March 26, 1929. A. H. ONSTAD 1,706,632

LUMBER SORTING MACHINE

Filed Sept. 12, 1927 6 Sheets-Sheet 1

Fig. 1

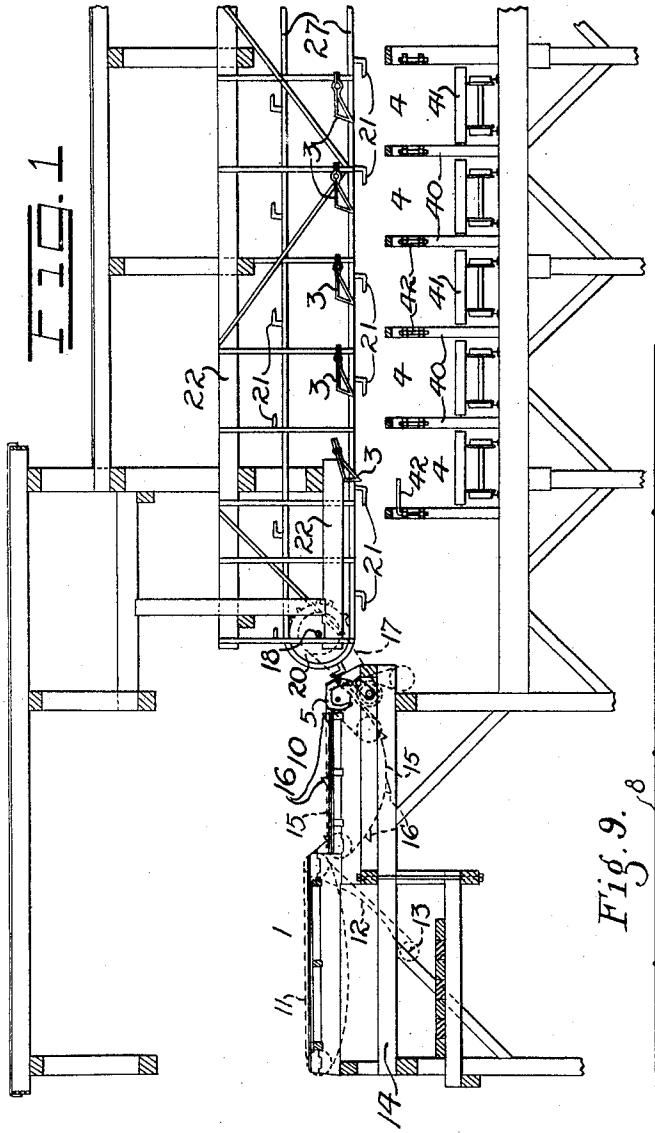
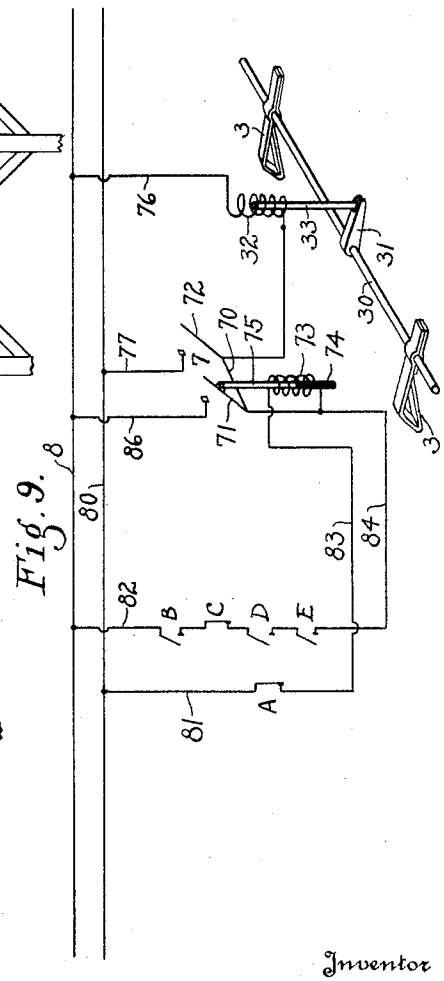


Fig. 9.



