

March 5, 1963

J. C. HANBURY

3,080,052

AUTOMATIC LUMBER SORTER

Filed June 20, 1960

12 Sheets-Sheet 1

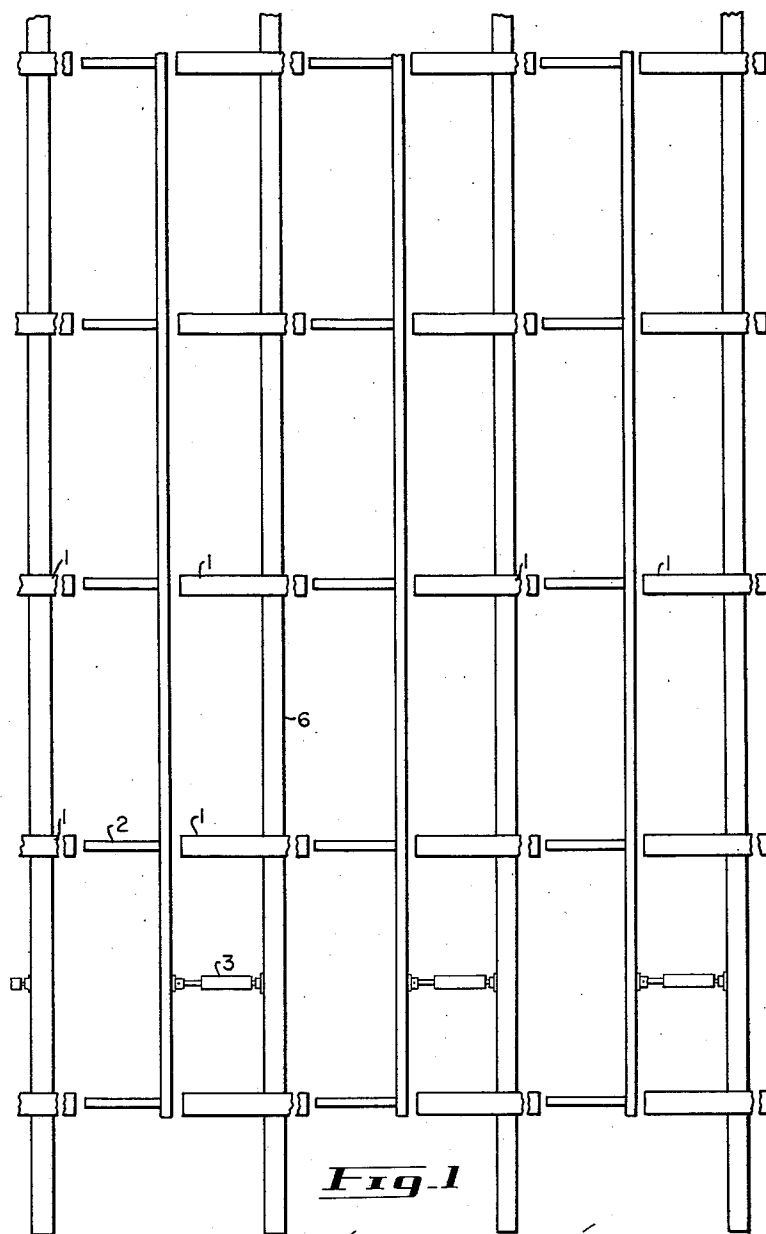


Fig. 1

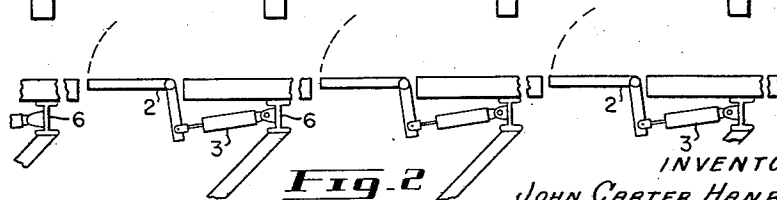


Fig. 2

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12 Sheets-Sheet 2

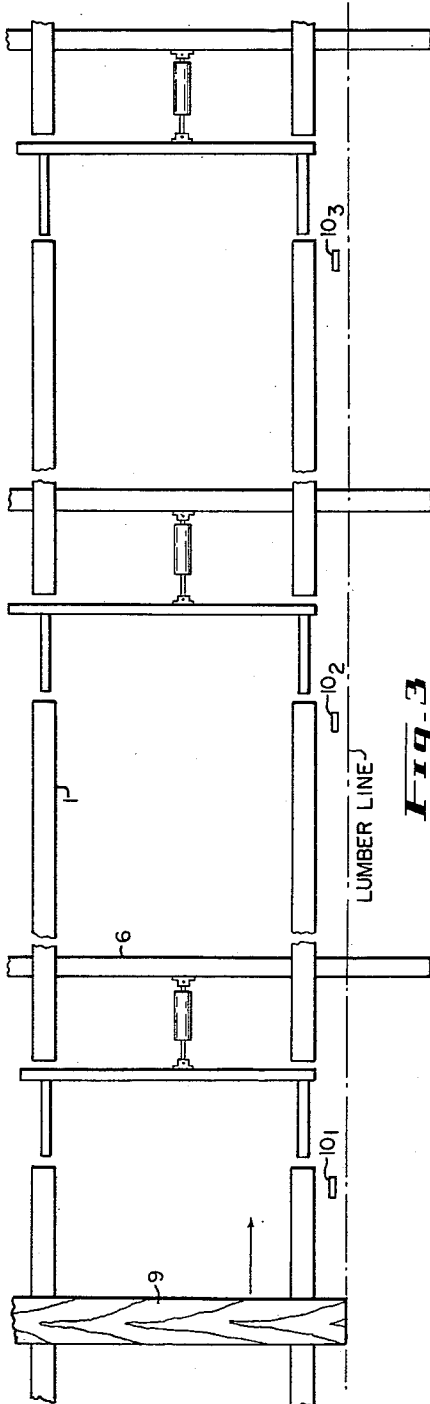


Fig. 3

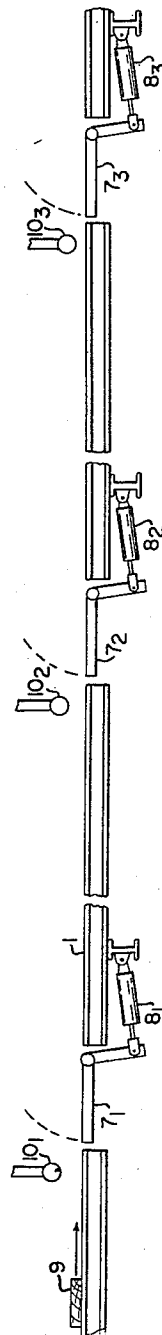


Fig. 4

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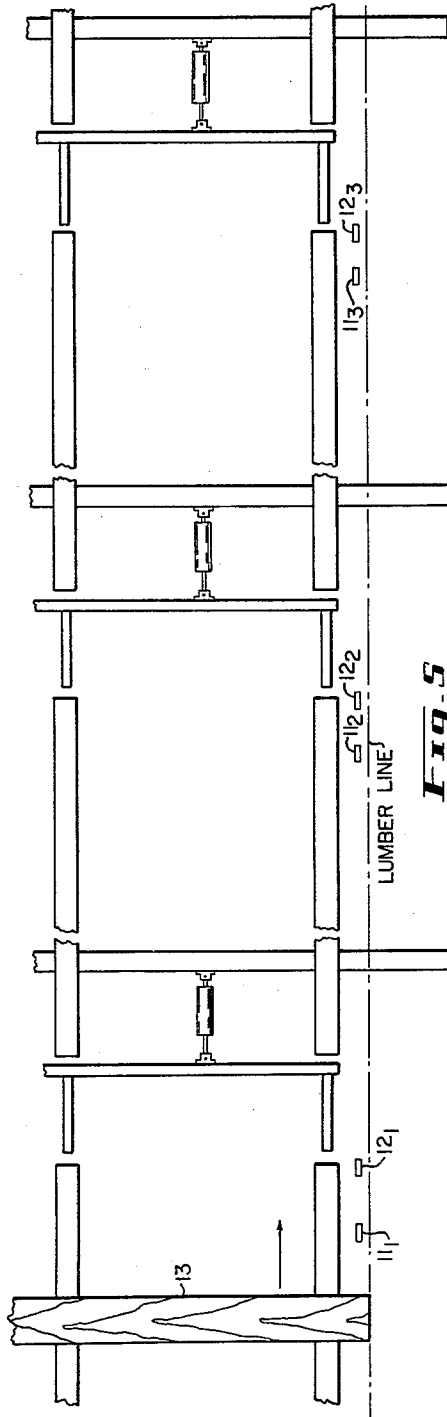


