Aug. 11, 1953 W. L. BEST ET AL 2,648,420

UNLOADER FOR WICKET-TYPE CONVEYERS

Filed Nov. 26, 1949 2 Sheets-Sheet 1

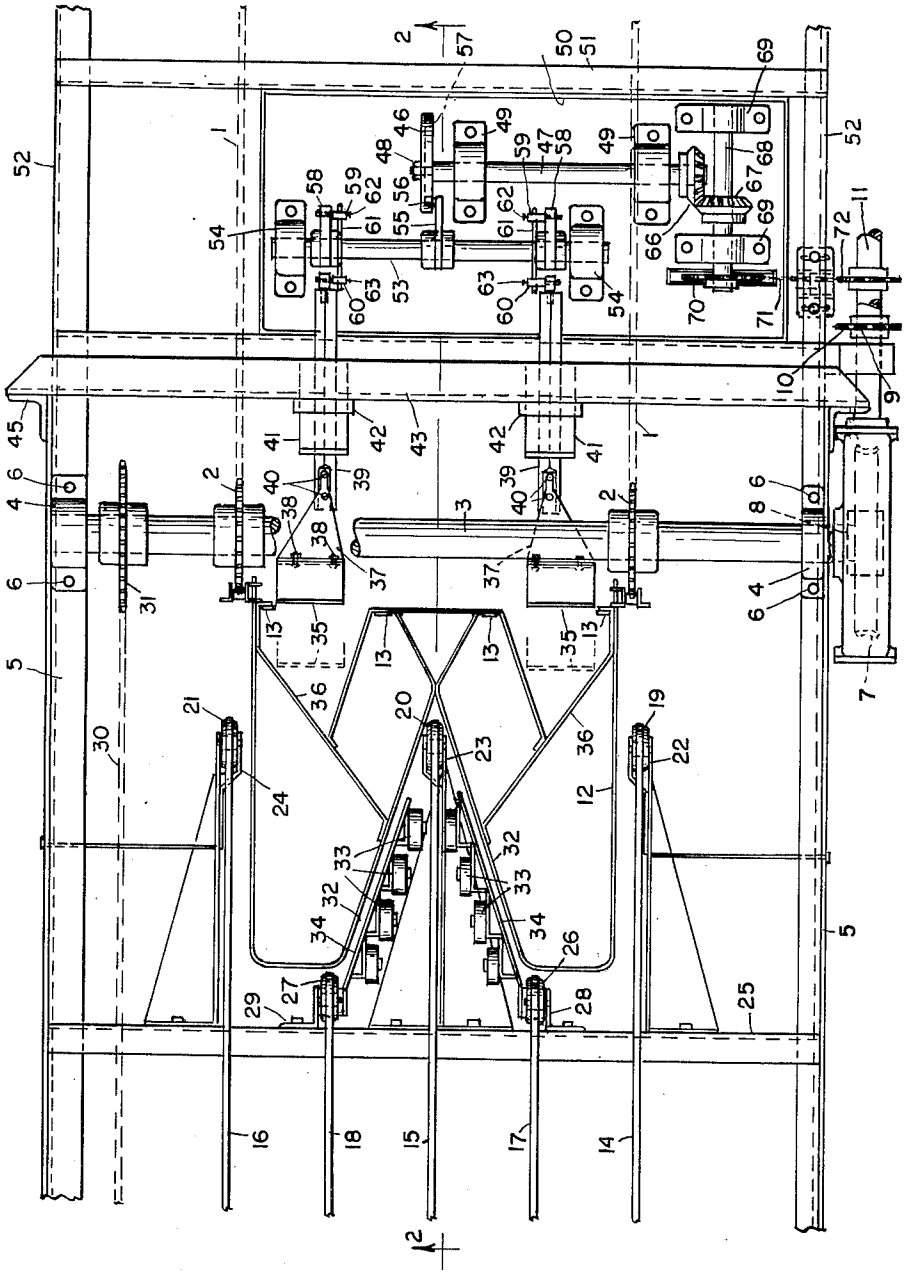

Fig. 1

INVENTORS
WILLIAM L. BEST AND
BY CHARLES H. LISCH, JR.
Oberlin & Limbach
ATTORNEYS

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2 Sheets-Sheet 2

