Aug. 26, 1930. E. L. SMALLEY 1,773,881

CONVEYER

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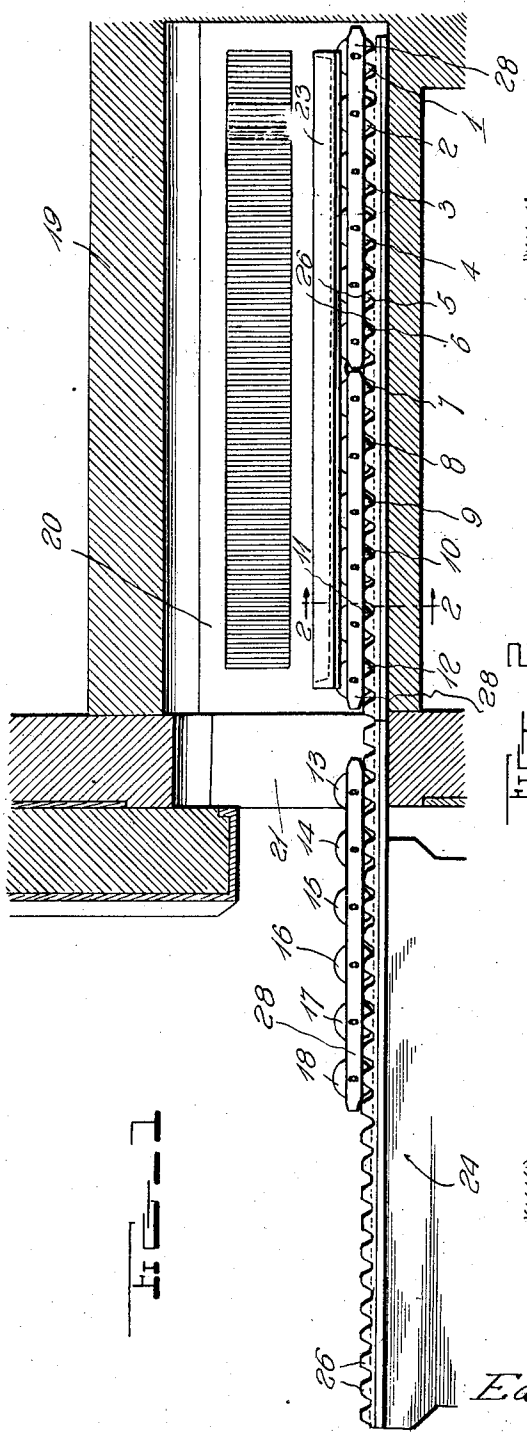


