March 12, 1963 R. E. BLAKE 3,080,969

SORTING APPARATUS

Filed Oct. 27, 1960 2 Sheets-Sheet 1

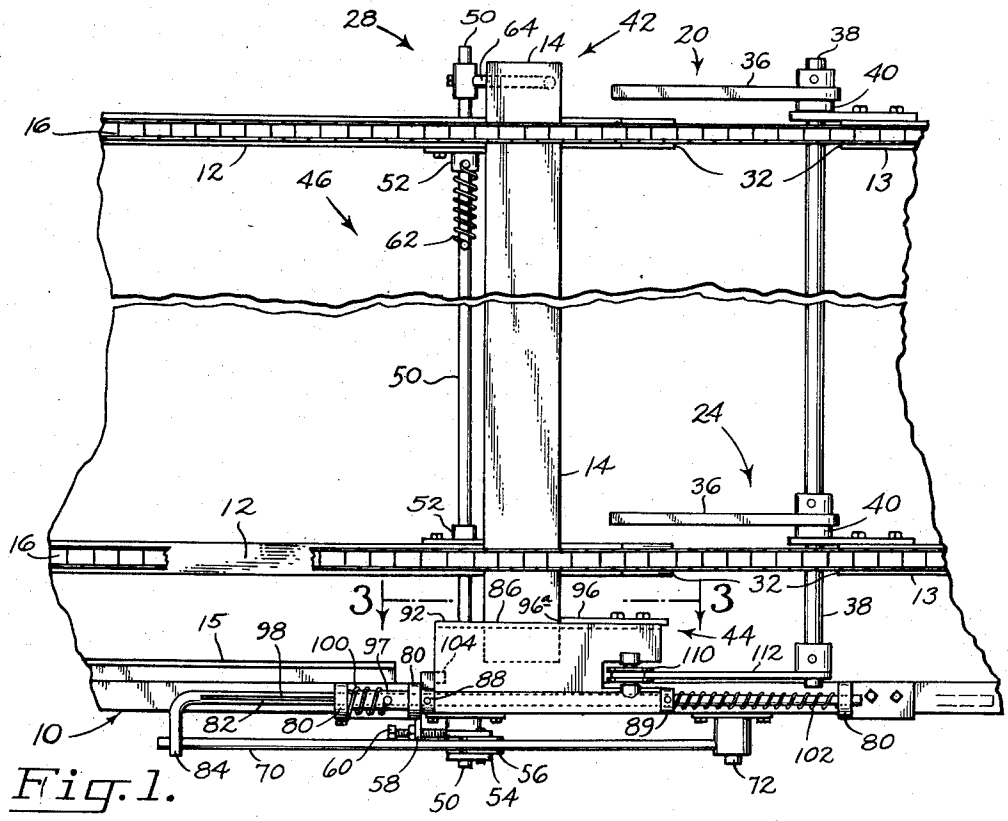


Fig. 1.

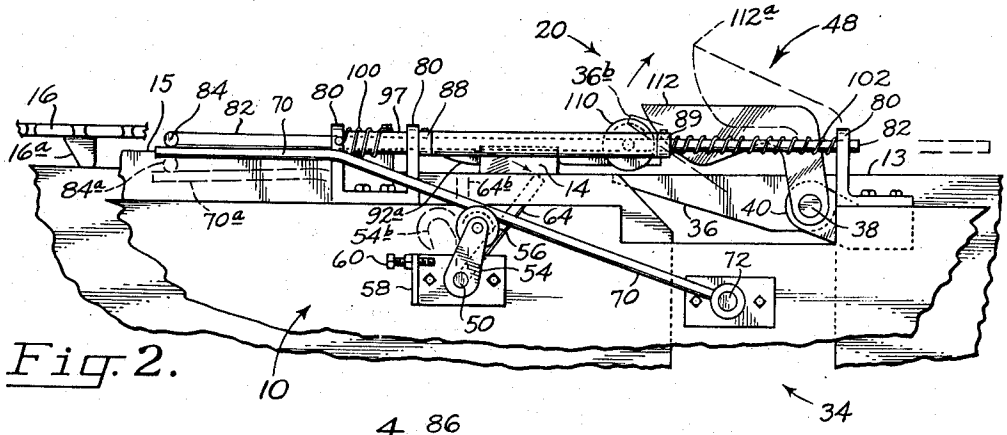


Fig. 2.

