Aug. 19, 1930. M. L. MUELLER 1,773,114

DEVICE FOR INDICATING THE DEGREE OF SHRINKAGE OR SWELLING OF MATERIALS

Filed Feb. 2, 1928 2 Sheets-Sheet 1

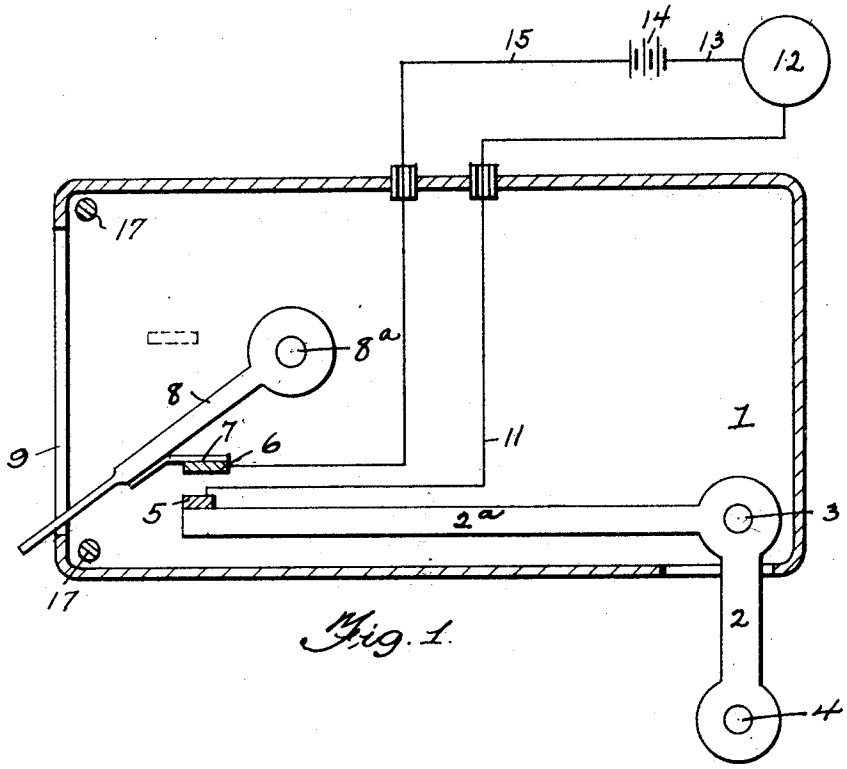


Fig. 1.

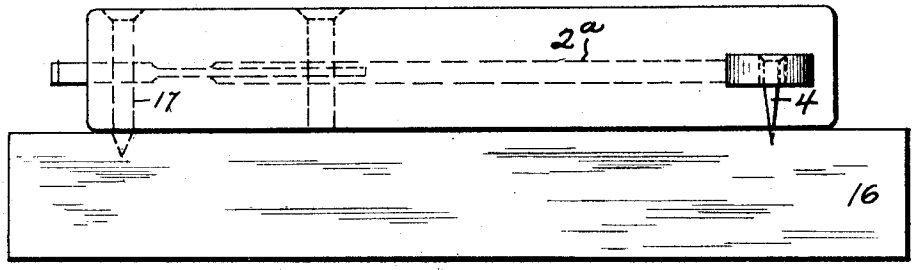


Fig. 2.

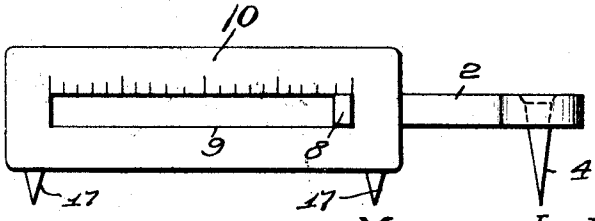


Fig. 3.

