D. R. TANNER.

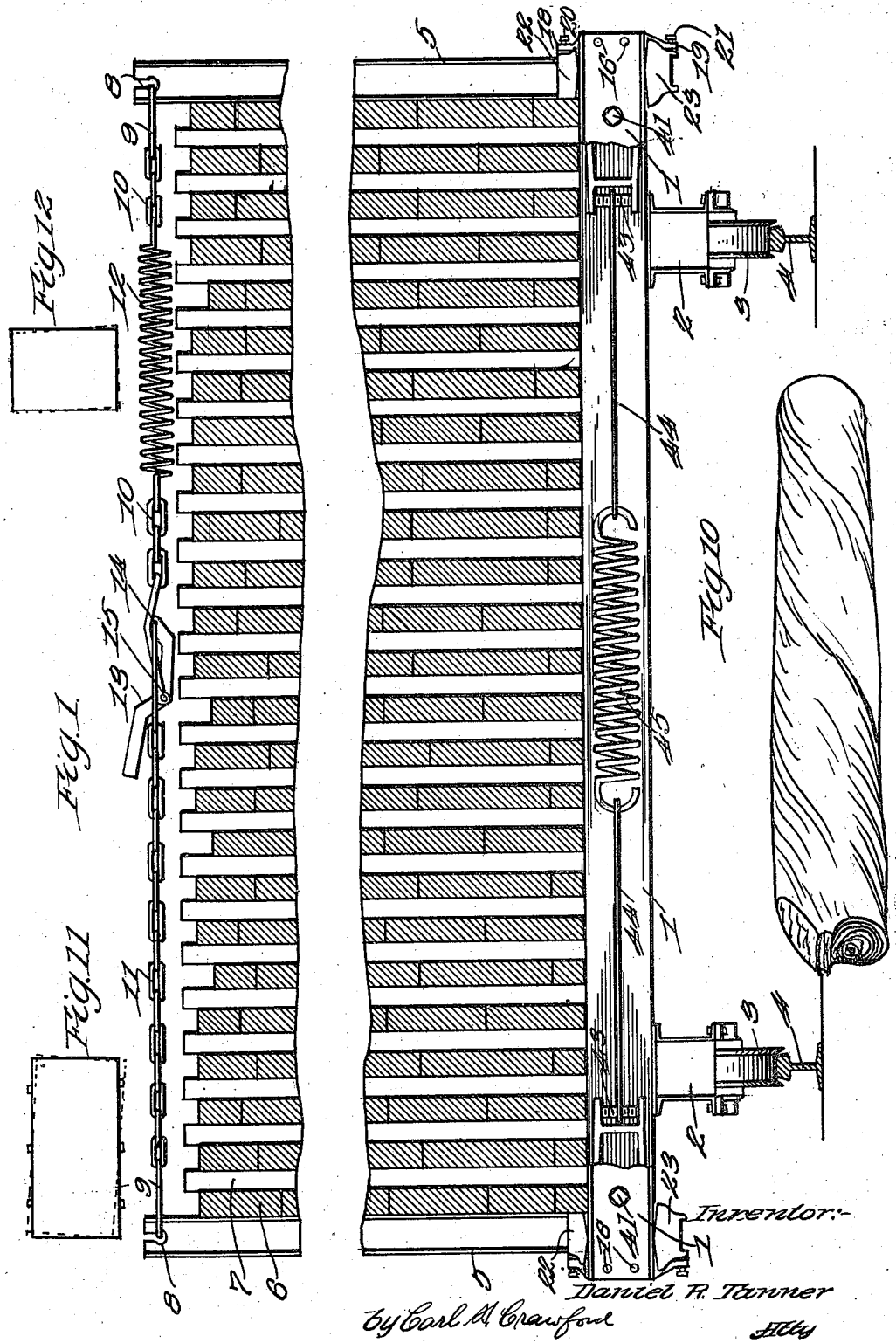
METHOD OF AND APPARATUS FOR PREVENTING WARPING AND TWISTING OF LUMBER DURING KILNING.