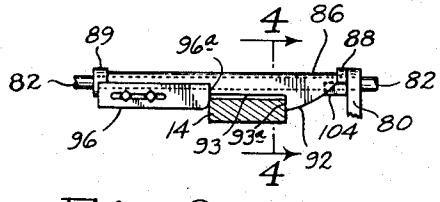


Fig. 3.

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SORTING APPARATUS

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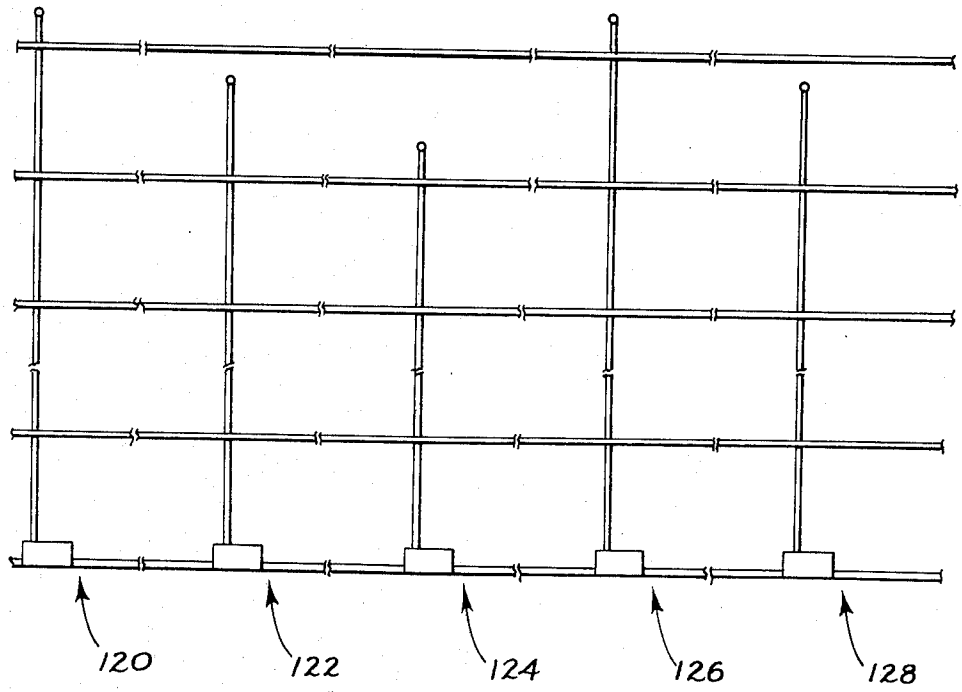


Fig. 7.

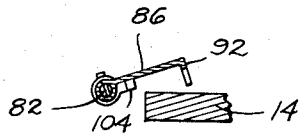


Fig. 4.

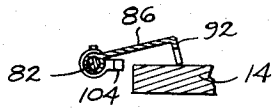


Fig. 5.

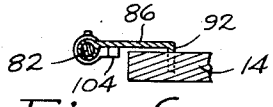


Fig. 6.

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SORTING APPARATUS

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10 Claims. (Cl. 209—90)

This invention relates to sorting apparatus, and more particularly to an improved construction for a lumber sorter.

One of the objects of the invention is to provide mechanism for sorting according to length, width, grade and the like, which does not require a series of separate motors and complicated controls for its operation. Instead, the power required to actuate the sorter can be derived from the movement of lumber through the sorter.

