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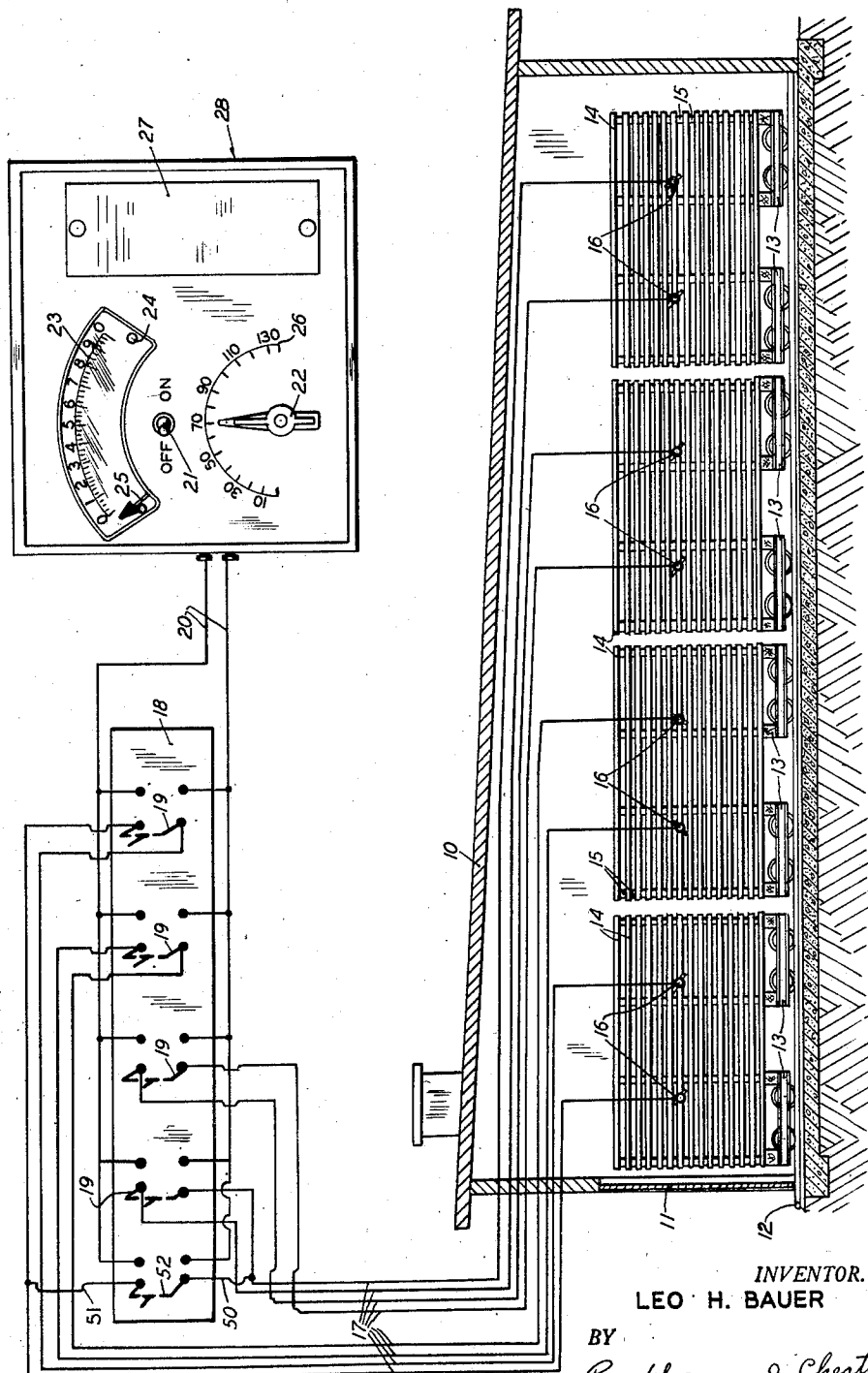
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2,821,682