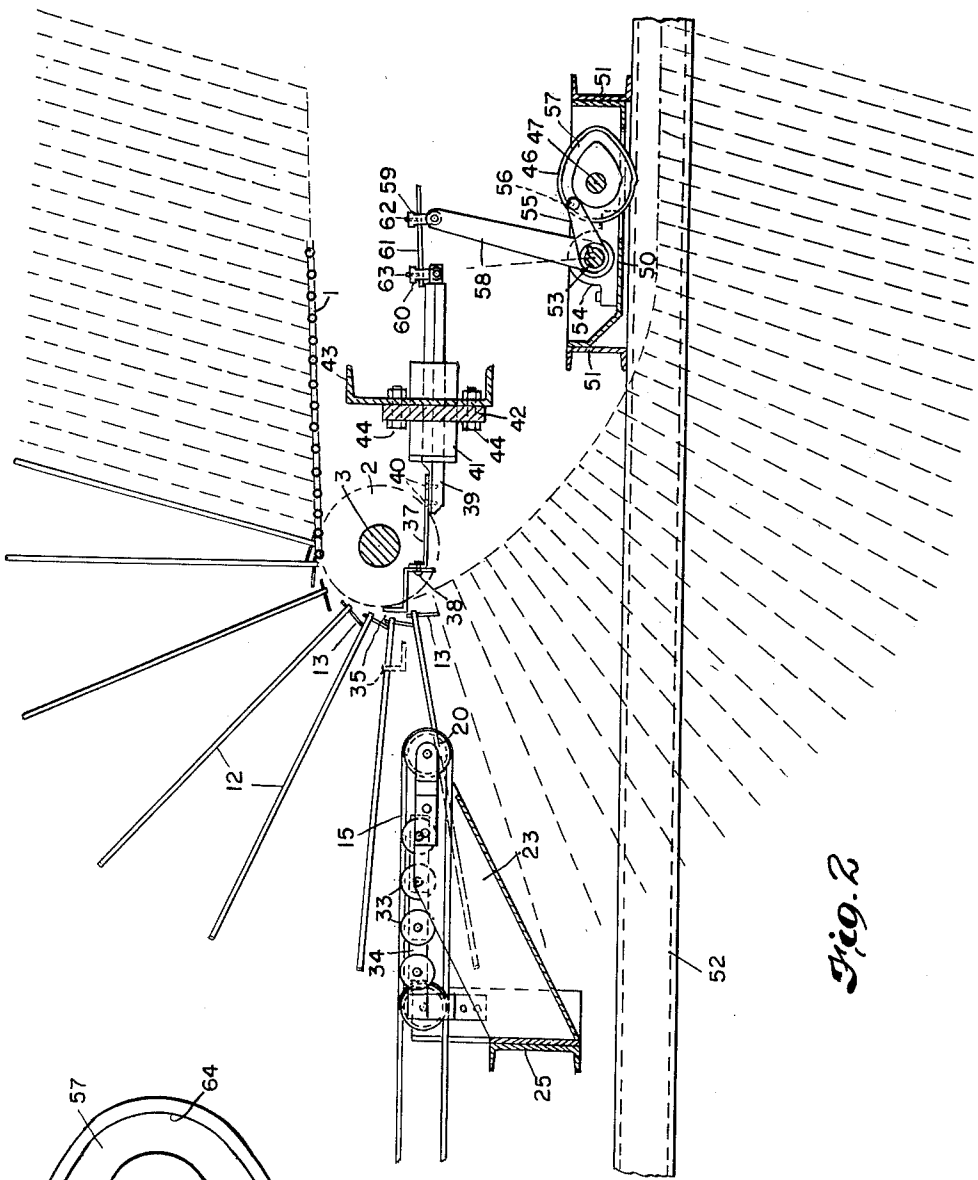

Fig. 2

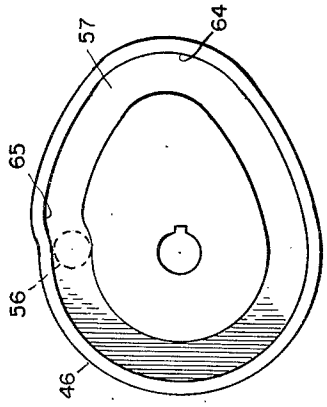

Fig. 3

INVENTORS
WILLIAM L. BEST AND
BY CHARLES H. LISCH, JR.
Oberlin & Limbach
ATTORNEYS

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UNLOADER FOR WICKET-TYPE CONVEYERS