Fig. 5

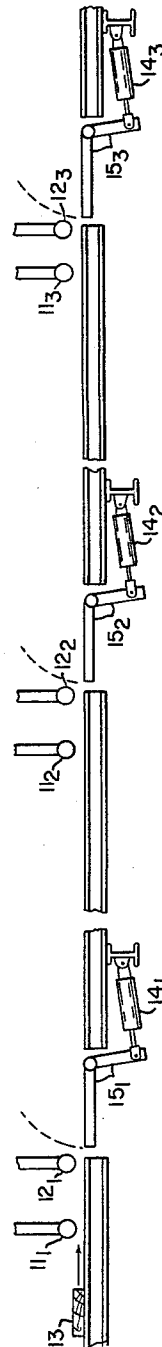


Fig. 6

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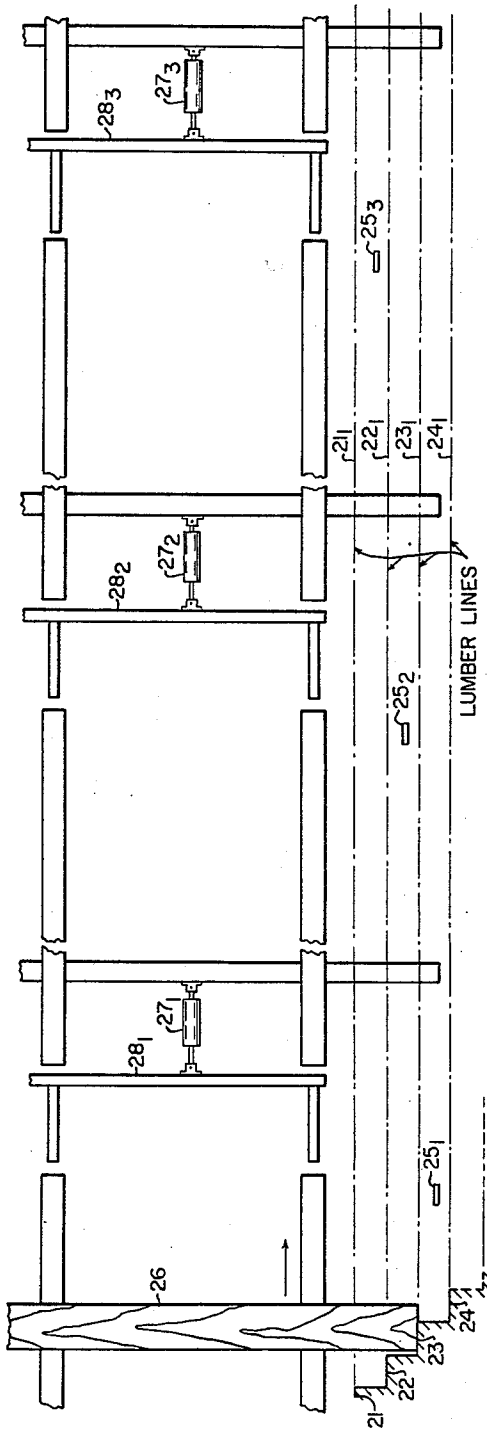
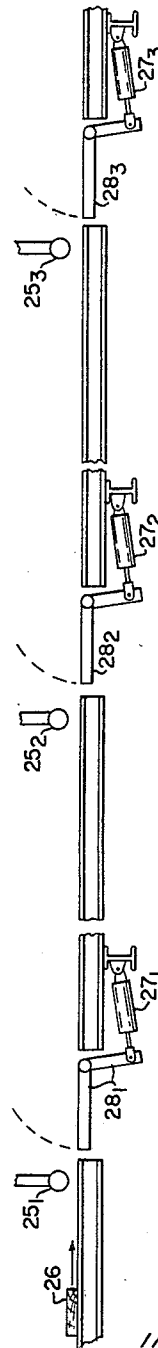
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12 Sheets-Sheet 5