FIG. 1

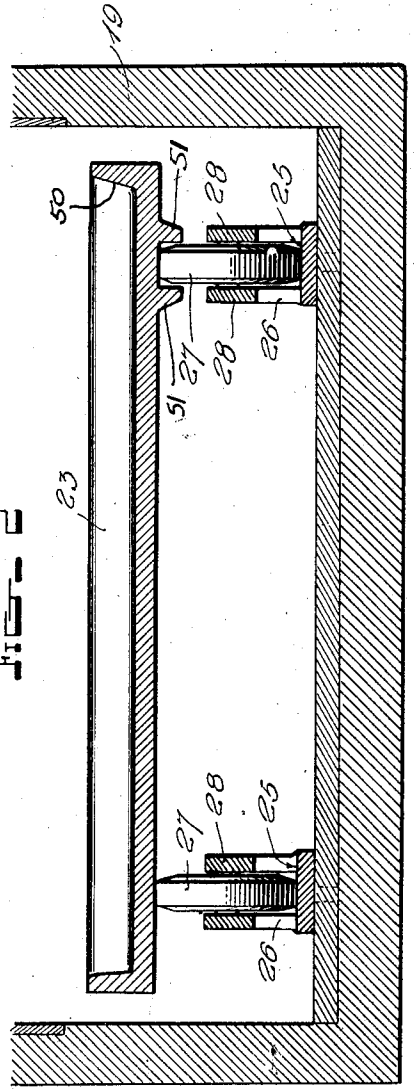


FIG. 2

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FIG. 3

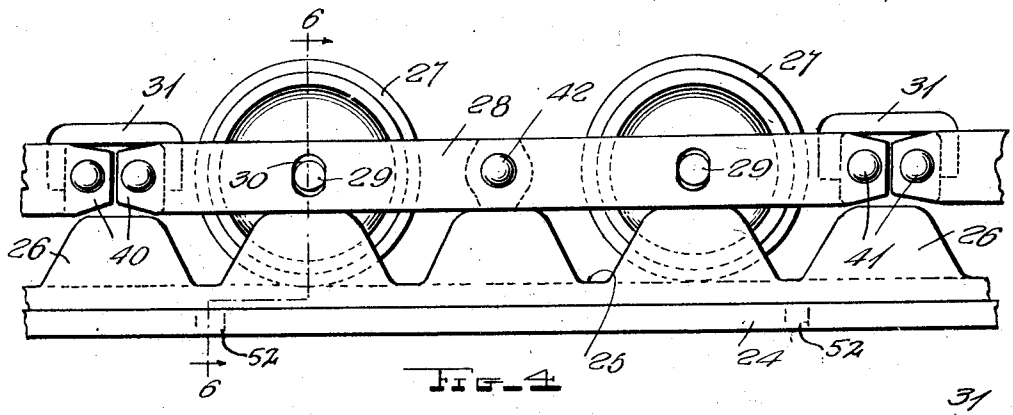


FIG. 4

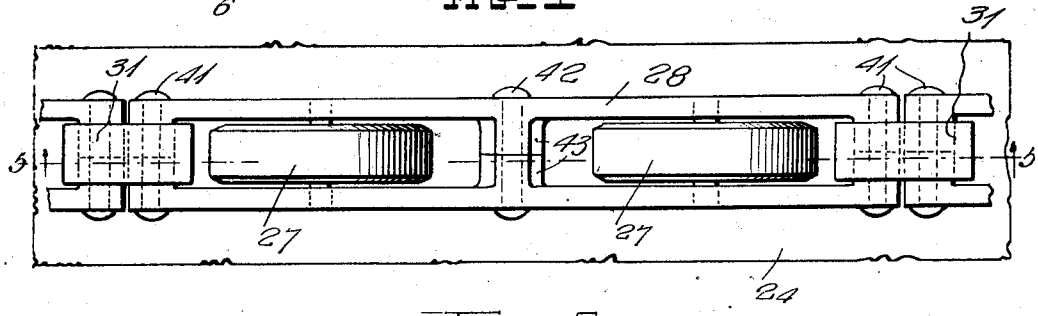


FIG. 5

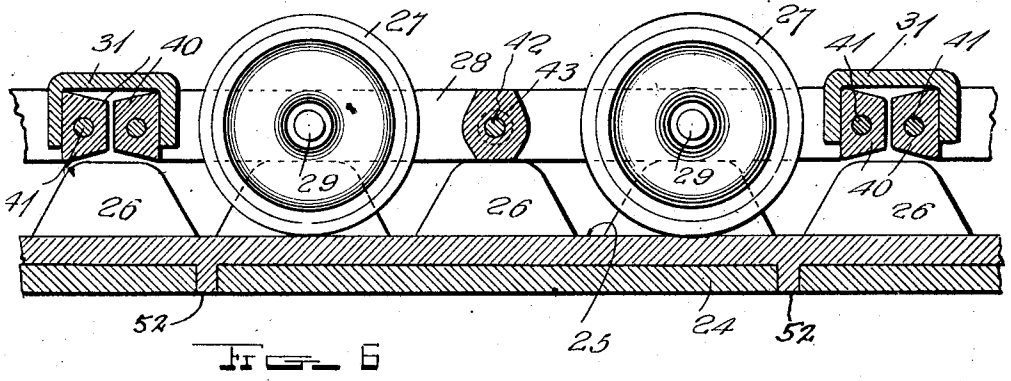
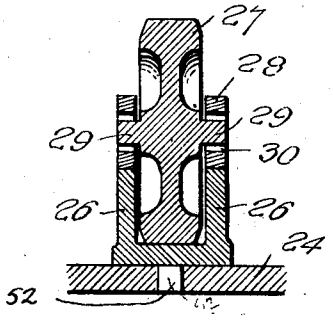