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LUMBER SORTING MACHINE

Filed Sept. 12, 1927 6 Sheets-Sheet 2

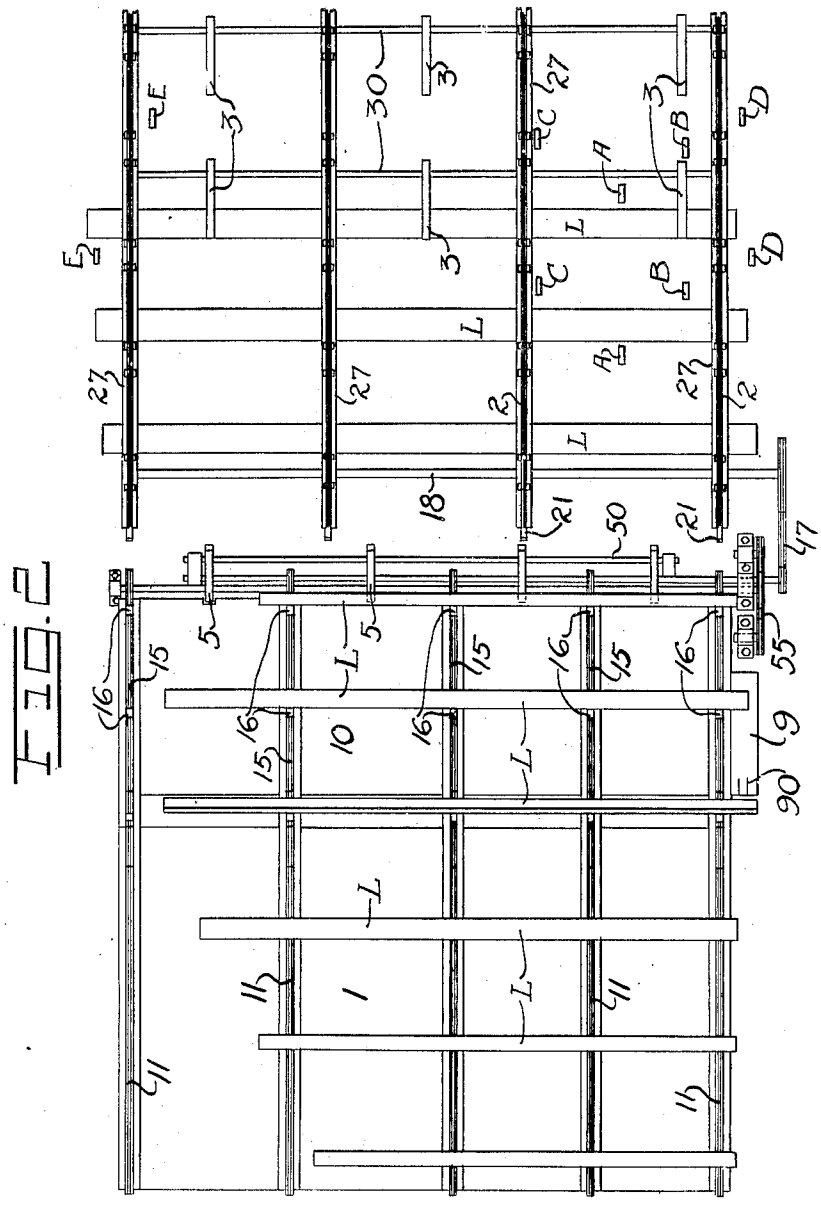


FIG. 2

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LUMBER SORTING MACHINE