MOISTURE TESTING APPARATUS FOR LUMBER DRY KILN

Filed Dec. 3, 1954

2 Sheets-Sheet 1



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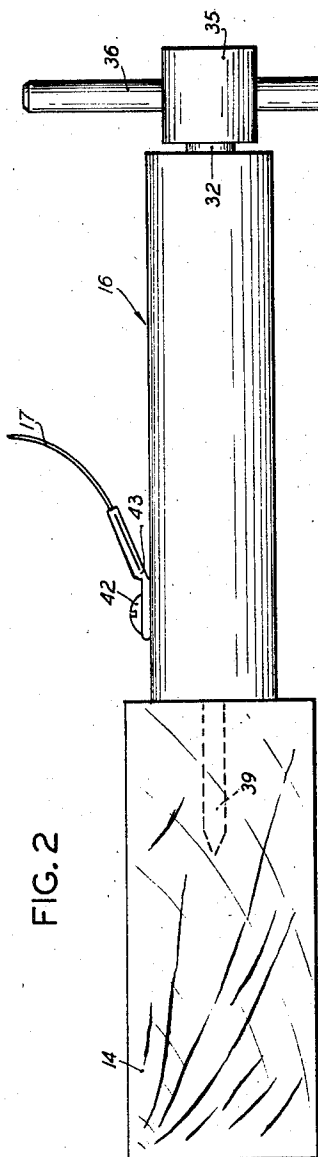


FIG. 2

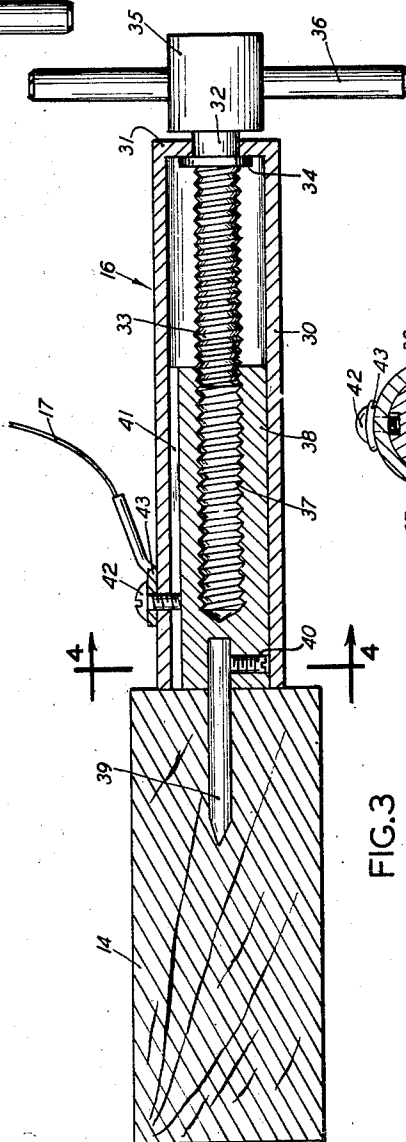


FIG. 3

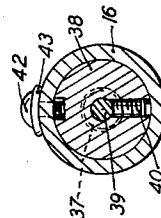


FIG. 4

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1

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MOISTURE TESTING APPARATUS FOR LUMBER DRY KILN

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1 Claim. (Cl. 324—65)

The object of the present invention is to provide means for simplifying the operation of kiln-drying lumber, and for more accurately and positively controlling the process of kiln-drying lumber.

At present there are two accepted methods of controlling the operation of a dry kiln by observing moisture content while the lumber being dried is inside of the kiln. These methods comprise the taking of a core sample which may be then tested outside of the kiln in a moisture testing apparatus, or the sawing of a length from the center of a board which is then checked for moisture content by weighing outside of the kiln. The first method is subject to the disadvantages that the operator has to go into the kiln when the temperature may be anywhere from 130° to 180° Fahrenheit; the taking of the cores requires time, so that from twenty to sixty minutes lost time occurs every time a core check is taken, totaling from one to three hours lost time per charge depending upon the number of cribs in the kiln; the time required to process the samples after procuring them is long, so that the adjustment of the kiln temperature or humidity lags far behind the checked conditions; and the small cores do not always give a true average moisture content due to different grain areas, pitch content, wet pockets, dry spots or proximity of knots in the wood. The same objections are true of the method involving removing a length of board from the middle of a piece of lumber. Either method involves spoilage of one or more pieces of lumber per crib which adds considerably to the expense of the finished lumber.

As a result of the above-noted disadvantages, most operators just guess at the moisture content of the lumber and automatically raise the kiln temperature or otherwise adjust conditions inside of the kiln from time to time according to a prearranged schedule based upon past experience. The operators usually raise the temperature a few degrees every twelve to twenty-four hours until the lumber is presumed to be dry, which means that quite often the lumber is dried to a point near the desired moisture content but has not been subjected to higher temperatures for a long enough period of time to set the pitch, and the resulting lumber bleeds pitch which is quite serious in most instances when it is realized that kiln-dried lumber is especially desired for interior finishing purposes.