FIG. 6



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Fig. 7

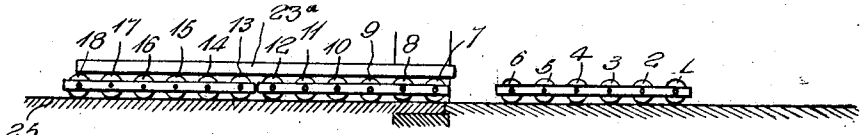


Fig. 8

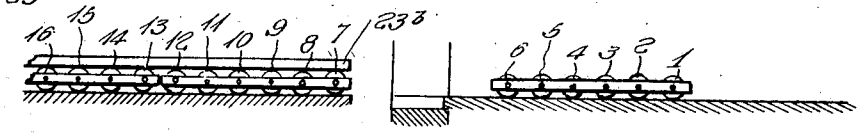


Fig. 9

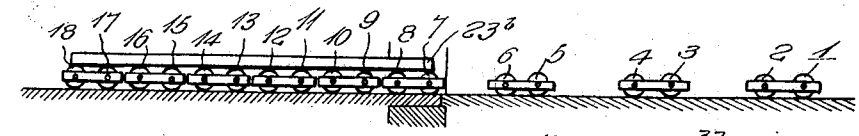


Fig. 10

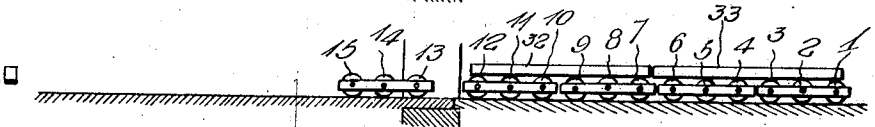


Fig. 11

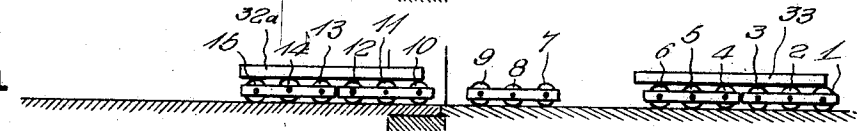


Fig. 12

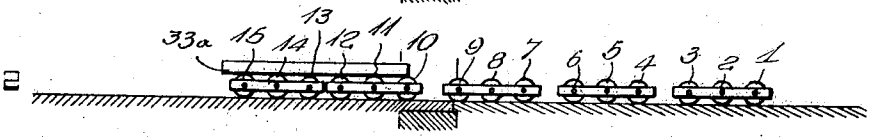


Fig. 13

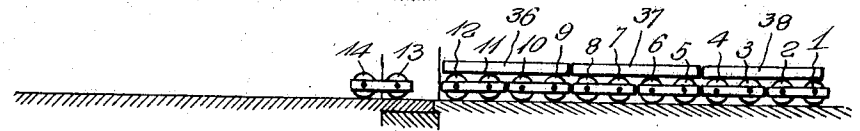


Fig. 14

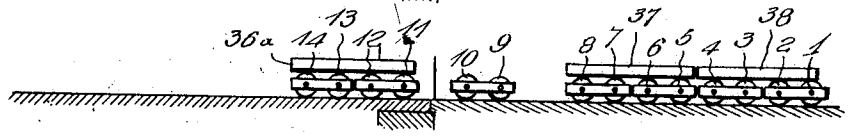


Fig. 15

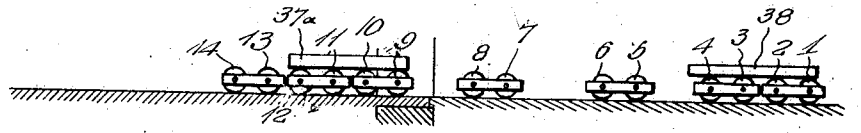
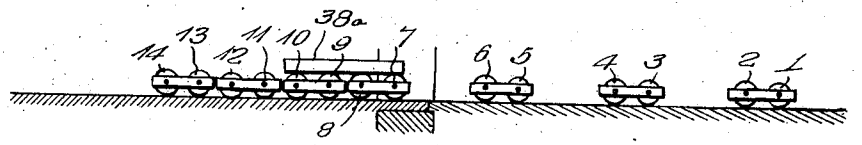


Fig. 16



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UNITED STATES PATENT OFFICE

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CONVEYER

Application filed June 22, 1928. Serial No. 287,486.

