Jan. 10, 1956 J. M. LAWSON 2,730,247

AUTOMATIC LUMBER STACKER

Original Filed Feb. 23, 1950 6 Sheets-Sheet 1

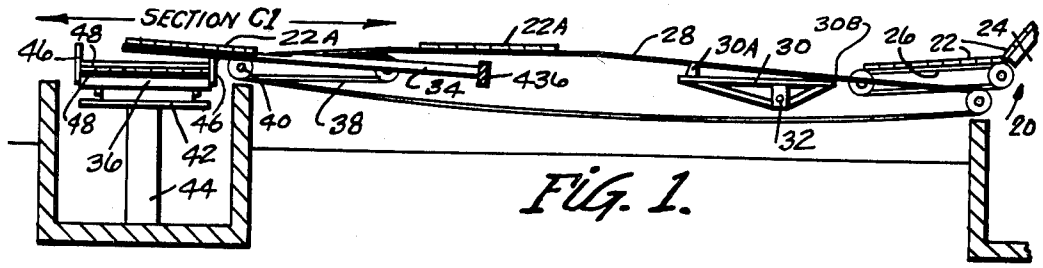

FIG. 1.

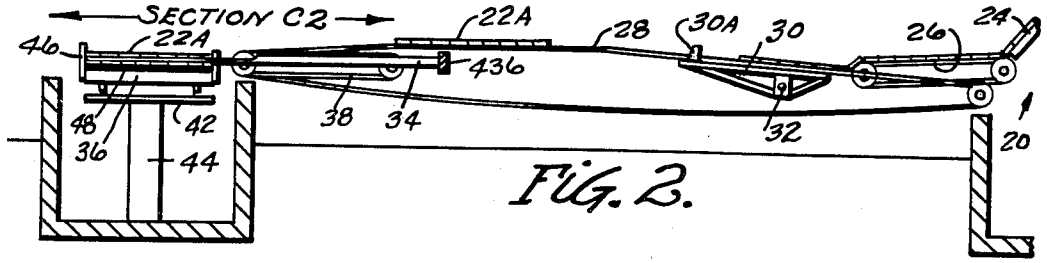

FIG. 2.

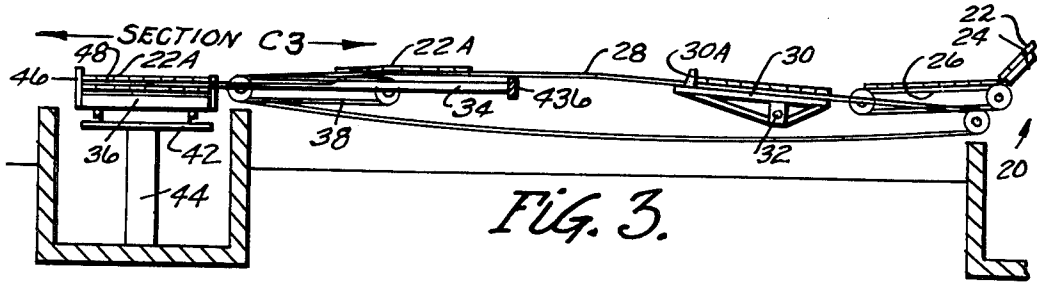

FIG. 3.

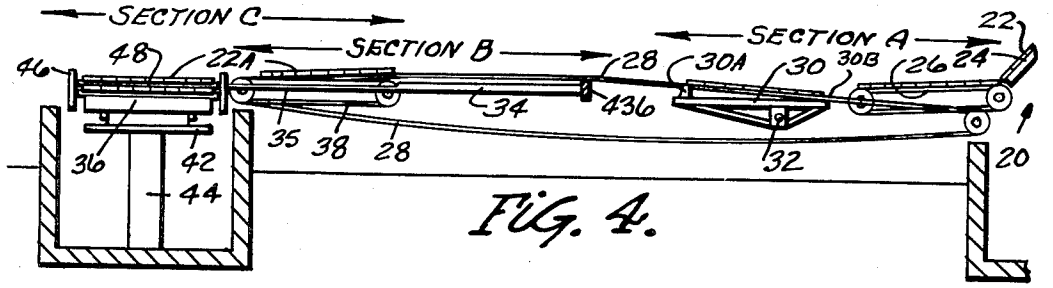

FIG. 4.

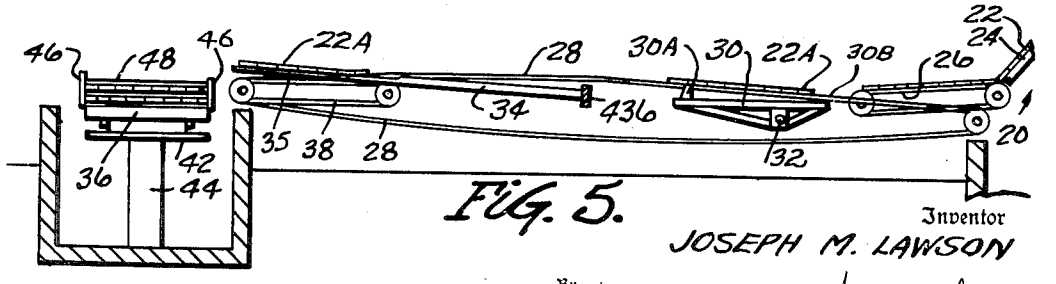

FIG. 5.

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Jan. 10, 1956 J. M. LAWSON 2,730,247

AUTOMATIC LUMBER STACKER

Original Filed Feb. 23, 1950 6 Sheets-Sheet 2

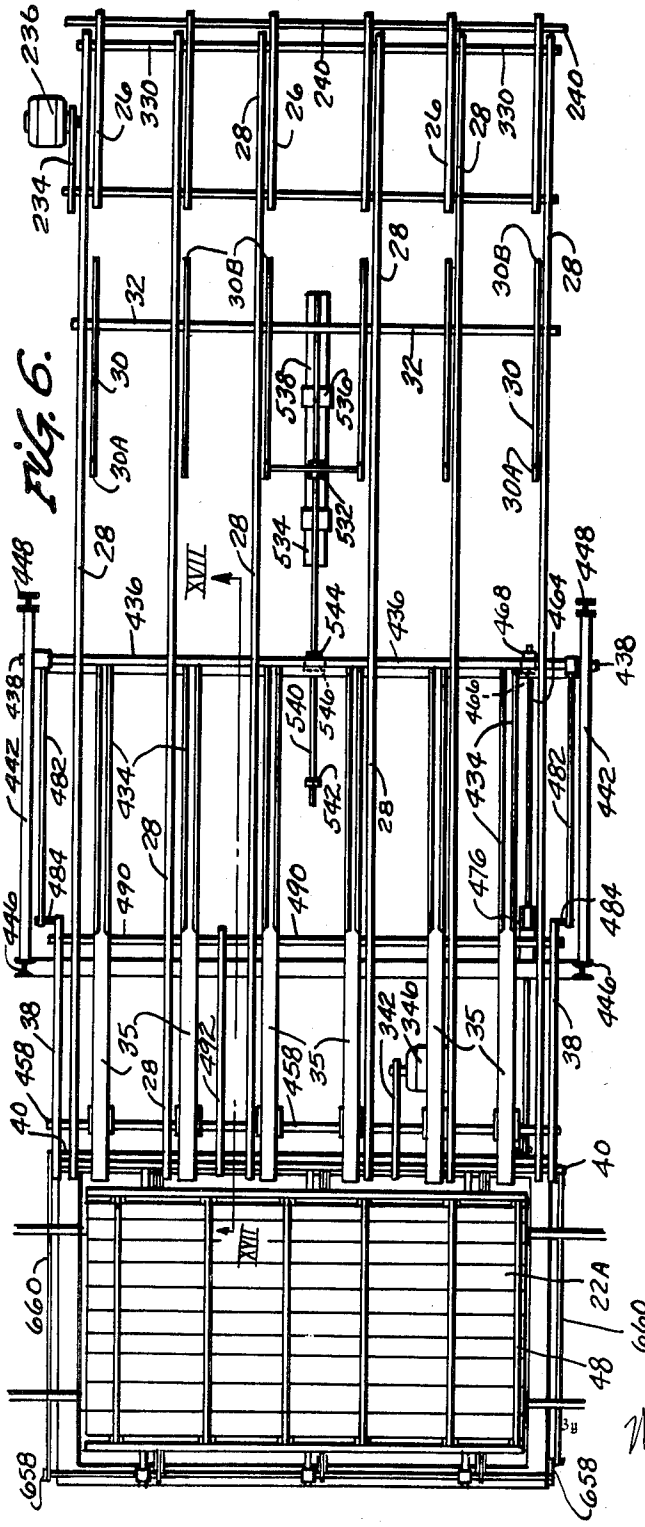

Fig. 6.