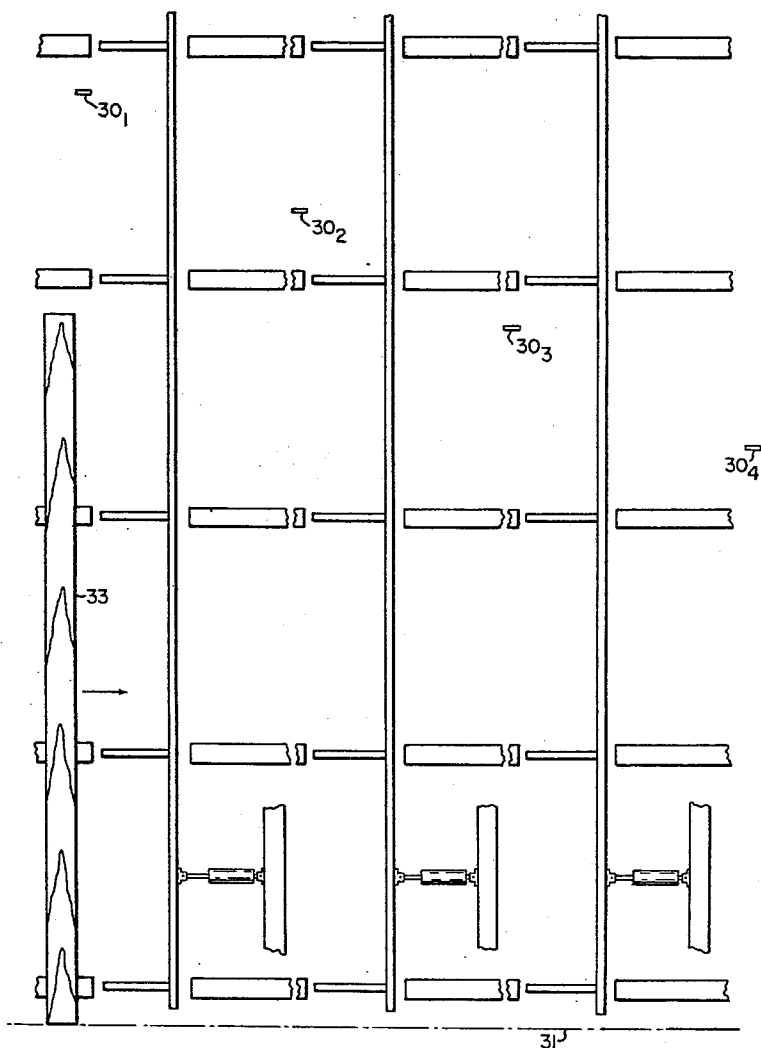


Fig. 9

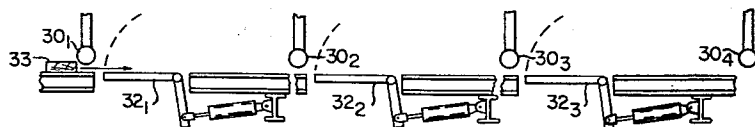


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12 Sheets-Sheet 6

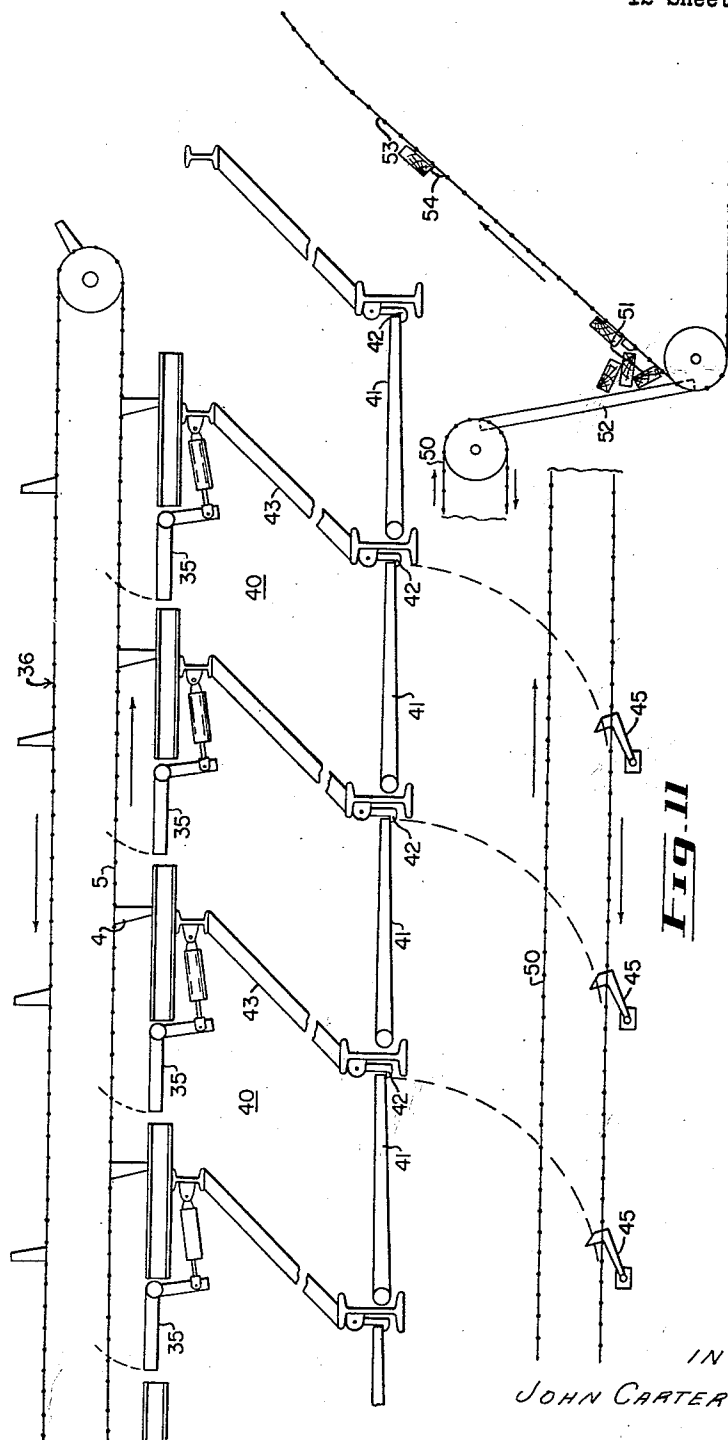


Fig. 11

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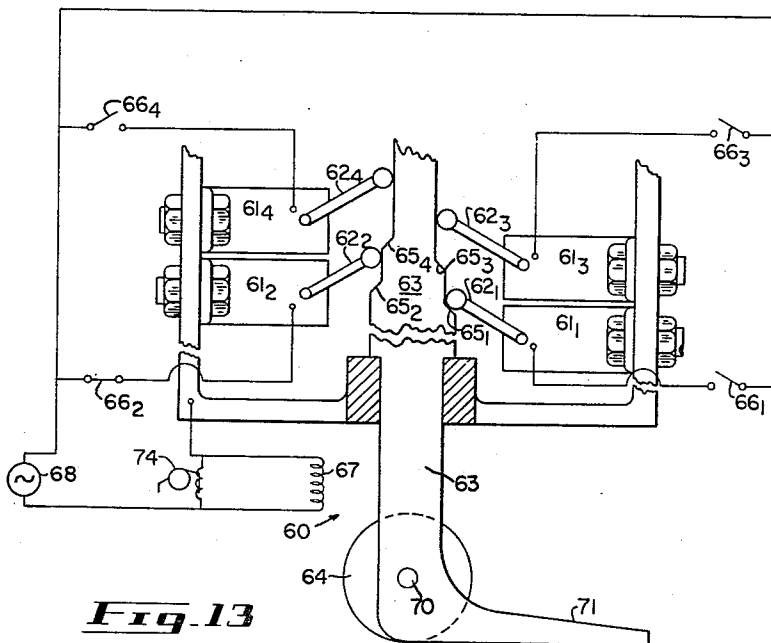


Fig. 13

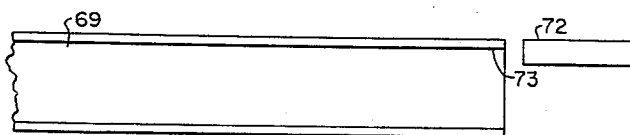
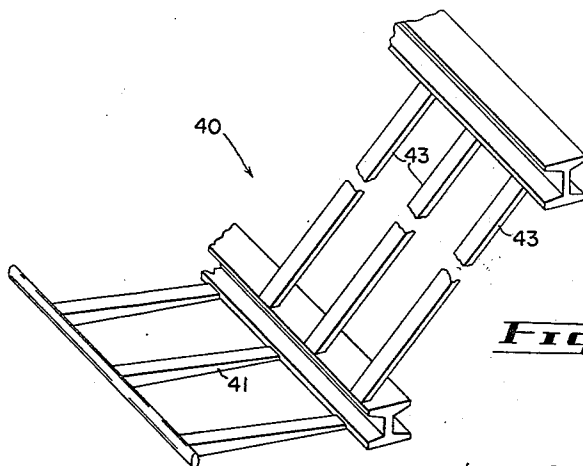


Fig. 12

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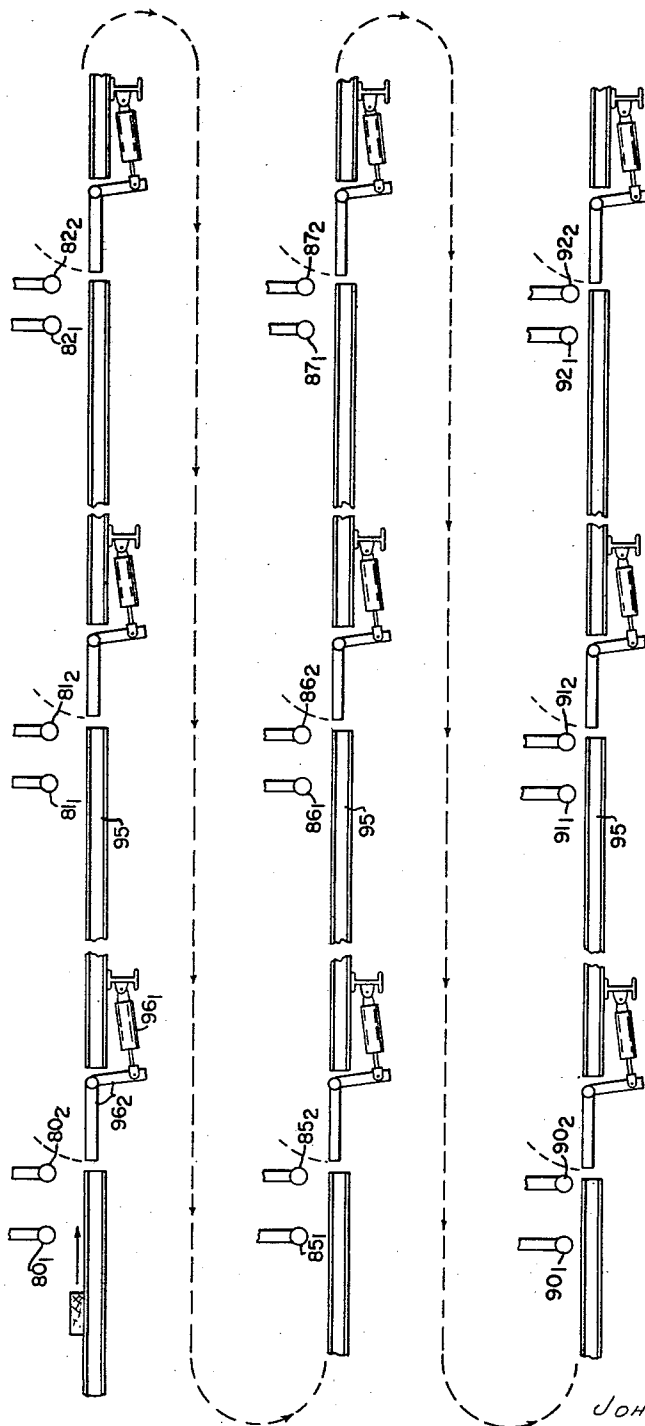


Fig. 14

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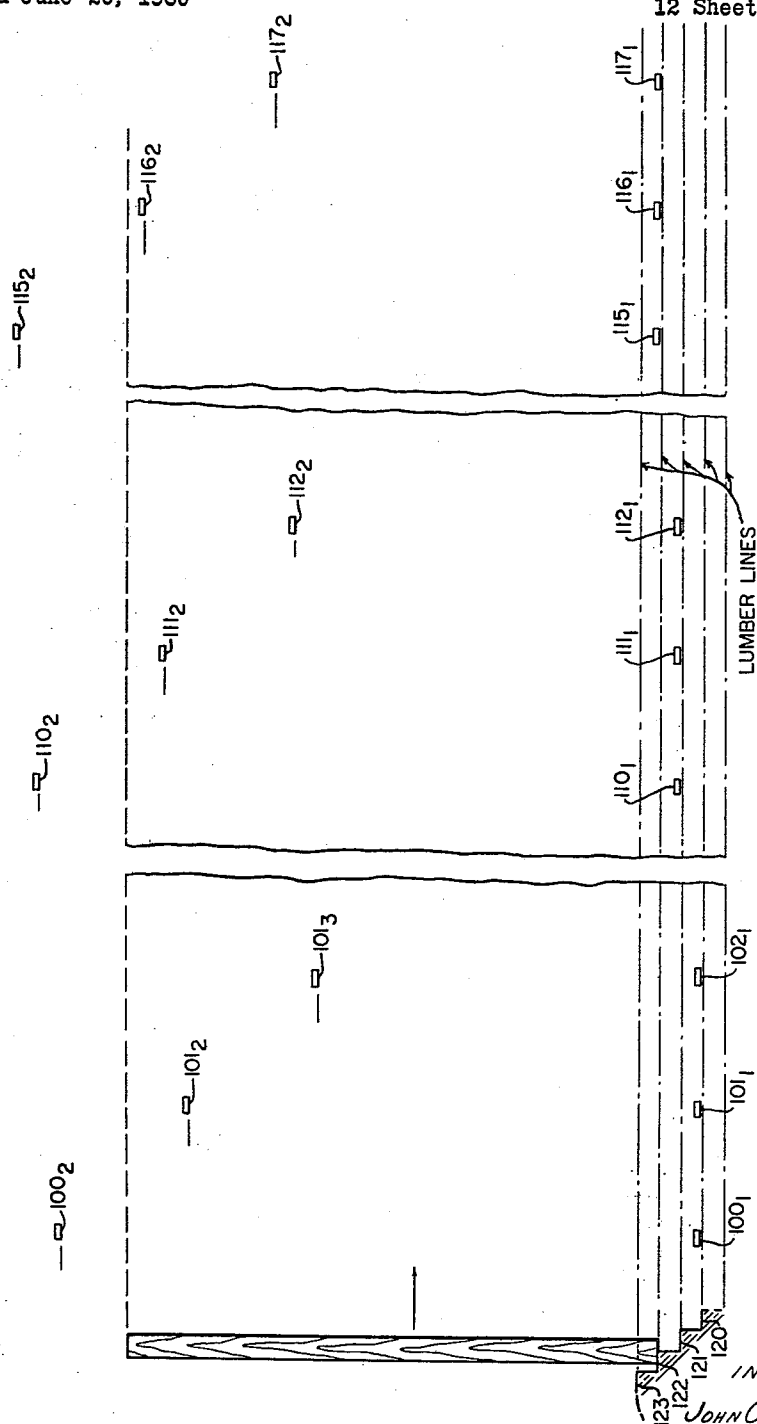
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AUTOMATIC LUMBER SORTER