My invention relates broadly to conveyers, and more particularly to a progressive roller type of conveyer for loading and unloading furnaces.

One of the objects of my invention is to provide a construction of progressive roller conveyer wherein minimum force is required to initiate movement of a load and substantially less force required to maintain the load in motion in the process of loading or unloading a furnace.

Another object of my invention is to provide a construction of conveyer in which the friction of the moving parts is substantially rolling instead of sliding in character, except for a braking action which increases only slightly the force required to both initiate and continue the movement of the load on the conveyer.

Still another object of my invention is to provide a construction of conveyer including a plurality of horizontally disposed rollers mounted in cages connected in trains with a shelf member movable with the rollers and carrying a load which may be advanced or retracted with respect to the entrance of the furnace for loading the furnace.

A further object of my invention is to provide a construction of progressive roller conveyer where a plurality of rollers are mounted in different cages on a manner whereby each roller moved in elongated apertures in the cages to enable the friction between the roller and the mountings thereof to be substantially in the nature of rolling friction instead of sliding friction, thereby lessening wear on the moving parts, and because of the direct compression on the rolling member permit an increase of distance between centers of the rollers in any selected train of rollers thereby reducing the quantity of non-oxidizing metal required for mounting the rollers.

A still further object of my invention is to provide a construction of progressive roller conveyer wherein a plurality of rollers are mounted in cages connected successively one to the other, each cage including longitudinally extending bar members which may slide in contact with the extremities of upwardly protruding lugs on each side of a guiding track member for providing the required braking effect on the rollers when the charge supported by a tray carried by the rollers leaves the last of the rollers located in contact with the tray.

My invention will be more fully understood from the specification hereinafter following by reference to the accompanying drawings, in which:

Figure 1 is a longitudinal vertical section through a box type furnace showing the progressive rollers of my invention applied thereto; Fig. 2 is a lateral cross-sectional view through the furnace shown in Fig. 1; Fig. 3 is a side elevational view of a pair of caged rollers employed in the progressive roller conveyer; Fig. 4 is a plan view of the fragmentary portion of the conveyer shown in Fig. 3; Fig. 5 is a cross-sectional view taken through the caged rollers of Figs. 3 and 4; Fig. 6 is a cross-sectional view taken through one of the rollers in the progressive rollers of Figs. 3, 4 and 5 taken on line 6—6 of Fig. 3; Figs. 7 and 8 show schematic diagrams of successive positions of a movable tray from a loaded position in the furnace chamber to successive positions to unloading position as in Fig. 8 when the progressive rollers are caged by sixes; Fig. 9 shows the resulting positions of the progressive rollers when the rollers are linked in pairs; Figs. 10 11 and 12 show progressive roller systems where the rollers are caged by threes and where the charge is supported on two trays, and Figs. 13, 14, 15 and 16 show a system of progressive rollers caged by pairs and supporting three separate trays thereon.

Referring to the drawings in detail a box-like furnace has been shown having walls 19 including furnace chamber 20 having facing brick or door jambs 21 forming an opening to the furnace chamber which may be closed by a suitable drop door. The tray for carrying the load which is moved into the furnace is shown at 23 in a position within the furnace chamber 20. The tray 23 has an upstanding peripheral edge 50 having downwardly depending lugs 51, which serve to guide the tray in its movement over the