The objects of the present invention are to provide means whereby all of the foregoing disadvantages and objections are eliminated by the use of permanently positioned electronic testing equipment which is affixed to representative boards in each of the cribs within a dry kiln and which may be periodically observed to give an instantaneous reading of the present moisture content throughout the charge in the kiln, so that an immediate adjustment of temperature or humidity conditions inside of the kiln may be made. Operators are not required to enter the kiln, and time required for making a complete check is a few seconds or several minutes as compared to an hour or more. Observations can be made

2

as often as desired so that exactly accurate control may be accomplished to achieve the highest quality kiln-dried lumber without any wastage.

A further object of the present invention is to provide means of the foregoing character which may be applied in a few minutes and removed from the lumber in a shorter period of time, so that the operator need enter the kiln only twice, once when the kiln is being charged with a fresh batch of lumber and once when the cured lumber is being removed.

A further object of the present invention is to provide means of the foregoing character in which a single moisture testing instrument is utilized to check the moisture content of a plurality of cribs in a single kiln, thus reducing the expense of the installation, and in which the moisture testing instrument is not exposed to the deleterious effects of high temperatures and unusual relative humidity existing within a dry kiln.

The foregoing and other objects and advantages of the present invention will be more readily apparent from inspection of the accompanying drawings, taken in connection with the following specification wherein like numerals refer to like parts throughout, and in which a preferred form of the invention is illustrated.

In the drawings,

Fig. 1 is a representative, vertical section through a typical dry kiln having a charge of lumber therein and with which the present invention is schematically illustrated;

Fig. 2 is an end elevation of a board, as illustrated in Fig. 1, with an electrode of the present invention attached thereto, the view being on an enlarged scale;

Fig. 3 is a vertical section through Fig. 2 taken coaxially of the electrode; and

Fig. 4 is a transverse section taken along the line 4—4 of Fig. 3.

In Fig. 1 a dry kiln of typical construction is indicated at 10, the kiln being provided with a sliding door 11 through which tracks 12 extend in order that wheeled cribs 13 may be rolled into and out of the kiln. Each crib supports a plurality of boards 14 which are to be cured, the boards being separated by crossbars 15 in order that the air may circulate freely through the charges of lumber. The kiln is provided with means (not shown) for heating and controlling the relative humidity of air which is circulated therethrough, in accordance with usual practice.

In accordance with the present invention, a plurality of electrodes 16 are applied, in spaced pairs, to centrally located boards 14. Each of the selected boards will have a pair of electrodes affixed thereto at a standard distance apart and in a standardized position with respect to the length of the board, so that a previously calibrated moisture testing instrument may be utilized to give a proper indication of the immediate moisture content of the board. The electrodes are permanently mounted within the kiln, each being at the end of a conductor wire 17 as illustrated, which wires lead to a suitable instrument location outside of the building. At this location there is provided a switchboard 18 on which are mounted a plurality of double pole switches 19 to which the electrodes 16 are connected in pairs by the wires 17. The switches 19 are adapted selectively to complete a circuit to a standard moisture indicating instrument 28 through a pair of wires 20 having appropriate terminals in pairs opposite each switch. Any suitable electronic moisture indicating instrument, such as disclosed in the patent to Suits et al. 1,875,359, September 6, 1932, may be utilized, the instrument comprising an electronic circuit as disclosed in the above-identified patent and having a control switch 21, a variable resistance device of which the

3

control lever 22 is illustrated, and a moisture content indicating scale 23 appearing in a window 24 and past which the indicating needle 25 moves. Adjacent the resistance control lever 22 there is provided an arcuate scale 26 provided with numerals which correspond to a calibration chart 27 mounted on the face of the instrument. The chart has been previously set up to indicate the numeral on the scale 26 toward which the control lever 22 is to be pointed for the particular type of wood being kiln-dried, and the distance between the pair of electrodes. By means of this device the four switches 19 may be successively operated to complete a circuit including the moisture content indicating instrument and one of the sample boards in each crib, and the average of the four readings will give an accurate determination of the present average moisture content of the entire charge. It is, of course, to be appreciated that a larger kiln in which a greater number of loaded cribs may be placed would have a corresponding number of pairs of electrodes and a corresponding larger number of pairs of wires and double pole switches. It will, of course, be apparent that one or two cribs may be placed in the kiln and the other electrodes would not be used.

