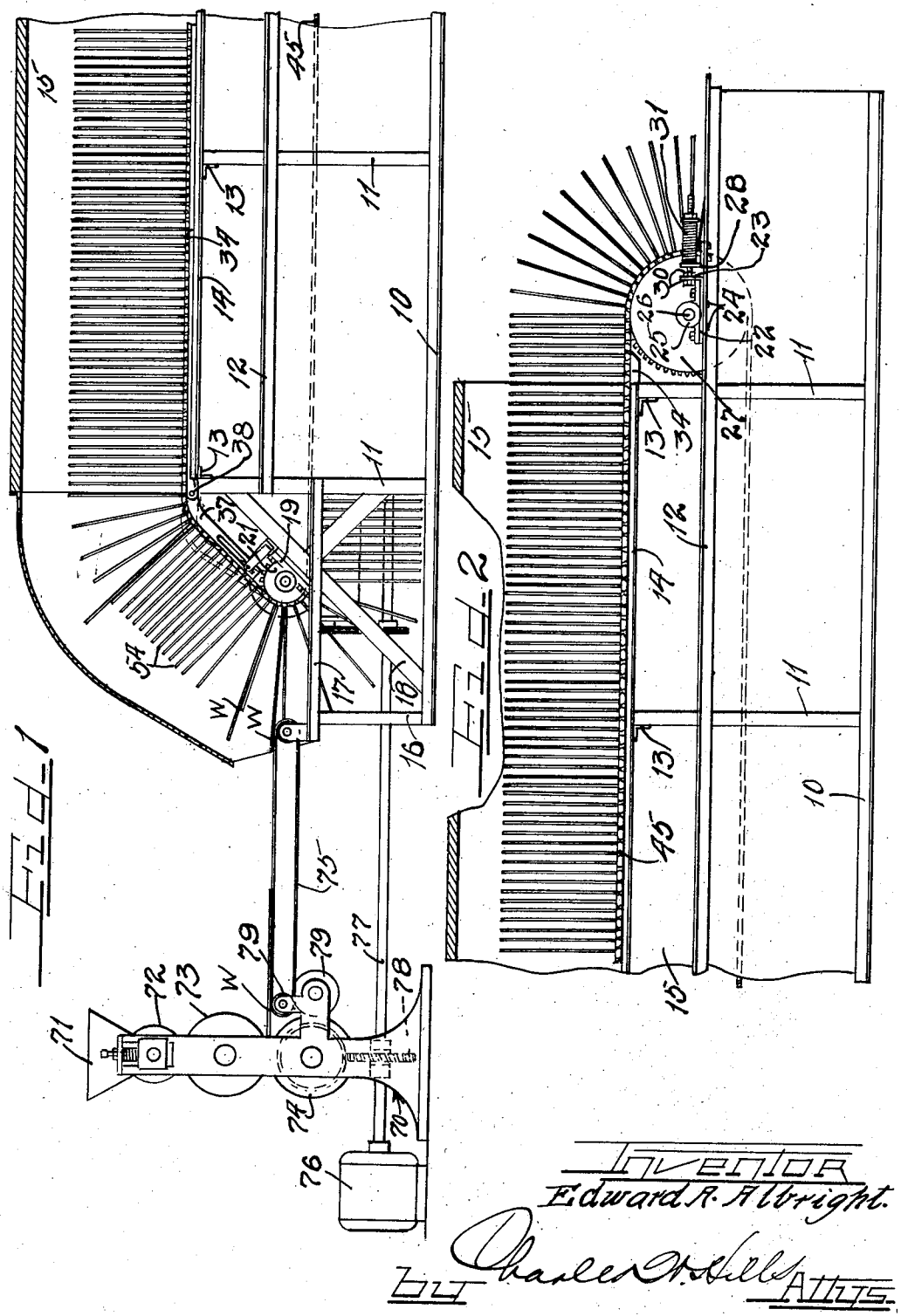
Jan. 9, 1940. E. A. ALBRIGHT 2,186,566

CONVEYER STRUCTURE FOR OVENS

Filed Dec. 9, 1937 4 Sheets-Sheet 1



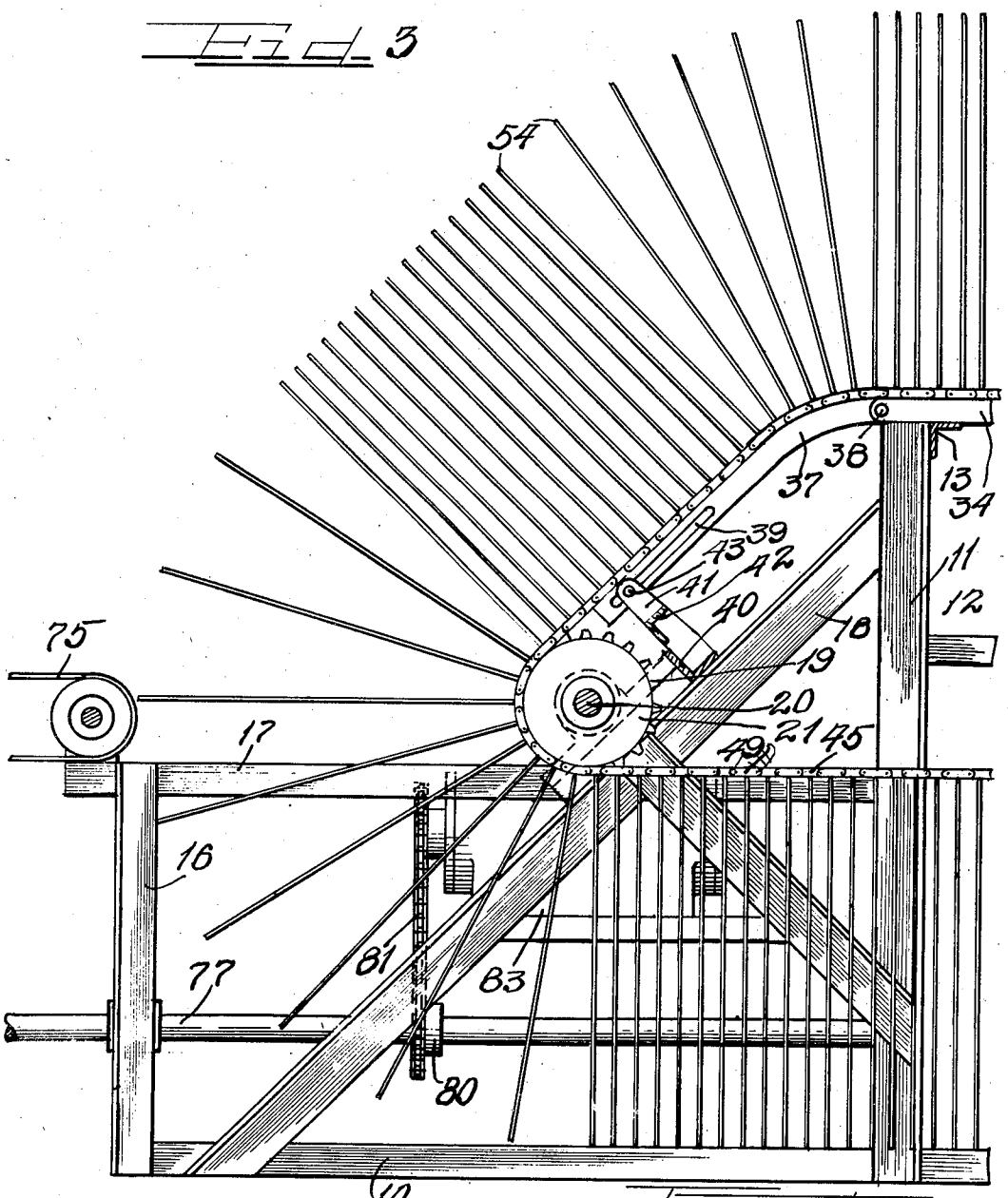
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CONVEYER STRUCTURE FOR OVENS

Filed Dec. 9, 1937 4 Sheets-Sheet 2

Fig. 3



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CONVEYER STRUCTURE FOR OVENS