William L. Best, Detroit, and Charles H. Lisch, Jr., Grosse Pointe Woods, Mich., assignors to Young Brothers Company, Detroit, Mich., a corporation of Michigan

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14 Claims. (Cl. 198—24)

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This invention relates as indicated to unloaders for conveyors, and more particularly to unloaders for conveyors having racks or carriers of the wicket type.

In the heat processing of thin, flat sheets, such as lithographic plates, it is customary practice to transport the sheets through an oven on a conveyor, the respective courses of which lie one above the other, having a plurality of outwardly extending, closely spaced racks therealong for supporting the sheets on edge. A typical example of this type conveyor is shown in Patent No. 2,406,821, issued to V. A. Fox under date of September 3, 1946. As the racks pass over the work discharging end of the conveyor, the sheets carried thereon are deposited flatwise on a moving take-off belt for removal therefrom. However, at that point the racks are moving in a downwardly direction and impart little or no forward velocity to the sheets. Further, since the sheets are supported on edge in rather close relation on the rack conveyor, and are then deposited flatwise on the take-off belt, it will be appreciated that the latter will necessarily be run at a much greater speed than the rack conveyor.

As a result of the relatively high speed of the take-off belt and the fact that the sheets have no appreciable forward velocity at the instant of contact with the belt, there will be considerable slippage before the sheets begin to move with the latter. Not only may such slippage result in damaging or marring of the sheets, but it has the further effect of delaying the removal of each sheet from the path of the next succeeding rack and thereby slowing down the conveyor operation. Additionally, differential slippage may cause the sheets to be turned askew as they contact the take-off belt or belts, making later handling awkward.

A primary object of this invention is accordingly to provide unloading means for a wicket-type conveyor which will permit rapid operation of such conveyor and eliminate slippage between work-pieces and a rapidly travelling take-off belt or the like.

A further object is to provide positive means operative to provide an initial impetus to the work-pieces in a new direction as they are deposited by such conveyor on continuously travelling take-off means.

Other objects and advantages of the invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

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In said annexed drawing:

Fig. 1 is a top plan view of the work discharging end of a conveyor showing an unloader device and a portion of a take-off belt illustrating one embodiment of my invention;

Fig. 2 is a sectional view taken along the line 2—2 on Fig. 1; and

Fig. 3 is a detail side elevational view of a cam forming an element of the unloader mechanism.

Apparatus suitable for use in connection with the drying of lithographic plates has been provided as one preferred embodiment of this invention, including an endless conveyor, the respective courses of which are located one above the other. Wicket-type rack members are arranged on the conveyor in closely spaced relation for supporting the plates on edge. Provided at the work discharging end of the conveyor and arranged in tandem therewith are a plurality of endless belts to receive and carry away the plates deposited thereon. A pair of pushers are positioned at the work discharging end of the conveyor adapted to be reciprocated longitudinally thereof, and cam means are provided thus to reciprocate the pushers in timed relation to the travel of the conveyor to engage each plate deposited on the belts and impart a velocity thereto substantially equal in magnitude and direction to the velocity at which the belts are travelling, whereby initial slippage between belts and plates is obviated.

Referring now to the drawing and more especially to Figs. 1 and 2 thereof, the apparatus to which this invention relates includes a conveyor which may comprise parallel courses of endless chains 1 engaging sprockets 2 secured to shaft 3, such shaft 3 being mounted in pillow blocks 4, secured to channels 5 by means of bolts 6. The shaft 3 is provided with a gear 7 keyed to the end thereof which is driven by a worm gear 8, the latter in turn being driven by a chain 9 upon a sprocket 10 carried by the longitudinally extending shaft 11. An electric motor, not shown in the drawing, may be provided to drive the shaft 11 in conventional manner. Provided at intervals along the conveyor are a plurality of closely spaced racks 12 which are inclined opposite to the direction of travel of the upper conveyor course and on which the sheets are carried. The racks are of the wicket-type and consist of open frames having flanges or lips 13 at the bottom thereof for supporting the sheets on edge.