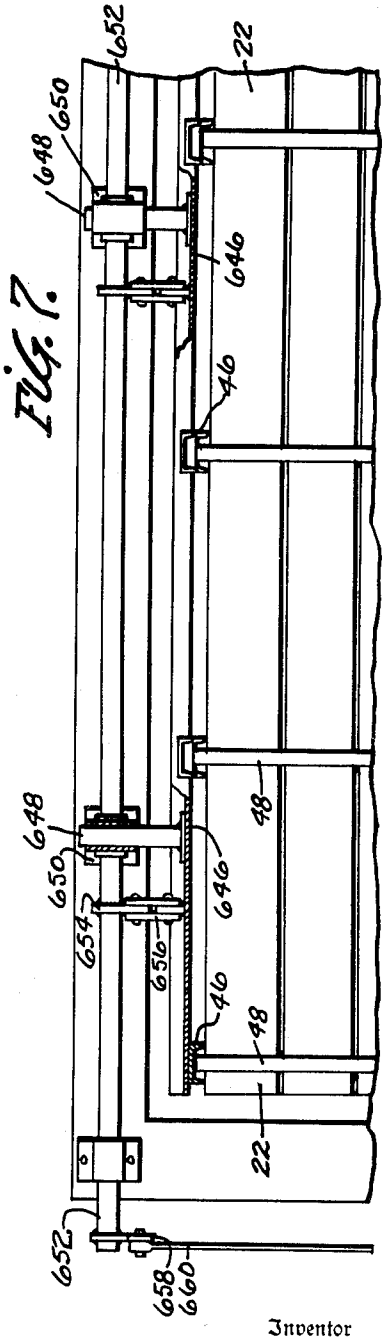

Fig. 7.

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Jan. 10, 1956 J. M. LAWSON 2,730,247

AUTOMATIC LUMBER STACKER

Original Filed Feb. 23, 1950 6 Sheets-Sheet 3

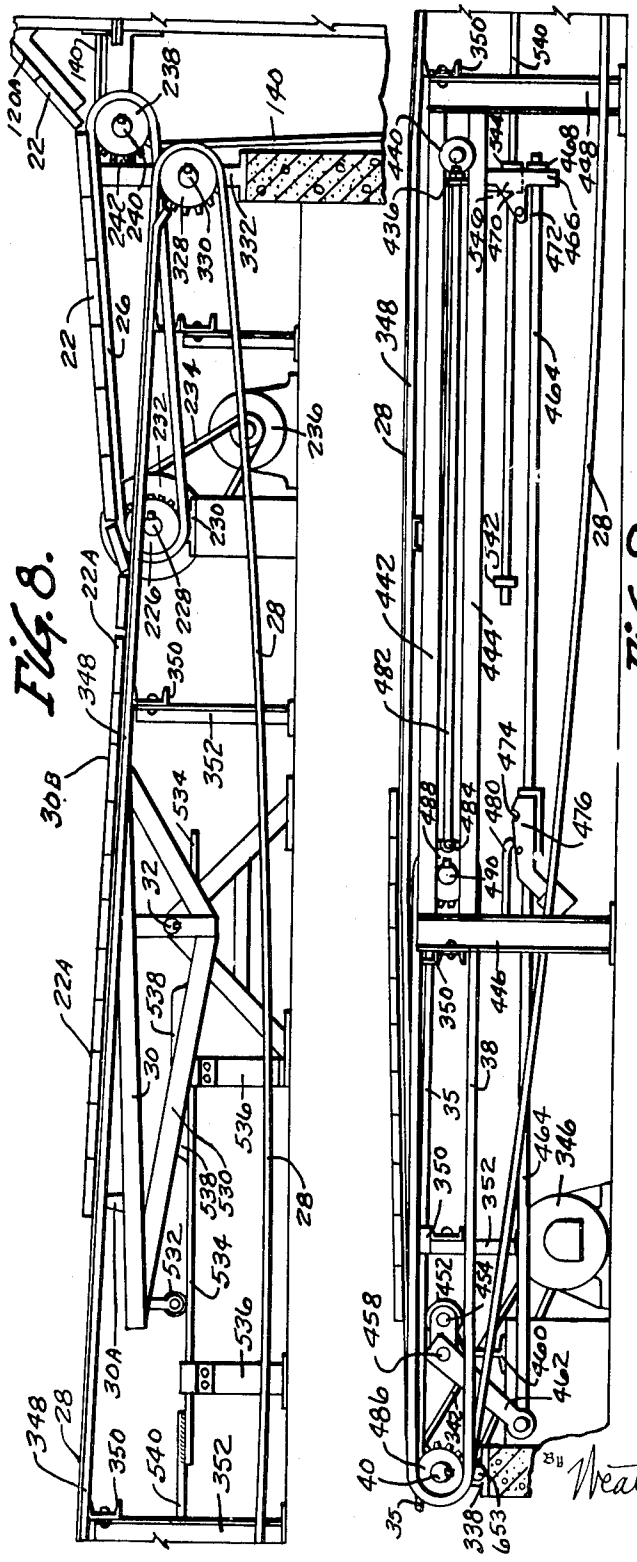

Fig. 8.

Fig. 9.

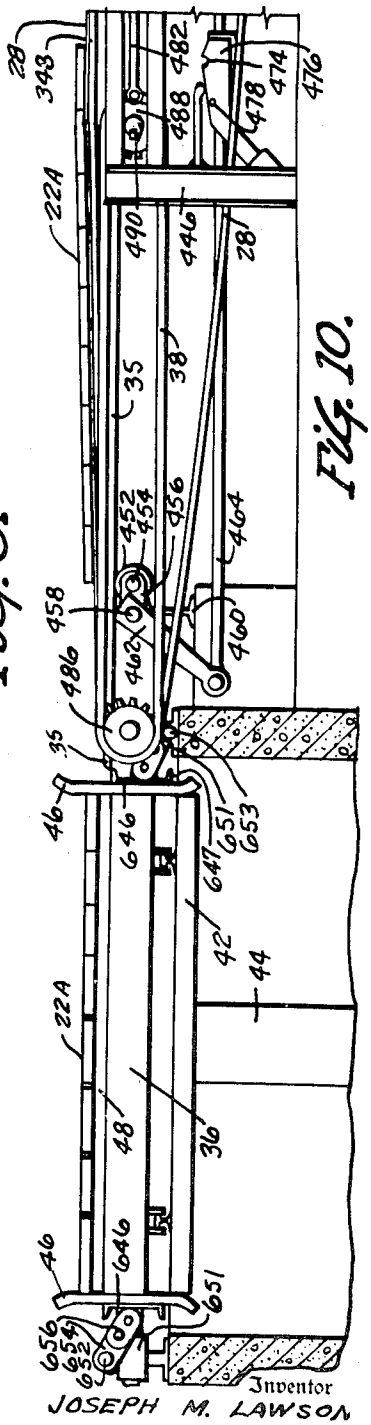

Fig. 10.

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Jan. 10, 1956 J. M. LAWSON 2,730,247

AUTOMATIC LUMBER STACKER

Original Filed Feb. 23, 1950 6 Sheets-Sheet 4

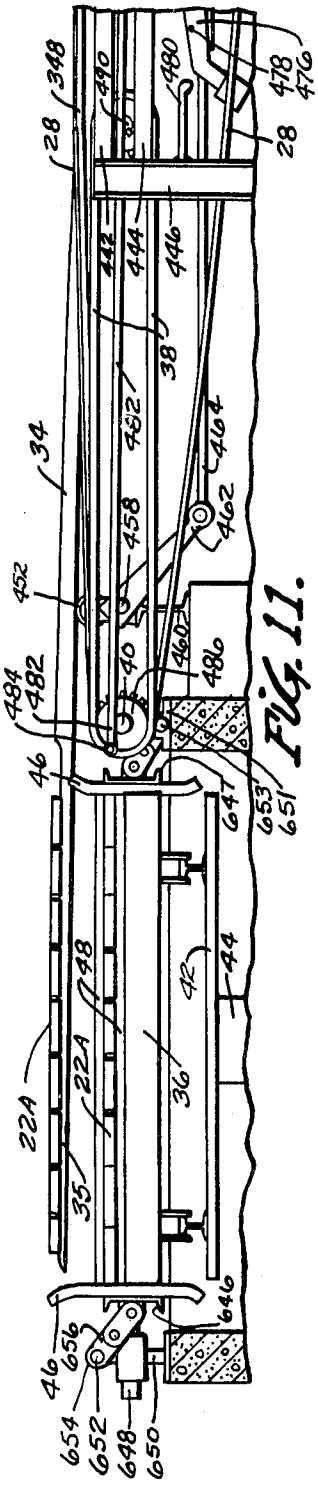

Fig. 11.