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Fig. 4

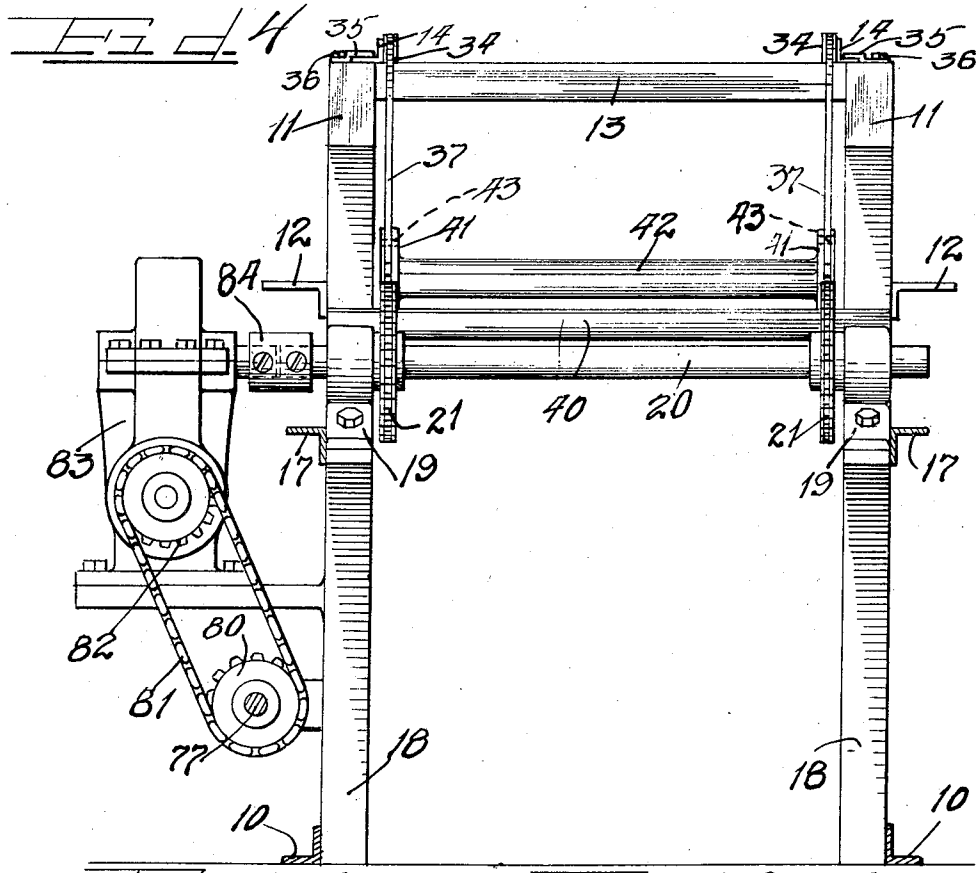


Fig. 5

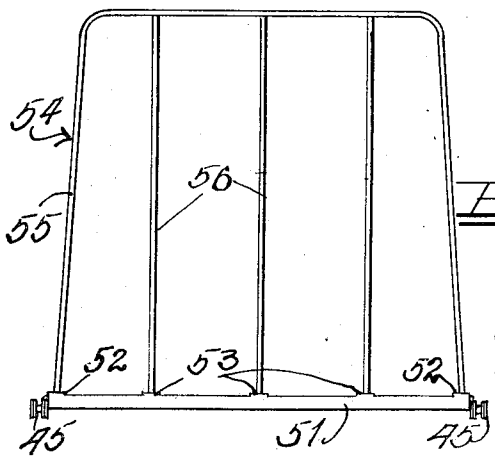


Fig. 6

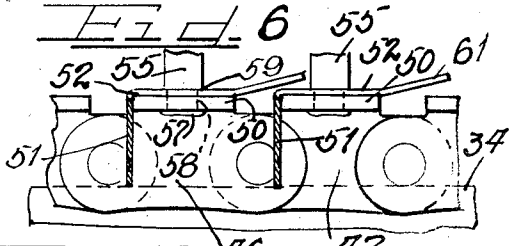
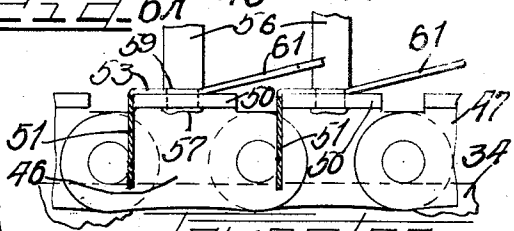


Fig. 6A



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CONVEYER STRUCTURE FOR OVENS