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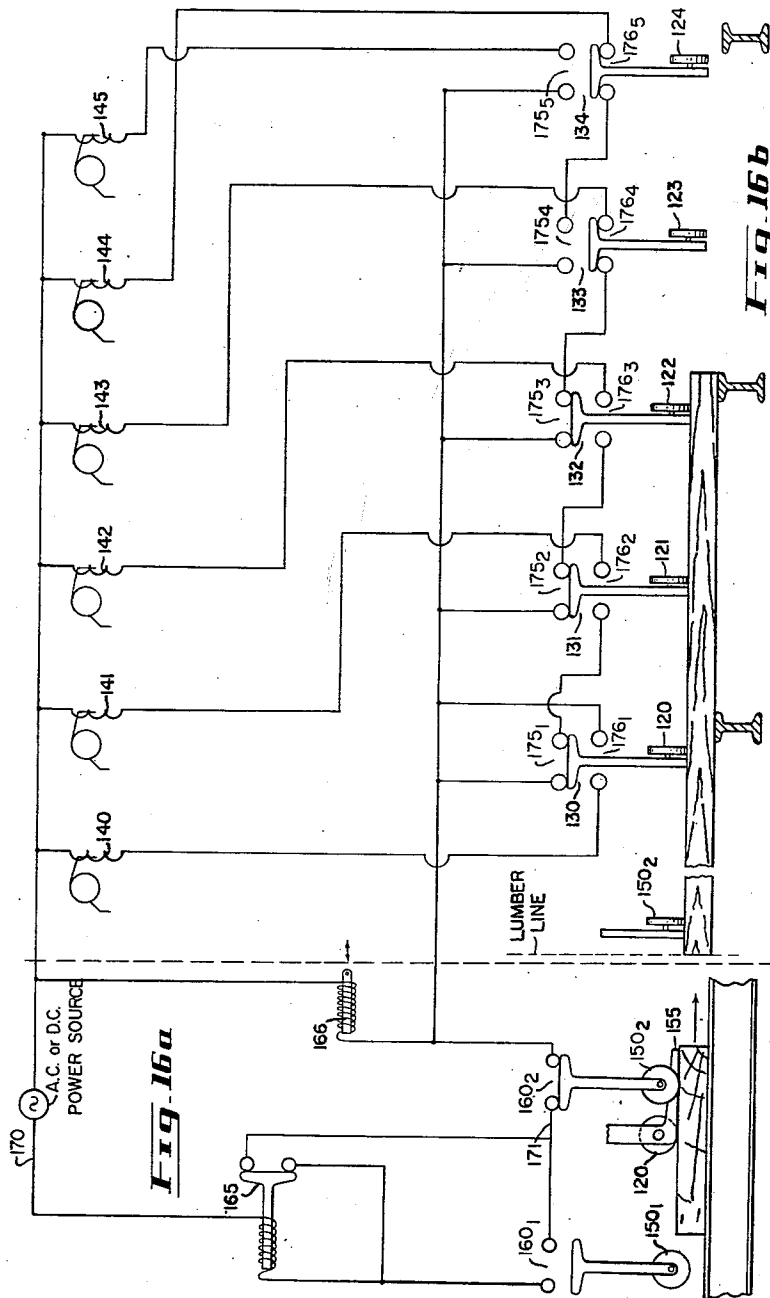
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AUTOMATIC LUMBER SORTER

Filed June 20, 1960

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AUTOMATIC LUMBER SORTER

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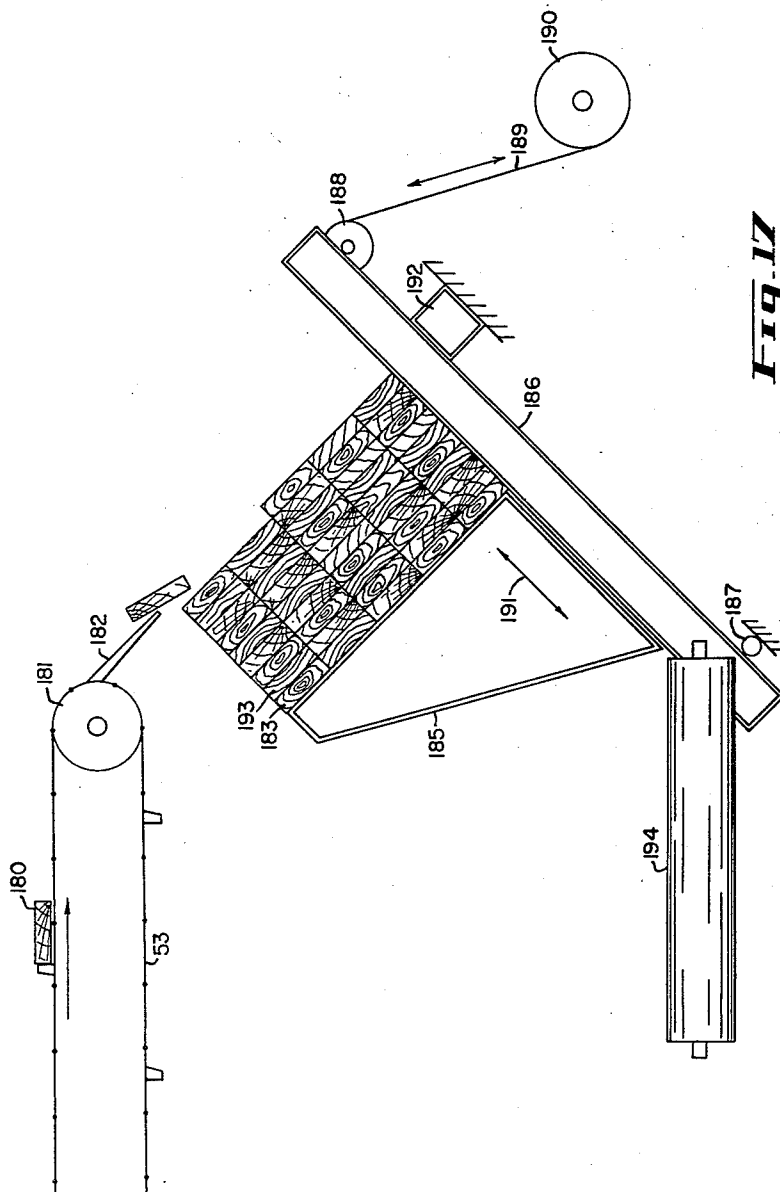