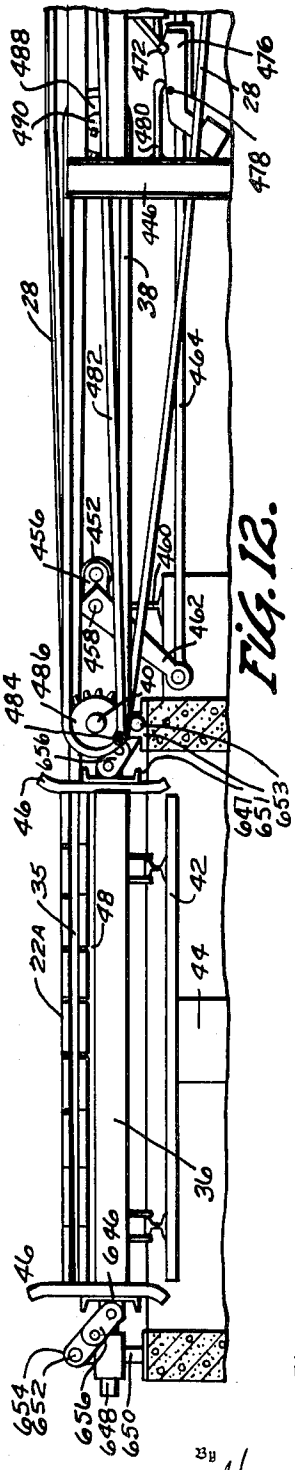

Fig. 12.

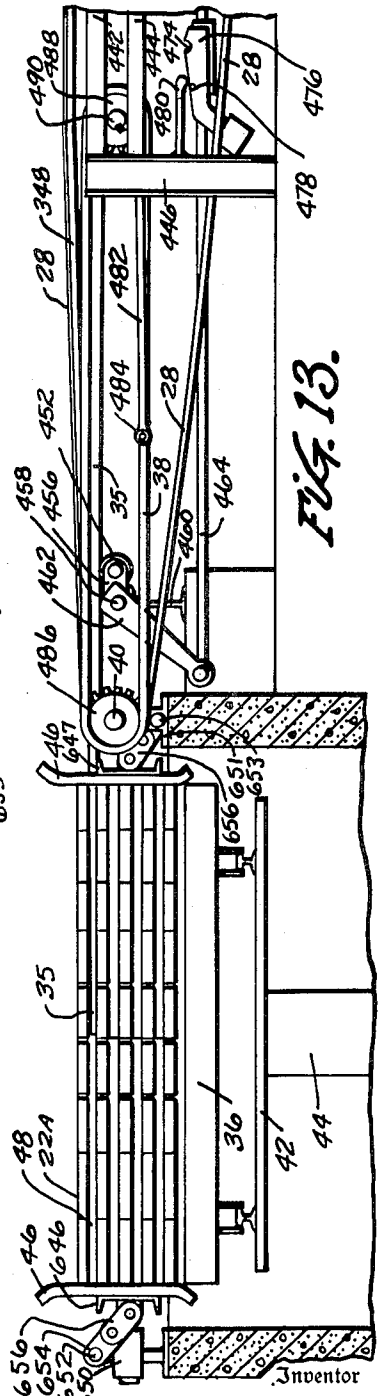

Fig. 13.

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Jan. 10, 1956 J. M. LAWSON 2,730,247

AUTOMATIC LUMBER STACKER

Original Filed Feb. 23, 1950 6 Sheets-Sheet 5

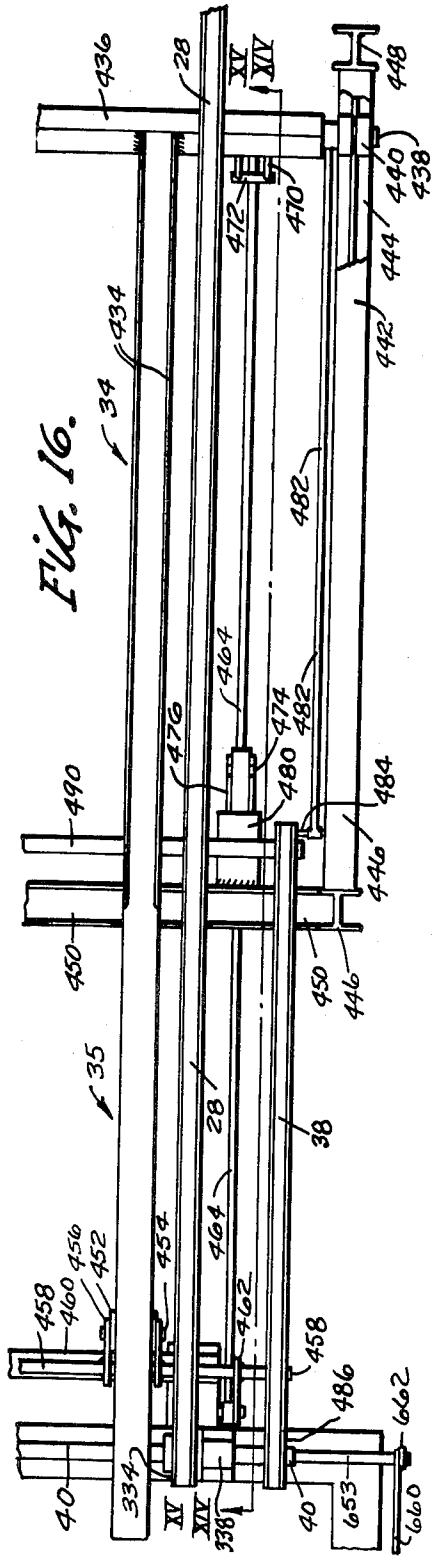

Fig. 16.

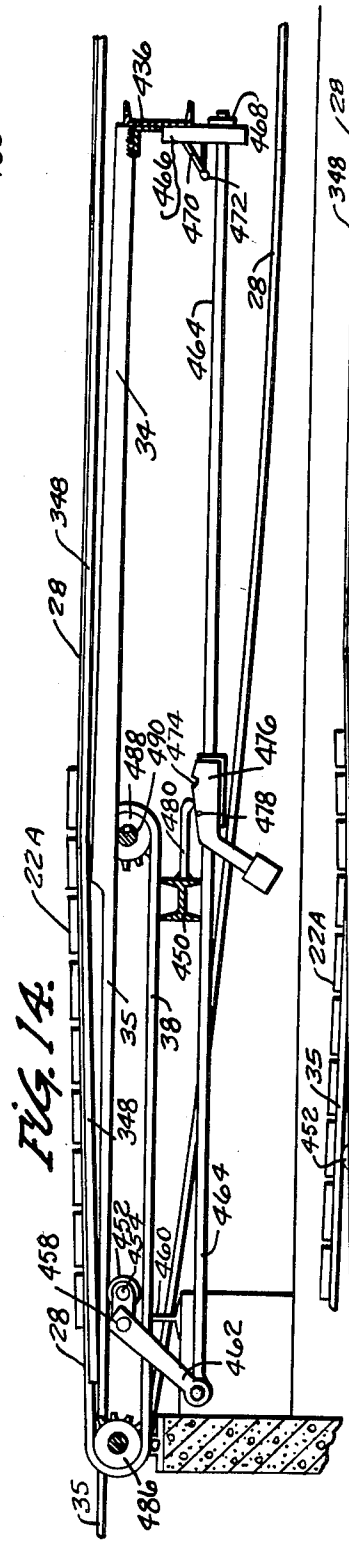

Fig. 14.

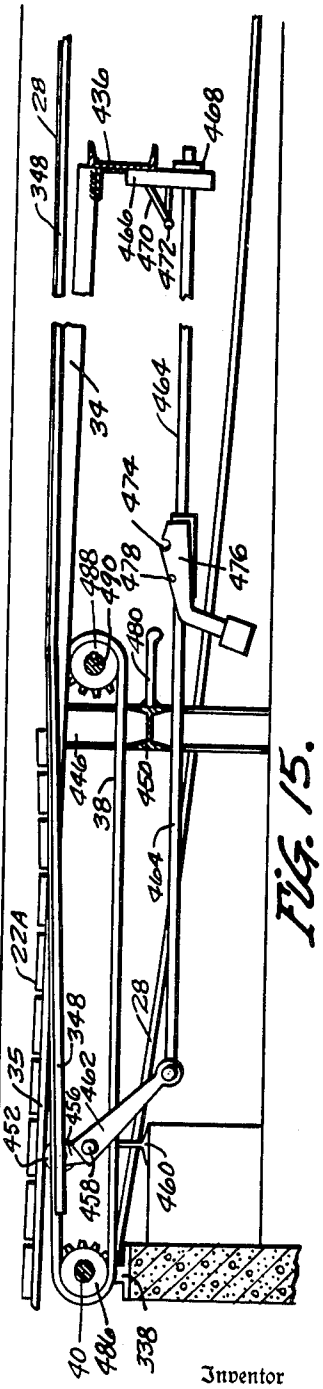

Fig. 15.