APPLICATION FILED FEB. 24, 1916.

1,212,583.

Patented Jan. 16, 1917.

3 SHEETS—SHEET 1.



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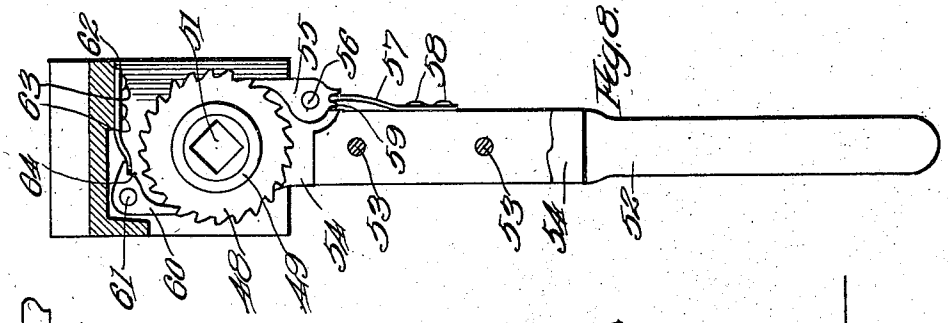


Fig. 6.

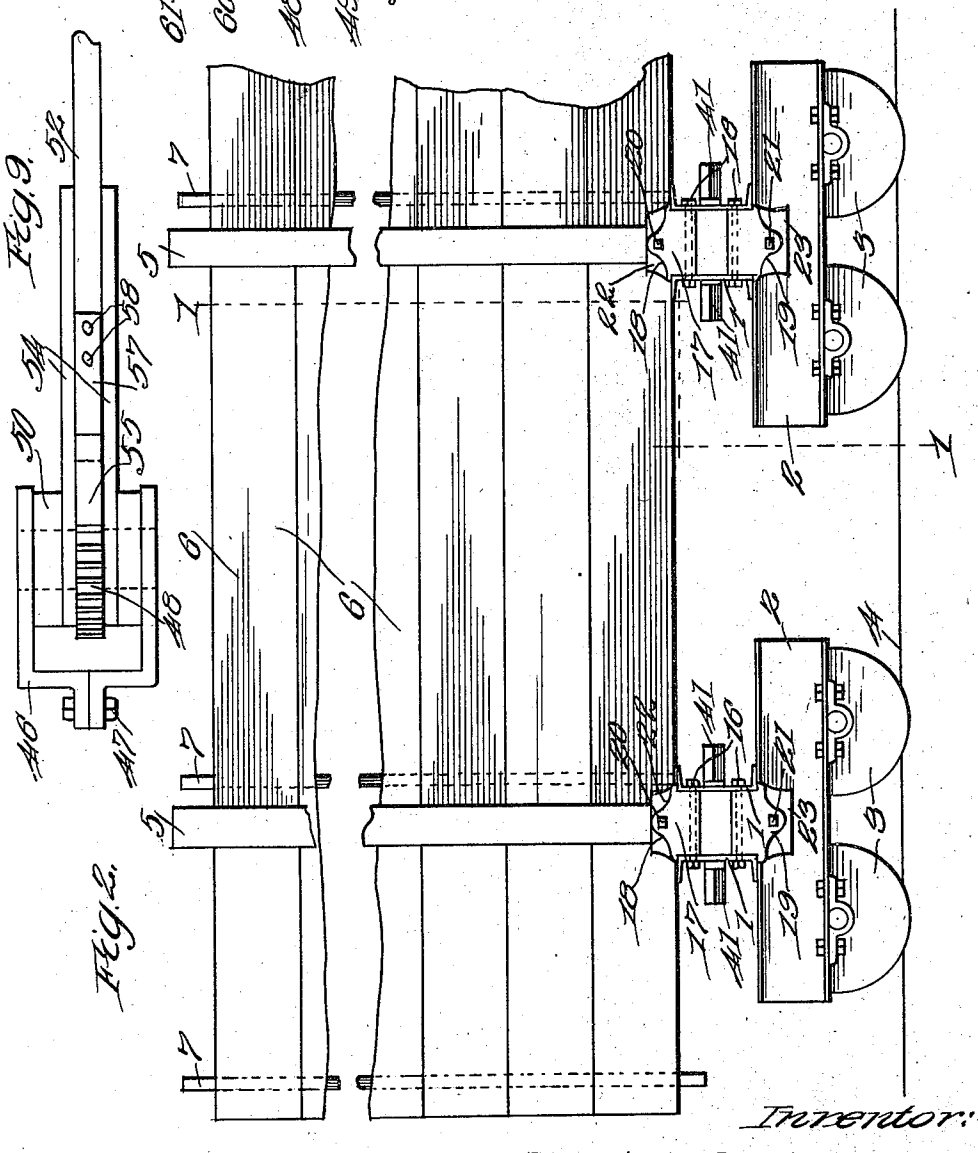


Fig. 9.

Fig. 2.

Inventor:-

Daniel R. Tanner

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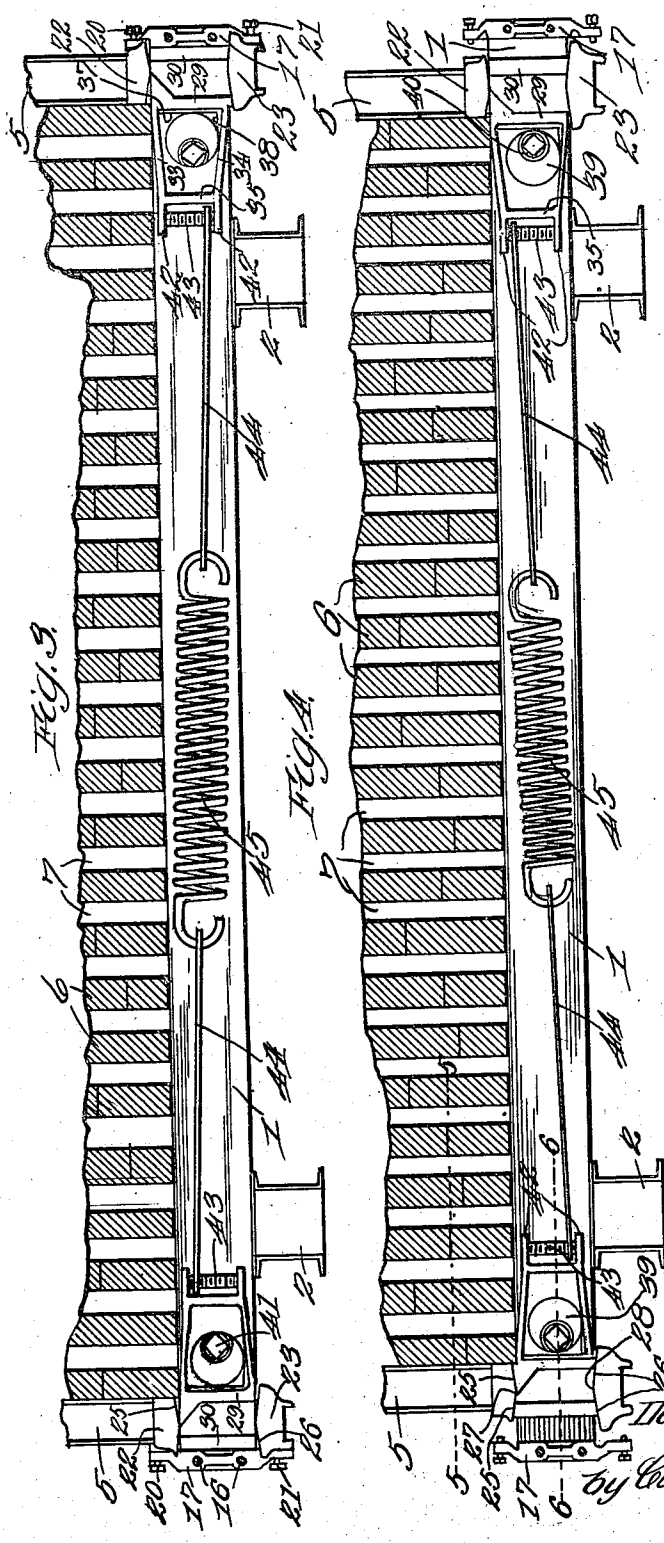