Fig-17

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AUTOMATIC LUMBER SORTER

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12 Sheets-Sheet 12

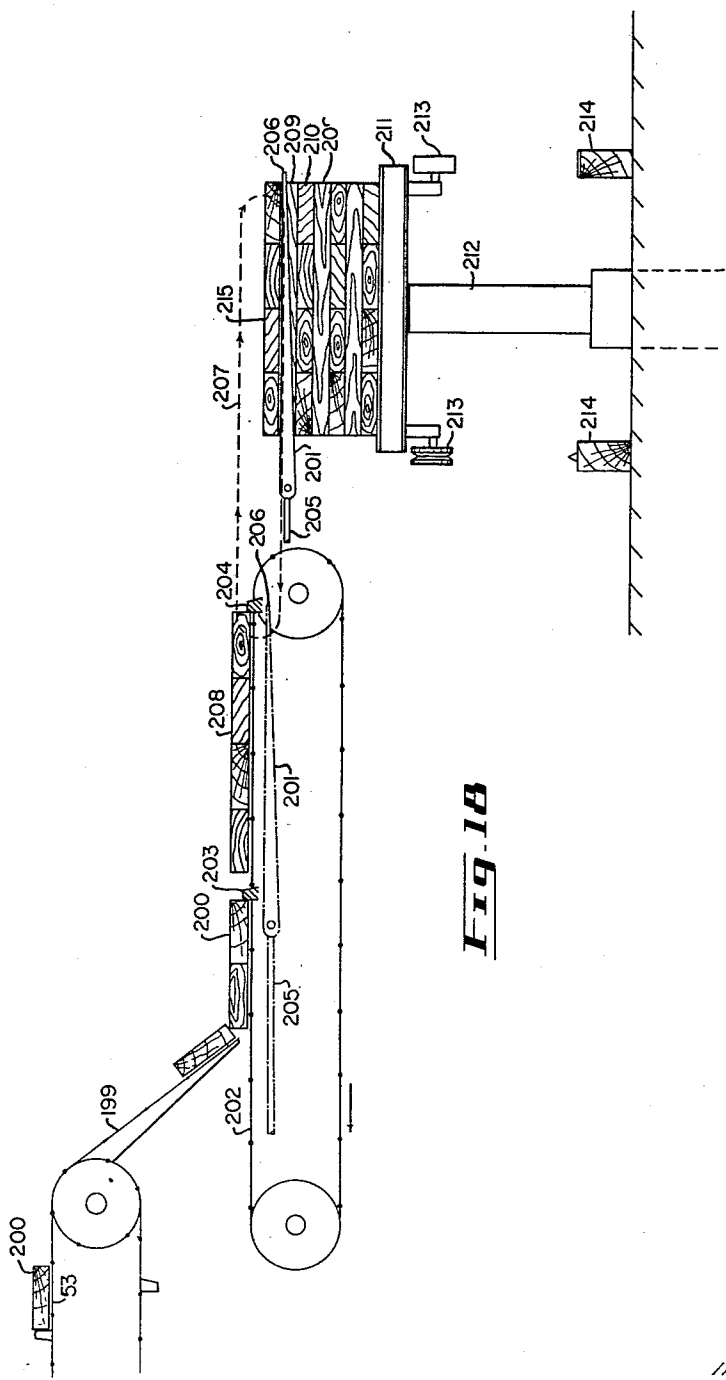


Fig. 1B

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AUTOMATIC LUMBER SORTER

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Filed June 20, 1960, Ser. No. 37,279

Claims priority, application Great Britain June 23, 1959
12 Claims. (Cl. 209—75)

This invention relates to a machine to be used for the automatic sorting of lumber for thickness, for width and for length, the semi-automatic sorting of lumber for grade, for species and for pattern, and the tallying of the number of boards of each length in any one size. Throughout this description the term "grade" shall include in its connotation the factors of species and pattern.

The invention also relates to a lumber sorter which can deliver lumber for stacking without the necessity for arranging of the sorted planks by hand for the stacker which has been necessary previously.

The value and the end use of lumber are determined by its thickness, width, length and grade. Consequently, on various occasions from the time of manufacture up to the time of ultimate use, the lumber is segregated into units in which the individual pieces have similar thickness, width, length and grade. The units must be neatly piled and of fairly uniform size to enable them to be efficiently handled by fork and lift trucks. In most cases, this sorting of the lumber is at present done manually by a number of men who remove the lumber from a series of moving chains or a belt and pile it in unit packages of lumber having similar qualities. These men determine the thickness, width and length visually, and the grade from a symbol previously marked on each piece of lumber by a skilled lumber grader. The cost of the manual sorting of lumber by these men adds appreciably to the cost of manufacture of the lumber. The work of the grader requires judgment and so is not economically susceptible to replacement by a machine at the present state of the mechanical arts.

It is an object of the invention herein described, to permit the automatic sorting of lumber for thickness, width and length, and the semi-automatic sorting of lumber for grade which used in conjunction with one of the devices now commonly used for stacking lumber, will reduce the number of men required and hence the cost of sorting lumber. When the device for semi-automatic sorting for grade is employed, the grader instead of marking a grade symbol on each piece of lumber, will move it longitudinally so that the ends of all pieces of a common grade move in the same plane. This permits the lumber to be automatically segregated into the various grades by the device. When the device is used for sorting lumber for thickness, width or length, this quality of the lumber automatically effects the sorting action. These devices may be used singly or in successive combination to effect the segregation of the lumber into units having one or more of the properties of thickness, width, length or grade in common. While it is possible by the proper arrangement of the trip devices in a machine of sufficient length to make the separate sorts of lumber contain only pieces having similar thickness, width, length and grade in a single passage through, the number of sorts required would be so great (normally over 2000) that the sorter would be excessively long. Hence it is probable that the sorter will be employed to segregate the lumber for two only of the above qualities on one passage through. The sorted lumber passes to a bin where pieces with common properties are sorted until a unit of the desired number of pieces has accumulated. When a unit has accumulated in one of the bins it is discharged onto moving chains and carried first to a device which separates and straightens the lumber so that it proceeds one piece at a time along a transfer which

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moves the lumber transversely to its length, and thence to a tilt hoist stacker or a reciprocating arm stacker, both commonly used devices for stacking lumber rapidly with little labor.

Since all the devices are identical except for the position of limit switches which determine the type of sorting function (thickness, width, length or grade), one machine could be used to effect, on one passage through, the sortation for say thickness and width, and by energizing a second set of limit switches, on a second passage through, the sortation for grade and length.

According to one aspect of the invention, there is provided a lumber handling system, comprising a lumber platform means for moving lumber transversely across said platform, a plurality of gates in said platform having an open and a closed position whereby to permit dropping lumber from said platform when lumber passes over one of said gates in the open position; a lumber transfer below said gates for receiving lumber dropped through any one of said gates; an inclined conveyor, lugs on said inclined conveyor, said first mentioned conveyor being arranged to discharge lumber transversely into a well for gripping by said inclined conveyor lugs. In many instances it will be desirable to include a bin below each gate and a discharge door in the lower part of each bin for releasing lumber collected in each bin onto the transfer.

According to another aspect of the invention there is provided a lumber handling system comprising a lumber platform and means for moving lumber transversely across the platform, so that one edge of said lumber moves to define a lumber line and wherein sorting of said lumber is actuated by engagement of said lumber with at least one trip mechanism, said trip mechanism being operative to open a gate in said platform for discharge of said lumber from said platform; a tally mechanism for recording the length of said lumber, which comprises a plurality of contactor devices spaced out transversely to and at successively increasing distances from said lumber line to permit contact with said lumber simultaneously with engagement by said lumber of said one trip mechanism, an associated counter for each of said contactors, means connecting each of said contactors to its associated counter, means for rendering each said contactor operative to initiate its said counter upon operation of said trip mechanism to open said gate, and means inter-connecting said contactors for permitting initiation of only that counter whose contactor is furthest from the lumber line and contacted by said lumber.

In the drawings which illustrate embodiments of the invention:

FIGURE 1 shows a plan view of part of a sorter platform;

FIGURE 2 shows a side view of the platform of FIGURE 1;

FIGURE 3 shows a plan view of a sorter for lumber thickness;

FIGURE 4 shows a side view of the sorter of FIGURE 3;

FIGURE 5 shows a plan view of a sorter for lumber width;

FIGURE 6 shows a side view of the sorter of FIGURE 5;

FIGURE 7 shows a plan view of a sorter for lumber grade;

FIGURE 8 shows a side view of the sorter of FIGURE 7;

FIGURE 9 shows a plan view of a sorter for lumber length;

FIGURE 10 shows a side view of the sorter of FIGURE 9;

FIGURE 11 shows a side view of a sorter and of

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apparatus for storage and passage of sorted lumber to be stacked;

FIGURE 12 shows a 3-dimensional view of part of a storage bin for sorted lumber;

FIGURE 13 shows a side partly diagrammatic view of a trip mechanism for use in the sorters described;

FIGURE 14 shows a side view of a sorter for lumber thickness and width;

FIGURE 15 shows a plan view of a sorter for lumber grade and length;

FIGURE 16a shows a partly diagrammatic side view of a tally mechanism for use with a sorter for thickness and width;

FIGURE 16b shows a partly diagrammatic front view of the mechanism of FIGURE 16a in which the lumber shown is advancing towards the reader out of the plane of the drawing;

FIGURE 17 shows a side elevation of a commonly employed tilt hoist stacker; and

FIGURE 18 shows a side view of a commonly employed reciprocating arm stacker.

For clarity, some of the supporting frame members have been omitted from the drawings, but having reference to FIGURES 1 and 2, the machine shown comprises a number of horizontal parallel rails 1 supported on beams 6 mounted between gates 2 which lie in the same plane and are capable of being individually opened by electromechanical devices 3. The lumber to be sorted rests on the rails on its wider face with its length perpendicular to the length of the rails 1. The lumber is moved along the tops of the rails and over the top of closed gates 2 in the direction from left to right and parallel to the length of the rails by the lugs 4 of an overhead chain 5 (see FIGURE 11). The rails and closed gates thus make a platform for the lumber.

Referring now to FIGURES 3 and 4, trip devices 10 which are operated by contact with the lumber passing beneath are mounted above the level of the platform. The encounter of any one of these trip devices 10 by lumber, closes a limit switch connected to a power source (not shown) and an associated one of the electro-mechanical devices 3 for opening one of the gates 2 to which the device 3 is coupled. The lumber thus moves along the tops of the rails 1 and across the gates 2 until upon contact with one of the trip devices 3, the gate 2 being approached is opened, allowing lumber 9 to drop from the platform 2.

