Oct. 12, 1954

T. A. WORK, JR

ELECTRICAL COUNTING AND COMPUTING SYSTEM FOR LENGTHS OF MATERIAL

2,691,486

Filed May 12, 1952

3 Sheets-Sheet 1

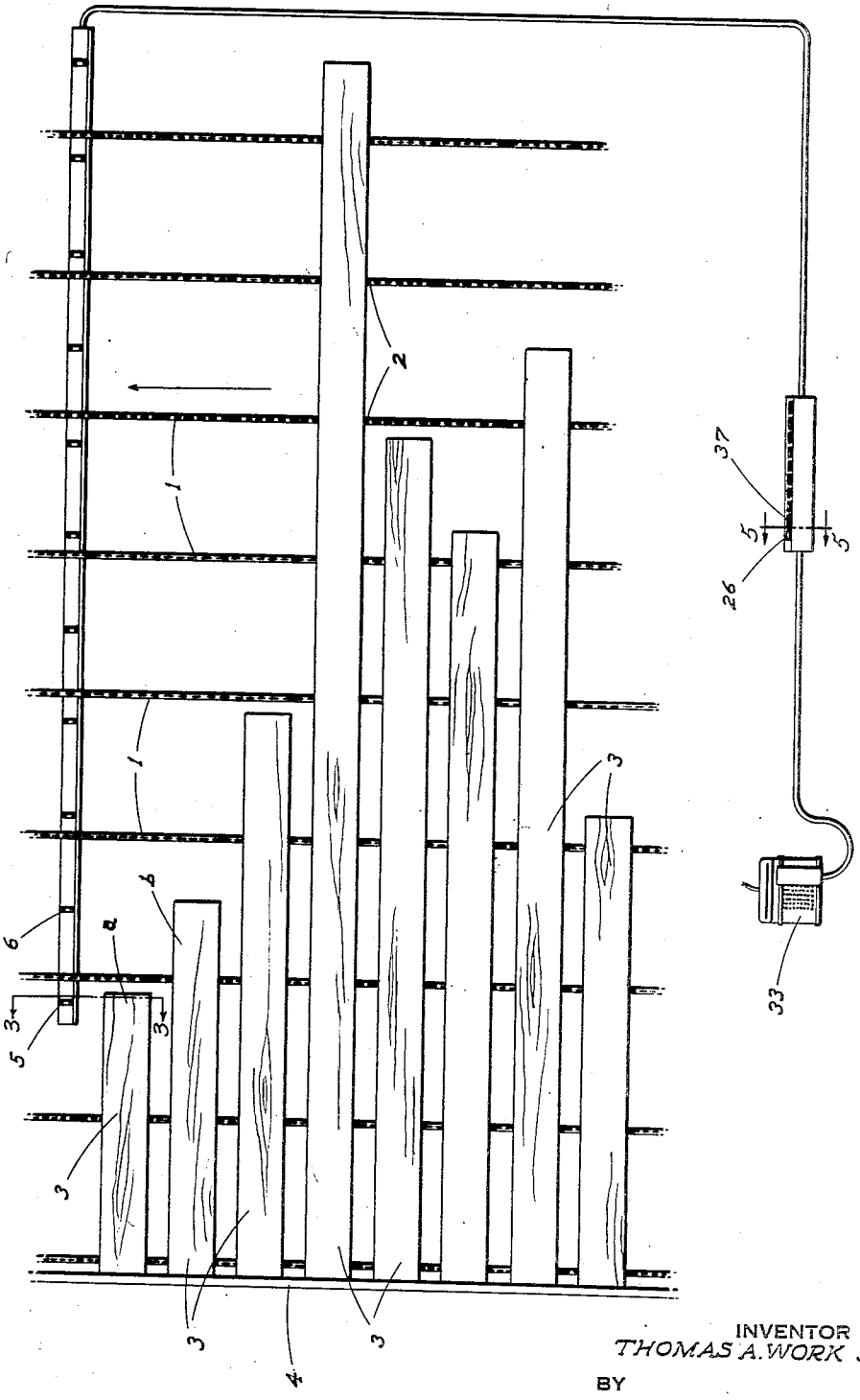


Fig. 1

INVENTOR
THOMAS A. WORK JR.