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DEVICE FOR INDICATING THE DEGREE OF SHRINKAGE OR SWELLING OF MATERIALS

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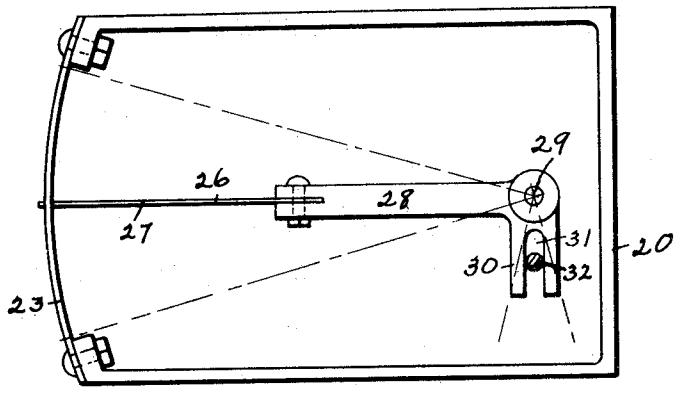


Fig. 4.

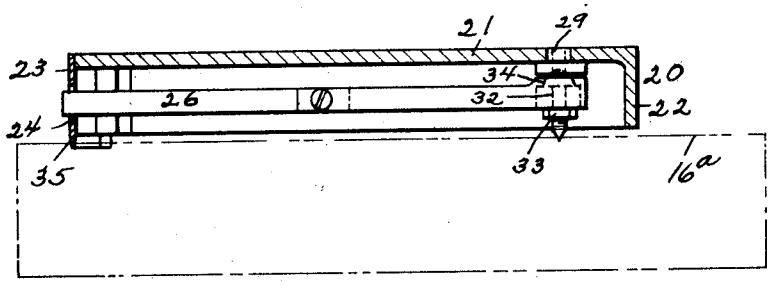


Fig. 5.

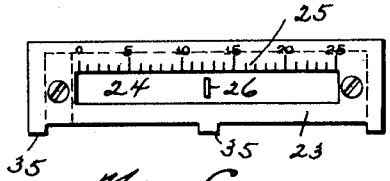


Fig. 6.

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UNITED STATES PATENT OFFICE

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DEVICE FOR INDICATING THE DEGREE OF SHRINKAGE OR SWELLING OF MATERIALS

Application filed February 2, 1928. Serial No. 251,387.

This invention relates to an apparatus for indicating the degree of shrinkage or swelling of materials being subjected to treatment. In many industrial processes, materials being treated are subjected to variations of temperature, moisture drying, etc., in such manner that the material is caused to shrink or swell. For example, when lumber is being dried, shrinkage of the wood is in close relation to its moisture content changes. In fact, I have found, from experience, that the laws of the shrinkage of lumber are in direct proportion to the moisture content thereof, and that, under the operation of those laws, the degree of shrinkage acts as a reliable index as to when the drying should be discontinued or changed.

In the lumber seasoning processes in common use, the time of terminating or changing the drying processes is determined by weighing samples of the drying wood. This is inconvenient, because it requires a person to enter the hot drying chamber, and it is inefficient because considerable time elapses before the result of the weighing is obtainable. During this elapsed time, harm may be done to the material being treated. The apparatus of the character herein disclosed and claimed is useful in any process wherein shrinkage or swelling of the material is involved, and wherein there is a definite relation between the amount of shrinkage or swelling and the process, though it is particularly useful in conjunction with lumber drying processes.

The method of controlling the processing of materials in accordance with change in dimensions thereof, under the influence of shrinkage or swelling is claimed in my copending application, Serial No. 232,094, filed November 9th, 1927, of which this application is a continuation in part.

In the drawings,

Figs. 1, 2 and 3 are, respectively, a horizontal section, a side elevation, and an end elevation of an indicating and controlling apparatus, adapted to close an electrical circuit when the drying of the material has reached a predetermined point, the section of Fig. 1 being taken just below the top of the casing, hereinafter described.

Fig. 4 is an underside plan view of a modified form of the apparatus, constituting a purely mechanical indicator.

Fig. 5 is a longitudinal sectional view through the apparatus of Fig. 4, and

Fig. 6 is an end elevation of the structure of Figs. 4 and 5.

Like numerals designate corresponding parts throughout the several figures of the drawings.