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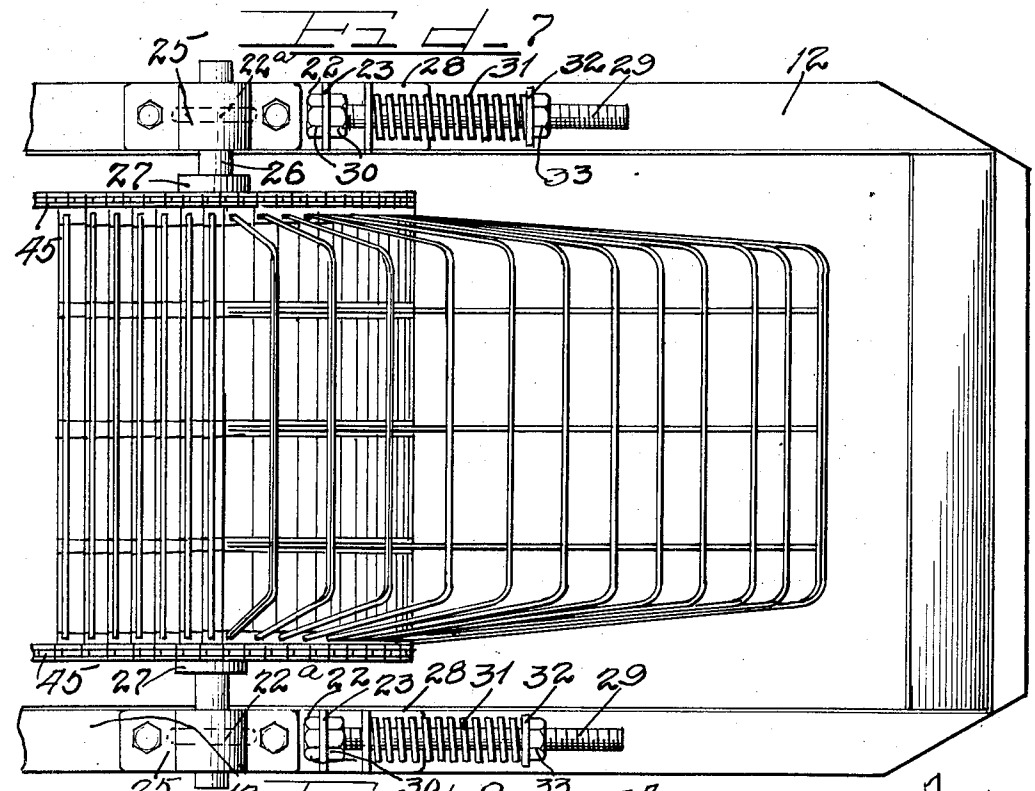


Fig. 7

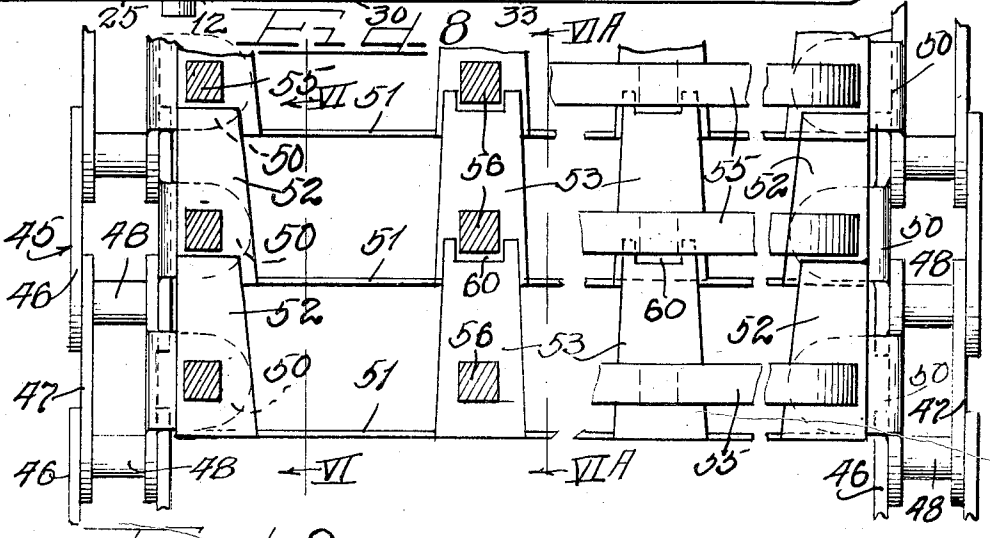


Fig. 8

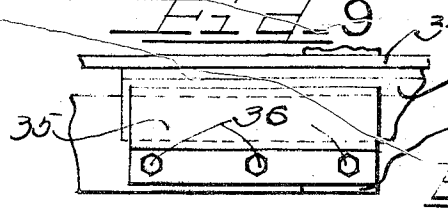


Fig. 9

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UNITED STATES PATENT OFFICE

2,186,566

CONVEYER STRUCTURE FOR OVENS

Edward A. Albright, Berwyn, Ill., assignor to Caspers Tin Plate Company, Chicago, Ill., a corporation of Illinois

Application December 9, 1937, Serial No. 178,855

11 Claims. (Cl. 198—134)

This invention relates to apparatus for conveying work through drying or baking ovens.

More specifically the invention relates to a work conveyer, for ovens or tunnels, driven from the work inlet end of the oven or tunnel and arranged to allow for expansion and contraction without loosening or straining the parts.