Filed Sept. 12, 1927 6 Sheets-Sheet 3

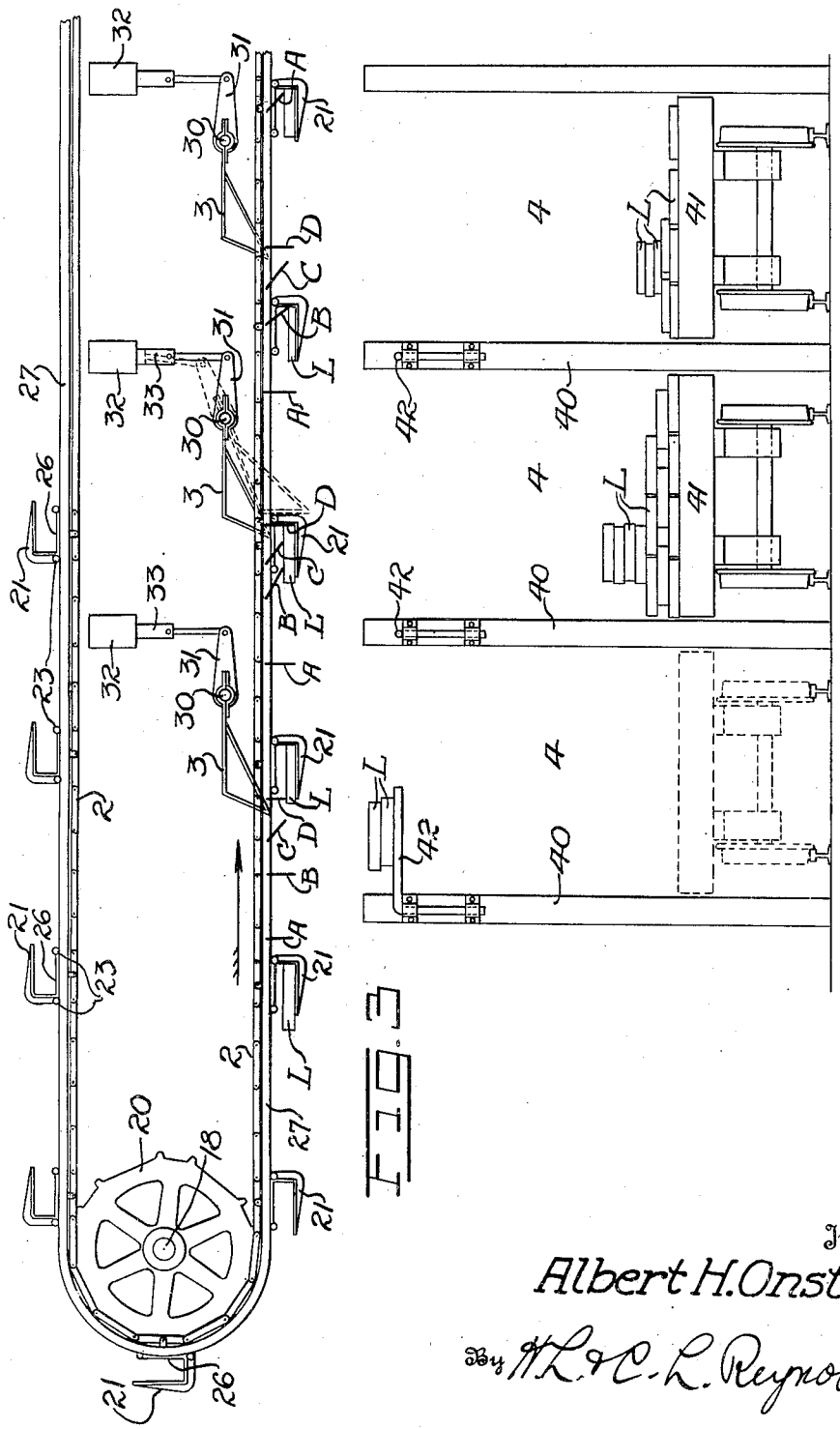


Fig. 3

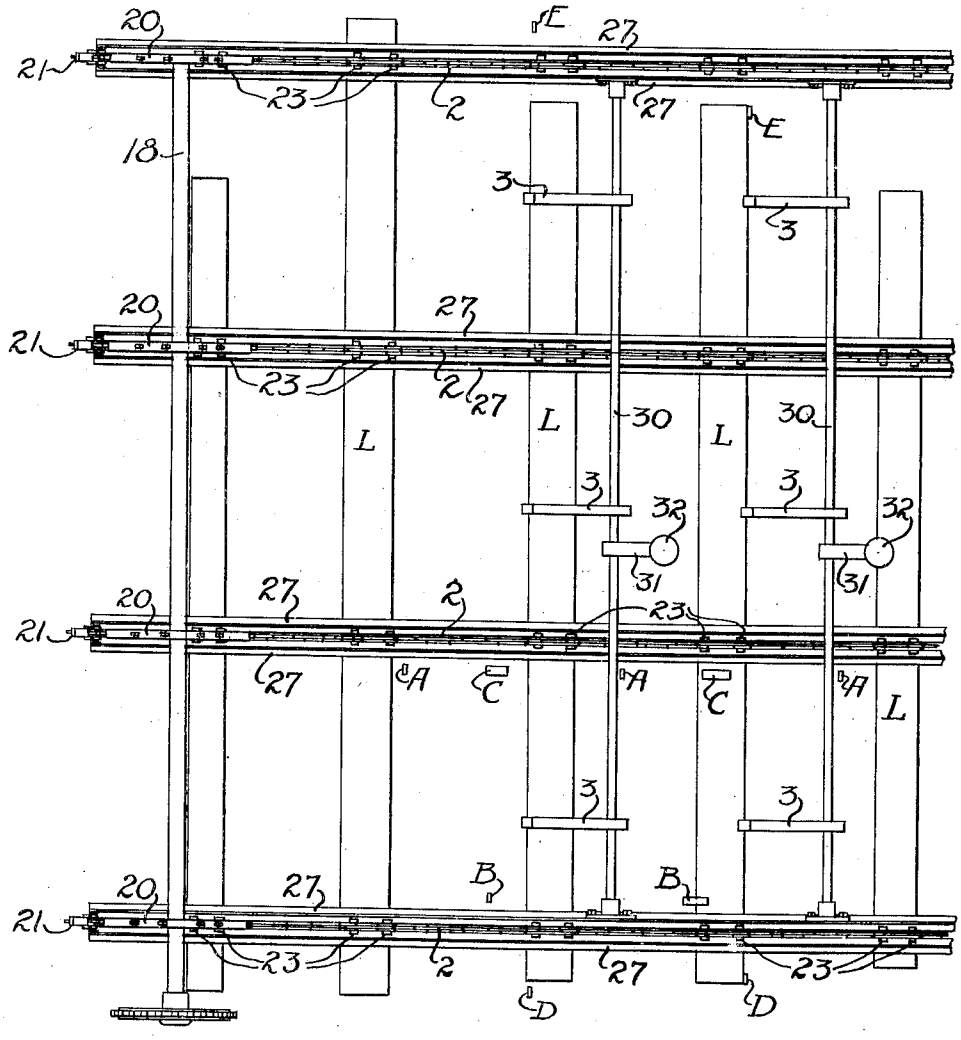
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LUMBER SORTING MACHINE