In Figs. 2 to 4, inclusive, details of the electrodes 16 are illustrated. The electrode comprises a tubular member 30 having an annular shoulder 31 at one end to define a central, coaxial opening through which the cylindrical shank 32 of a threaded rod 33 extends into the interior of the cylindrical member. A flange 34 on one side of the shoulder 31 and an enlarged head 35, both of which are fixed to the threaded member, prevent the threaded member from being separated from the cylindrical member while permitting rotation of the threaded member. A crossbar 36 fixed in the head 35 facilitates rotation of the threaded member. The threaded member engages a longitudinal, coaxial, internally threaded socket 37 in a plunger 38 guided in the cylindrical member 30. The plunger 38 coaxially supports a forwardly projecting, wood piercing needle 39 which is retained in position by a set-screw 40. The plunger is provided with a longitudinal slot 41 in which is engaged the inner end of a screw 42 threadedly mounted on the cylindrical member 30 and retaining a terminal 43 mounted on the end of the conductor wire 17. The screw 42 permits longitudinal movement of the plunger 38 while preventing rotation thereof whereby relative rotation of the head 35 with respect to the cylindrical member 30 may be employed to project or retract the piercing needle with respect to the cylindrical member. The device is utilized by rotating the threaded rod 33 until the end of the plunger 38 is flush with the open end of the cylindrical member 30 whereupon the point of the piercing needle 39 may be placed at a selected position on a board and a hammer employed to drive it into the wood by striking the head 35. When it is desired to disconnect the electrode the head 35 is rotated in the opposite direction to retract the piercing needle from the wood. It will readily be appreciated that the device permits selective positioning of the pair of electrodes at exactly determined points on the board and at an exactly determined distance apart. The board is not rendered unusable by the slight fiber destruction occasioned, as distinguished from the major weakening action of core sample drilling, or the complete destruction of a length of board by sawing out a central section.

It is to be appreciated that the one instrument may be

4

utilized for reading the moisture content of lumber in individual cribs in a kiln, or in as many kilns as are present in the one locality, merely by switching from one set of electrodes to another. Likewise, it is to be appreciated that the average moisture content of a plurality of cribs in a single kiln may be read by so arranging the cribs in the kiln that the ends of the pieces of lumber in adjoining cribs are abutted. For the latter purpose it is necessary to have a branch line 50 attached to the line leading from the last electrode in a row of electrodes and a branch line 51 attached to the line leading from the first electrode in a row so that by throwing the switch 52 the reading would account for the average throughout the kiln. It will be appreciated that a multiplicity of such arrangements could be arranged for reading the average of two, three, or other numbers of cribs.

Having illustrated and described a preferred embodiment of the present invention, it should be apparent to those skilled in the art that the same permits of modification in arrangement and detail. I claim as my invention all such modifications as come within the true spirit and scope of the appended claims.

I claim:

A lumber drying kiln comprising a structure in which lumber to be treated may be placed, a plurality of pairs of conductor wires leading from within the structure to the exterior thereof, the inner ends of said wires of each of said pairs terminating adjacent each other in said kiln and the inner ends of said pairs of wires terminating at positions spaced from each other in said kiln, an electrode comprising a lumber piercing needle connected to the inner end of each of said wires, a cylindrical member, a plunger longitudinally guided within said member and supporting said lumber piercing needle at one end in position to be projected from said cylindrical member, said plunger being provided with an internally threaded, coaxial bore, a threaded rod coaxially mounted in said cylindrical member for rotation therein, and means preventing relative longitudinal movement of said threaded rod with respect to said cylindrical member, said threaded rod being threadedly engaged with the internally threaded bore in said plunger, and the outer end of said threaded rod being adapted to be struck to drive said lumber piercing needle into lumber within the kiln when the needle is projected from said cylindrical member, said electrodes of each of said pairs of wires being positioned for insertion at spaced points in a single board of said lumber in said kiln, a plurality of switches positioned at an instrument station located exteriorly of said kiln, the outer ends of each of said pairs of wires being connected to one of said switches, a pair of conductors having a plurality of terminals arranged to be selectively engaged by said switches, and a moisture testing instrument at said instrument station and connected to said conductors.

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