roller members. The roller members are numbered 1 through 18, and, as shown in Fig. 1, rollers 1 to 6 are coupled together, while rollers 7 to 12, inclusive, and rollers 13 to 18 are coupled together. The coupling is accomplished by means of yokes 28 in the form of horizontally extending bar members having inwardly directed abutting portions 43 secured together by means of rivets 42. The bar members provide means for journaling the trunnions 29 of each of the rollers for movement in a predetermined direction for guiding the tray 23. A representative form of roller is indicated at 27 having trunnions 29 which project through elongated apertures in each of the members 28. The elongated apertures are shown at 30 and are so shaped that the trunnions 29 are free to move vertically to permit the bottom edge of the yoke 28 to assume a sliding contact with the upper extremities of the vertically extending lugs 26 which form a guiding means for the rollers 27 on opposite sides thereof. The movable conveyer by which the furnace is charged or discharged has been represented at 24. On this conveyer the longitudinally extending channel members 25 are firmly anchored in position by means of downwardly depending projections 52. In this manner the rollers are free to enter the track formed by the upstanding lugs 26 and the yoke members 28 are free to frictionally slide upon the upper extremities of the lugs 26. Each yoke 28 contains a selected number of rollers. The ends of the yokes are secured together by suitable means such as rivets 41 forming a closed cage for the rollers. These cages may be linked together as by means of coupling members 31 which engage the abutting terminals 40 of the members 28. The elongations in the apertures 30 serve to permit a sliding movement of the yoke members 28. A braking effect is produced by the sliding movement of yoke members 28 upon lugs 26 and this tends to retard the movement of the rollers 27 when the charge on tray 23 reaches the last of the rollers in contact with the tray.

The last arrangement referred to is a preferred construction: but if apertures 30 are made round instead of elongated in cages 28, then cages 28 will be suspended on trunnions 29, provided guide flanges or lugs 26 are made of such a height as will be out of contact with yokes 28. A similar braking effect thereby results by the sliding friction between trunnions 29 and yokes 28, because the same braking weight results. Lugs 26 may be made continuous upstanding flanges of considerable length, but short lugs are preferred on account of lessened possibility of warpage due to heat action to which the channel members 25 and lugs 26 may be subjected.

In Figs. 7 to 16 various combinations of cages for the tray which carries the load with respect to the furnace chamber have been shown. In Fig. 7 the rollers are caged in sixes and the tray is shown at 23^a about to enter the furnace structure. In Fig. 8 the loading shelf has been shown removed from the entrance of the furnace structure where the tray 23^b is being carried away from the furnace chamber or advanced toward the furnace chamber.

In Fig. 9 I have shown the rollers caged in pairs with the conveyer loading shelf moved directly against the entrance to the furnace chamber where the tray 23^b can be either moved into the furnace chamber over the several pairs of rollers or carried away from the furnace chamber on the movable conveyer shelf.

In Fig. 10 I have shown the rollers connected in threes with trays 32 and 33 supported wholly within the furnace chamber. In Fig. 11, I have illustrated the convenient manner in which tray 32 may be moved to a position 32^a outside of the furnace structure, while tray 33 remains inside the furnace chamber.

In Fig. 12 I have shown the tray 33 of Fig. 11 removed to a position outside of the furnace chamber as indicated at 33^a. In Fig. 13 the rollers are grouped in pairs and the tray is divided into three parts as shown at 36, 37 and 38. Any portion of the system of trays may be removed individually, as illustrated in Figs. 14, 15 and 16, that is, tray 36 may be moved to a position 36^a outside of the furnace structure, as shown in Fig. 14, and tray 37 may be removed to a position 37^a, as illustrated in Fig. 15, while tray 38 may be moved to a position outside the furnace chamber. as shown at 38^a in Fig. 16.

While in the drawings I have shown the method of loading or unloading a moving shelf as adapted to a single end or box type furnace, I desire that it be understood that the rollers are adaptable to a tunnel type furnace where the rollers may always travel in the same direction while in the furnace.

The conveyer system of my invention is adaptable to the so-called reciprocative or counterflow furnaces. In these tunnel or counterflow furnaces the rollers which leave the furnace chamber with the charge can be readily transferred outside the furnace to the entering end.

Heretofore in the conveyer art, such as the conveyer illustrated in the Fred A. Hanson application, Serial No. 263,499, filed March 21, 1928, rollers have been mounted in U-shaped bearings. In this construction of conveyer there are rollers having a diameter of $3\frac{1}{2}$ inches and a trunnion diameter of one inch. The load arm is equal to the radius of the trunnion, or one-half inch. The power arm is equal to one-half the diameter of the roller, or $1\frac{3}{4}$ inches. This gives a ratio be-

tween the power arm and the load arm of 7 to 2. By my invention I provide traveling rollers where the power arm is equal to the diameter of the roller, and that power is applied to overcome rolling friction compared to the sliding friction of the trunnion.