Fig. 3.

Fig. 4.

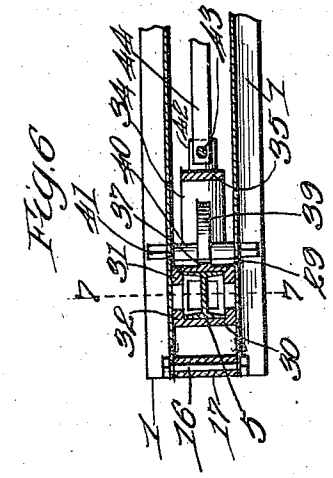


Fig. 6.

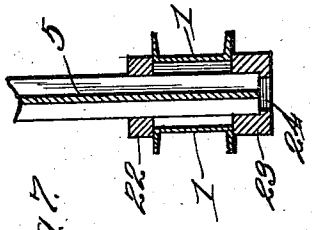


Fig. 7.

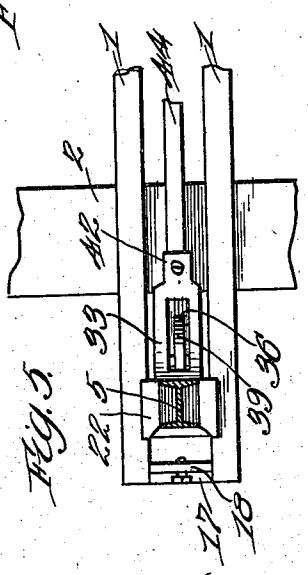


Fig. 5.

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UNITED STATES PATENT OFFICE.

DANIEL R. TANNER, OF LA GRANDE, OREGON.

METHOD OF AND APPARATUS FOR PREVENTING WARPING AND TWISTING OF LUMBER DURING KILNING.

1,212,583. Specification of Letters Patent. Patented Jan. 16, 1917.

Application filed February 24, 1916. Serial No. 80,316.

To all whom it may concern:

Be it known that I, DANIEL R. TANNER, residing at La Grande, in the county of Union and State of Oregon, United States of America, have invented new and useful Improvements in Methods and Apparatus for Preventing Warping and Twisting of Lumber During Kilning, of which the following is a specification.

This invention has for its object the provision of improved means for preventing lumber from twisting when the lumber is being dried or kilned.

It has been determined that a tree exposed to the rays of the sun will twist in the direction in which the sun moves about the tree. When the tree or log is sawed up into boards, the green boards will be flat, but when these boards are dried or kilned they will twist in the direction in which the log, from which they were sawed, was twisted by the sun. Trees not exposed to the sun's rays will not twist but the lumber from a plurality of logs is never assorted to segregate the lumber with inherent twist from lumber without such twist and therefore when a stack of boards is closely held in compact form, those boards which twist during the drying operation will not only distort themselves from true planes but will distort adjacent boards that would normally dry flat. The drying or kilning of lumber not only initiates twist of certain kinds of stock but warping of all kinds of stock and if the lumber is permitted to either twist or warp when kilned, it will be graded low and the resultant loss will be very great.

It is one of the primary objects of this invention to provide means for embracing a stack of lumber during the kilning operation, and holding the lumber in such compact pressure engagement and abutting relation as not only to prevent warping but to resist and prevent twisting, and my invention has to do not only with the improved mechanism, but also with the method of performing this function.