Another object is to provide a novel method for sorting lumber traveling along a conveyor into piles according to length and width.

A related object is to provide a novel method for sorting lumber wherein the nature of successive separations made during the sorting are such that a series of random pieces may be completely separated with the pieces traveling down a single conveyor line and with movement of the pieces providing the power necessary to produce separation.

Another object is to provide a novel method of separating lumber by grade, wherein grade separations are brought about as the result of adjusting the position of the ends of lumber pieces on a conveyor.

A further object of the invention is to provide improved sorter mechanism for lumber which comprises a pair of detector devices, one having a movable part measuring length and one having a movable part measuring width, separator mechanism for removing lumber from a path travel through the sorter, and mechanical means interconnecting the operation of the detector devices and the separator mechanism, whereby movement of the movable part of one detector device places the movable part of the other in operation, and movement of the movable part of the other produces by mechanical means actuation of the separator mechanism.

In a more specific sense, an object of the invention is is to provide sorter mechanism which comprises a gauge member for determining width and an arm engaged by lumber moving through the sorter for determining length, such arm lowering the gauge member to an operative position when it is actuated by a piece of lumber of predetermined length engaging the arm, the gauge member when in operative position being in position to lock onto a board of correct width and translate movement of the board to movement of the sorter.

The invention is described hereinbelow in conjunction with the accompanying drawings, wherein:

FIG. 1 is a plan view of portions of a sorting line for lumber, such sorting line including separator mechanism and means for actuating the separator mechanism constructed according to an embodiment of the invention;

FIG. 2 is a side view of the portions of a sorting line illustrated in FIG. 1;

FIG. 3 is a view along the line 3—3 of FIG. 1, illustrating details of a gauge member present in the invention;

FIGS. 4, 5, and 6 illustrate various positions of the gauge member during the operation of the sorter; and,

FIG. 7 is a plan view, slightly simplified, illustrating how a complete sorting line may be used to separate lumber into piles of different sizes and widths.

Referring now to the drawings, **10** indicates generally framework of a lumber sorting line, such framework supporting ways or guides **12**, **13** extending longitudinally therealong. Lumber, such as board or lumber piece **14**, is moved over ways **12**, **13** by means of overhead lug chains or conveyor means **16**. One end of the lumber piece slides against a fence **15**. The ways define a path of travel for lumber through the sorter, and lumber is moved sidewise over this path, that is to say, with the lumber extending transversely of this path of travel. Lug **16***a* of the lug chains positively engage the rear edge of a lumber piece. The chains are aligned with ways **12**, **13**, and the ways provide support for the bottom runs of the chains.

Generally indicated at **20** is a separating station in the processing line. Separating station **20** includes separator mechanism, indicated generally at **24**, and means for actuating the separator mechanism, indicated generally at **28**.

Specifically, describing the separator mechanism, ways **12** and **13** have their ends spaced apart, at **32**, to leave an opening for the dropping of a lumber piece downwardly from the support plane of the ways. A recess **34** is provided in framework **10** beneath spacing **32**, and lumber may fall downwardly into this recess, whence it may be transported away from the processing line by any suitable conveyor means (not shown).

For opening and closing the space between the ends of ways **12** and **13**, a series of sorting arms **36** are provided. These arms are offset laterally to one side of the ways, and normally occupy the substantially horizontal position shown in solid outline for arm **36** in FIG. 2. In this horizontal position, the upper surfaces of the arms provide a continuation between the two sets of ways.

The arms are affixed at one set of ends to a shaft **38**. This shaft is journaled in bearings **40** mounted on framework **10**. On rotation of shaft **38**, arms **36** move from a horizontal position to the raised position indicated in dashed outline in FIG. 2 and indicated at **36***b*. In this raised position a piece of lumber is free to drop into recess **34**.