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Jan. 10, 1956 J. M. LAWSON 2,730,247

AUTOMATIC LUMBER STACKER

Original Filed Feb. 23, 1950 6 Sheets-Sheet 6

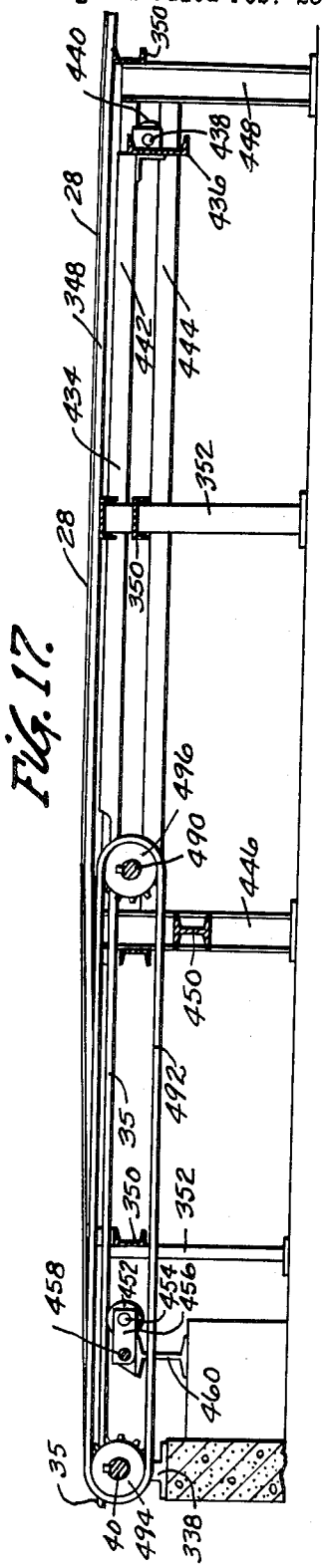

Fig. 17.

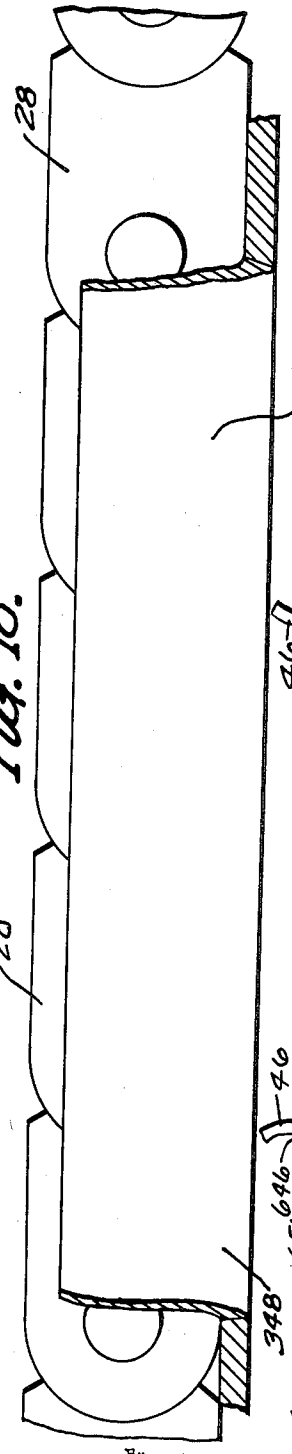

Fig. 18.

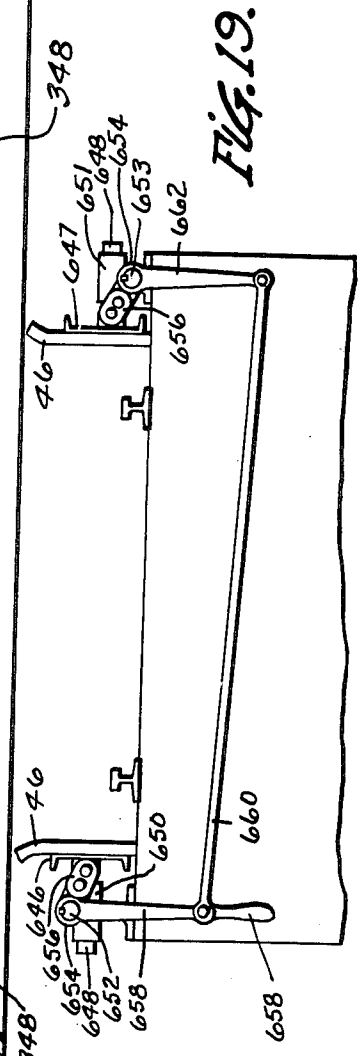

Fig. 19.

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2,730,247

AUTOMATIC LUMBER STACKER

Joseph M. Lawson, Memphis, Tenn., assignor, by direct and mesne assignments, to Lawson Stacker Company, Inc., a corporation of Tennessee

Continuation of abandoned application Serial No. 145,641, February 23, 1950. This application October 13, 1954, Serial No. 462,003

19 Claims. (Cl. 214—6)

This application is a continuation of my co-pending application, Serial No. 145,641, filed February 23, 1950, now abandoned.

This invention relates to lumber stackers and is designed particularly to pile lumber on cars or kiln trucks preparatory to drying it.

In drying lumber in kilns the lumber is ordinarily stacked in flat layers or tiers with separating sticks between the layers, on cars which are then rolled into the kilns for subsequent drying of the lumber. Kilns as ordinarily constructed are slightly wider than the cars and it is necessary that the lumber be stacked on the cars with the sides of the piles vertically above the sides of the cars in order that they may be rolled into the kilns without interference, and manual stacking is an onerous, difficult and expensive operation.

The present device is intended to mechanically accomplish the transfer of the lumber from a supply, the separating of the lumber during transfer into batches of car width, the placing of the layers or tiers on the cars on transverse sticks, which usually are manually placed to separate the layers and provide for air circulation, and the lining up of the edges of the tiers as they are successively placed so that the side edges are truly vertically above the side edges of the car. Piles of the lumber which previously may have been air dried are brought to the stacking mechanism and in usual manner these piles are tilted and raised by hoisting appartus of well known type, and the lumber is discharged by gravity. In the present device the lumber so discharged is received on feed belts which are operated as needed to deliver the lumber onto the ends of endless conveyor belts by which it is transferred to measuring cradles which divide off batches of car width and release these batches to be further transferred by the conveyor belts to a position over a coordinated group of placing forks. These forks are raised to remove or receive the lumber batch from the conveyor belts, and are shifted in the direction of movement of the belts at the same speed as the belts into position over the car unless it be desired to space the boards apart on the car, in which case the forks are shifted faster than the belt speed. After shifting, the forks are lowered to place the lumber on transversely disposed sticks resting on the car or upper tier of lumber thereon, these sticks being usually manually placed, and the forks are withdrawn to the initially described position in underlying relation to the next subsequent batch of lumber for placing. During placing the side edges of each tier of lumber is alined with the sides of the previously alined tiers and the sides of the car, and the car is lowered in the amount of the thickness of the sticks and tier to receive the next tier. These operations are subsequently repeated until the car is loaded, at which time the placing operation is interrupted, the edge alining guides are retracted, the loaded car is raised and removed for transfer to the kilns or yard. An empty car is placed on the platform, the edge guides are reset, sticks are manually placed on the car and alined by the guides, and the operation of loading and lowering of the placed car is begun.

My device as a whole is intended to stack the lumber on the truck in flat layers or tiers, one above the other, with separating sticks regularly and properly placed between the layers, and if desired, with vertical spaces left for the circulation of the air at intervals upward through the lumber as well as laterally. It utilizes a vertically movable platform on which the cars or kiln trucks are run, and means for raising and lowering the platform so that the car on it will be in proper position to receive the successive layers of lumber and separating sticks. In the preferred form, these operations are automatic, and the car is automatically lowered each time a tier is placed, to receive the next successive tier.

The objects of the invention are:

To provide conveyor means for laterally transferring lumber delivered thereto from a feed-in mechanism to a placing mechanism.

To provide means during the transfer for separating the lumber into batches or tiers having the width of the car on which they are to be placed, and for releasing the separated tier or batches for further transfer by the conveyor means into overlying relation to the placing mechanism.

To provide and position a car to receive successively placed tiers, raise said car to receiving level and subsequent to placing each tier to lower the car to establish a new receiving level.

To provide a said placing mechanism which includes arms or forks adapted to underlie the tiers of lumber as they are successively placed.

To provide means for raising the forks to pick up each tier of lumber in succession, and to subsequently lower the forks.

To provide means for shifting and coordinating the movement of the forks at a speed synchronized with the transfer speed of the conveyor means, as the forks are raised into lifting contact with the lumber, and to project the forks and the tier of lumber carried thereby to position the said tier of lumber over the car on which it is to be placed.

To provide fork shifting means which may be increased in speed over the speed of the transfer means to space the boards apart in the stack for vertical circulation of air should such spacing be desirable.

To provide means for positioning a car to receive the first tier of lumber thereon, and for lowering the car subsequent to placing each tier thereon to receive the next subsequent tier, and for subsequently raising the loaded car to initial level for removal and replacement.

To provide means to lower said forks and support said tier of lumber on transversely disposed sticks placed on the car, or on the uppermost tier of lumber thereon.

To provide means for alining and determining the spacing of transverse lumber supporting sticks.

To provide means for alining the opposite sides of the placed tier of lumber vertically above the side edges of the car; and

To provide means for lowering the car in an amount equal to the thickness of the sticks and the lumber to position the upper surface of the last placed tier to receive additional sticks and tiers of lumber and repeating the operation after placing of each subsequent tier of lumber.

Further objects are:

To provide means for laterally transferring lumber, means for interrupting said transfer and separating car-width tiers of said lumber during transfer, and for subsequently releasing each tier of lumber in succession for further transfer over placing means, means for advancing said placing means to position each tier successively over

a receiving car, and for retracting said placing means to initial position and repeating the cycle.