Filed Sept. 12, 1927 6 Sheets-Sheet 4

FIG. 4



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March 26, 1929. A. H. ONSTAD 1,706,632

LUMBER SORTING MACHINE

Filed Sept. 12, 1927 6 Sheets-Sheet 5

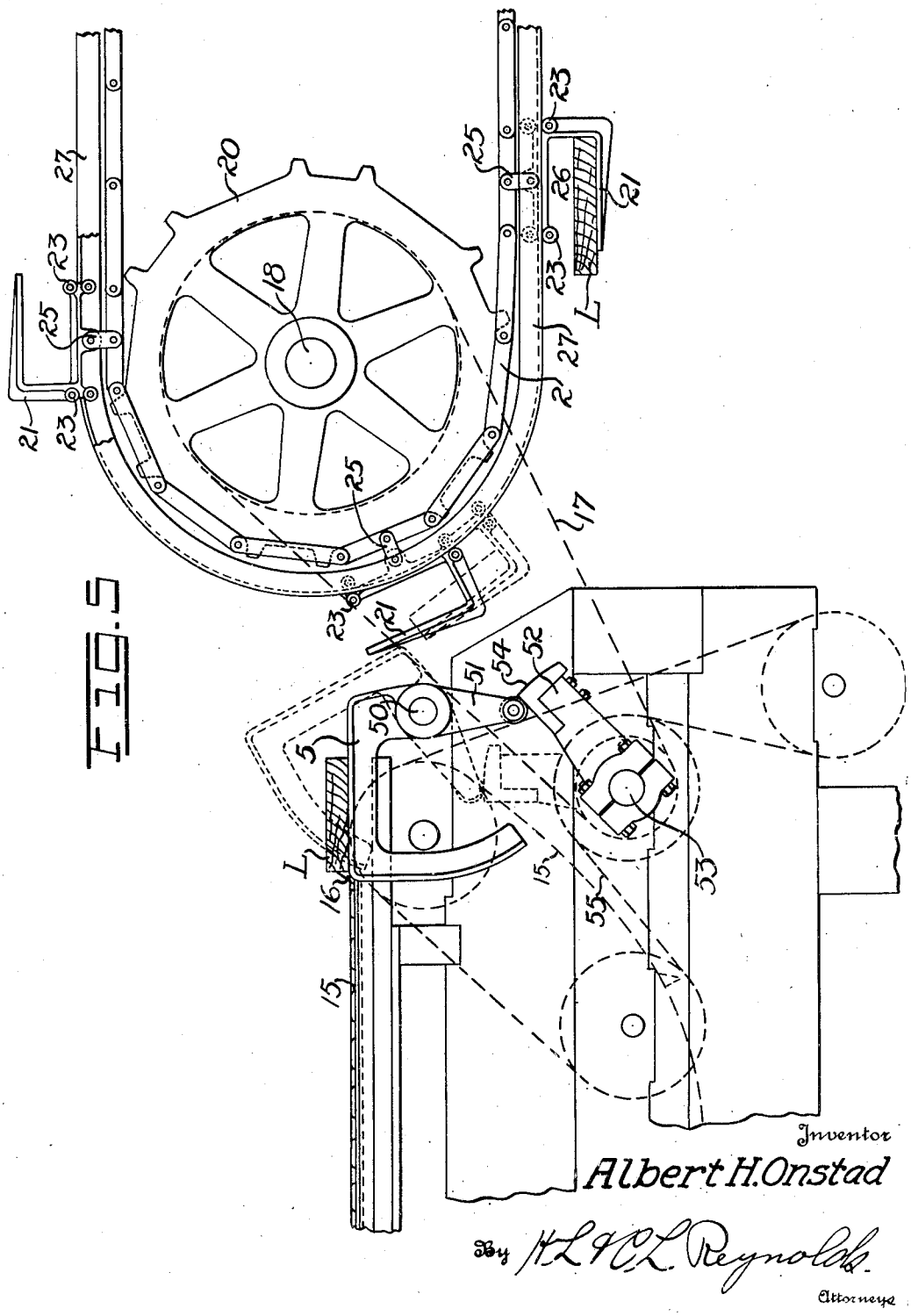


FIG. 5

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March 26, 1929. A. H. ONSTAD 1,706,632