The means **28** provided for actuating sorting arms **36** comprises a length detector (designated generally at **42**), a width detector (designated generally at **44**), mechanism interconnecting the length detector and width detector (shown at **46**) whereby actuation of one sets the other in operative position, and mechanical means operatively connecting the width detector **44** and the sorting arms **36** (indicated at **48**) whereby motion in the width detector is translated into rotation of shaft **38** and raising of arms **36**.

More in particular, extending transversely of ways **12**, **13** and beneath the ways is a shaft **50** journaled in bearings **52**. Secured to one end of shaft **50** (the end visible in FIG. 2) is a crank arm **54**. The latter projects substantially vertically upwardly from the shaft. The crank arm has rotatably mounted on its upper end a wheel **56**. To one side of the crank arm and mounted on framework **10** through a bracket **58** is an adjustment screw **60**. The end of screw **60** limits movement of the crank arm in a counterclockwise direction from the limit position shown in dashed outline in FIG. 2 at **54***b*. The shaft and crank arm are urged toward this limit position by a coil spring **62** (see FIG. 1) secured at one end to the shaft and at its other end to one of the bearings supporting the same.

Secured to the end of shaft **50** opposite the one mounting arm **54** is a detector arm **64**. This detector arm, in the limit position just described, extends substantially vertically upwardly from the shaft, as indicated by the dashed outline for the arm identified at **64***b* in FIG. 2. In this position the upper end or contacting portion of arm **64** is in the path of travel of a lumber piece over ways **12**, **13**.

When arm **64** is engaged by a lumber piece of suitable length, pivotal movement of the arm results on continued

travel of the lumber, which operates to swing crank arm 54 to the right, and to the position shown in solid outline for the arm in FIG. 2. This causes wheel 56 to engage the underside of an actuating bar 70, pivoted to framework 10 at 72, and lift the bar, which places width detector 44 in operative position, as described below.

Explaining the width detector 44, secured to framework 10 are a pair of brackets 80. These rotatably support a rod 82 extending therebetween. Rod 82 is also shiftable axially in the brackets. Rod 82 has an end 84 which turns outwardly and is in contact with the end of actuating bar 70.

Rotatably mounted intermediate brackets 80 on rod 82 is a gauge or contacting member 86. This is fixed against axial movement on rod 82 by anchoring collars 88, 89. Gauge member 86 has a turned-over flange 92 along its inner edge, and this is provided with a cutout 93 (see FIG. 3). Secured to flange 92 is a plate 96 adjustable in position along the length of the flange. Edge 96*a* of the plate and edge 93*a* of the cutout define recess means shaped to fit across a lumber piece of predetermined width. It should be obvious that adjusting the position of the plate along flange 92 varies the width of lumber that the recess means of the gauge member will receive.

Adjacent the left bracket 80 in FIGS. 1 and 2 and mounted about rod 82 is a sleeve 97. This sleeve is spline-connected, by means of a key (not shown) and slot 98, to rod 82, and thus the sleeve and rod rotate together. The spline connection accommodates axial movement of the rod within the sleeve, however. Encircling sleeve 97, and anchored at one end to the sleeve and at its other end to the bracket 80, is a spring 100. Spring 100 applies a torque to sleeve 97 and rod 82 which urges end 84 of the rod downwardly on bar 70.

Resisting axial movement of rod 82 to the right in FIGS. 1 and 2 is a compression spring 102 interposed between one of the brackets 80 and collar 89.

The gauge member 86 in its inoperative position occupies the raised position illustrated in FIG. 4. In this condition of the parts, bar 70 is in the lowered position shown in dashed outline at 70*a* in FIG. 2 and end 84 of rod 82 is in the position shown at 84*a*. A projection 104 of collar 88 underlying the gauge member supports the gauge member in the raised position of FIG. 4. On lifting of bar 70 by crank arm 54, rod 82 is rotated and the gauge member is permitted to fall to the operating or lowered position shown in FIG. 6. Gravity holds the gauge member in its lowered position, however, if a piece of lumber is moved under the gauge member, flange 92*a* of the member rides on the lumber and operates partially to lift the member to the position of FIG. 5. If such lumber fits within the recess means of the gauge member, the gauge member drops to the lowered position of FIG. 6 at such time as the lumber moves to within the confines of the recess.