To provide means for raising said placing means prior to advancement to remove said tier from said transfer means, and for lowering said placing means subsequent to advancement, to place said tier on said car.

To provide means for measuring car-width tiers of lumber and for transferring said tiers to and placing said tiers on a car.

To provide means for measuring car-width tiers of lumber, for transferring said tiers to and placing said tiers on said car, and for alining the edges of the placed tier vertically above the side edges of said car; and

To provide means for laterally transferring lumber, means for interrupting and spacing along said transfer means, separate car width tiers of said lumber during transfer, and means for subsequently releasing each tier of lumber in succession for further transfer into overlying relation with tier placing means.

The means by which the foregoing and other objects of this invention are accomplished and the manner of their accomplishment will readily be understood from the following specification upon reference to the accompanying drawings, in which:

Figs. 1–5 are schematic side elevational key views of the lumber stacker, showing the relation of the means for feeding in the lumber, the means for transferring the lumber, the means for separating and releasing batches or tiers of the lumber, the forks for advancing the tiers over and placing them on the lumber receiving car, and the means for lining up the side edges of the tiers.

Fig. 1 shows the tier-loading placing forks raised and advanced partially over the lumber receiving car.

Fig. 2 shows the forks fully advanced and the tier lowered into place.

Fig. 3 shows the forks partially retracted, leaving the tier in place.

Fig. 4 shows the forks fully retracted with an additional measured tier advanced substantially to pick up position; and

Fig. 5 shows the retracted forks raised to pick up an additional tier for advancement.

Fig. 6 is a plan view on a somewhat larger scale of the lumber stacker.

Figs. 7 through 19 are views on a larger scale.

Fig. 7 is a plan view showing fragmentary side end portions of the kiln car, the lumber and sticks thereon, and the means for alining the lumber and the sticks.

Fig. 8 is a side elevational view of the lumber feed-in or receiving end of the machine including a measuring cradle, and is substantially coextensive with the bracketed section A of Fig. 4.

Fig. 9 is a complementary view of the tier transfer middle portion of the machine substantially coextensive with the bracketed section B of Fig. 4.

Fig. 10 is a complementary view of the lumber delivery and placing end of the machine substantially coextensive with the bracketed section C of Fig. 4 after the first tier has been placed on the car and with the tier alining guides in place and ready to receive and align the next tier.

Fig. 11 is a similar view of the delivery end of the machine substantially coextensive with section C–1 of Fig. 1, showing a tier of lumber advanced over the car, but before the tier has been lowered between the alining guides.

Fig. 12 is a view substantially coextensive with section C–2 of Fig. 2, showing the tier lowered, and before retraction of the placing forks with the outer boards resting on the spacing sticks and clear of the forks and the inner boards still supported by the forks and clear of the sticks.

Fig. 13 is a view substantially coextensive with section C–3 of Fig. 3, showing the forks partially retracted, the outer boards against the outer alining guides and the inner boards dragged against and alined by the inner guides.

Fig. 14 is a sectional side elevational view taken on the line XIV—XIV of Fig. 16 and substantially coextensive with section B of Fig. 4, showing the linkage through which raising of the tier placing forks is accomplished as raising movement begins; and

Fig. 15 is a complementary view showing completion of the raising operation and a tier of lumber partially free from the transfer belts.

Fig. 16 is a fragmentary plan view showing the same parts and details shown in Figs. 14 and 15 but without overlying lumber.

Fig. 17 is a fragmentary sectional elevation taken on the line XVII—XVII of Fig. 6 showing the fork driving belts.

Fig. 18 is an enlarged fragmentary elevational view of the conveyor belt chain and supporting channelway; and

Fig. 19 is a fragmentary elevational view showing the guide actuating toggle links and connecting linkage.

Referring now to the drawings in which the various parts are indicated by numerals, and initially to the key views, Figs. 1 through 5, and the plan view, Fig. 6, the stacker preferably includes suitable driven endless feed belts **26**, which are intermittently operated as need arises, which belts may be fed by a lumber hoist (not shown) which delivers boards onto the belts.

The feed belts deliver the boards **22** onto suitable driven endless conveyor belts **28** extending from end to end of the stacker. The belts **28** shift the boards over tier measuring cradles **30**, Figs. 1 through 3 and Fig. 8, which carry dogs **30A** and are rocked, by mechanism later described, to project the dogs, Figs. 2 and 3, above the conveyor belts into the path of the boards and are lowered, Figs. 4 and 5, to release batches or tiers **22A** of crade length after measurement by the cradle. The dogs are spaced from the feed-in ends **30B** of the cradles the desired width of the batches or tiers **22A** of the lumber which are to be placed or stacked, and interrupt movement of the boards by the conveyor **28**. The cradles **30** are mounted to rock about a transversely disposed rockshaft **32** and are tripped by automatically operated control means, hereinafter described, to release the measured tier and allow it to be bodily shifted by the conveyor belts into overlying relation with placing arms or forks **34**, having thinned and slightly tapered tier receiving end portions **35**. These forks are alternately lowered and retracted as in Fig. 4 into underlying relation to the belts, and are raised as in Fig. 5 to lift or receive the tier **22A** presently thereover, are shifted forwardly while still raised with their forward end portions **35** cantilevered over a kiln car **36** on which the boards are to be placed, to position the tier in overlying relation with respect to the car as in Fig. 1, are lowered as in Fig. 2, and withdrawn as in Figs. 3 and 4, leaving the placed tier on the car.

The reciprocatory shift of the forks is accomplished by endless traction belts **38** which are driven from the head shaft **40** of the conveyor belts **28** in coordinated relation to the movement of the conveyor belts, all in manner later hereinafter described.

The car **36** is supported by an elevator platform **42** which is raised, as by a plunger **44**, to position the car and lowered after placing of each tier to position it for the next tier. Alinement of the side edges of the tiers is accomplished by guides **46** of channel cross section which are manually moved together to receive the approaching tiers and aline the tier edges, and are separated to allow raising and removal of the car after loading. Spacing sticks **48** are placed on the car to receive the first tier and between the tiers in usual manner, the ends of the sticks being engaged in the channels of the guides to hold the sticks against lateral or longitudinal displacement.

The conveyor belts and other belts are preferably chain belts and the pulleys are sprockets, but are shown as belts and pulleys to simplify the drawings, and are correspondingly described.

Feed and conveyor belts

The feed belts **26** are endless belts, preferably chain

belts, which pass over forward pulleys or sprockets 226 which are keyed or otherwise secured to a transverse shaft 228 journalled in suitable bearings 230 and driven through a pulley 232 and belt 234 by an electric motor 236 which is manually switched on and off as need arises during the transfer operation of the lumber. Oppositely the feed belts 26 pass over rear pulleys or sprockets 238 which are jointly mounted on, and preferably keyed to, a shaft 240 journalled in suitable bearings 242.

The conveyor belts 28 are also endless belts, preferably chain belts, which pass over tail pulleys or sprockets 328 (Fig. 8) adjacent and at a lower level than the rear pulleys 238 of the feed belts, the tail pulleys 328 being mounted on and preferably keyed to a transverse tail shaft 330 which is suitably journalled by bearings 332. At their opposite ends (Figs. 9 through 16) the conveyor belts pass over head pulleys or sprockets 334 which are secured as by keys on the transverse head shaft 40 which is journalled in suitable bearings 338. The head shaft 40 is driven through a pulley 340 (Fig. 6) and a belt 342 from a pulley 344 mounted on the shaft of a manually controlled motor 346, the pulley 340, belt 342, and the motor 346 and its pulley 344, having been omitted from Fig. 10 and other figures for purposes of clarity. Between the head pulleys 334 and the tail pulleys 328 the upper flights of the conveyor belts 28 are preferably supported in channelways 348, indicated in Figs. 8, 9 and 10, and shown in detail in Figs. 18 and 19, but otherwise omitted for clarity. These channelways are supported by transverse beams 350 and posts 352, shown in Figs. 8, 9 and 10 only.

Placing forks

The placing forks 34 are shown as channels having upwardly turned flanges 434. The forks are rigidly secured at their rearward ends to a transverse beam 436 which extends laterally across and outward beyond the conveyor chains 28 and carries outwardly extending pins 438 (Fig. 16) which journal rollers 440. The rollers 440 may be grooved and are confined by, and roll between upper and lower track rails 442 and 444, which prevent vertical displacement and support the rear ends of the forks. The rails are preferably of T cross section with their stem portions respectively downwardly and upwardly faced and engaging the grooves of the rollers to guide them and prevent lateral displacement. The forward ends of the rails are carried by upright posts 446 and their rearward ends by similar posts 448. The posts 446 may be connected below the forks by a transverse beam 450.

At their forward ends the flanges of the forks 34 are cut away, for a distance in excess of the width of the tiers of lumber to be supported thereby, to reduce the thickness of the outer ends of the tiers supporting end portions 35 of the forks to substantially less than the thickness of the sticks 48, which space the tiers of boards when they are in place on the kiln cars 36. These end portions are preferably tapered, the centers of the end portions 35 being substantially the same thickness as the depth of the sticks, and their inner ends of greater thickness so that when lowered over the car the outer boards rest on the sticks and the inner ones are still supported by the forks.