BY

Webster & Webster
ATTORNEYS

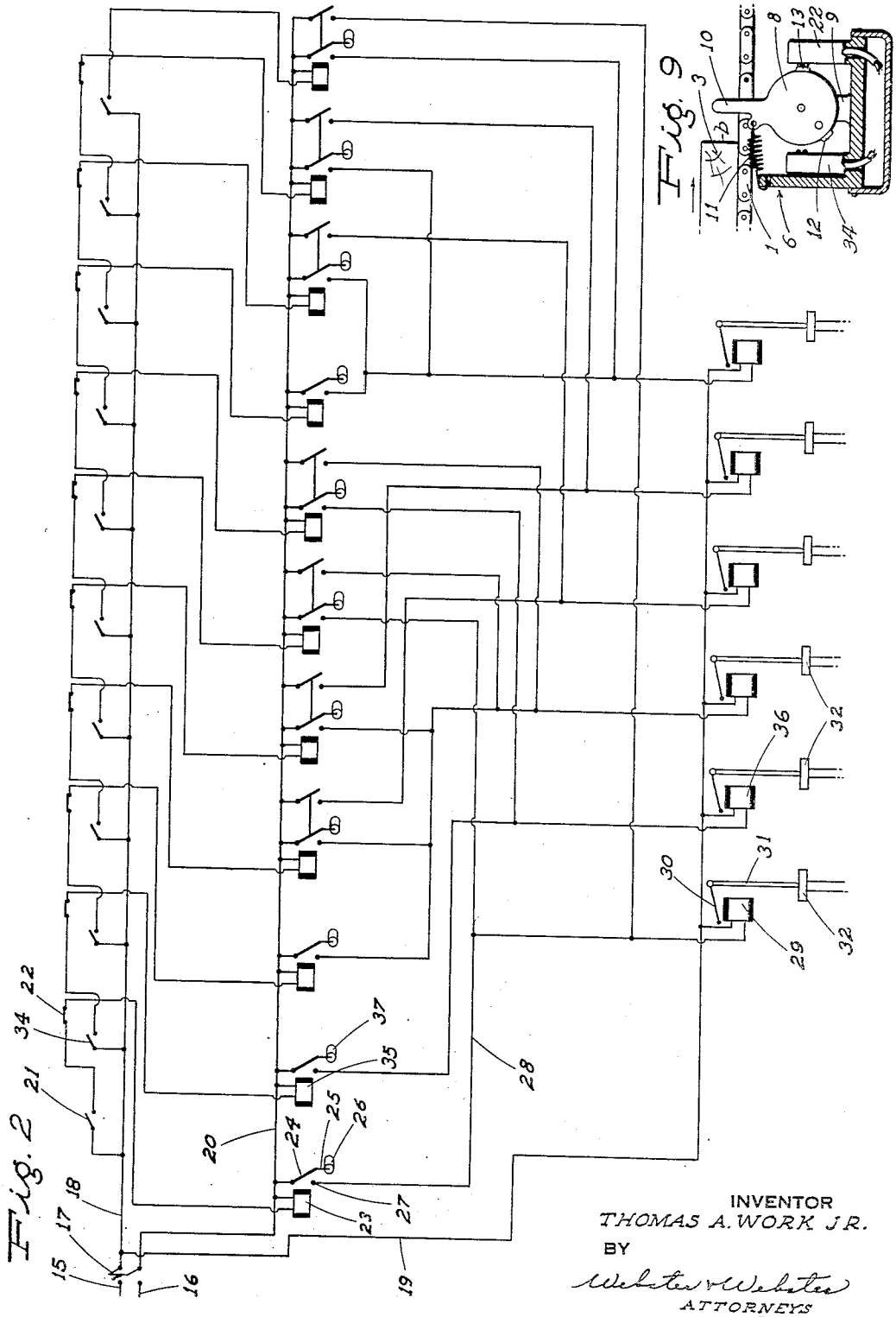
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Fig. 3