LUMBER SORTING MACHINE

Filed Sept. 12, 1927 6 Sheets-Sheet 6

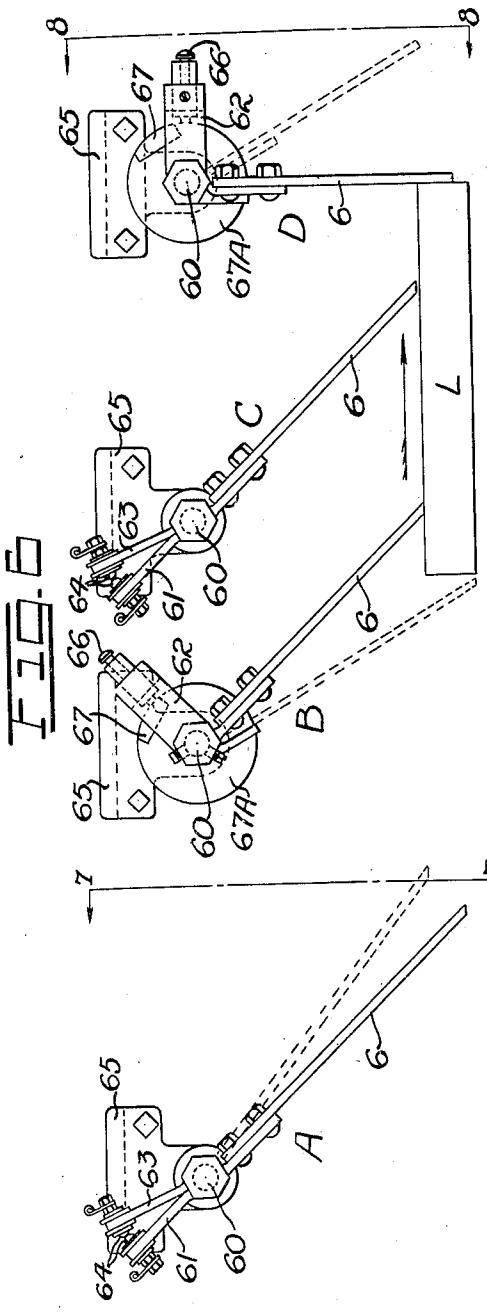


FIG. 6.

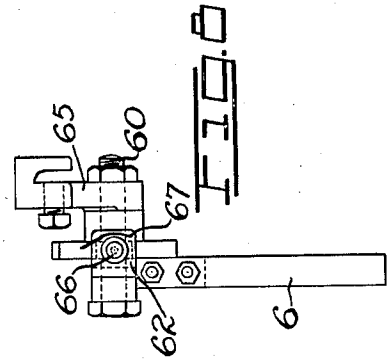


FIG. 8.

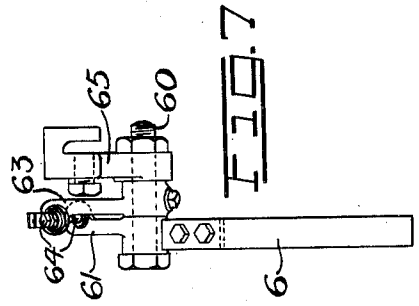


FIG. 7.

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UNITED STATES PATENT OFFICE.

ALBERT H. ONSTAD, OF TACOMA, WASHINGTON.

LUMBER-SORTING MACHINE.

Application filed September 12, 1927. Serial No. 218,886.

My invention relates to sorting or selecting apparatus designed particularly for sorting lumber according to its size and grade, the principles of which may however be applicable to like work upon other materials.

The object of my invention is to produce an apparatus which will function to automatically perform certain of the selective acts required in sorting lumber, thus eliminating much of the manual labor which would otherwise be required.

A further object of my invention is to lighten the manual effort or labor required from the operators thereof, thereby making it more attractive for labor of a higher grade of intelligence, thus securing more perfect grading.

The particular features of my invention will be disclosed in conjunction with the accompanying drawings, the same representing a typical construction of an apparatus for this purpose, while the novel features thereof upon which I claim patent protection will be defined by the claims which terminate the specification.

Figure 1 is a side elevation of a short section at the receiving end of the apparatus, many of the parts of the supporting frame structure being in section.

Figure 2 is a plan view of the same parts.

Figure 3 is a side elevation on a larger scale showing the carrier belts or chains, with the selective agencies and the receiving compartments and cars.

Figure 4 is a plan view showing upon a larger scale the receiving end of the conveying and selecting belts.

Figure 5 is a side view upon an enlarged scale, of a short section of the conveying belt and the means employed for placing the lumber upon the said belt.

Figure 6 is a side view upon a larger scale of the trip-actuating means employed for determining the action of the trip mechanisms by which the lumber is removed from the carrier belt.

Figures 7 and 8 are views taken from a direction at right angles to that of Figure 6, showing two types of trip relays used.

Figure 9 is a diagram showing the circuits by which the trip relays are controlled and operated.

The present device is designed to receive and convey the lumber as it is received from the mill, and to selectively deposit it in the proper compartment, this selection being by length, width, thickness and quality or grade. For its operation to secure these results, it requires that an attendant properly position the lumber before or at the time of delivery thereof to the conveyor belt. This position of the lumber determines the selective action of the device as based upon quality or grade, and also, but less prominently, that based on length. The selective actions following this preliminary positioning are fully automatic.

As a preliminary to the delivery of the lumber to the selective apparatus, I employ what may be called a grading and positioning table. This is in two parts or sections, one section 1 receiving the lumber as it is delivered from the mill, there having been no selection or classification given thereto. Lumber of all sizes, lengths and grades are delivered to this preliminary table, except that as a matter of policy it will be found best to previously remove large dimension stuff, slabs and other irregular pieces.