In the form of the invention illustrated in Figs. 1, 2 and 3, 1 designates a casing. A bell crank lever comprising a short arm 2, and a long arm 2^a is pivoted at 3, upon the base of the casing, and carries a prong 4, which projects downwardly from the outer end of the short arm 2, of the lever. The extremity of the long arm 2^a of the lever carries an electrical contact point 5, which coacts with an electrical contact point 6, that is supported by means of a spring tongue 7, from a swinging lever 8, said lever being pivoted at 8^a, to the base of casing 1. The outer portion of the lever 8 moves through a slot 9, formed in the end wall of the casing, said end wall being graduated as indicated at 10. The contact point 5 is connected by a conductor 11, with one side of an element 12, and the other side of this element 12 is connected by conductor 13, with a battery 14. The other side of the battery is connected by a conductor 15, with the contact point 6. Thus, it will be seen that whenever the contact points 5 and 6 touch each other, a circuit will be completed to energize element 12. This element may be either a visual signal, such as an electric light, an audible signal, such as a bell, or a controlling device, such as any one of the well known electrically operated valves purchasable upon the open market, and which may control steam, compressed air, water or any other liquid or gas used in the treatment of the material being processed.

A piece of the material being treated is indicated at 16, it being understood that this material may be located in a kiln or other closed chamber where the conditions as to temperature, moisture condition of the air, etc., may be controlled.

The structure described is placed upon the

material 16, the prong 4 being engaged with said material along with fixed prongs 17, of the base. The prongs 17 hold the casing or base in fixed position with relation to the material. The arrangement illustrated in Figures 1 to 3 is such that the circuit is closed under the influence of shrinkage. As the material 16 shrinks, the pin 4 is moved toward the left, in Figures 1 and 2, to swing the long arm of the bell crank lever toward, and to bring contact point 5, into engagement with contact point 6, thereby completing the circuit, as aforesaid.

In order to avoid any binding, due to the movement of the pin 4, upon an arc, said pin may be made of such flexibility as to be slightly yieldable laterally. By mounting the contact point 6 on a movable and definitely settable lever 7, I am able to provide for a variety of materials which will shrink different amounts, or to provide for different amounts of shrinkage in the same material. If the shrinking continues after contact 5 engages contact 6, lever 8 may be moved along scale 10, and visually indicate the degree of such shrinkage.

In using the device of the invention, the degree of shrinkage of any given material between its original or green condition, and the final condition at which the treatment is to be discontinued or changed, is determined. The lever arm 8 is then placed in such position, with respect to the scale, that its contact 6 will be touched by the contact 5, when the prong 4 has moved such determined distance. The reading of the scale 10 is noted at the time the treatment is started. The material is then treated or dried until, the electric circuit is completed by the contacts of points 5 and 6, at which time treatment is discontinued. Repeated using of the scale may be made upon the same material, without further experimentation, by a corresponding setting of the lever 8 at the beginning of each operation.

I have stated that the element 12 may be either a signal or a control device. A signal may be a control device in the sense that, when energized, it indicates that control is to be exercised upon the material being treated, to change the conditions exerted thereon. Therefore, the terms signal or control device are to be construed broadly, and as including either a signal, valve or other controlling element.

In the form of the invention illustrated in Figures 4, 5 and 6, 16^a designates a piece of material, such as a piece of lumber, that is being treated. The indicating apparatus comprises a casing 20.

In the particular embodiment of the invention illustrated in these figures, this casing comprises a top 21, an integral end wall 22, and a thinner removable end wall 23. The end wall 23 is slotted, as indicated at 24, and is graduated at 25, to constitute a scale along which an indicating arm or pointer 26 moves. This pointer comprises a relatively thin blade 27, that is clamped to an arm 28, of a bell crank lever. This bell crank lever is pivoted at 29 to the top wall of the casing. The other arm 30 of the bell crank lever is slotted, as indicated at 31, for the reception of a set pin 32. This set pin is threaded for engagement with a lock nut 33. It is manifest that if the screw be tightened to bind the lock nut against the underside of the arm 31 of the lever, the set pin will be bound in its adjusted position.