Located at the work discharging end of the conveyor and arranged in tandem therewith are endless take-off belts 14, 15, 16, 17 and 18 which are provided for removing the sheets from their respective racks. The belts 14, 15 and 16 are carried respectively by pulleys 19, 20 and 21 mounted on brackets 22, 23 and 24 bolted to the transverse channel 25. The belts 17 and 18 are car-

ried by pulleys 26 and 27 respectively, mounted on columns 28 and 29, likewise bolted to the transverse channel 25. The chain 30 driven by sprocket 31 of the shaft 3 is provided to actuate all of the belts. The frame work forming the upper boundary of each rack is shaped with a V-shaped notch or indentation 32 therein so that the racks may pass the belt 15 and its pulley and bracket without interference therewith. Thus, as each rack passes the work discharging end of the conveyor, the sheet carried thereon is deposited on moving belts 14, 15 and 16 and quickly removed from the path of the next succeeding rack, belts 17 and 18 assisting in this action as soon as the sheet is moved into contact with the same. Where the sheets are not of sufficient width to contact the belts 14 and 16, they are deposited on the central belt 15 only which extends into the notch 32 of the rack frames, lateral support being provided by the rollers 33 until the sheets are moved into contact with the belts 17 and 18. The rollers 33 are mounted on brackets 34 bolted respectively to the columns 28 and 29 and are progressively increasingly laterally spaced to the extent permitted by the generally V-shaped notch 32 in the work-supporting racks.

Positioned at the unloading end of the conveyor is a pair of laterally spaced kickers or pushers 35 which are adapted to reciprocate longitudinally of the conveyor, thereby to give an initial forward velocity or impetus to the sheets as the latter come in contact with the take-off belts. There will be no interference between the pushers and the racks since, as illustrated in Fig. 1, ample clearance is provided by the notched recesses 36 in the base of the racks to permit the reciprocation of the pushers. Each respective pusher 35 is secured to one end of a connector 37 by means of bolts 38, such connector being secured at its other end to push rod 39 by means of set screws 40. Each push rod 39 is reciprocably mounted in a pusher bearing guide 41 welded to a boss 42 secured to the transverse channel 43 by means of bolts 44, such channel being secured to the columns 45 as by means of bolts or welding.

The reciprocating motion of the pusher 35 is controlled by a groove follower cam 46 which is keyed on one end of a cam shaft 47 and secured thereon by nut 48, such shaft being located between the respective courses of the conveyor transversely thereof and mounted in pillow blocks 49 bolted to the channel 50. The channel 50 is bolted to the transverse channels 51, such latter channels being bolted to the longitudinal channels 52. Likewise located between the courses of the conveyor and parallel to the cam shaft 47 is a cam follower shaft 53 mounted in pillow blocks 54 bolted to the channel 50. A rocker arm 55 is keyed to the central portion of the cam follower shaft 53, and pivotally mounted at the end of the arm 55 is a roller cam follower 56 which is adapted to engage the cam track or groove 57 of the cam 46.

Likewise keyed to the cam follower shaft 53 are upwardly extending rocker arms 58 and to the end of each such arm is pivotally secured a snap connector 59. Similarly mounted on the end of each push rod 39 is a snap connector 60. The corresponding push rods 39 and arms 58 are connected together by means of connecting rods 61. Each connecting rod 61 passes through the externally projecting portion of a snap connector 59 of an arm 58 and likewise through a snap connector 60 of the corresponding push rod 39 and is adjustably secured in each such snap connector by means of set screws 62 and 63. Thus, as the cam 46 rotates, raising and lowering the cam follower 56, arm 55 is caused to oscillate, thereby imparting a rocking action to the cam follower shaft 53. Such rocking action is transmitted to the pushers 35 in the form of a reciprocating motion by means of the linkages hereinabove described. As shown in Fig. 3 of the drawing, the contour of the cam track 57 between the points 64 and 65 is designed so as to suddenly "lift" the cam follower 56 as the latter rides in that portion of the cam track, thereby imparting a forward thrust to the pushers. The cam 46 is rotated in timed relation with the conveyor, in a manner hereinafter described, so that the pushers are thrust forward as each sheet is deposited on the moving take-off belt and quickly retracted to avoid obstructing the next following sheet.