FIGURES 3 and 4 show the arrangement of three of a series of trip devices, 10₁, 10₂, 10₃, so arranged as to effect the segregation of lumber into pieces of uniform thickness. Lumber moving in the direction from left to right of the figure passes successively under trip devices 10₁, 10₂, 10₃ etc. until it comes in contact with one of them, thus, causing the corresponding gate to open. Each trip device 10 is mounted a distance above the rails less than the thickness of the pieces of lumber that are to pass through the gate 7 which it controls, and greater than the next thinner pieces of lumber to be separately segregated. Thus all pieces of lumber of like thickness make contact with the same trip device and hence pass through the same gate. The separation of the trip devices 10 from the platform decreases in going from left to right. In FIGURE 4 the piece of lumber 9 has a thickness which is less than the separation of platform and devices 10₁ and 10₂ but greater than the separation between the platform and device 10₃. This lumber therefore comes into contact with trip device 10₃ and, drops through gate 7₃ as device 8₃ is actuated.

FIGURES 5 and 6 show the arrangement of three pairs of a series of trip devices, 11₁, 12₁, 11₂, 12₂ and 11₃, 12₃, so arranged as to effect the segregation of lumber into pieces of uniform width. All pieces of lumber 13 moving from left to right pass under and come successively into contact with the trip devices 11₁, 12₁, 11₂, 12₂, and 11₃, 12₃. The trip devices are grouped in pairs at

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progressively decreasing distances apart. The separation between each pair of devices is less than the width of the pieces of lumber that are to pass through the gate with which they are associated and greater than the width of the next narrower piece of lumber to be separately segregated. Thus all pieces of lumber of like width make simultaneous contact with the same pair of trip devices 11, 12 and hence pass through the same gate. Limit switches (not shown) operated by each pair of trip devices 11, 12 are connected in series to a power source and the associated electro-mechanical device 14 controlling the adjacent gate 15. Consequently both of any pair of trip devices must be simultaneously in contact with the piece of lumber passing under them in order that the corresponding series connected limit switches be simultaneously closed allowing current to flow to the associated electro-mechanical device 14, to which they are connected so that it may open the associated gate 15.

In FIGURE 6 the piece of lumber 13 shown is of a width less than the separation of the first two pairs of trip devices 11, 12 and greater than that of devices 11₃, 12₃. It thus passes under the first two pairs but causes both 11₃ and 12₃ to be raised at one time, thus actuating electro-mechanical device 14₃ which opens gate 15₃ allowing it to drop from the platform.

It should be noted that in these thickness and width sorting machines the trip mechanisms are arranged to "fail safe." If a piece of lumber is warped or has a protruding splinter or knot in the path of a trip mechanism, it is segregated along with the thicker or wider pieces. This is important for two reasons. Firstly, a smaller than standard piece cannot cause damage when fed at a high rate of feed into a remanufacturing machine such as a planer, whereas larger than normal pieces could. Secondly, a smaller than normal piece of lumber is not liable to cause instability in the unit pile of lumber for handling by fork or lift truck. Breakdown of these loads when they are being moved or even when piled in the storage yard due to wind or other causes is both hazardous and expensive.

FIGURES 7 and 8 show the arrangement of three of a series of trip devices 25₁, 25₂ and 25₃ so arranged as to effect the segregation of the lumber into pieces of uniform grade. A man, a lumber grader, moves each piece of lumber longitudinally against one of stops 21, 22, 23, 24 depending upon his classification of it.

Thus each piece of lumber will move so that the end which was in contact with the stop will thenceforth move along one of the lumber lines 21₁, 22₁, 23₁, 24₁. Trip devices 25₁, 25₂, 25₃ etc. are placed so that the first one 25₁ approached by the lumber will contact only with these pieces displaced longitudinally the greatest distance (in FIGURES 7 and 8) those moved against stop 24 and moving along lumber line 24₁. The following trip device 25 is touched only by those pieces of lumber having the second greatest displacement and so forth. In FIGURES 7 and 8 the piece of lumber shown has been moved against stop 23 so that its end will travel along the lumber line 23. Thus it will miss trip device 25₁ but will contact trip device 25₂. The limit switch controlled by trip device 25₂ is thus closed, and electro-mechanical device 27₂ opens gate 28₂ allowing the lumber to drop through.

FIGURES 9 and 10 show four of a series of trip devices 30₁, 30₂, 30₃ and 30₄ so arranged as to effect the segregation of lumber into pieces of uniform length. All pieces of lumber move in the direction from left to right with one end moving along the lumber line 31. The trip devices 30₁, 30₂, 30₃, 30₄ etc. are placed in the path of the approaching lumber at successively smaller distances from the lumber line. Each successive trip device 30 is mounted a distance from the lumber line 31 less than the length of the pieces of lumber that are to pass through the gate 32 that it controls, and greater than the length of the next shorter pieces of lumber to be separately

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segregated. Thus all pieces of similar length make contact with the same trip device and hence pass through the same gate. In FIGURES 9 and 10 the piece of lumber 33 has a length which is less than the separation of 30₁ and 30₂ from the lumber line 31 and so passes over gates 32₁ and 32₂. The length of lumber 33 is however greater than the separation of trip devices 32₃ from the lumber line 31 and therefore gate 32₃ is opened.

As shown in FIGURE 11, all pieces of lumber having a property of thickness, width, length or grade in common (depending upon the type of sorting being carried out) is segregated by the sorting device 36 by passage through the appropriate gate 35, drops into a bin 40 having a hinged bottom gate 41 held shut by a catch 42. FIGURE 12 illustrates the construction of one of the bins 40 and the bottom gate 41, showing the sides formed of steel channel or I-beams 43. When sufficient lumber has accumulated in any one bin to make up a unit package of the desired size, catch 42 is released allowing gate 41 to open, discharging the lumber onto chains 50. The bin bottom doors 41 are held in the open position to allow complete discharge of the lumber by electrically released holding catches 45 similar to the opening catches 42. The doors 41 would be returned to the closed position on release of the holding catches by means of a spring or counterweight (not shown), the doors being opened by the weight of the lumber. The counter for the bin concerned is reset to zero upon electrical release of the holding catches 45.

In this apparatus of FIGURE 11 it would normally be desirable to include an electric counter of the impulse motor type for each of the gates leading into each bin 40. This counter would be connected in parallel with the leads to the solenoid of the electromechanical device for the gate concerned and would thus advance the counter by one unit each time the gate were opened. The reading of each counter would be displayed on a board near the operator of the machine, and would enable him to know the load in each bin.

This enables a tally of the lumber by size and grade to be kept by the operator or by an automatic recording device attached to and operated conjointly with the electric counters. The recording device is not reset when holding catches 45 are released. The release of catches 42 and 45 could be solenoid operated and electrically controlled by switches adjacent to the counter dials mounted near the operator.

The lumber is transferred over the end of chains 50 and drops into the V-shaped well 51 formed between the steeply inclined skids 52 and the chains 53 which rise at an angle to the horizontal greater than the angle of repose of lumber. Only one chain 50 and chain 53 is shown, but it is understood that there would be at least one more of each directly behind that shown in FIGURE 11 to provide proper support for the lumber. The lugs 54 on the chains 53 have heights less than the thickness of the lumber so that only one piece at a time is carried upwards by the chains 53. All other pieces, not being restrained by the lugs, slide down to the bottom of the well 51 since the chains 55 rise at an angle greater than the angle of repose of the lumber on the chains. Each set of lugs 54 on the various chains 53 are aligned at right angles to the direction of travel of the chains and since the chains 53 are all driven at the same speed the lumber is carried at right angles to the chains 53 one piece at a time to one of the automatic or semi-automatic lumber stackers now in common use throughout the lumber industry. Two particular types of stacker will be discussed later.

FIGURE 13 shows a method by which one trip device 69 may be used for selecting lumber of different thicknesses as required. Only one of the limit switches 61₁, 61₂, 61₃ and 61₄ is energized by closing the corresponding manual switch 66₁, 66₂, 66₃ or 66₄. Each limit switch is closed through lever arms 62₁, 62₂, 62₃, and 62₄ by a cam

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surface 65₁, 65₂, 65₃ and 65₄ at a different height of the wheel 64, mounted to rotate on axle 70 on stem 63. The gate associated with the trip device is opened when the energized limit switch is thus closed by the associated cam on the stem 63, since current then flows to its solenoid 67 from source 68. A counter of the impulse motor type 74 connected across solenoid 68 is advanced at the same time. As an example, if manual switch 66₂ is closed thus energizing limit switch 61₂ the gate operated by the trip device opens when a piece of lumber of sufficient thickness to raise the stem and close limit switch 61₂ passes underneath on platform 69. The closure of limit switch 61₁ by cam 65₁ on stem 63 does not cause the gate to open since that limit switch is not energized, manual switch 66₁ being open. A trailing shoe 71 is provided on stem 63 and ensures that the stem is maintained in the raised position until just before the lumber falling through gate 72 passes beyond the edge 73 of platform 69, so that there is no danger of the gate's closing before the lumber has fallen through.