Rotatably supported on the gauge member is a wheel 110. This wheel is aligned longitudinally with the end of a lift crank 112 that has one end secured to shaft 38. Movement of the gauge member to the right in FIGS. 1 and 2 shifts wheel 110 underneath the free end of crank 112, producing swinging of the crank to the raised position shown at 112*a* in FIG. 2, and pivoting of the sorting arms to their raised position.

The operation of the structure so far described will now be explained.

A lumber piece is transported from left to right in FIGS. 1 and 2, with one end sliding against fence 15. At the outset it will be assumed that the piece is relatively short, and that the end of the piece opposite said one end is disposed laterally inwardly of detector arm 64. With the ways clear of lumber in the vicinity of the separator mechanism, spring 62 urges shaft 50 to the limit position defined by arm 58 striking screw 60. Arm 64 is perpendicular. Gauge member 86 is in the raised, inoperative position of FIG. 4. The sorting arms 36 are in their lowered, horizontal position. As the lumber piece continues through the sorter, since it is a short piece, arm 64 is not contacted, and gauge member 86 remains in its inoperative or raised position. The piece travels beneath the gauge member and over the sorting arms without contacting the gauge member and without being diverted from the path defined by ways 12, 13.

Now it will be assumed that a board wider than the recess means of the gauge member is traveling down the ways, and that such board has a length sufficient to reach from fence 15 beyond arm 64. When this board reaches arm 64 it engages the arm to produce pivotal movement of the arm and crank arm 54. This causes actuating bar 70 to pivot upwardly, resulting in lowering of the gauge member. The gauge member drops downwardly on the board, but because the board has substantial width, the gauge member is prevented from fitting over the board. The board slides beyond the gauge member and down the ways of the apparatus without separation occurring.

Assuming now that a relatively long board having a width that is narrower than the recess means of the gauge member travels down the ways, on striking arm 64 the arm is rotated and the gauge member is lowered from its inoperative position. When the board moves within the confines of the recess means, the gauge member drops to the position of FIG. 6. Continued movement of the board produced by lug chains 16 then operates to shift the gauge member longitudinally. This shifting of the gauge member is accompanied by compression of spring 102; and movement of wheel 110 under lift crank 112. On continued shifting of the gauge member, the lift crank is pivoted upwardly in FIG. 2, and the sorting arms are raised. The board on coming to the ends of ways 12 drops into recess 34, and is separated out. After the board leaves way 12, springs 102 and 62 operate to return the gauge member to its inoperative position.

Referring now to FIG. 7 this illustrates schematically, a sorting line equipped with plural sorting stations of the type contemplated by this invention. For reasons of simplicity, five stations are illustrated, although it should be understood that in practice many more could be employed. These stations are indicated at 120, 122, 124, 126, and 128. A sorting line of the type illustrated in FIG. 7 may be employed to separate lumber of two different length ranges and two different width ranges.

According to this invention, the method of sorting lumber comprises first separating out lumber pieces or boards at successive stations into a first series of piles according to one dimension, i.e., either width or length, the other of the dimensions of the lumber pieces in the piles being substantially uniform, and then separating out boards farther down the sorting line into a second series of piles according to differences in the same said one dimension, the other of the dimensions of the pieces in the piles being substantially uniform but different from said other dimension of the pieces in the first series of piles. Progressing from the feed end of the processing line, where width is changed, succeeding piles of lumber contain pieces of increasing width, and where length is changed, succeeding piles of lumber contain pieces of decreasing length.