Keyed to the other end of the cam shaft 47 is a bevel gear 66 which is adapted to mesh with a second bevel gear 67, such latter gear being keyed to counter shaft 68. The counter shaft 68 is mounted in pillow blocks 69 bolted to the channel 50 and has keyed to the end thereof a sprocket 70 which is adapted to be driven by chain 71. The chain 71 is in turn driven by a sprocket 72 upon the shaft 11, which shaft likewise actuates the shaft 3 of the conveyor 1, in a manner hereinbefore described.

In operation, the conveyor, moving for example through a heat processing oven, carries sheet material on racks along its upper course. These racks are inclined opposite to the direction of conveyor travel until they reach the work discharging end of the conveyor, whereupon they tilt forward, as shown in Fig. 2 of the drawing, causing the sheets thereon to shift to the trailing side of the next preceding rack. As the racks pass down over the work discharging end of the conveyor, and pass belts 14, 15 and 16, the sheets thereon are deposited on such belts (narrower sheets being deposited on the central belt 15 only) and on rollers 33. The cam 46, which is rotated in timed relation with the conveyor travel, is designed to impart a forward stroke to the pushers as each sheet contacts the belts, engaging the inner edges of such sheets and giving them an initial forward velocity so that they are moving with the belts at the instant of contact. The velocity of the forward stroke of the pushers depends on the design of the cam, and should be such that it will impart a velocity to the sheets which is substantially equal to the velocity of travel of the belts, so that no slippage will result when the sheets come in contact with the latter. It will be appreciated that, where such a conveyor is employed to transport lithographic plates through a drying oven, such plates will likely be deposited upon the belts face downward (having preferably been loaded face upward at the work entering end of the oven) so that slippage might mar the same.

Once the cam is adjusted to function in harmony with the conveyor, i. e. to impart a forward stroke to the pushers as each sheet is deposited on the belts, synchronization is obtained for all speeds of the conveyor since both the cam and the conveyor are actuated by the shaft 11. Similarly, since the take-off belts are driven by the conveyor, the speed of the belts will at all times be proportional to the speed of the latter.

By giving the sheets a "push" in the direction of travel of the belts at the instant of contact, it

will be seen that the unloader device of this invention not only obviates initial slippage and the damage and marring attendant thereto, but also implements the removal of the sheets from the conveyor racks, permitting speedier conveyor operation.

Since it is a characteristic of a groove follower cam such as the one employed in this embodiment that the outer edge of the groove tends to turn the cam follower in one direction while the inner edge of the groove tends to turn it in the other, sufficient clearance or play should be provided between the groove and the cam follower in order that wear on such respective members may be kept at a minimum.

It will be understood that the form of work supporting racks or wickets may be varied considerably and may, for example, comprise transverse alignments of erect fingers carried by two or more parallel conveyor courses, all as is well known in the art. Since such fingers need not be laterally interconnected the problem of introducing the work transfer pusher means therebetween is eliminated as well as permitting extension of the take-off conveyor belts.

Although the unloader device herein described has been indicated as being serviceable in connection with the drying of lithographic plates, it is clear that it has a wider field of use and may be used wherever it is desired to transfer work-pieces from one conveyor to another, or quickly to discharge work-pieces from the racks of a wicket-type conveyor. Further, although the sheet material transported will generally be flat, clearly the unloader device is equally useful for material of other conformations where all portions of such material do not lie in the same plane. It should also be kept in mind that the scope of this invention is not limited to such cam means as is herein described, but that any suitable device, as, for example, a Scotch-yoke may be utilized to impart a reciprocating motion to the pushers. Certain subject-matter disclosed but not claimed herein is disclosed and claimed in co-pending application Serial No. 133,172 of Charles H. Lisch, Jr., and Frank Schuman filed December 15, 1949, now Patent No. 2,552,101.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

We therefore particularly point out and distinctly claim as our invention:

1. The combination of an endless conveyor, having courses lying one above the other, wicket-type racks carried thereby in closely spaced relation for supporting sheet material on edge, an endless travelling take-off belt located at the work discharging end of said conveyor and arranged in tandem therewith to receive and carry away such sheet material deposited flatwise thereon from said respective racks, pusher means positioned at the work discharging end of said conveyor and adapted to be reciprocated longitudinally thereof, means operative to drive said belt at a speed greater than, and proportional to, the speed of said conveyor, whereby to accommodate singly the sheets deposited flatwise thereon, and drive means operative to reciprocate said pusher means in timed relation to the travel of said conveyor to engage each sheet deposited on said belt and impart a velocity thereto substantially equal in magnitude and direction to the velocity at which said belt is travelling, whereby initial slippage between said belt and sheets is obviated, and then to retract said pusher means from the path of the next succeeding sheet.

2. The combination with an endless conveyor having courses lying one above the other, wicket-type racks carried thereby in spaced-apart relation for supporting sheet material on edge, and an endless travelling take-off belt located at the work discharging end of such conveyor arranged in tandem therewith to receive and carry away such sheet material deposited thereon from such respective racks; of pusher means positioned at the work discharging end of such conveyor and adapted to be reciprocated longitudinally thereof, and drive means operative thus to reciprocate said pusher means in timed relation to the travel of such conveyor to engage each sheet deposited on such belt and impart a velocity thereto substantially equal in magnitude and direction to the velocity at which such belt is travelling, whereby initial slippage between such belt and sheets is obviated.

3. The combination with an endless conveyor having courses lying one above the other, racks carried thereby in spaced-apart relation for supporting sheet material on edge, and an endless travelling take-off belt located at the work discharging end of such conveyor arranged in tandem therewith to receive and carry away such sheet material deposited thereon from such respective racks; of a pusher positioned at the work discharging end of such conveyor and adapted to be reciprocated longitudinally thereof and into the path of such racks, a recess provided in the base of each such rack to permit the advance of said pusher, and drive means operative thus to reciprocate said pusher in timed relation to the travel of such conveyor to engage each sheet deposited on such belt and impart a velocity thereto substantially equal in magnitude and direction to the velocity at which such belt is travelling, whereby initial slippage between such belt and sheets is obviated.

4. The combination with an endless conveyor having courses lying one above the other, wicket-type racks carried thereby in spaced-apart relation for supporting sheet material on edge, and an endless travelling take-off belt located at the work discharging end of such conveyor arranged in tandem therewith to receive and carry away such sheet material deposited thereon from such respective racks; of two pushers positioned at the work discharging end of such conveyor and adapted to be reciprocated longitudinally thereof and into the path of such racks, recesses provided in the base of each such rack to permit the advance of said pushers, a recess in the outer portion of each such rack to permit the protrusion therein of such belt, and drive means operative thus to reciprocate said pusher means in timed relation to the travel of such conveyor to engage each sheet deposited on such belt at the instant of contact therewith and impart a velocity thereto substantially equal in magnitude and direction to the velocity at which such belt is travelling, whereby initial slippage between such belt and sheets is obviated.

5. The combination with an endless conveyor, racks carried thereby in spaced-apart relation for supporting work-pieces, and an endless travelling take-off belt located at the work discharging end of such conveyor arranged in tandem therewith to receive and carry away such work-pieces deposited thereon from such respective racks; of pusher means positioned at the work discharging end of such conveyor and adapted to be reciprocated longitudinally thereof,

and drive means operative thus to reciprocate said pusher means in timed relation to the travel of such conveyor to engage each work-piece deposited on such belt and impart a velocity thereto substantially equal in magnitude and direction to the velocity at which such belt is travelling, whereby initial slippage between such belt and work-pieces is obviated.

6. The combination with an endless conveyor adapted to carry work-pieces thereon, and an endless travelling take-off belt located at the work discharging end of such conveyor arranged in tandem therewith to receive and carry away such work-pieces deposited thereon from such conveyor; of pusher means positioned at the work discharging end of such conveyor and adapted to be reciprocated longitudinally thereof, and drive means operative thus to reciprocate said pusher means in timed relation to the travel of such conveyor to engage each work-piece deposited on such belt and impart a velocity thereto substantially equal in magnitude and direction to the velocity at which such belt is travelling, whereby initial slippage between such belt and work pieces is obviated.