Heretofore it has been considered impractical to drive a work conveyer, and especially a rack type conveyer, through a heating tunnel from the work inlet end of the tunnel because the heating of the conveyer in the tunnel caused an expansion of the conveyer thereby elongating that portion thereof disposed in the tunnel. When the conveyer was pushed through the tunnel by the drive at the work inlet end, the expanded portion in the tunnel would pile up and buckle. If the conveyer was of the type carrying fingers or racks for receiving the work therebetween, an added drawback was encountered in that the expansion of the conveyer would displace the fingers or racks entering the tunnel thereby making it almost impossible to time the feeding of work between the racks.

As a result, it has been the practice to pull work conveyers through heating tunnels from the work discharge end of the tunnel.

Since apparatus for feeding the work to the conveyer must be located at the work inlet end of the tunnel, either separate prime movers were required to drive the feeding apparatus and the work conveyer or a long drive shaft was used extending the entire length of the tunnel. Separate prime movers are expensive and difficult to place in exact synchronous operation. A long drive shaft is objectionable because the torque developed therein effects a jerky or whip-like movement.

This invention now provides for the driving of a feeding apparatus and a work conveyer at the work inlet end of a heating tunnel from a single prime mover.

According to this invention, a pair of horizontal tracks are provided in an oven or heating tunnel for supporting looped sprocket chains. The horizontal tracks are mounted to permit expansion and contraction thereof due to temperature changes. The sprocket chains are entrained between sprocket gears at the ends of the tunnel and have their upper runs supported on the horizontal tracks. The links of the chains have work supporting racks secured thereon. These racks extend between the chains.

The sprocket gears at the work inlet end of the tunnel are driven from a prime mover that also drives apparatus for feeding work to the racks. The sprocket gears at the work outlet end of the tunnel are urged away from the work inlet end by spring means to maintain the upper runs of the chains in a taut condition.

A pair of curved track members are pivoted to the horizontal track members at the work inlet end of the tunnel and have their free ends mounted for longitudinal and rotative movement. These curved track members support the chains between the driving sprockets and the horizontal tracks and permit expansion and contraction of the horizontal tracks.

The invention will be hereinafter specifically described as embodied in a lithographing oven wherein the work comprises inked, enameled, or lacquered metal sheets. The sheets are coated by coating rolls, deposited on a feeding apparatus and fed directly into the conveyer racks on which they are carried through the oven to have the coatings thereon dried. A single prime mover drives the coating rolls, the feeding apparatus and the oven conveyer. It should be understood, however, that the invention is not limited for use on a lithographing oven but is adapted for embodiment in all types of heating tunnels or ovens.

It is then an object of this invention to provide a work conveyer for heating tunnels adapted to be driven at the work inlet end of the tunnel.

A further object of this invention is to provide a conveyer system for ovens that permits free expansion and contraction of the constituent parts without interfering with the operation and efficiency of the system.

A further object of this invention is to provide apparatus for conveying work through heating tunnels that is driven at the work inlet end of the tunnel and can freely expand or contract under temperature variations without causing a piling up of movable conveyer structure in the tunnel.

Another object of this invention is to provide a work inlet end drive for oven conveyers.

A further object of this invention is to provide apparatus, driven by a single prime mover, for coating sheet material, for conveying the coated sheet material into a rack conveyer, and for operating the rack conveyer.

Other and further objects of the invention will become apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which disclose a preferred embodiment of the invention.

On the drawings:

Figure 1 is a fragmentary side-elevational view of the work inlet end of a lithographing oven according to this invention, with parts of the oven broken away and shown in vertical cross section to more clearly illustrate the conveyer construction.

Figure 2 is a side elevational view of the work discharge end of the oven shown in Figure 1 with parts of the oven construction broken away and shown in vertical cross section to more clearly illustrate the conveyer structure.

Figure 3 is an enlarged fragmentary side-elevational view of the work receiving end of a conveyer structure according to this invention.

Figure 4 is a front elevational view of the track structure for the conveyer of this invention.

Figure 5 is a front elevational view of a rack forming part of the conveyer structure.

Figure 6 is a fragmentary cross-sectional view, with parts in elevation, taken along the line VI—VI of Figure 3.

Figure 6*a* is a fragmentary cross sectional view, with parts in elevation, taken along the line VI—A—VI—A of Figure 8.

Figure 7 is a fragmentary top plan view of the work discharge end of the conveyer structure according to this invention.

Figure 8 is a top plan view, with parts broken away and shown in vertical cross section, of a portion of the conveyer structure.

Figure 9 is a fragmentary top plan detail view of a horizontal track in the oven showing the track mounting.

As shown on the drawings:

In Figures 1 to 4 inclusive, the reference numerals 10 designate angle irons forming a rectangular base for the oven. Uprights 11 extend from the angle irons 10 and carry, in spaced relation from the top thereof, a pair of horizontal angle irons 12.