In a similar way pairs of trip devices only one pair of which is energized at a time, may be arranged to open one gate as different widths of lumber pass, and a plurality of separate trip devices may be set to be energized separately so as to enable several different lengths to pass through one gate as required. This would increase the range of sizes that the machine could sort without an increase in the number of bins 40 and for example in some cases, with six bins in a length sorter say it might be advantageous at one time to sort more than one length group into one bin such as in the following length groups—6' and 8', 10' and 12', 14', 16', 18' and 20', 22' and 24', whereas if shorter lumber was being sorted the following lengths could be separately piled—6', 8', 10', 12', 14' and 16'.

The electro-mechanical devices which open the gates may be completely electrical (i.e. solenoids) or may be air or hydraulic cylinders controlled by solenoid or mechanically operated valves. As a final simplification the gates might be operated by a mechanical linkage only to wheel 64. It is believed however, that the use of limit switches, and solenoid valves for air or hydraulic cylinders directly actuating the gates probably represents the soundest practical design at present using standard components.

In the majority of applications of automatic lumber sorter, two main sorting functions will normally be required; those for thickness and width in the sawmill, and grade and length during subsequent manufacture, processing, drying, shipping or storage. The two following designs are feasible if the machine is to be used to sort for thickness and width exclusively, or for grade and length exclusively.

FIGURE 14 shows three groups of pairs of a series of trip devices, 80₁, 80₂, 81₁, 81₂, 82₁, 82₂, etc. being one group; 85₁, 85₂, 86₁, 86₂, 87₁, 87₂ etc. being a second group; 90₁, 90₂, 91₁, 91₂, 92₁, 92₂, being the third group, of a series of trip devices so arranged as to effect the segregation of lumber into pieces of uniform thickness and width. All the trip devices within each group are mounted at the same height above the platform 95. Each group of trip devices is mounted a distance above the platform less than the thickness of the pieces of lumber that are to pass through the gates controlled by the trip devices of that group, and greater than the next thinner pieces of lumber to be separately segregated. Within each group the trip devices are mounted in pairs at progressively decreasing distances apart, which distances are repeated in each group. The clearance between each trip device of a pair is less than the width of the pieces of lumber that are to pass through the gates that they control and greater than the width of the next narrower piece of lumber to be separately segregated. All pieces of lumber of similar width and thickness make simultaneous contact with the same pair of trip devices in one group. The limit switches operated by each pair of trip devices are connected in series to a power source and the electro-mechanical device

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controlling the associated gate 96₂ and consequently simultaneous contact of a pair with a piece of lumber allows the electro-mechanical device to open the gate.

FIGURE 15 shows the arrangement of a series of trip devices so placed as to effect the segregation of lumber into pieces of uniform grade and length. A man, a lumber grader, moves the pieces of lumber longitudinally against one of the stops 120 to 123 so that the ends of all pieces of the same grade are temporarily in contact with the stop which represent that grade and thenceforth move across the platform along lumber lines in a similar manner as described for FIGURES 7 and 8. Groups of trip devices 100₁, 101₁, 102₁, 110₁, 111₁, 112₁, etc. are placed so that those of the first group will contact only the lumber displaced longitudinally the greatest distance to stop 120. The members of the following group of trip devices are touched only by those pieces of lumber having the second greatest displacement to stop 121 and so forth.

Opposite each device 100₁, 101₁, 102₁ in the first group, in a line parallel to the length of the lumber and at successively smaller distances is a pairing trip device 100₂, 101₂, 102₂ respectively. Thus, within each grade group all pieces of lumber of similar length make contact with the same pair of trip devices, and hence pass through the same gate. The limit switches on each pair of trip devices are connected in series with each other, a power source, the electro-mechanical device which operates the adjacent gate controlled by that pair of trip devices. A piece of lumber, having been displaced against one of the stops by the grader man, will come into contact only with a pair of trip devices in that grade. Further, within each group all pieces of similar length pass through the same gate.

In FIGURE 15 the piece of lumber shown, is of such a grade that it is moved against stop 122. It thence passes all the devices 100₁, 101₁, 102₁ etc. and 110₁, 111₁, 112₁ etc. without coming into contact with them. It cannot thus be in simultaneous contact with a pair of actuating devices. The lumber strikes all the trip devices 115₁, 116₁, 117₁ but not trip device 115₂. The lumber does however, make simultaneous contact with 116₁ and 116₂.

In these last two embodiments (FIGURES 14 and 15) all pieces of lumber pass through gates directly into bins and are thence discharged onto chains dropped into a well and transferred to a lumber stacker by an inclined conveyor in the manner previously described for FIGURE 11.

It should be understood that by suitable arrangement of the trip devices sorters for any two or even three or four qualities of the lumber may be constructed.

Tally Mechanism

When a sorter is being used to classify lumber for grade and length, a record of the number of pieces passing into each bin as given by the electrically operated counter for that bin (described for FIGURE 11) enables an exact tally of the feet board-measure of each separate grade and length to be made. All pieces of lumber passing through would be of the same thickness and width during one "run" and all pieces passing into any one bin are of the same length and grade.

When however, the automatic lumber sorter is being used to sort lumber for thickness or width or grade, alone, or when no length classification is made, pieces of varying length pass into any one bin, and thus an exact tally of the feet board-measure of the lumber sorter cannot be made.

FIGURES 16a and 16b are partly schematic diagrams showing an automatic sorter for thickness and width which can also record the length of lumber classified. Trips 150₁ and 150₂ are those for determining the thickness and width of lumber to be passed through the gate controlled by solenoid 166 (such as described for the apparatus of FIGURE 14). There are in addition contactor devices 120 to 124 which operate associated counters 140 to 145. These contactor devices are placed on a line parallel to the length of the lumber (i.e. perpendicular to the lumber

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line), passing between the points of contact of trip devices 150₁ and 150₂. Contactors 121 to 124 are thus behind 120 as shown in FIGURE 16a, and each is coupled to a switch 130 to 134 for operating a respective counter. The contactors all also have trailing shoes, such as 155 for contactor 120, so that once struck by lumber the limit switch remains operated during a period starting before and ending after the lumber is in contact with trip device 150₂. Each contactor device 120 to 124 is mounted a distance from the lumber line less than the length of the piece of lumber being counted and greater than the length of the next shorter pieces that are counted separately.

It can be seen in FIGURES 16a and 16b that a piece of lumber of sufficient width and thickness to come into simultaneous contact with trip devices 150₁ and 150₂ closing limit switches 160₁ and 160₂ allows current to flow to the relay 165 closing its contacts permitting current to flow both to the electro-mechanical device 166 opening the gate, and to energize the limit switches 130 to 134. The relay 165 remains energized and its contacts remain closed until the lumber passes trip device 150₂ when the contacts of limit switch 160₂ open.

The switches 130 to 134 connected electrically to solenoids 140 to 145 of electrically operated counters, are double pole single throw switches. Contacts 175 are normally open and contacts 176 are normally closed when the corresponding contactor devices are not in contact with lumber passing through. When the associated contactor is raised by contact with the lumber, contacts 175 are closed and contacts 176 are opened.

The counter associated with each solenoid 140 to 145 is of the impulse type and is advanced by one integer every time current flows through its solenoid.

One side of counter solenoid 140 is connected to one terminal of electro-mechanical device 166; the other side is connected in series to the normally closed contacts 175 of the limit switch 130 closest to the lumber line, and to the other terminal of electro-mechanical device 166. If a piece of lumber closes limit switches 160₁ and 160₂ simultaneously but is too short to come into contact with 120, the electrical circuit is completed to counter solenoid 140 across the normally closed contacts 176₁ of limit switch 130 and the total shown on the counter associated with solenoid 140 is increased by one.

The remainder of the counters with the exception of the one most remote from the lumber line, recording the longest lengths, have their solenoids connected so that, one side of each is joined to one terminal of electro-mechanical device 166 and the other side of the solenoid is connected in series with the normally closed contacts 176 of the limit switch adjacent to and further removed from the lumber line than the limit switch whose closing is to be recorded. The connection then goes from contact 176 to the normally open contacts 175 of the limit switch whose closing is to be recorded by the counter, and thence to the other terminal of electro-mechanical device 166. Thus the total is increased by one only on the counter in series connection with the normally open contacts 175 of that limit switch closed by the passing lumber situated most remotely from the lumber line. The open contacts 176 of all limit switches operated by passage of the lumber break the circuits to and hence deenergize the switches for counters placed closer to the lumber line. The open contacts 175 of all limit switches not operated by the passing lumber prevent energization of switches placed farther from the lumber line.

The final counter solenoid 145 is connected to one side of the electro-mechanical device 166 and to the normally open contacts 175₅ of the switch most remote from the lumber line. Hence any lumber longer than that required to strike contactor 124 at a time when electro-mechanical device 166 is energized closes the electrical circuit to this counter and increases the total shown by one.