For purposes of illustration, it will be assumed that boards 4" and 6" in width and having length of 8', 10', and 12' are to be sorted. Referring to FIG. 7, the first station from the feed end (at the left of the figure), i.e., station 120, may be constructed to separate out pieces 12' in length and of 4" width. Station 122 may be constructed to separate out pieces 10' in length and of 4" width. Station 124 may be constructed to separate out pieces 8' in length and of 4" width. In the next series of separations, station 126 may be constructed to separate out pieces 12' in length and of 6" width, station 128 con-

structed to separate out pieces 10' in length and 6" in width, and 8' boards would travel to the discharge end of the line.

As another alternative, the first series of selections may be determined by differences in width instead of length, as just discussed. Thus the first station **120** may be constructed to separate out pieces 12' in length and 4" in width. Station **122** may be constructed to separate out pieces 12' in length and having 6" width. The second series of separations, made at stations **124**, **126**, would separate out first pieces 10' in length of 4" width and then pieces 10' in length of 6" width. The last series of separations, made at station **128** and the end of the line, would separate first 8' boards 4" in width to leave only 8' boards 6" in width.

The long boards should be separated before the short boards in order that arm **64** be selective, and the narrow boards should be separated out before the wide boards in order that the recess means of the gauge member be selective.

It will be noted, and it is contemplated by this invention, that the sorter also may be used in the grading of lumber. When used to grade lumber, lumber pieces are first separated into piles according to length. If the boards of a given pile are then transported as a series down a processing line equipped with the sorters of this invention, separations according to grade may be made if successive boards are given a relative lateral position on the line determined by the grade of the piece. Thus an operator at the entering or feed end may shift inferior grade boards to the left of the line (or upwardly in FIG. 1), and better grade boards to the right (or downwardly in FIG. 1). The gauge member is positioned in the apparatus so that it is over one set of ends of the boards regardless of the position of the lumber. When boards are thus arranged on the line, as they travel into the sorter, the arm **64** will be actuated depending upon the grade of each board.

A feature of the invention is the fact that the power for moving the sorter arms to a raised position, thus to produce separation of a board, comes from the lug chains moving over the ways. The chains impart movement to the lumber, and the lumber in turn shifts the gauge member, the latter producing the force necessary to raise the sorter arms. By the construction contemplated it is not necessary to provide numerous motors and controls therefor. This is a decided advantage, particularly when it is remembered that a considerable number of separations may be involved.

It is claimed and desired to secure by Letters Patent:

1. Sorter apparatus for lumber pieces comprising a frame, elongated power-driven conveyor means mounted on the frame for transporting lumber pieces as a series of single pieces along a path of travel with the lumber pieces extending transversely of the path of travel, plural separating stations spaced along said path of travel, each having separator mechanism operable when actuated to remove a lumber piece from said path of travel, and means for actuating the separator mechanism of each station powered by the movement of the lumber, the latter means including a detector of length and a detector of width adjacent said path of travel, one of said detectors having contacting means engaged and moved in position by a piece of lumber moving thereby, the other of the detectors being adjustable between inoperative and operative positions and having contacting means engaged and moved in position by a piece of lumber moving thereby only when in operative position, means interconnecting the detectors whereby said one places said other in operative position when the contacting means of said one is moved by a piece of lumber, and means moved by movement of the contacting means of said other detector providing the power for actuating the separator mechanism.

2. Sorter apparatus for lumber pieces comprising a frame, elongated power-driven conveyor means mounted on said frame for transporting lumber pieces as a series of single pieces along a path of travel with the lumber pieces extending transversely of the path of travel, plural separating stations spaced along said path of travel, each having separator mechanism operable when actuated to remove a lumber piece from said path of travel, and means for actuating the separator mechanism of each station powered by movement of the lumber, the latter means including a detector measuring length and a detector measuring width adjacent said path of travel, one of said detectors being adjustable between an operative and an inoperative position and having contacting means constructed to move with a lumber piece of a given size in the dimension it measures when adjusted to operative position only, the other of the detectors having contacting means movable with a lumber piece of given size in the dimension it measures, means mechanically interconnecting the detectors whereby movement of the contacting means of said other detector adjusts said one to its operative position, and mechanical means moved by movement of the contacting means of said one detector providing the power for actuating the separator mechanism.

