approach tables, push rods making universal joint connection between the kick-off levers and the kick-off arms of said one approach table at points remote from the pivots, an exterior shaft surrounding the interior shaft and recessed to permit egress and relative motion of the kick-off levers on the interior shaft, kick-off levers on the exterior shaft positioned along its length at points corresponding with the operative positions of the kick-off arms on the opposite approach table and push rods making universal joint connection between the kick-off levers on the exterior shaft and the kick-off arms on the opposite approach table at points remote from their pivots.

6. In transfer mechanism for travelling stock, a plurality of approach tables side by side and each including a set of approach table rollers and an apron having an inactive position below the rollers, in combination with frames supporting the aprons, guides for vertical motion of the frames, levers positioned at intervals along the frames and interconnected to elevate the frames with their aprons individually, kick-off arms pivotally mounted on the respective aprons on the side of each approach table adjoining the other approach table, the pivots being on vertical axes

adjacent the end of each kick-off arm from which the stock approaches, coaxial shafts longitudinal of the approach tables in the space between the same, one surrounding the other and recessed for access to the other, kick-off arms in sets, one set secured to one of the shafts at positions for operation of the kick-off arms of one approach table and the other secured to the other shaft at positions for operation of the kick-off arms of the other approach table, and push rods making universal joint connection between each kick-off arm and the corresponding kick-off lever of the corresponding set.

7. In approach mechanism for transfer of metallic stock, a pair of oppositely directed sets of pivotally supported kick-off arms, arranged back to back, in combination with a plurality of kick-off shaft units connected end to end, extending through the space between the kick-off arms, and each including an inner shaft, kick-off levers mounted at intervals along the inner shaft, an outer shaft surrounding the inner shaft recessed

to permit clearance from the kick-off levers on the inner shaft, a plurality of kick-off levers mounted at intervals along the outer shaft, means for interconnecting the inner shaft at intermediate ends with the inner shaft of the next unit and means for connecting the outer shaft at intermediate ends with the outer shaft of the next unit and in combination with push rods interconnecting the kick-off levers on the inner shaft with one set of kick-off arms and interconnecting the kick-off levers on the outer shaft with the other set of kick-off arms.

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