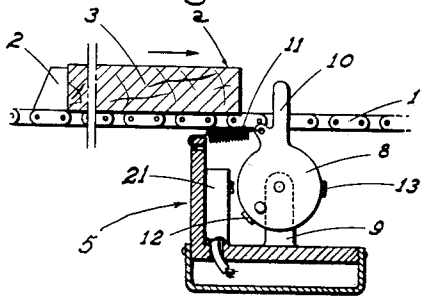


Fig. 4

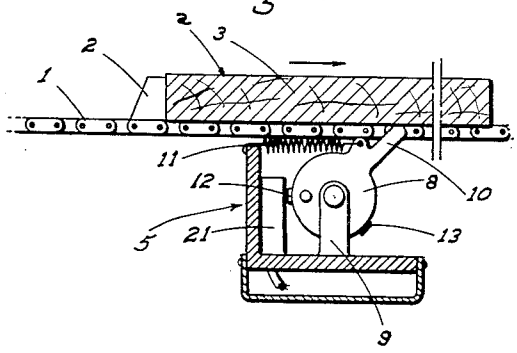


Fig. 5

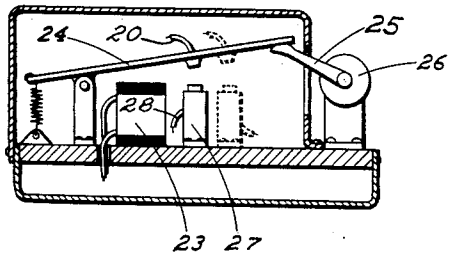


Fig. 6

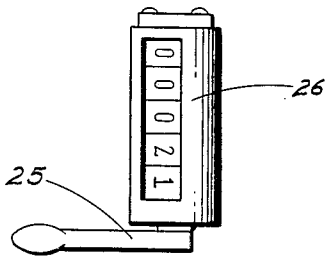


Fig. 7

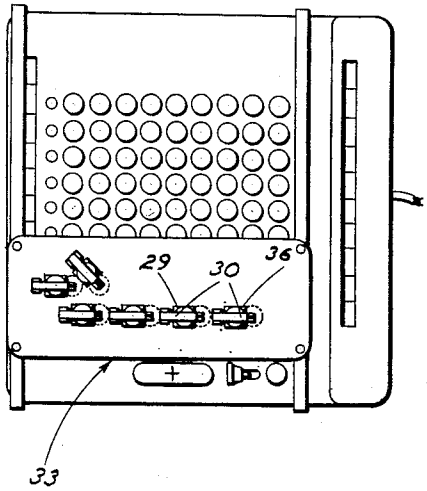
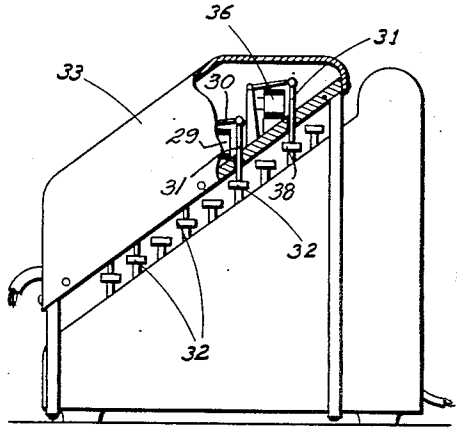


Fig. 8



INVENTOR
THOMAS A. WORK JR.
BY
Webster & Webster
ATTORNEYS

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ELECTRICAL COUNTING AND COMPUTING SYSTEM FOR LENGTHS OF MATERIAL

Thomas A. Work, Jr., Pebble Beach, Calif.

Application May 12, 1952, Serial No. 287,323

5 Claims. (Cl. 235—98)

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This invention relates in general to a mechanical and electrically operated combined counting and computation system; the main purpose of the invention being to avoid the possibility of errors which is always present where counting and computing of materials is carried on by an individual. The application of the system is preferably herein described in connection with its use for the selective counting of a number of pieces of lumber of variant length passing a given counting point, and simultaneously computing the total lineal footage of the aggregate number of pieces of lumber passing the counting point in a given time.