This table 1 is provided with transfer chains or belts, as 11, which are driven to slowly transfer the lumber to the selecting or positioning table 10, which is preferably at a slightly lower level. The chains 11 may be driven in any suitable manner, but, preferably, their motion should be secured through means which may be made independent in timing any rate from the mechanisms following in the apparatus, and also so that its action may be momentarily arrested, if desired. I have, therefore, shown it as driven through a chain 12 from a shaft 13, which latter may be driven in any suitable manner.

The selecting or positioning table 10 has feed or transfer chains 15 which are provided with feeding lugs or fingers 16, the rate of movement of these chains and the spacing of the fingers thereon being so rated as to register with the lumber-receiving and carrying members of the selective conveyor. To this end they are shown as driven through a chain 17 from a sprocket secured upon an axle 18 of the selective conveyor. The above parts are mounted upon any suitable frame or supporting structure, as by that illustrated and indicated by 14.

The selective conveyor, to which the conveyor chain of the positioning table delivers the lumber, will be of considerable length, possibly of eighteen hundred feet in length, this depending upon the number of classes, grades and sizes which are to be made. As

these would be essentially duplicates, the illustration and description of a small number thereof will suffice.

The selective conveyor comprises a number of endless chains 2 (Fig. 3), carried upon sprockets 20 secured in groups upon common shafts to insure uniform and simultaneous movement of all the chains. Secured to these chains are the carrying fingers 21, which are of an L-shape with the longer arm spaced outwardly of the chain and extending oppositely to the direction of travel of the chain. These are to be of a size to accommodate and carry the largest size of lumber which the apparatus is to handle.

It is evident that if lumber, represented by L in Figure 3, be placed one piece in each set of carrying fingers, and the chain is caused to travel in the direction indicated by the arrow, a stop or finger projected into the path of the lumber will cause it to be slid off of the fingers and dropped. If now means be provided whereby the placing of these fingers in operative position may be controlled by the lumber itself, in accordance with its size and grade, the deposit of the lumber in its particular bin or receiving compartment 4 may be secured.

As preliminary to securing this result, the operator, stationed alongside the classifying or positioning table 10, positions all the lumber lengthwise so that one end of the piece has a definite position relative to one edge of the device, determined by its grade or quality. For example, if classification is desired into five grades, there are five positioning locations for the lumber, each varying from the others in the directions of the length of the lumber. The number of grades wanted determines the number of positions used.

In Figure 5 is shown the mechanism employed for transferring the lumber from the classifying table to the selecting conveyor chains. A shaft 50 carries a series of irregular arms or transfer fingers 5 which, in their position of rest, are adapted to receive thereon the pieces of lumber L as they are advanced by the chains 15. A shaft 53 carries a tappet arm 52 which, in its revolution, contacts with an arm 51 carried by shaft 50, thereby to rock said shaft in a direction to raise the fingers 5. As shaft 53 is driven in synchronic relation with the transfer chains 15 and the conveyor chains 2, this movement synchronizes with the delivery of a stick of lumber upon or over the transfer fingers 5 and also with the proper positioning of a set of the carrier fingers 21 to receive it. The relative position of these parts at the beginning of this movement is shown by solid lines in Figure 5, and the position at completion of the transfer in dotted lines. To provide a short rest period for fingers 5 when in extreme raised position, the actuating arm 52 is provided with an end surface 54 of sufficient extent and shape to give a short rest period. As this passes the arm 51, the transfer fingers 5 will drop back to their normal position. Shaft 53 is synchronized with transfer chains 15 by both being turned through chain 55, and these with selective conveyor chain 2 through chain 17.

The trip arms or fingers by which the lumber is removed from the carrying fingers 21 are best shown in Figure 3. These arms 3 are pivoted at 30 and normally are above the path of travel of the lumber on the fingers 21. These are so weighted or controlled by a spring as to normally return to the inoperative position. An electrically energized element, illustrated as a solenoid coil 32 and core 33, is connected with an arm 31 fixed relative to the finger 3, to throw the latter down when energized.

A set of two or more trip fingers 3, all fixed to the same shaft 30, are used for each receiving station or bin 4. For each receiving station, a series of switches are employed for the control of the electrical element 32 which throws down the trip fingers 3. Of these I prefer to use two types, one of which is normally "open circuit" and one normally "closed-circuit". These are operated to change their normal condition by fingers which extend into the path of movement of the lumber and are actuated by contact therewith.

The detail construction chosen for these switches is shown in Figures 6, 7 and 9. Figure 6 shows four of the five switches of one set in the positions they would occupy relative to each other and to the passing lumber. These are differentiated from each other by the reference letters A, B, C and D. A fifth switch is employed in each set. This would, or might, be of the same construction as switch D, and be placed in alignment therewith so that it would not separately show in this view.