Transverse angle members 13 are secured to the tops of the uprights 11 and horizontal angle members 14 are carried on the transverse members 13 in a manner to be hereinafter more fully described.

The oven or tunnel 15, as shown in Figures 1 and 2, is built around the thus formed frame structure. Heating means (not shown) are disposed in the tunnel.

At the work inlet end of the tunnel or oven, the base angle members 10 extend beyond the first upright 11 and carry at their ends shorter uprights 16. Horizontal angle members 17 are carried on top of the short uprights 16 and are secured to the first uprights 11. Sloping beams or angle irons 18 extend between the first uprights 11 and the front ends of the base angle irons 10 as shown, for a purpose to be more fully hereinafter described.

Bearing housings 19 are bolted on the sloping beam members 18 for rotatably carrying a shaft 20 extending between the beam members. Sprocket gears 21 are fixedly secured on the shaft 20 between the beam members 18.

As best shown in Figures 2 and 7, the horizontal angle members 12 carry, near the rear ends thereof, bracket members 22 having elongated slots 22*a* therein and vertical legs 23 at the rear ends thereof. Bolts 24 extend through the angle members 12 and into the slots 22*a* of the bracket members 22. The bracket members are thus held in alignment on the members 12.

Bearing housings 25 are bolted onto the bracket members 22 and rotatably support a shaft 26 having sprocket gears 27 fixedly secured thereon between the angle members 12.

Angle brackets 28 are bolted on the members 12 in spaced relation behind the vertical legs 23 of the brackets 22.

Rods 29 extend through the vertical legs of the brackets 28 and 22 and have the inner ends thereof bolted on the vertical legs 23 of the brackets 22 by means of nuts 30.

Coiled springs 31 are disposed around the rods 29 in back of the vertical legs of the brackets 28.

Washers 32 are disposed around the rods 29 in abutting relation to the outer ends of the springs 31. Nuts 33 are threaded on the ends of the rods to urge the washers 32 against the springs 31 for maintaining the springs under compression.

It is obvious that when the springs 31 are under compression the brackets 22 will be drawn toward the brackets 28 thereby moving the shaft 26 and the sprocket gears 27 thereon toward the end of the support members 12 and away from the sprocket gears 21.

As pointed out above the transverse support members 13 carry horizontal angle members 14. As best shown in Figures 4 and 9, these angle members 14 have tracks 34 secured to their vertical legs. The tracks 34 are horizontal and extend the entire length of the heating tunnel.

The members 14 are clamped on the cross members 13 by means of offset clamps 35 having a portion thereof disposed over the horizontal legs of the angle members 14. The clamps 35 are bolted to the cross members 13 and uprights 11 but permit sliding movement of the members 14 relative to the frame structure including the cross members 13.

The tracks 34 can thus freely expand and contract due to changes in temperature without straining or distorting any of the frame parts since the tracks and their supporting members 14 can slide relative to the frame.

The ends of the tracks 34 at the work inlet end of the oven have curved track members 37 pivoted thereon as at 38 (Figure 3).

The curved track members 37 extend from the tracks 34 toward the sprocket gears 21 and have their lower ends slotted as at 39.

An angle member 40, shown in Figures 3 and 4, is secured to the sloping beam members 18 intermediate the sprocket gears 21 and the uprights 11, and extends between the beams 18.

Arms 41 are secured on the angle member 40 and are spaced from each other by an angle member 42 welded or otherwise secured to the arms.

The arms 41 receive pins such as 43 through the tops thereof. The pins 43 extend through the slots 39 in the curved track members 37.

The curved track members 37 thus can have slidable and rotatable movement with respect to the arms 41. Therefore as the tracks 34 expand the same may slide relatively to the frame on which they are mounted as pointed out above and the elongation of the tracks 34 merely moves the curved track members about their pivot points and along the slots to compensate for the expansion.

As best shown in Figures 1 to 3 and 7, endless sprocket chains 45 are trained around the sprocket gears 21 and 27 and have their upper runs supported on the curved tracks 37 and horizontal tracks 34.

As shown in Figure 8, the chains 45 comprise outer links 46 and inner links 47 having cylin-

drical stationary or roller portions 48 riding on top of the tracks 34 and 37. The sides of the links 46 and 47 abut the sides of the tracks and thus hold the chains on the tracks. As is customary, pins such as 49 (Figure 3) extend through the cylindrical portions 48 and pivotally connect the links 46 and 47.

As best shown in Figure 8, the inner side members of the links 46 and 47 have ears 50 formed on the tops thereof and extending inwardly at right angles therefrom.