3. Sorter apparatus for lumber pieces comprising a frame, elongated power-driven conveyor means mounted on the frame for transporting lumber pieces as a series of single pieces along a path of travel with the lumber pieces extending transversely of the path of travel, plural separating stations spaced along said path of travel, each having separator mechanism operable when actuated to remove a lumber piece from said path of travel, and means for actuating the separator mechanisms of each station powered by movement of the lumber, the latter means comprising a detector of length having a movable arm with a contacting portion disposed in said path of travel and engaged and moved by movement of a lumber piece of given length over the same, a detector of width having a gauge member adapted to fit about the sides of a lumber piece of given width, means mounting the gauge member whereby it is adjustable between an operative position where it can contact and fit about a lumber piece and an inoperative position where it is out of the way of lumber moving over said path of travel, said means mounting the gauge member enabling shifting of the member in the direction lumber moves over said path of travel, means interconnecting the detectors whereby movement of said arm adjusts said gauge member to its operative position, and means moved by shifting of the gauge member actuating the separator mechanism.

4. A method of sorting elongated lumber pieces into piles determined by width and length comprising transporting the pieces one after another down a conveyor, initially separating out pieces according to their length at stations spaced along the conveyor into a first series of successive piles with succeeding piles containing pieces of decreasing length, the pieces in said first series of piles having substantially the same widths, and then separating out pieces according to their length at stations spaced farther along the conveyor into a second series of successive piles with succeeding piles containing pieces of decreasing length, the pieces in said second series having substantially the same widths that are larger than the widths of the pieces in the first series of piles.

5. A method of sorting elongated lumber pieces into piles determined by the dimensions of width and length comprising transporting the pieces one after another down a conveyor, initially separating out pieces according to differences in one of said dimensions at stations spaced along the conveyor into a first series of successive piles, the other of the dimensions of the pieces in said first series being substantially the same, and then separating out pieces according to differences in said one of said dimensions at stations farther along the conveyor into a second series of successive piles, the other of the dimensions of

the pieces in said second series being substantially the same but different in size from the other of the dimensions of the pieces in said first series, succeeding piles where length is a variable having pieces of successively decreasing length, succeeding piles where width is a variable having pieces of successively increasing width.

6. Lumber sorting apparatus comprising a frame, power-driven conveyor means mounted on the frame for transporting lumber pieces along a path of travel with the lumber pieces extending transversely of the path of travel, a pair of detector devices mounted adjacent said path, a movable part for each detector, one of which is always in operative position and the other of which is adjustable between operative and inoperative positions, the movable part of one detector device being constructed to be moved when in operative position by the motion of a lumber piece of given width past the same and thus being responsive to the width of a piece of lumber, the movable part of the other detector device being constructed to be moved when in operative position by the motion of a lumber piece of given length past the same and thus being responsive to the length of a piece of lumber, mechanical means interconnecting the movable parts of the two detector devices whereby movement of said one part adjusts said other part to its operative position, separator mechanism mounted adjacent said path of travel operable when actuated to remove a lumber piece from said path of travel and mechanical means for actuating the same, and means transmitting the motion of said other part to the mechanical means actuating the separator mechanism.

7. Lumber sorting apparatus comprising a frame, power-driven conveyor means mounted on the frame for transporting lumber pieces as a series of pieces along a path of travel with lumber pieces extending transversely of the path of travel, a width detector device mounted adjacent said path of travel responsive to the width of lumber traveling thereover, the latter having a gauge member adjustable between operative and inoperative positions and movable with a lumber piece of predetermined width when in operative position, a length detector device mounted adjacent said path of travel responsive to the length of lumber traveling thereover, said length detector device having contacting means movable with a lumber piece of predetermined length, means interconnecting the width and length detector devices whereby movement of said contacting means adjusts the gauge member to its operative position, separator mechanism operable when actuated to remove a lumber piece from said path of travel, and mechanical means operatively interconnecting the gauge member and the separator mechanism whereby movement of the gauge member powers actuation of the separator mechanism.