In FIGURES 16a and 16b the piece of lumber shown

passing through is of sufficient thickness and width to be in simultaneous contact with devices 150₁ and 150₂ closing the series connected switches 160₁ and 160₂ thus energizing the coil of the relay permitting current to flow to the electro-mechanical device 166 and opening the gate to which it is attached, and also energizing the switches 130 to 134. When the lumber ceases to contact device 150₁ and switch 160 opens, relay 165 remains closed under the control of switch 160₂ and current continues to flow through solenoid 166. The lumber shown is of a length such that it encounters contactors 120, 121 and 122. The only completed counter circuit from the energized terminals of electro-mechanical device solenoid 166 lies through closed contacts 175 and 176 to counter solenoid 143. Thus the total on the counter associated with solenoid 143 is increased by one.

Although the description of FIGURES 16a and 16b is directed to a sorter for thickness and width, it will be understood that any one of the other sorters described may make a tally of the length of lumber by including the contactors such as 120 to 124 and their associated counter mechanism. It is only necessary to ensure that the counters are sufficiently quick acting that they can record in the length of time during which the electro-mechanical device for the associated gate is energized and the switches operated by the contactors are closed. Thus if the sorter of FIGURE 16 was adapted to classify for grade, relay 165 and switch 160, would be omitted. Trip 150₂ would then operate a gate passing one grade classification.

In FIGURE 17 pieces of lumber 180 arriving on conveyor 53 are discharged down the chute 182 into the loading section of a tilt hoist stacker. This stacker basically comprises a set of beams 186 (behind one another in the view of FIGURE 17) which are free to rock from a vertical to an inclined position, about a hinge 187. A pulley wheel 188 is mounted on the upper end of each beam. A cable 189 passing round each pulley connects a winding drum 190 with sliding supports 185 upon which lumber is stacked. Each support 185 is free to move in the direction of arrows 191 on its beam 186. Before the loading of lumber begins, the beams 186 assume vertical position and are then wound into that shown in FIGURE 17 at about 45° to the horizontal and against stops 192 by rotating drum 190. Further rotation of the drum 190 raises the supports 185 so that they are in a position to receive the first pieces of lumber sliding down the chute 182. As the first course of lumber 183 is stacked, a brake on the drum 190 is released to allow supports 185 to descend down the beams 186 by the thickness of one course of lumber. The next course 193 thus builds up by lumber falling off chute 182. This process is continued until a sufficient load is obtained and drum 190 is then slackened off further until the centre of gravity of the system supported on hinge 187 moves over the vertical through the hinge. The members 186 thus assume the vertical position again. When members 186 are in the vertical position, the load is allowed to descend further until its weight is taken by rolls 194 (mounted one behind another in FIGURE 17). The lumber is thence moved off longitudinally along the rolls 194 for removal by a fork or lift truck.

In FIGURE 18 a reciprocating arm stacker is shown. Lumber 200 arriving on conveyor 53 slides down chute 199 on to chains 202, whence it comes to rest against stops 204. When sufficient lumber is collected behind stops 204 to form a course 203 for stacking a second stop 203 is raised to hold back any further lumber 200. Beneath chains 202 is a reciprocating arm 201 driven by a connected rod and other means not shown, which moves, so that its tip 205 follows the dotted path 207. Each course of lumber 208 is lifted thus from the chains 202 by the arms 201 and delivered into the position shown on top of the load being piled on the buggy 211.

After each course is placed in position, stickers 209 are placed to space and support the next course and also provide a clearance for the reciprocating arms 201 in the position shown in FIGURE 18, so that they may be retracted to the situation beneath the chains 202. Course 215 has just been placed on top of stickers 209 on course 210 in FIGURE 18. As each course is completed the buggy descends by the width of one course plus that of the stickers by lowering the hydraulic jack 212. When the load is completed, the jack 212 is collapsed so that wheels 213 of the beam engage rails 214. The load is then moved off along the rails for removal by a fork or lift trucks as with the tilt hoist stacker.

The embodiments of the invention in which an exclusive property or privilege is claimed, are defined as follows:

1. A lumber handling system comprising, a lumber platform, means for moving lumber transversely across said platform, a plurality of gates in said platform each said gate having an open and a closed position, said lumber being carried across each said gate when in its closed position, and dropping from said platform through one of said gates when in its open position, a plurality of electrical trip means above said platform, each of said trip means being associated with a respective gate, said platform being fixed and serving as a stable base for determining the dimension of said lumber by said trip means, said trip means being so placed relatively to said platform for engagement by lumber when of a chosen dimension to open said respective gate, a bin below each said gate for collecting separately lumber dropped through each said gate, a lumber transfer below said bins, discharge means associated with each bin for releasing lumber collected in a respective bin on to said transfer, an inclined conveyor comprising a plurality of laterally spaced members to be advanced at the same speed as one another, lugs on each said member for holding a piece of lumber transversely to the direction of travel of the inclined conveyor, said lugs projecting from said members sufficiently only to engage and carry a single piece of lumber, said transfer being arranged to discharge lumber transversely for gripping by said inclined conveyor lugs, whereby lumber is discharged one piece at a time from said inclined conveyor with its length transverse to the direction of travel, and stacker means for receiving lumber discharged from the inclined conveyor.

2. A system as defined in claim 1 comprising a bin below each said gate and a discharge door in the lower part of each bin for releasing lumber collected in said bin onto said lumber transfer.

3. A system as defined in claim 2 comprising a counter associated with each bin, for recording each opening of the gate for that bin.

4. A system as defined in claim 1 comprising a plurality of pairs of electrical trip means above said platform, each said pair of trip means being associated with said respective gate and being operative to open the respective gate upon simultaneous engagement of lumber with said pair of trip means.

5. A system as defined in claim 1 wherein lumber moves across said platform so that one edge of said lumber defines a lumber line, comprising a plurality of electrical contactor devices spaced out transversely to and at successively increasing distances from said lumber line to permit contact with said lumber simultaneously with operation of said gate, each said contactor comprising a switch for operation upon contacting of said contactor by said lumber, a counter associated with each switch, means connecting each switch to its associated counter for initiation of said counter upon energization and operation of its switch, means for energizing said switches upon operation of said gate, and means intercommunicating said switches for de-energization of all except that of the contactor furthest from the lumber line and contacted by said lumber.

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6. A system as defined in claim 1, wherein said inclined conveyor rises from said well at an angle greater than that of repose of lumber on said laterally spaced members and of lumber on other pieces of lumber.

7. In a lumber handling system comprising a lumber platform and means for moving lumber transversely across the platform, so that one edge of said lumber moves to define a lumber line and wherein sorting of said lumber is actuated by engagement of said lumber with at least one trip mechanism, said trip mechanism being operative to open a gate in said platform for discharge of said lumber from said platform; a tally mechanism for recording the length of said lumber, which comprises a plurality of contactor devices spaced out transversely to and at successively increasing distances from said lumber line to permit contact with said lumber simultaneously with engagement by said lumber of said one trip mechanism, an associated counter for each of said contactors, means connecting each of said contactors to its associated counter, means for rendering each said contactor operative to initiate its said counter upon operation of said trip mechanism to open said gate, and means inter-connecting said contactors for permitting initiation of only that counter whose contactor is furthest from the lumber line and contacted by said lumber.

8. The tally mechanism of claim 7 wherein each contactor comprises a switch, means for energizing said switches upon opening of said gate, and means inter-connecting said switches for de-energizing all except that of the contactor furthest from the lumber line and contacted by said lumber.

9. A system as defined in claim 1, each gate upon opening defining an edge to said platform, and each trip means including a trailing shoe adjacent said edge to maintain engagement of said trip means by said lumber

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until said lumber, falling through said gate, passes by said edge.

10. A system as defined in claim 1 wherein said stacker comprises at least a pair of horizontal chains for receiving lumber discharged transversely from said inclined conveyor.

11. A system as defined in claim 1 comprising, a well for receiving lumber discharged from said transfer, said conveyor rising from said well, whereby lumber discharged into said well is gripped by said inclined conveyor lugs with said lumber oriented transversely to the direction of travel of said conveyor.

12. A system as defined in claim 1 wherein said trip means for each respective gate comprises, a first member or engagement by lumber of a chosen grade and a pair of members arranged for simultaneous engagement by lumber of a chosen dimension, whereby lumber of the same grade and dimension is discharged through the respective gate for collection in the respective bin.

References Cited in the file of this patent

UNITED STATES PATENTS

749,459	Stevens	Jan. 12, 1904
1,349,836	Johanson	Aug. 17, 1920
1,706,632	Onstad	Mar. 26, 1929
2,206,660	Bryce	July 2, 1940
2,466,386	Curioni	Apr. 5, 1949
2,613,824	Tallman	Oct. 14, 1952
2,729,248	King	Jan. 3, 1956
2,730,247	Lawson	Jan. 10, 1956
2,788,896	Coleman	Apr. 16, 1957
2,838,185	Horstkotte	June 10, 1958
2,998,133	Rambo	Aug. 29, 1961