Metal ribs 51 extend between the chains 45. These ribs 51 have tab portions 52 at the ends thereof and intermediate tab portions 53 extending normal to the ribs.

The end tab portions 52 are mounted on top of the ears 50 of the chain links.

Rack members such as 54, shown in Figure 5, are carried between the chains 45 on the rib members 51. Each rack member 54 comprises a U-shaped rod or bar 55 and intermediate rods or bars 56 extending between the base of the U and a tab 53 of a rib 51.

As best shown in Figures 6 and 8, the side legs of the U-shaped member 55 extend through openings in the tab members 52 of the ribs 51 and also extend through the ears 50 of the chain links. The ends of these legs of the U-members 55 are then peened over as at 57 (Figure 6) to hold the U-members onto the ribs and chains. As shown in Figure 6, the ends of the U-members 55 can be reduced in size as at 58 to provide shoulders 59 for seating on top of the tab members 52.

The reinforcing members 56 of the racks 54 are secured at one end thereof to the base of the U-member 55 and at the other end thereof to the intermediate tab members 53 of the ribs 51 as shown in Figures 6a and 8.

The racks 54 are thus secured onto the rib members and onto the chain links.

The intermediate tabs 53 can have the central portions cut away as shown at 60 in Figure 8, so that these tabs fit around the rods 56 of the next rack member.

The tabs 52 and 53 of the ribs fit on top of the corresponding tabs in the next succeeding rib 51 and may be tilted upward slightly as shown at 61 in Figures 6 and 6a so as to more easily fit over the adjacent tabs on the next rib member. This upward tilt also serves another function that will be hereinafter described.

As shown in Figure 1, a coating machine 70 comprising a trough 71 for paint, ink or enamel, a supply roll 72, a coating roll 73 and a work feed roll 74 is mounted in spaced relation in front of the work inlet end of the oven.

Work W, in the form of metal sheets, is passed over the roll 74 and receives a coating of ink, enamel, or paint thereon from the roll 73. The work W is deposited on an endless conveyer belt 75 and fed directly from the belt onto a rack 54 of the oven conveyer system.

A single prime mover 76 drives a shaft 77 having a gear 78 thereon which drives the coating machine 70. A gear train including gears 79, driven by the coating machine, drives the endless belt 75.

The shaft 77, as best shown in Figure 4 has a sprocket gear 80 thereon which drives a chain 81. The chain in turn drives a sprocket gear 82 of a speed reducer 83. The speed reducer 83 is coupled at 84 to the shaft 20 having the sprocket gears 21 secured thereon for driving the oven conveyer system.

The single prime mover 76 therefore drives the coating machine 70, the feeding belt 75 and the oven conveyer system.

All three apparatuses are thus synchronized exactly by various gear reductions.

Since the conveyer chains are looped around the sprocket gears 21 and 27 and the spring members 31 urge the sprocket gears 27 away from the sprocket gears 21, the conveyer chains are maintained in a desired taut condition irrespective of lengthening of the upper run thereof due to expansion of the chains when the same are heated in the oven. The track structure supporting the upper run of the chains is allowed to contract and expand freely by virtue of the mounting in the oven and the pivoted curved track members.

The upward tapered portions 61 of the tab members 52 and 53 supports the work W in a tilted position so as to tilt backward against the racks 54. The tabs 52 and 53 also serve as spacers to hold the racks in proper spaced relation as they are pushed through the tunnel.

From the above descriptions it should be understood that this invention provides for the driving of work conveyers through heating tunnels from the work inlet end of the tunnel.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. A work conveyer for heating ovens comprising a pair of tracks in spaced parallel relation, gears at the ends of the tracks, chains looped around said gears and supported on said tracks, work supports mounted on said chains and extending between the chains, said supports having means thereon adapted to abut adjacent work supports along the upper run of the chains, resilient means urging the gears at one end of the tracks away from the gears at the other end of the tracks and means for driving said gears at said other end of the tracks to push the chains along the track, said driving means located adjacent the driven gears and the resiliently urged gears being free from driving connections.

2. A work conveyer comprising a pair of horizontal tracks in spaced parallel relation, a pair of short inclined tracks cooperating with the same ends of the horizontal tracks, sprocket gears at each end of the tracks, endless sprocket chains trained around the sprocket gears and supported along their upper runs on the tracks, spring means urging the gears at one end of the tracks away from the gears at the other end of the tracks to maintain the chains therebetween in a taut condition and means driving the sprocket gears at the other ends of the tracks for pushing the chains along the tracks, said driving means located adjacent the driven gears and the spring urged gears being free from driving connections.