The forward end portions 35 of the forks are supported by rollers 452, the rollers being journalled on pins 454 carried by arms 456 which in turn are rigidly secured to a transverse shaft 458. The shaft 458 is journalled in bearings which underlie the forks and are not shown, the bearings being supported by a transverse beam 460. An arm 462 is rigidly secured to the shaft 458 and extends downwardly therebelow. Pivotally secured to the lower end of the arm is a shift link 464 which extends rearwardly therefrom and passes slidably through a trip block 466 secured to and depending from the cross beam 436 of the fork. The link carries on its rear end a stop 468 which is engaged by the block 466 as under shift the forks approach their retracted positions. This engagement shifts the link and arm 462, and through the shaft 458, the arms 456 and the rollers 452 carried thereby, and raises the forks and the tier 22A of boards thereabove from the conveyor belts. The shift of the arm 462 is sufficient to move the rollers 452 slightly past dead center and bring the opposite ends of the roller carrying arms 456 into engagement with the top of the transverse beam 460. The rollers 452 remain in this supporting position during subsequent advance movement of the end portions 35 of the forks 34 to tier placing position over the kiln car 36.

The trip block 466, through projecting brackets 470, carries a horizontally disposed trip pin 472 which overlies the shift link 464 and advances forwardly therealong during the advance movement of the forks, into engagement with a notch 474 in a latch 476. The latch is pivotally secured to the link 464 by a pivot pin 478, and engaging the notch, shifts the link 464 and the arm 462 forwardly, displacing the rollers 452 and allowing the forks to lower and deposit the tier of boards carried thereby on the lumber sticks 48. As this movement approaches completion, the latch 476 is engaged by the end 480 of an arm secured to the transverse beam 450, and the latch is depressed to disengage the notch 474 from the trip pin 472 and allow retractive movement of the forks.

Fork shift

To accomplish shift of the forks the beam 436 is connected at its opposite ends through drag links 482 to pins 484 respectively carried by the traction chains 38. These chains at their forward ends pass over head sprockets 486 which are journalled on the opposite ends of the head shaft 40, and at their rearward ends over sprockets 488 which are keyed or otherwise rigidly secured to a cross shaft 490, the sprockets 488 being preferably of the same size as the head pulleys 334 of the conveyor chains. The shaft 490 is preferably driven by an endless chain drive belt 492, which is driven by a sprocket 494 secured on the head shaft 40 and turns a sprocket 496 secured on the cross shaft 490. The sprocket 494 is preferably of the same size as the head sprockets 334 of the conveyor chains, and, if the boards in the tiers are to be closely assembled on the kiln car 36, the sprocket 496 is of equal size, but if spaces are to be left between the boards of the kilns, as is sometimes desired, the sprocket 496 is smaller, ordinarily by one, two, or a few more teeth, depending on the amount of space which it is desired to leave between the boards, the effect of the reduction in size of the sprocket 496 being to increase the speed of the shaft 490 and the sprockets 488 secured thereto and thereby to slightly speed up the movement of the chains 38 and of the forks 34 which are moved thereby, relatively to the speed of the conveyor chains 28, and by such increase open spaces between the boards being removed by the forks.

The measuring cradles

Coordination of delivery of the tiers of the forks 34 is controlled by release of the measured tiers by the cradles 30, and the positioning of these cradles relatively to the forks. The cradles are rigidly secured to the rock shaft 32 which compels concurrent movement of all of them, the shaft being positioned rearwardly of the center of the cradles, or the cradles otherwise counterweighted so that their forward ends will drop in spite of dog engagement unless supported. This support is preferably accomplished by an arm 530 which is secured to the shaft 32, preferably midway of its length and extends forwardly therefrom. The forward end of the arm journals a wheel 532 which rests on a track 534 shiftably supported by brackets or posts 536. The track includes a raised section 538 which, when the track is forwardly shifted, engages the wheel 532 and through the arm holds the upper surfaces of the cradles substantially parallel with and underlying the con-

veyor belts, and the boards carried above the cradles by the belts with the dogs 30A projecting above and limiting the forward movement of the boards.

A link 540 is secured to the track, extends forwardly therefrom and carries a stop 542. The stop is preferably positioned with respect to a trip block 546, depending from the cross beam 436 of the fork, for engagement with said stop and shift of the raised track section 538 under the wheel 532, as the forks are shifted into overlying relation with the kiln car 36. The link 540 also carries a second stop 544 which is engaged and rearwardly shifted by the trip block 546 during return movement of the forks, and rearwardly shifts the track section 538, allowing the forward ends of the cradles to withdraw the dogs 30A from retaining engagement with the tier of boards then assembled over the cradles, and release the tier for transfer by the conveyor belts to the forks. The stop 544 is positioned along the link 540, to so time the release of the successive tiers onto the conveyor belt that they will reach the forward end of the conveyor belts as the forks are fully retracted and are raised by the rollers 452 to lift the tier from the belts.

The cradles rearwardly of the dogs 30A may have a length equal to the desired width of the tiers, and would then determine the width of the tier to be shifted, or the cradles may serve merely as actuators for the dogs and the dogs be spaced the desired tier width from the delivery point of the feed belts 26 onto the conveyor belts 28, or from some other marking point.

The lumber delivered by the feed belts 26 onto the conveyor belts 28 is shifted by the conveyor belts against and is stopped by the dogs 30A. Actuation of the feed belts 26 is controlled by an operator who may shut off the feed belt motor 236 as the desired width of tier is accomplished. Should the last board delivered be too wide or too narrow, the last board or some other board or boards is flipped or rolled backward by the operator and a narrower or wider board as the case may be substituted to complete as nearly as possible the desired tier width.

The alining guides

The side edges of the tiers as delivered to the car 36 are alined by the guides 46.

The guides are preferably short sections of channel, vertically disposed with their flanges facing the kiln car 36, and are rigidly secured in oppositely disposed sets to oppositely disposed beams 646 and 647, preferably channels, which are of kiln car length.

The guides are spaced along the beams at the places where it is desired that the tier spacing sticks are to be placed with the guides secured to one beam directly opposite those secured to the other beam. In placing the sticks on the car and subsequently on the tiers of lumber one end of each stick is engaged between the flanges of a guide and the opposite end in or alined with the opposite guide so that the sticks will lie substantially at right angles across the car and the sticks between each tier will be vertically above the sticks underlying that tier.

Rigidly secured to the beams 646 and 647 are guide bars 648 which extend outward therefrom and are slidably mounted in guide brackets 650 and 651 suitably supported. Shafts 652 and 653 respectively adjacent and parallel to the beams 646 and 647 are turnably mounted in the brackets 650 and 651 and carry links 654 which are pin connected to similar links 656, which in turn are pin connected to their respectively adjacent beams to effect toggle connecting links between the shafts and the beams. A hand operated lever 658 is secured to the shaft 652 and is coupled through a link 660 and a second lever 662 to the opposite shaft 653 to effect concurrent movement and actuation of the toggle links and the beams to which they are connected.

When the car is positioned to receive the first tier and before placing that tier the lever 658 is shifted to move the guides 46 substantially into contact with the sides of the car and in position to aline the edges of the subsequently placed tiers with the edges of the car. After the car is loaded the guides are withdrawn before the platform is raised, and are not reset until the loaded car has been removed and replaced by an empty one.

Any tendency of the boards adjacent the ends of the fork to shift outward along the forks and over the fork ends as outward fork movement is checked, occurs after the tier on the forks is between the guides 46 and such movement is checked and the boards alined by the remote guides. As has been previously noted the thickness of the outer ends of the forks is less than the thickness of sticks 48 so that retraction of the lowered forks is from beneath boards against and adjacent the remote guides which are supported by the sticks and there is substantially no tendency to shift the boards away from those guides and alinement of that edge of the tier is insured. Boards adjacent the inner guides are however still supported by the forks and are shifted against these guides insuring alining contact of the inner edge of the tier with the guides.

After each tier of boards is placed the platform and car are lowered in an amount equalling the thickness of the boards and sticks and a new set of sticks placed and alined by the guides, one end of each stick being engaged between the guide flanges and the opposite end with the guide in proximity thereto, and the tier placing sequences continued until the desired height of stack on the car is completed, after which the guides 46 are retracted, the car is raised to initial level, pulled from the platform and replaced by an additional car to be loaded, and the guides reset.

I claim:

1. In a machine for tiering lumber in a stack, which machine includes horizontally shiftable forks having tier carrying forward end portions movable under shift into cantilevered relation over said stack, means for supporting said forks for shift, including means constraining the rear ends of said forks against vertical displacement during shift, and means for alternately shifting said forks toward said stack and said forward end portions into overlying relation to said stack and for retracting said forks; the improvement which comprises means for raising and lowering the support for the forward end portions of said forks, linkage operatively coupled to said forward end supporting means and including stops respectively positioned along and secured on said linkage for engagement and displacement by said forks as rearward shift is ending, to raise, and as forward shift is ending, to lower, said fork end portions.