The switches A and C are normally closed circuit, while switches B, D and the fifth switch which might, for identification, be called switch E, are normally open. Each switch has a trip or actuating arm 6 depending therefrom into the path of movement of the lumber L. Each switch swings upon a pivot, as 60, positioned to permit swing of the arm by contact of the progressing lumber therewith.

The function of switches B, C, D and E is to measure the lumber for, respectively, width, thickness, length and grade. This is accomplished by so positioning these four switches in relation to each other and the passing lumber over compartments 4 so that a board destined by its grade, class and dimensions for this compartment simultaneously closes switches B, D and E without opening switch C. The simultaneous closure of these four switches completes the electrical

circuit from conductor 8 through lead 82, switches B, C, D and E, lead 84, solenoid coil 73, lead 83, switch A, lead 81 to conductor 80. This causes the switch 7 with switch blades 71 and 72 to close through the action of the solenoid core 74 being drawn into the coil 73. The upper portion 75 is of non-magnetic character, the junction of the two sections being normally well down in the coil 73. Solenoid coil 32 then becomes energized by the closing of switch blade 72, completing the electrical circuit from conductor 8 through lead 76, coil 32, switch blade 72, lead 77 to conductor 80, causing the core 33 to be drawn into the coil 32 which raises arm 31, causing shaft 30 to rotate and forcing the fingers 3 downward into the path of the lumber.

The physical construction of the switches employed may be widely varied. The only characteristic really essential for these switches is that they be operated by contact of the lumber in passing, and in a manner analogous to that of the switches illustrated. The particular construction chosen for illustration is as follows:

Each switch has a long arm 6 extending into the path of travel of the lumber. The angular position of the arm 6 differs for switches A, B and C from that of switches D and E, but there is no vital reason why this should be so.

Switches A and C have a swinging contact arm 61 and a fixed contact arm 62 which carry face-contacting terminals consisting of insulated bolts 64 which form the electrical current carrying parts of these two switches. Contact arm 63 is adjustably fixed upon the same axis as that upon which arm 61 with its pendant finger 6 is mounted. The pivot and supporting shaft which forms axis 60 is carried by a bracket or plate 65 securable upon or from the supporting frame 22. These two switches A and C are normally closed-circuit switches and their opening is dependent upon the level of the lower end of arm 6. In other words, their operation is controlled by the thickness of the lumber passing under them.

Switches B, D and E are normally open-circuit switches having a rotatable brush holder arm 62 mounted on and rotating on shaft 60. Rotation of the brush holder arm 62 is dependent on the pendant finger 6 attached thereto coming in contact with the boards as they pass under the switch. Each switch has an insulated contact holder 67^A which is adjustably fixed upon the supporting shaft 60 and which has an electrical contact shoe 67. The brush holder arm 62 carries an insulated current carrying brush holder 66. The electric current is carried to the brush holder 66 and the contact shoe 67 through flexible leads.

In Figure 6 switch B is shown in a position where the circuit is closed through brush holder 66 and contact shoe 67. In this same figure switch D is shown open circuit, there being no contact between brush holder 66 and the current carrying shoe 67.

In Figure 9 is shown the wiring diagram for one group of switches, the explanation of which now will assist in describing the function of switches A, B, C, D and E. 7 represents a two-pole switch comprising two switch blades 71 and 72 having a pivot axis 70 with a closing solenoid coil 73 and the core 74.

As switches B, C, D and E are simultaneously closed the current will flow from conductor 8 through the conductor 82 and the four switches, then successively through conductor 84, solenoid coil 73, conductor 83, switch A and conductor 81 to lead 80, causing the core 74 to close switch blades 71 and 72. The current then flows from conductor 8 through lead 86, switch blade 71, coil 73, lead 83, switch A, conductor 81 to the circuit lead 80, which energizes the coil 73, keeping the same energized after the board has passed by the switches, and switches B, D and E have opened. The current also flows from conductor 8 through lead 76, solenoid coil 32, switch blade 72 and lead 77 to conductor 80, causing the solenoid 32 to draw in the core 33, which through the arm 31 rotates the shaft 30 causing the fingers 3 to descend into the path of the lumber.

Switch B is used in measuring the width of the board. Switch C is used in measuring the thickness of the board; switch D is used in measuring the grade or quality of the board; switch E is used for measuring the length of the board.

The positioning of the switches will be such as to place the switches governing length and thickness so that the thinnest boards and the longest boards are first dropped into compartments 4. The switch C is the one which determines the selection by the thickness of the lumber. It is set so that lumber of the thickness selected for that particular compartment will pass under the lever arm 6 without touching it while lumber thicker than that desired at that point will contact with lever arm 6 causing the contact 64 to separate and open the energizing circuit 82—84.

Switch B is controlled by the width of the board. It is so positioned that its contact arm 6 rides on the board closing the circuit through brush holder 66 and contact shoe 67 as long as the contact arm 6 is held in its upward position by the board. This switch is so positioned in regard to the width of the board and switches D and E that if its arm 6 is still in contact with the board when the board reaches switches D and E the circuit will be closed, causing the solenoid 32 to become energized, the arms 3 to drop into position in the path of the lumber, and the board to be moved off the carrier arms 21.