On account of the small force required to move a charge on the rollers, as hereinafter proved, a charge to be placed in or withdrawn from the furnace as on trays 23 may be operated manually. For charges in excess of those which may be manually handled easily, a pusher mechanism familiar to those versed in the art, may be employed.

With a 600 pound load and the type of U-shaped bearing conveyer as illustrated in the aforesaid application, I have found that it requires from 110 to 125 pounds to start movement of the load, and furthermore it requires 110 pounds to keep the load in motion. In the conveyer of my invention and with the same 600 pound load, I have found that to start the movement of the load it has only been necessary to expend 12 to 16 pounds to start motion and 8 pounds of effort to keep the load in motion. At the same time the required braking as the load reaches the last of the rollers is obtained by virtue of the combined sliding and rolling friction.

The conveyer of my invention has been found to be extremely practical in its construction, and while I have described specific embodiments of the invention, I desire that it be understood that modifications may be made by those skilled in the art without departing from the spirit of my invention. The yoke members need have no holes for trunnions and the rollers need have no trunnions, for the rollers may be lodged in spaced openings of the yokes so that the yokes prevent any tilting action of the rollers. A similar braking effect will still maintain because the yoke members in this case will slide along the lugs of the channel members. Furthermore, an additional braking action will be effected for the tread of the rollers will at some time engage the transverse portions of the yokes. Further modifications of the conveyer structure may be made and no limitations upon my invention are intended other than are imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. In a conveyer system a pair of channel members, rows of successive lugs formed on each side of said channel members, a plurality of rollers positioned within said channel members for supporting a charge, a plurality of yoked frames coupled end to end, each of said yoked frames carrying a selected number of said rollers, said yoke frames being slidable along the top surfaces of said lugs.

2. In a conveyer a plurality of channel members, each of said channel members having rows of upstanding guiding lugs on opposite sides thereof, a plurality of yoke members slidable along the upper surfaces of said guiding lugs, a plurality of rollers journaled in said yoke members for supporting a charge, each of said rollers being capable of independent vertical movement with respect to said yoke members, and means coupling said yoke members end to end.

3. In a conveyer a plurality of channel members, each of said channel members having rows of upstanding guiding lugs on opposite sides thereof, a plurality of yoke members slidable along the upper surfaces of said guiding lugs, a plurality of rollers journaled in said yoke members, for supporting a charge, each of said rollers being capable of independent vertical movement with respect to said yoke members, means coupling said yoke members end to end, and a tray movable over the upper surfaces of said rollers.

4. In a progressive roller conveyer a plurality of channel-like members having rows of upstanding lugs at opposite sides thereof, rollers movable within said channel-like members for supporting a charge, a plurality of frame members embracing opposite sides of said rollers and supporting said rollers in bearings, said frame members being slidable along the upper surfaces of said lugs, and means coupling the ends of adjacent frame members for simultaneous movement along the upper surfaces of said lugs.

5. In a progressive roller conveyer a plurality of channel-like members, each having a plurality of rows of upstanding vertical lugs spaced one with respect to the other, frame-like members constituted by a longitudinally extending bar members, rollers journaled between said longitudinally extending bar members for supporting a charge, and movable along said channel-like members in a path confined between said upstanding lugs, each of said rollers being capable of independent vertical movement with respect to said frame-like members for permitting frictional sliding engagement between said lugs in the course of movement of said rollers along said channel-like members.

6. In a conveyer of the progressive roller type a plurality of channel-like members each having parallel extending rows of upstanding lugs separated one from the other, frame-like members having a pair of side bars spaced apart for a distance corresponding to the spacing of said lug members, rollers journaled between said side bars and shiftable vertically with respect thereto for supporting a charge, said rollers supporting said side bars in frictional engagement with the upper surfaces of said upstanding lugs, and a tray shiftable over the upper surfaces of said rollers.

7. In a progressive roller conveyer a pair

of channel-like members, rows of upstanding lugs positioned along opposite sides of said channel-like members, rollers movable in a path between said upstanding lugs, frame-like members for supporting said rollers in spaced relationship in individual cages, said frame-like members being slidable over the upper surfaces of said upstanding lugs, and a tray having downwardly depending members thereon embracing opposite sides of said rollers for guiding said tray along the path of said rollers.

In testimony whereof I affix my signature.

EDWIN L. SMALLEY.