2. In a machine for tiering lumber in a stack, which machine includes horizontally shiftable tier placing forks having tier carrying forward end portions movable under shift into cantilevered relation over said stack, means for supporting and constraining the rear ends of said forks against vertical displacement during shift, and means for alternately forwardly shifting said forks toward said stack and said end portions into overlying relation to said stack and for rearwardly retracting said forks; the improvement which comprises means for supporting, raising, and lowering the forward end portions of said forks linkage operatively coupled to said supporting means and including stops respectively positioned for engagement by said forks as rearward retraction is ending, to raise, and as forward shift is ending, to lower, said fork end portions, and means for measuring, releasing and delivering tiers of boards over said tier carrying end portions of said forks when retracted.

3. In a machine for tiering lumber in a stack, which machine includes horizontally shiftable tier placing forks having tier carrying forward end portions shiftable into cantilevered relation over said stack, means for alternately shifting said forks toward said stack and said

end portions into said overlying relation to said stack, and for retracting said forks, and conveyor means for delivering tiers of lumber successively over said tier carrying end portions of said forks, and means for constraining the rear ends of said forks against vertical displacement during shift, the improvement which comprises means for supporting, raising, and lowering the forward end portions of said forks including trip means carried by said forks, means for timing delivery of said tiers with fork movement, and linkage operatively coupled to said fork supporting, raising and lowering means, including stops mounted on said linkage respectively engaged by said fork carried trip means during said movements to raise, and to lower, said fork end portions.

4. In a machine for tiering lumber in a stack, which machine includes a horizontally shiftable fork assembly having tier supporting forward end portions extending under shift into cantilevering relation over said stack, means for supporting and constraining the rear ends of said forks against vertical displacement during shift, means for alternately shifting said forks toward said stack and said end portions into overlying relation to said stack and for retracting said forks, conveyor means for delivering tiers of lumber over said tier receiving ends of said forks, means for assembling said lumber in tiers of measured width on said conveyor, means for timing release of said tiers and delivery of said tiers by said conveyor as return movements of said forks are completed; the improvement which comprises means for supporting, raising and lowering said forward end portions of said forks, and linkage operatively coupled to said fork supporting, raising and lowering means, including stops carried on said linkage respectively engaged by said fork assembly during shift movement of said assembly to raise said fork end portions into engagement with a tier advanced thereover by said conveyor, and to lower said fork end portions and deposit said tier on said stack.

5. In a machine for tiering lumber in a stack, which machine includes a lumber conveyor having a head shaft journalled in adjacency to one side of said stack, pulleys secured on said shaft, endless chain conveyor belts passing over said pulleys and means for driving said shaft and pulleys and the upper flights of said belts toward said stack, means for separating lumber placed on said conveyor into tiers, tier transferring forks, underlying the stack proximate ends of said conveyor, means for supporting said forks, and means for reciprocating said forks; the improvements which comprise a fork assembly including a transverse beam secured rigidly to the stack-remote ends of said forks, and supporting means including guides reciprocably supporting said beam and means for supporting, raising and lowering the forward ends of said forks, said reciprocating means including a cross shaft journalled rearwardly of said head shaft and forwardly of said beam, a driving pulley secured on said head shaft, an alined pulley secured on said cross shaft and a driving belt on said pulleys, establishing a desired speed relation between said shafts, traction belt pulleys secured on opposite ends of said cross shaft, complementary traction belt pulleys journalled on opposite ends of said head shaft and endless traction chain belts mounted on said pulleys, linkage operatively connecting opposite ends of said beam to said traction belts, for retracting and advancing actuations of said forks, and linkage coupled to said forward end raising and lowering means, slidably extending through said beam, stop means on said linkage beyond said beam and engageable thereby as said beam approaches the end of retracting actuation, to raise said forward ends, and additional stop means carried by said linkage intermediate its length, and cooperative means carried by said beam engaging therewith as said beam approaches the end of said advancing actuation, to lower said forward ends.

6. In a machine for tiering lumber in a stack which machine includes a lumber conveyor having a head shaft journalled in adjacency to one side of said stack, pulleys secured on said shaft, endless belts passing over said pulleys, and means for driving said shaft and pulleys and the upper flights of said belts toward said stack, means for separating lumber placed on said conveyors into tiers, tier transferring forks underlying the stack proximate ends of said conveyors, means for supporting said forks, and means for reciprocating said forks; the improvement which comprises a fork assembly including a transverse beam secured rigidly to the stack-remote ends of said forks, guides reciprocably supporting said beam and means for supporting, raising and lowering the forward ends of said forks, said reciprocating means including a cross shaft journalled rearward of said head shaft and forwardly of said beam, traction belt pulleys secured on opposite ends of said cross shaft, complementary traction belt pulleys journalled on opposite ends of said head shaft and endless traction belts mounted on said pulleys, and means for driving said cross shaft from said head shaft, and said traction belts at an increased speed as related to said conveyor belts, linkage operatively connecting opposite ends of said beam to said traction belts, for retracting and advancing actuation of said forks, and linkage operatively coupled to said forward end raising and lowering means, slidably extending through said beam, stop means beyond said beam and engageable thereby as said beam approaches the end of said retracting actuation, to raise said forward end, and additional stop means carried by said linkage intermediate its length, and cooperative means carried by said linkage intermediate its length, and cooperative means carried by said beam, engaging with the latter said stop means as said beam approaches the end of said advancing actuation to lower said forks.

7. A machine for tiering lumber in a stack, including a lumber conveyor, having a head shaft journalled in adjacency to one side of said stack, pulleys secured on said shaft, endless conveyor belts passing over said pulleys, and means for driving said shaft and pulleys and the upper flights of said belts toward said stack, means for separating lumber placed on said conveyors into tiers, tier transferring forks, means for supporting said forks and means for reciprocating said forks; the improvement which comprises an assembly of forks underlying the stack-proximate end of said conveyor and including a transverse beam secured rigidly to the stack-remote ends of said forks, said supporting means including guides reciprocably supporting said beam, and means for supporting, raising and lowering the forward ends of said forks, said reciprocating means including traction belt pulleys mounted on the opposite ends of said head shaft and cooperative pulleys respectively disposed and journalled rearwardly of said traction belt pulleys and forwardly of said beam, endless traction belts respectively mounted on said traction belt pulleys and their respective cooperating pulleys, said cooperating pulleys being driven from said head shaft, linkage operatively coupling said traction belts and said beams for advancing and retracting said forks and related means carried by said fork end raising and lowering means cooperatively engaged by said beam as said beam approaches the end of retractive movement, for raising, and as it approches the end of advancing movement, for lowering said fork ends.

8. A machine for tiering lumber in a stack, including a lumber conveyor having a head shaft journalled in adjacency to one side of said stack, pulleys secured on said shaft, endless conveyor belts passing over said pulleys, and means for driving said shaft and pulleys and the upper flights of said belts toward said stack, means for separating lumber placed on said conveyors into tiers, tier transferring forks, means for supporting said forks and means for reciprocating said forks; the improvement which comprises an assembly of forks underlying the

stack-proximate end of said conveyor, said supporting means including guides reciprocably supporting the rear end of said assembly and means for supporting, raising and lowering the forward ends of said forks, said reciprocating means including traction belt pulleys mounted on the opposite ends of said head shaft and cooperative pulleys respectively disposed and journalled rearwardly of said traction belt pulleys and forwardly of said beam, endless traction belts respectively mounted on said traction belt pulleys and their respective cooperating pulleys, and means for driving said traction belts at increased speed over said conveyor belts, linkage operatively coupling said traction belts and said assembly for advancing and retracting said forks and related means carried by said fork and raising and lowering means cooperatively engaged by said assembly as said assembly approaches the end of retractive movement, for raising, and as it approaches the end of advancing movement, for lowering said fork ends.

9. In a machine for tiering lumber in stacks which machine includes tier carrying means, means for advancing said carrying means and a tier of lumber thereon, over said stack, means for lowering said carrying means and depositing said tier on said stack, and means for retracting said carrying means; means for alining the opposite edges of said tier with the edges of underlying tiers of said stack, said means comprising a pair of horizontal beams disposed on opposite sides of said stack, vertically disposed guides in pairs secured in opposed relation to the facing sides of said beams, said guides having their upper and lower ends respectively above and below the level of said deposited tier, and said beams being spaced to position said guides desired tier width apart, horizontally disposed means transverse to said beams, supporting said beams for shift horizontally away from said stack, a pair of horizontally disposed shafts respectively lying along and outward from said beams, means supporting and journalling said shafts, toggles comprising hingedly connected arms respectively secured at their outer ends on said shafts and hingedly connected at their inner ends to said beams, said toggles being of straightened length to extend between said shafts and said beams, a manually operable lever secured to one of said shafts, a complementary lever secured to the other of said shafts in substantially parallel relation and a link operatively interconnecting said levers, for concurrently collapsing said toggles to retract said beams and said guides carried thereby.