It is further clear that adjustment of the pin toward and from the pivot 29 will vary the degree of throw of the pointer 26, that will take place for any given movement of the pin under the influence of shrinkage or swelling of the material, as will be presently set forth. The lower end of the set pin is pointed to adapt it to slightly penetrate the surface of the piece of lumber 16^a, while the end wall 23 of the casing is provided with a plurality of sharpened prongs 35, which are also adapted to slightly penetrate the lumber. The last named prongs hold the casing 21 in fixed relation to the piece of lumber, with the result that the pointer 26 will move over the scale 25, under the influence of longitudinal change in dimension of the material, as the same shrinks or swells. The degree of such shrinkage or swelling will be apparent at any time upon mere inspection of the apparatus, and this enables kiln operators and lumber yard foremen to anticipate, and to estimate when the stock will reach the desired moisture content. Weather conditions make it extremely difficult for lumber yard operators to follow the exact rate of drying and to determine at any time very far in advance how much the stock has dried. The result is that the stock is sometimes found to be insufficiently dry, after it has been shipped or used. It is to be noted that the proportions of the bell crank lever are such that the movement of the set pin is multiplied several times, at the point where the pointer 26 passes over the scale. Thus, a very sensitive instrument is produced; one that will indicate a very slight change in the moisture content of the lumber.

It will further be observed that the movement of the pointer in Figures 4, 5 and 6 is a positive one in both directions. That is to say, if the device be used upon materials subject to swelling under treatment, the movement of the set pin away from prongs 35 will be just as accurately registered upon the scale as the movement of said set pin toward said prongs is registered under the influence of shrinkage of the material. It will be apparent that many constructions adapted to secure the desired results will readily suggest themselves to persons skilled in this art.

Consequently, it is to be understood that the invention is not limited to the particular ways herein shown and described, but that it includes within its purview any apparatus fairly within either the terms or the spirit of the appended claims.

Having described my invention, what I claim is:

1. A device of the character described, comprising a casing carrying prongs at a plurality of points for engagement with a plane surface of a piece of material being treated, there being a scale upon one of the walls of said casing, a bell crank lever pivoted upon said casing, a pointer associated with one arm of said bell crank lever and actuated by the movement of said arm and movable along said scale, and a pointed pin carried by the other arm of said bell crank lever, and adapted to engage the surface of the material being treated.

2. A device of the character described, comprising a support, pins projecting from the bottom of said support, adapted to penetrate the surface of a plane piece of lumber being treated, and thereby hold the support against movement on said lumber, a bell crank lever pivoted to swing about a vertical axis, upon said support, a pointed pin extending downward from the extremity of one arm of said bell crank lever, said pin being adapted to engage the surface of the lumber being treated, a pointer pivoted to swing horizontally with respect to the support, movable by the other arm of said bell crank lever, there being a scale upon the support along which said pointer moves.

3. A device of the character described, comprising a support, pins projecting from the bottom of said support, adapted to penetrate the surface of a plane piece of lumber being treated, and thereby hold the support against movement on said lumber, a bell crank lever pivoted to swing about a vertical axis, upon said support, a pointed pin extending downward from the extremity of one arm of said bell crank lever, said pin being adapted to engage the surface of the lumber being treated, a pointer pivoted to swing horizontally with respect to the support, movable by the other arm of said bell crank lever, there being a scale upon the support along which said pointer moves, an electric circuit and contact members included in said circuit, one of which is carried by the pointer, and the other of which is carried by the last named arm of the bell crank lever.

4. A device of the character described, comprising a casing having a plurality of spaced pointed pins projecting downwardly from its bottom, and adapted to engage at a plurality of points with the plane face of a piece of lumber being treated, whereby said casing is held against movement with respect to said lumber, a bell crank lever pivoted in said casing to swing in a horizontal plane, one arm of said bell crank lever projecting outwardly beyond said casing, a pointed pin carried at the extremity of the last named arm, adapted to penetrate and be engaged with the surface of the said piece of lumber, an electric circuit, an alarm in said circuit, and contact members included in said circuit, one of which is carried by the other arm of the bell crank lever, as and for the purposes set forth.

5. A structure as recited in claim 4, in combination with a pointer by which the other contact member is carried, said pointer being mounted to swing horizontally about a vertical pivot in said casing.

6. A structure as recited in claim 4, in combination with a pointer mounted to swing about a vertical pivot, and in a horizontal plane in said casing, the other of said contact members being carried by said pointer, said pointer projecting through the end wall of the casing, said end wall being provided with graduations constituting a scale with which the pointer coacts.

In testimony whereof I affix my signature.

MORITZ L. MUELLER.