3. In a tunnel having a work inlet and a work outlet at opposite ends thereof, a track frame in said tunnel and a pair of spaced parallel tracks on said frame, the improvements which comprise clamps holding the tracks on the frame allowing an expansion and contraction of the tracks relative to the frame, a pair of short track members pivoted to the tracks at the work inlet end of the tunnel, means slidably carrying the

free ends of the short track members, a drive shaft rotatably mounted in front of the free ends of the short track members, sprocket gears secured on the drive shaft in alignment with the tracks, a pair of sprocket gears rotatably mounted at the work discharge end of the tunnel in alignment with the tracks, looped sprocket chains trained between the sprocket gears at opposite ends of the tunnel and supported on said tracks along the upper runs thereof, and work supporting means mounted on the chains and extending therebetween.

4. A work conveyer for heating tunnels comprising spaced parallel horizontal tracks adapted to extend through a heating tunnel, curved track members pivotally mounted to one end of said horizontal tracks and extending downwardly therefrom, said curved track members having slotted free ends, pins disposed in the slots of said curved track members for supporting the same, a pair of driven sprocket gears disposed in front of said curved track members at the lower ends thereof, an additional pair of sprocket gears at the other end of the horizontal tracks in alignment with the tracks, endless sprocket chains trained between said gears and supported along their upper runs on the tracks, and means driving the sprocket gears adjacent the curved track members for pushing the chains through a heating tunnel.

5. A conveyer structure comprising spaced parallel sprocket chains, ears extending inwardly from said chains, rib members extending transversely between the chains and having tab portions disposed over said ears and rack members extending through said tab portions and said ears for uniting the ribs with the ears and for forming work supports.

6. A conveyer structure comprising a pair of spaced parallel looped link chains, the links of said chains having ears extending inwardly therefrom, rib members disposed between the chains having tab portions on the ends thereof secured on top of the ears and racks carried on said rib members, said tab portions of the ribs adapted to abut the adjacent racks for holding the racks in spaced relation.

7. A conveyer system for a heating tunnel having a work inlet and a work outlet at opposite ends thereof which comprises, a track frame in said tunnel, spaced horizontal tracks extending through said tunnel and supported on said track frame, sprocket gears rotatably mounted on said track frame at the ends of said tracks, means for driving the sprocket gears at the work inlet end of the tunnel, endless sprocket chains trained between said gears and supported along their upper runs on said tracks, rib members extending transversely between said chains having tabs disposed at right angles thereto, racks secured to said tabs, the tabs of successive ribs overlying the adjoining tabs and adapted to abut the adjoining racks whereby said racks are held in proper spaced relation as the same are pushed through the heating tunnel.

8. In a work conveyer system for heating tunnels, a pair of spaced parallel horizontal tracks adapted to extend through a heating tunnel, a pair of curved short track members pivoted to the same ends of the horizontal tracks and extending downwardly therefrom, said short tracks having slotted lower ends, supporting means slidably mounted in said slotted ends of the short tracks for supporting said ends, and looped chains supported along their upper runs on said horizontal tracks and on said curved tracks whereby longitudinal expansion of the horizontal tracks due to heat in the tunnel merely effects a sliding of the short tracks on said supporting means.

9. A rack type endless conveyer adapted to be pushed through a heating tunnel comprising, a pair of spaced parallel horizontal tracks, link chains looped over said tracks with the sides of the links abutting the sides of the tracks, ears formed on the links and extending at right angles therefrom, ribs extending between the chains having tab portions at the ends thereof on said ears and U-shaped racks inserted through said tabs and said ears and secured thereto, said tabs adapted to abut an adjacent rack for holding the racks in spaced relation.

10. A conveyer structure comprising a pair of spaced parallel looped chains, the links of said chains having ears extending inwardly therefrom, transverse rib members having end tab portions mounted on the ears of the chain links and intermediate tab portions extending in the same direction as the end tabs, conveyer racks having end legs extending through the end tabs and ears to join the rib with a pair of ears and to secure the racks to the chain links, and additional legs on said racks between the end legs secured to the intermediate tabs of the rib member, all of said tabs adapted to thrust against the legs of a preceding rack and form a work support between the racks.

11. A conveyer structure comprising a pair of spaced parallel looped link chains, vertical rib portions extending transversely between the chains and secured at their ends thereto, inclined tab portions extending forwardly from the transverse rib members along the length of the rib members, conveyer racks having a plurality of legs secured in said tab portions adjacent the vertical transverse ribs and said tab portions adapted to thrust against the legs of a preceding rack for forming inclined work supports between the racks to hold the work in a tilted position.

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