In this connection, it is an object of the invention to apply the novel structure hereinafter described to the counting of the number of pieces and total lineal footage of lumber travelling on a conveyor conventionally leading from a matcher, or other device in a planing mill, onto a sorting and grading chain. However, while the invention is particularly designed for such use, it is not intended to limit its use to such a specific operation, since the system can be used in connection with any piece of material travelling on a conveyor cross wise to the direction of travel of such conveyor.

It is also an object of the invention to provide a practical, reliable and durable electrical counting system, and one which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings:

Fig. 1 is a diagrammatic plan view of a section of a conveyor shown carrying a number of lumber pieces of variant length, with an outline of the novel counting and computing system shown in connection therewith.

Fig. 2 is a diagrammatic outline of the electrical circuit used in connection with the system.

Fig. 3 is an enlarged end view of a circuit make and break trigger mechanism used in connection with the system, taken on line 3—3 of Fig. 1 and shown in the position assumed just prior to engagement of the trigger by a travelling lumber piece, a single switch being here shown.

Fig. 4 is an end view of the same mechanism shown in Fig. 3, but depicting the same in the position it assumes upon being engaged by a traveling lumber piece.

Fig. 5 is an enlarged detached view of a counter

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and counter operating mechanism used in connection with the system, taken on line 5—5 of Fig. 1.

Fig. 6 is an elevation of the type of counter shown in Fig. 5.

Fig. 7 is a plan view of an outline of a computing machine, or calculator, such as a comptometer, used in connection with the system and showing some of the operating parts of the system installed thereon.

Fig. 8 is an end elevation of the machine shown in Fig. 7 partly broken out and in section to show certain installed operating parts of the system.

Fig. 9 is a view similar to Fig. 3 but showing two switches.

Referring now to the characters of reference on the drawings and with particular reference to Fig. 1, the numeral 1 designates a lumber conveyor of conventional form having alined lumber engaging cleats 2. The lumber pieces 3 are carried on this conveyor; and before being carried to the counting and computing station, are brought into end engagement with a straight edge fence 4 by conventional means, not shown.

The lumber pieces 3, as shown, may be of variant length, usually such as six feet, eight feet, ten feet, twelve feet, and on up, sometimes to as much as twenty-six feet, in length.

As indicated in the preamble to this specification, it is the function of the mechanism of the system comprising the present invention to separately count the number of pieces having the same length, and to simultaneously compute the total lineal feet of the aggregate number of pieces passing the counting point. The mechanism, electrical circuits and mode of operation thereof to accomplish this desired result will now be described.

Disposed transversely of the direction of travel of the conveyor 1 and in the path of travel of the lumber pieces 3 are a plurality of switch trigger mechanisms, one for each piece of a given length. These are generally all alike and therefore in the interest of brevity in this specification, only the construction and operation of two of these mechanism operative by lumber pieces of six and eight feet in length will be indulged in as it is believed this will be all that is necessary to a full understanding of the structure involved and the operation of the system.

In Fig. 1 these trigger mechanisms to be described are indicated generally at 5 and 6. For the purposes of this specification the lumber pieces which will be counted and the linear feet of which will be computed through the operation

of these two mechanisms have been designated in Fig. 1 as *a* and *b*, which will be assumed to be of a length of six and eight feet respectively

While these are shown in the drawing as following each other in consecutive order, it will be obvious that they may lie on the conveyor at divers relative positions, the consecutive order being shown merely to simplify the description of the operation.

The trigger mechanism per se may possibly be of variant construction but in the form here shown (see Figs. 3 and 4) each consists of a disc 8 rotatably mounted on a support 9 below the conveyor 1. On the disc 8 is a radially projecting finger 10 normally held in vertical position in the path of the traveling lumber pieces by a spring 11. On the disc 8 is a pair of spaced nubs 12 and 13 which functions to open and close switches in electrical operating circuits for counters and computing machines which constitute the operating mechanism of the system.