7. In combination with an endless conveyor, racks carried thereby in spaced-apart relation for supporting work-pieces, and an endless travelling take-off belt located at the work discharging end of such conveyor arranged in tandem therewith to receive and carry away such work-pieces deposited thereon from such respective racks; reciprocable pusher means positioned at the work discharging end of such conveyor operative in timed relation to the travel of such conveyor to engage each work-piece deposited on such belt and impart a velocity thereto substantially equal in magnitude and direction to the velocity at which such belt is travelling, whereby initial slippage between such belt and work-pieces is obviated.

8. In combination with an endless conveyor adapted to carry work-pieces thereon, and an endless travelling take-off belt located at the work discharging end of such conveyor arranged in tandem therewith to receive and carry away such work-pieces deposited thereon from such conveyor; pusher means positioned intermediate such conveyor and belt operative in timed relation to the travel of such conveyor to engage each work-piece deposited on such belt and impart a velocity thereto substantially equal in magnitude and direction to the velocity at which such belt is travelling, whereby initial slippage between such belt and work-pieces is obviated.

9. In combination, two conveyors arranged in tandem and travelling in the same direction, work supporting means carried by one of said conveyors operative to transfer work-pieces directly from one conveyor to the other, and pusher means intermediate said two conveyors operative to engage the work-pieces at the point of transfer and impel the same in the direction of the receiving conveyor

10. In combination, a conveyor having racks for supporting generally flat work-pieces thereon in closely spaced relation, a second conveyor travelling at a greater speed in the same direction and arranged in tandem to directly receive work-pieces from said first conveyor, and pusher means reciprocable in timed relation to the travel of said first conveyor and disposed to engage such work-pieces and impel them flatwise in the direction of travel of said second conveyor for removal by the latter in spaced relation thereon.

11. In combination, an endless conveyor having upper and lower courses and comprising spaced parallel runs laterally connected by upstanding racks adapted to support generally flat work-pieces on edge in such upper course, a second conveyor arranged in tandem with said first conveyor and travelling at a greater speed in the same direction, said second conveyor lying in a generally horizontal plane successively in alignment with each of such racks as the latter pass from the upper to the lower course of said first conveyor whereby the work-pieces will be directly deposited flatwise on such second conveyor, and pusher means reciprocable in timed relation to the travel of said first conveyor adapted to advance between such runs and engage and impel such work-pieces in the direction of travel of said second conveyor.

12. In combination, a conveyor adapted to transport generally flat work-pieces in closely spaced relation flatwise to the direction of travel, a second conveyor in close association with said first conveyor to directly receive work-pieces therefrom and travelling in a direction generally normal to the direction of travel of said first conveyor at such point of close association, said second conveyor being adapted to transport such work-pieces edgewise to the direction of travel, and pusher means positioned intermediate said conveyors operative in timed relation to the travel of said first conveyor to engage such work-pieces thereon at the point of closest association with said second conveyor and impel the same in the direction of movement of said second conveyor, thereby to assist in transferring the same.

13. In combination, an endless conveyor adapted to carry work-pieces thereon, a plurality of endless take-off belts arranged in tandem with said conveyor and unequally spaced therefrom to directly receive and carry away such work-pieces, and pusher means intermediate such conveyor and belts operative in timed relation to engage each work-piece as it is transferred to such belts and impart a velocity thereto substantially equal in magnitude and direction to the velocity at which such belts are travelling, whereby initial slippage between such belts and work-pieces is obviated.

14. In combination, an endless conveyor having transverse racks for supporting work-pieces, a second conveyor located at the work discharging end of said first conveyor in overlapped relation therewith, whereby work-pieces supported on such first conveyor will be directly deposited on such second conveyor, and pusher means intermediate such conveyors operative to engage each work-piece thus deposited and positively impel the same in the direction of said second conveyor.

WILLIAM L. BEST.
CHARLES H. LISCH, JR.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
648,684	Davis	May 1, 1900
1,288,810	Birchbauer	Dec. 24, 1918
1,306,573	Bevier	June 10, 1919
1,753,998	Podel	Apr. 8, 1930
2,100,441	Greene	Nov. 30, 1937