10. In a machine for tiering lumber in stacks with spacing sticks interposed between the tiers, means for lowering and depositing a tier of lumber on said stack; means for alining the opposite edges of said tier with the edges of underlying tiers of said stack and transversely alining said spacing sticks, said means comprising a pair of horizontal beams disposed on opposite sides of said stack, vertically disposed channel shaped guides in pairs secured in opposed relation to the facing sides of said beams, with the channels of said guides facing to receive the opposite ends of tier spacing sticks placed across said stack, said guides having their upper and lower ends respectively above and below the level of said deposited tier, and said beams being spaced to position said guides desired tier width apart, horizontally disposed means transverse to said beams, supporting said beams for shift horizontally away from said stack, a pair of horizontally disposed shafts respectively lying along and outward from said beams, means supporting and journalling said shafts, toggles comprising hingedly connected arms respectively secured at their outer ends on said shafts and hingedly connected at their inner ends to said beams, said toggles being of straightened length to extend between said shafts and said beams, a manually operable lever secured to one of said shafts, a complementary lever secured to the other of said shafts in substantially parallel relation and a link operatively interconnecting said levers, for concurrently collapsing said toggles to retract said beams and said guides carried thereby, and disengage the channels of said guides from said stick ends.

11. In a machine for tiering lumber in a stack which machine includes a lumber conveyor having a head shaft journalled in adjacency to one side of said stack, pulleys secured on said shaft, endless belts passing over said pulleys, and means for driving said shaft and pulleys and the upper flights of said belts toward said stack, means for separating lumber placed on said conveyors into tiers, tier transferring forks underlying the stack proximate ends of said conveyors, means for supporting said forks, and means for reciprocating said forks; the improvement which includes a fork assembly including a transverse beam secured rigidly to the stack-remote ends of said forks, reciprocating means including a cross shaft journalled rearward of said head shaft and forwardly of said beam, traction belt pulleys secured on opposite ends of said cross shaft, complementary traction belt pulleys journalled on opposite ends of said head shaft, endless traction belts mounted on said traction pulleys, means driven by said head shaft for driving said cross shaft and said traction belts at an increased speed as related to said conveyor belts, and linkage operatively connecting opposite ends of said beam to said traction belts, for retracting and advancing actuation of said forks.

12. In a machine for tiering lumber in a stack, which machine includes a lumber conveyor having a head shaft journalled in adjacency to one side of said stack, pulleys secured on said shaft, endless belts passing over said pulleys, and means for driving said shaft and pulleys and the upper flights of said belts toward said stack, means for separating lumber placed on said conveyor into tiers, tier transferring forks, underlying the stack proximate ends of said conveyor, means for supporting said forks, and means for reciprocating said forks; the improvements which comprise a fork assembly including a transverse beam secured rigidly to the stack-remote ends of said forks, guides reciprocably supporting said beam, reciprocating means including a cross shaft journalled rearward of said head shaft and forwardly of said beam, a driving pulley secured on said head shaft, an alined pulley secured on said cross shaft and a driving belt on said pulleys establishing a desired speed relation between said shafts, traction belt pulleys secured on opposite ends of said cross shaft, complementary traction belt pulleys mounted on opposite ends of said head shaft, endless traction belts mounted on said pulleys, and rigid links operatively connecting opposite ends of said beam to said traction belts, for retracting and advancing actuations of said forks.

13. In a machine for tiering lumber in a stack which includes a belt-like lumber conveyor, having a head shaft at one end of said conveyor and means for driving said shaft, a reciprocable tier transferring fork assembly, shaft means journalledly supported transversely relative to said fork assembly and spaced from said head shaft toward the opposite end of said conveyor, means drivingly coupling said shaft means to said head shaft in desired speed relation, traction drive means secured to and driven with said shaft means, idler means journalled on said head shaft, endless traction means mounted on said traction drive means and said idler means, said fork assembly being coupled to said endless traction means for retracting and advancing reciprocation of said fork assembly responsive to drive of said lumber conveyor, means for raising and lowering one end of said fork assembly in coordination with said reciprocation, trip means carried by said fork assembly, linkage operatively coupled to said raising and lowering means and stops mounted on said linkage in the path of said trip means engaged by said trip means during said reciprocation to actuate said raising and lowering means.

14. In a machine for tiering lumber in a stack, which machine includes a lumber conveyor having a head shaft, pulleys secured on said shaft, endless belts passing over said pulleys, and means for driving said shaft and pulleys and the upper flights of said belts toward said stack, means

for separating lumber placed on said conveyor into tiers, tier transferring forks, underlying the stack-proximate ends of said conveyor, means for supporting said forks, and means for reciprocating said forks; the improvements which comprise a fork assembly including beam means secured rigidly to the stack-remote ends of said forks, guides reciprocably supporting said beam means, reciprocating means including cross shaft means, a driving pulley secured on said head shaft, an alined pulley secured on said cross shaft means and a driving belt on said pulleys establishing a desired speed relation between said shafts, traction belt pulleys secured on opposite ends of said cross shaft means, complementary traction belt pulleys mounted on opposite ends of said head shaft, endless traction belts mounted on said pulleys, and means operatively connecting opposite ends of said beam means to said traction belts, for retracting and advancing actuation of said forks.

15. In a machine for tiering lumber in a stack, a lumber conveyor comprising a shaft adjacent one side of said stack, pulleys secured on said shaft, endless belts supported on said pulleys, means for driving said shaft and pulleys to drive the upper flights of said belts toward said stack, a tier transferring fork assembly underlying said belts adjacent said stack, means reciprocably supporting said fork assembly, reciprocating drive means for said fork assembly, said reciprocating drive means comprising speed differential means secured on and driven with said shaft, cross shaft means substantially horizontally alined with said shaft positioned intermediate the length and flights of said conveyor endless belts, means drivingly coupling said speed differential means to said cross shaft means, endless traction means supported on said shaft and said cross shaft means and driven by said cross shaft means, and connecting means coupling said fork assembly to said endless traction means.

16. In a machine for tiering lumber in a stack, a lumber conveyor comprising a shaft adjacent one side of said stack, pulleys secured on said shaft, endless belts supported on said pulleys, means for driving said shaft and pulleys to drive the upper flights of said belts toward said stack, a tier transferring fork assembly underlying said conveyor adjacent said stack, means reciprocably supporting said fork assembly, reciprocating drive means for said fork assembly, said reciprocating drive means comprising speed differential means secured on and driven with said shaft, cross shaft means substantially horizontally alined with said shaft positioned intermediate the length and flights of said conveyor endless belts and projecting oppositely laterally outwardly from said conveyor, means drivingly coupling said speed differential means to said cross shaft means, endless traction means supported on said shaft and said cross shaft means and driven by said cross shaft means, and connecting means coupling said fork assembly to said endless traction means for fork assembly reciprocation responsive to traction means drive.

17. In a machine for tiering lumber in a stack, a lumber conveyor comprising a shaft adjacent and spaced from one side of said stack, pulleys secured on said shaft, endless belts supported on said pulleys, means for driving said shaft and pulleys to drive the upper flights of said belts toward said stack, a tier transferring fork assembly underlying said belts, means reciprocably supporting said fork assembly, reciprocating drive means for said fork assembly, said reciprocating drive means comprising speed differential means secured on and driven with said shaft, cross shaft means substantially parallel with said shaft positioned intermediate the length of said conveyor endless belts, means drivingly coupling said speed differential means to said cross shaft means, endless traction means supported on said shaft and said cross shaft means and driven by said cross shaft means, and connecting means coupling said fork assembly to said endless traction means.

18. In a machine for tiering lumber in a stack, a lumber conveyor comprising a shaft adjacent and spaced from one side of said stack, pulleys secured on said shaft, endless belts supported on said pulleys, means for driving said shaft and pulleys to drive the upper flights of said belts toward said stock, a tier transferring fork assembly underlying said belts, means reciprocably supporting said fork assembly, reciprocating drive means for said fork assembly, said reciprocating drive means comprising speed differential means connected and driven with said shaft, cross shaft means substantially parallel to said shaft positioned intermediate the length of said conveyor endless belts, means drivingly coupling said speed differential means to said cross shaft means, endless traction means supported on said shaft and said cross shaft means and driven by said cross shaft means, and connecting means coupling said fork assembly to said endless traction means.

19. In a machine for tiering lumber in a stack, a lumber conveyor comprising a shaft adjacent one side of said stack, pulleys secured on said shaft, endless belts supported on said pulleys, means for driving said shaft and pulleys to drive the upper flights of said belts to drive the upper flights of said belts toward said stack, a tier transferring fork assembly underlying said conveyor adjacent said stack, means reciprocably supporting said fork assembly, reciprocating drive means for said fork assembly, said reciprocating drive means comprising speed differential means driven with said shaft, cross shaft means substantially parallel with said shaft positioned intermediate the length of said conveyor endless belts and projecting oppositely laterally outwardly from said conveyor, means drivingly coupling said speed differential means to said cross shaft means, endless traction means supported on said shaft and said cross shaft means and driven by said cross shaft means, and connecting means coupling said fork assembly to said endless traction means for fork assembly reciprocation responsive to traction means drive.

References Cited in the file of this patent

UNITED STATES PATENTS

2,065,674	Fay, Jr.	Dec. 29, 1936
2,358,283	Walter	Sept. 12, 1944
2,397,720	Beane	Apr. 2, 1946