The combined electrical and mechanical mechanism involved in the system is diagrammatically displayed in Fig. 2 of the drawings and with reference only to those parts which act in response to the operation of trigger mechanisms 5 and 6 will now be described in detail.

Input and output wires 15 and 16, respectively, connect the system with a source of electricity, not shown, and connection between these wires and the system may be controlled by a master switch 17.

Within the system, and when switch 17 is closed, a first main line wire 18 and a second main line wire 19 are placed in connection with the input wire 15, and a main line wire 20 is placed in connection with the output wire 16.

Connected with the line 18 and lying adjacent the trigger mechanism 5 is a normally open switch 21 and connected in series with this switch and lying adjacent the trigger mechanism 6 is a normally closed switch 22 which in turn is connected with one terminal of a solenoid 23 the other terminal of which connects with wire 20.

When the solenoid 23 is energized, it operates a lever 24 which in turn actuates the operating lever 25 of a counter 26 (see Fig. 5).

Operation of the lever 24 also closes a switch 27 interposed in a wire 28 leading from a solenoid 29 to the wire 20, the solenoid 29 in turn being connected with the wire 19. Upon closing of switch 27, a circuit is therefore completed from wire 15 through wire 19, the solenoid 29, wire 28, and the wire 20, thus energizing solenoid 29.

Energization of solenoid 29 causes it to operate a lever 30 which in turn operates a finger 31 which engages and depresses a key 32 of a computing machine or calculator 33 (see Fig. 8). When the solenoid 29 is de-energized, the conventional spring which returns the key 32 likewise returns the finger 31 and lever 30 to their initial position.

As stated, the switch 21 lies adjacent the trigger mechanism 5, the finger 10 of which lies in the path of travel of the lumber piece *a* which, we will say, is of a six foot length. Hence, as the piece *a* moves against the finger 10, the disc 8 is rotated, causing the wiper nub 12 to engage and close switch 21. This establishes a circuit from wire 15, through wire 18, switch 21, switch 22, solenoid 23, wire 20, to wire 16, and thus energizes solenoid 23 which in turn operates counter 26. Succeeding passes of pieces *a* are consequently added up by the counter 26.

As the lever 24 is operated by the solenoid 23, it closes switch 27 causing the circuit above described to be completed to solenoid 29, causing this latter solenoid to operate key 32 of the computing machine 33. In this instance, this would be the one for the numeral 6 since it acted in response to the lumber piece of a six foot length. Continued operation of this key by the movement of succeeding lumber pieces will therefore cause the machine to compute the total lineal feet of the aggregate lumber pieces moving against the trigger mechanism.

The switch 22 is normally held closed by the nub 13 on the disc 8 of the trigger mechanism 6 which lies in the path of travel of the board piece *b*, (see Fig. 9) and another normally open switch 34 likewise lies adjacent this trigger mechanism. With the operation of this mechanism 6 by the lumber piece *b*, the turning of the disc 8 thereon first carries the nub 13 out of engagement with the switch 22 allowing it to open. Continued movement of the disc then carries the nub 12 into engagement with the switch 34 to close the latter. The opening of switch 22 breaks the circuit therethrough which would be established by the action of trigger mechanism 5 which would obviously also be engaged by lumber piece *b*, so that solenoids 23 and 29 do not function except in conformity to the movement of the six foot lumber piece *a*.

However, closing of switch 34 by trigger mechanism 6 in response to movement of the eight foot lumber piece *b* establishes circuits to solenoids 35 and 36 exactly in the same manner as those established to solenoids 23 and 29 respectively. Action of solenoid 35 operates a counter 37, the same as counter 26, which counts the number of eight foot lumber pieces passing through the machine. Action of solenoid 36 operates a key 38 on the computing machine 33 which key corresponds to the numeral 8 so that there is an input of figures into the computing machine corresponding to the total lineal footage of the aggregate number of eight foot lumber pieces *b* moving through the machine.