Selection by length is usually limited to differences of two feet in length. The length-controlled switch would be located within the last two feet in length of the length to be discharged. The grade switch is located for control by the opposite end of the board. The operator at table 10 has placed the lumber with its adjacent end edge positioned within the narrow zone which has been assigned for the grade to which, in his judgment, it belongs. For instance, the first or best grade may be assigned the outer three inches, the second grade the next three inches, and so on for as many grades as desired, and can be accommodated in the space available. The width of this zone may be as small as it is found practicable to accurately position the lumber.

Each grade switch D is located in its particular grade zone, and is contacted by the end section of lumber of that particular, or a better, grade in passing, to thereby close the switch. This necessitates removing successive grades from the conveyor in their proper order, usually the higher grades first.

In Figure 9 is shown the wiring diagram for one group of switches. This shows the resetting solenoid comprising coil 73 and core 74, the latter having a non-magnetic extension 75 connecting it with a double-throw switch 7, diagrammatically illustrated, and having a pivot axis 70 and two arms 71 and 72, representing switch blades, each in its respective circuit.

When a board has simultaneously closed switches B, D, and E without opening switch C so as to close the circuit through switch blades 71 and 72 of the switch 7 the circuit is maintained on coil 73 through switch blade 71 and switch A even after the board has passed the position of switches B, C, D and E, permitting them to "open circuit" so the fingers 3 remain in the path of the lumber until the board has been shoved off the carrier arms 21. The function of switch A is to open the circuit through leads 81 and 83 de-energizing coil 73 and by opening switch blades 71 and 72 de-energizing coil 32, permitting the solenoid core 33 to drop and restore arms 3 to their normal position. This is accomplished by positioning switch A sufficiently in advance of switches B, C, D and E towards the direction from which the lumber approaches so that when a board passes under switch A and by its movement of raising arm 6, it opens the circuit at contact 64.

If any one of the switches B, C, D and E are open, no movement is caused in the trip levers 3, and the lumber passes by. No stick upon the carrier fingers 21 will be removed until it reaches the group of switches which have been set to conform to the dimensions and grade of that stick. By properly combining the various switches and their operating arms, any number of classifications within reasonable limits may be made.

In Figure 3 is shown an arrangement of receiving stations. Posts 40 divide the space beneath the conveyor into bins, which accommodate trucks 41. L-shaped arms 42 pivoted by branch to the post 40 may be swung unto position to receive any lumber discharged, while a new truck is being placed, and a filled truck removed.

The carrier fingers 21 are of U-shape in outline, the upper arm 26 having rollers 23 engaging both the upper and lower surfaces of the horizontal web of a trackway 27. By this means the vertical position of the lumber during its passage through the conveyor is accurately determined. The carriage thus formed is connected with the chain 2 by links 25.

In Figure 2 at 9 is shown a board or table having indications thereon, shown as marks 90, forming a scale by which to adjust the lumber for grade. The adjacent end of the lumber is adjusted to conform in position with the mark upon this scale representing the grade of the particular piece of lumber being positioned.

What I claim as my invention is:

1. In a lumber sorter, endless conveyors and means for operating them, lumber-carrying fingers carried by and spaced outwardly from the conveyors, and a series of devices for selective removal of lumber from said fingers, each having swinging arms adapted to be placed in the path of the lumber, an electrically-actuated operated means for said arms, and a series of switches controlling the circuit of said operating means and having operating arms positioned for engagement by the passing lumber.

2. A selective device for lumber sorters comprising a conveyor for the lumber, a series of lumber-removing devices located in successive positions along the path of the lumber as transported by said conveyor and each containing a series of switches connected in series in the same circuit, lumber-checking means, and an electrically-energized member operatively connected with the said lumber-checking means and conected in the same circuit with said switches, and operating means carried by each switch positioned to be engaged by the lumber in passing, the operation of one of said means being dependent upon the width of the lumber, of another by its thickness, another by its length, and another by the spacing of one end of the lumber transversely of its path and with reference to a base line extending alongside said path.

3. In a lumber sorter, a lumber conveyor, a lumber checking device, and an electrically-energized actuating means for said checking device, of a switch actuated by the passing lumber, and an electrically-energized means controlled by said switch to restore the checking device to inoperative position.

4. In a lumber sorting machine, a grading

table provided with fed chains and transfer arms operated synchronously, a conveyor provided with carrier fingers for receiving the lumber from the transfer arms, all of said parts being operatively connected for synchronous action, means separate for each class of lumber and distributed in succession along the path of the lumber, adapted to remove the lumber from the conveyor, means controlled by the three dimensions of the lumber and also by the selective positioning of one end of the lumber transversely of the conveyor, to determine the place of removal of the lumber from the conveyor.

Signed at Tacoma, Pierce County, Washington this 3rd day of September, 1927.

ALBERT H. ONSTAD.