8. In sorting apparatus, the combination of a frame and ways mounted thereon defining a path of travel for lumber, an overhead lug conveyor for transporting lumber along said ways with the lumber extending transversely of said path of travel, a gauge member positioned to one side of said path of travel and shiftable between an inoperative position wherein the same is held clear of lumber and an operative position wherein the same contacts lumber moved over said ways, said gauge member having a recess means adapted to fit about a lumber piece of given width, a movable arm positioned in said path of travel contacted and moved by lumber pieces of given length moving over the ways, means interconnecting said arm and gauge member whereby movement of said arm places said gauge member in operative position, a mounting for the gauge member accommodating movement of the member longitudinally along said path conjointly with a lumber piece when the gauge member is fitted about a lumber piece, pivotable sorter arms mounted on said frame adjacent said path of travel and pivotable to a position wherein a lumber piece moved across the sorter arms is removed from said path of travel, and mechanical means translating longitudinal movement of the gauge member into pivotal movement of the sorter arms.

9. Sorter apparatus for lumber pieces comprising a frame; means on the frame defining a horizontally extending path of travel for lumber; power-driven conveyor means for transporting lumber pieces over said path of travel with the lumber pieces extending transversely of said path of travel; sorting means mounted on the frame adjacent said path of travel and movable between one position wherein a lumber piece moved thereby continues along said path, and a second position wherein a lumber piece moved thereby is diverted from said path; a gauge member having a recess shaped to fit across a lumber piece of predetermined width; mounting means for the gauge member supporting the member adjacent and toward the feed end of the path of travel from said sorting means; said mounting means being constructed to accommodate vertical movement of the gauge member from an inoperative position out of the way of a lumber piece to a locked position wherein the recess of the gauge member is fitted about a lumber piece and the member is locked against movement in a horizontal direction relative to the lumber piece, and also being constructed to accommodate horizontal movement of the gauge member paralleling said path of travel toward said sorting means; and power-transmitting means interposed between said gauge member and sorting means operable to translate horizontal movement of the gauge member toward said sorting means into movement of said sorting means from its said one to its said second position.

10. Sorter apparatus for lumber pieces comprising a frame; means on the frame defining a horizontally extending path of travel for lumber; power-driven conveyor means for transporting lumber pieces over said path of travel with the lumber pieces extending transversely of said path; sorting means mounted on the frame adjacent said path of travel and movable between one position wherein a lumber piece moved thereby continues along said path, and a second position wherein a lumber piece moved thereby is diverted from said path; a gauge member having a recess shaped to fit across a lumber piece of predetermined width; mounting means for the gauge member supporting the member adjacent and toward the free end of said path of travel from said sorting means; said mounting means being constructed to accommodate vertical movement of the gauge member from an inoperative position out of the way of a lumber piece to a locked position wherein the recess of the gauge member is fitted about a lumber piece and the member is locked against movement in a horizontal direction relative to the lumber piece, and also being constructed to accommodate horizontal movement of the gauge member paralleling said path of travel toward said sorting means; deactuating means normally holding said gauge member in its inoperative position; a length detector positioned in said path of travel and toward the free end of said path of travel from said gauge member; said length detector including a movable arm positioned to engage and move with a lumber piece of predetermined length moved past the detector; means interposed between the arm of the length detector and the deactuating means constructed to release the gauge member from its inoperative position on movement of said arm; and power-transmitting means interposed between said gauge member and sorting means operable to translate horizontal movement of the gauge member toward said sorting means into movement of said sorting means from its said one to its said second position.

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