Reference to Figs. 1 and 2 will clearly show how a predetermined number of separate circuits may be successively opened and closed in direct response to the lumber pieces of variant lengths passing through the machine, each circuit functioning to operate a separate counter and a separate key on the computing machine. All function alike except that when a counting circuit is established by a lumber piece of a length greater than ten feet, there are two computing circuits closed to two solenoids to operate two keys on the computing machine as would be necessary to input the proper numeration into the computing machine. See Fig. 2 and the dotted lines in Fig. 5.

From the foregoing description it will be obvious that when all the lumber pieces of a given lot or run have passed the counting station, counter 26 will indicate the total number of lumber pieces of a six foot length which have passed the station, while counter 37 will indicate the total number of eight foot pieces which have passed through, and the other counters will in turn indicate the total number of pieces of the length which caused them to function. The computing machine 33 will have calculated and will show the total lineal footage of all lumber pieces which have passed the counting point.

Before another run or lot of lumber is tallied, all counters and the computing machine must be cleared and returned to zero.

The above described system of counting and calculating makes it possible to do away with human errors in counting lumber pieces of variant lengths and makes it unnecessary to mentally calculate the total lineal footage. When the machine tally of pieces and the total lineal footage is given to a clerical force in an office, the board footage may be obtained by multiplying the total lineal footage by a factor in accordance with the cross section of the lumber pieces tallied. The time of the required clerical work in the office is thus greatly shortened.

From the foregoing description, it will be readily seen that there has been produced such a system as substantially fulfills the objects of the invention, as set forth herein.

While this specification sets forth in detail the present and preferred construction of the system, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful, and upon which Letters Patent are desired:

1. Mechanism for counting the number of lumber pieces of variant length passing a point, such mechanism comprising a plurality of counters, one corresponding to each length of the lumber pieces, means to operate the counters, such means including a plurality of electrical circuits, one corresponding to and in operative connection with each counter, means engageable by the lumber pieces to open and close the circuits, and means to render all other circuits inoperative when the circuit of any one length of lumber is in operation irrespective of the simultaneous engagement of a plurality of such engageable means by such piece.

2. In combination with a counter and a computing machine, the latter including an actuating device, means to move lengths of material in single file order past a given point, a trigger positioned in the path of movement of the lengths for engagement thereby, means between the trigger and counter to actuate the latter upon engagement of a piece with the trigger, and means included in part with the last named means and functioning upon actuation thereof to actuate said device.

3. Mechanism for counting the number of lumber pieces of various lengths as such pieces are moved along a predetermined path, said mechanism comprising a longitudinally movable conveyor on which the pieces are disposed in parallel arrangement at right angles to the direction of

movement of the conveyor with the inner end of each piece alined at one side of the conveyor, a counter for each length of lumber, means to operate the counters including a plurality of electric circuits, one for each counter, means engageable by the pieces to open and close the circuits and including triggers, one for each length and circuit, positioned in the path of movement of the lumber pieces adjacent the outer end thereof, whereby all the triggers will be engaged by the longest pieces and one trigger only will be engaged by the shortest pieces, and means to render all the circuits controlled by such triggers inoperative except that one corresponding to the length of lumber whose outer end engages a trigger.

4. Mechanism for counting the number of lumber pieces of various lengths as such pieces are moved along a predetermined path, said mechanism comprising a longitudinaly movable conveyor on which the pieces are disposed in parallel arrangement at right angles to the direction of movement of the conveyor with the inner end of each piece alined at one side of the conveyor, a counter for each length of lumber, means to operate the counters including a plurality of electric circuits, one for each counter, each circuit including a normally open switch and a normally closed switch, a trigger for each circuit and length of lumber, and means included with the triggers of all but the shortest length of lumber to close the normally open switch of the corresponding circuit and open the normally closed switch of the circuit of the next shortest length.

5. A mechanism as in claim 4, with a computing machine, and means controlled by the closing of each circuit to actuate the machine so as to register, in the machine, the linear footage of that piece of lumber which caused such closing of said circuit.

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