Lumber to be kilned is usually stacked on edge on a carrier or car provided with a plurality of upstanding or upright stakes for embracing the lumber stack on opposite sides thereof. My invention includes means for each pair of stakes, the said means being selectively adjusted in suitable gradation or degrees so as to automatically act at different longitudinal and vertically elevated points on the load with varying or different degrees of pressure in such a manner that the finished kilned stack will be rectangular instead of trapezoidal in cross sections, which latter form it would take if the lumber were permitted to twist when kilned.

An interdependent function to the foregoing, is that of not only preventing twist, but at the same time, preventing the lumber from warping, and also, holding the lumber under such sustained pressure that when the boards dry and their edges space apart as a result of shrinkage, the lumber will be prevented from collapsing into contact and adjacent edges will be sustained in spaced relation so that all areas of each board will be exposed to the kilning action.

A special feature of novelty consists in providing each stake of each pair or set with an independently tiltable pocket or holder, the pockets of each stake set being connected by actuating means which is adjustable for the purpose of causing the upper end of one stake to exert a greater degree of restraint or resistance against lumber twist than the lower end of such stake, the said means causing the companion stake to exert a greater resistance against twist at its lower end than at its upper end.

In practice, lumber twist initiates from the longitudinal vertical center of the stack and increases toward the ends of the stack, and one end of the stack will seek to twist in one direction whereas the other end of the stack will seek to twist in a direction reverse to the first named direction.

Now, in accordance with my improved method and structure, I can adjust sets of stakes from the central set toward the end sets in increasing gradations in accordance with the gradation of increase of twist and also in accordance with the reversal of twist, end to end, so as completely to eliminate any distortion of the stack from a true rectangular cross section during the kilning operation.

Other features of novelty will be more fully described in connection with the accompanying drawings and will be more particularly pointed out in and by the appended claims.

In the drawings:—Figure 1 is a vertical sectional view on line 1—1 of Fig. 2. Fig.

2 is a view in elevation looking from the left of Fig. 1. Fig. 3 is a sectional view similar to the lower portion of that shown in Fig. 1 illustrating the difference between a central or neutral adjustment and an end adjustment. Fig. 4 is a view similar to Fig. 3 showing the reverse adjustment for the opposite end with the parts released so that the stakes will exercise pressure engagement on the load. Fig. 5 is a horizontal sectional view taken on line 5—5 of Fig. 4, with the lumber omitted. Fig. 6 is a sectional view on line 6—6 of Fig. 4. Fig. 7 is a sectional view on line 7—7 of Fig. 6. Fig. 8 is a sectional view of an improved type of wrench employed in the device of my invention. Fig. 9 is a view in elevation of the wrench looking from the right of Fig. 8. Fig. 10 is a view of a log which is spirally lined to show the direction of twist from the sun's rays. Fig. 11 is a diagrammatic plan view of a stack of lumber showing in full lines how the device of my invention prevents twist, and showing in dotted lines, in greatly exaggerated form how the lumber would twist without the device of my invention. Fig. 12 is view in end elevation showing in full lines how the device of my invention prevents lumber twist, and in dotted lines how the lumber would twist in the absence of my improved apparatus.

Like characters of reference designate similar parts throughout the different figures of the drawings.

As illustrated, the device of my invention is in the form of a lumber carrier comprising a plurality of bolsters, each of which is shown formed of lengths of channel iron 1. Each bolster of the carrier is mounted upon a pair of truck units and each truck unit comprises a truck bolster 2 supported upon truck wheels 3, the latter being adapted to run upon rail 4. The foregoing comprises a lumber carrier, as a whole, upon which the lumber may be stacked. In order to sustain the lumber in edged stacked form, each carrier bolster is provided with a pair or set of stakes 5 extending vertically along opposite sides of the load at spaced points therealong as indicated in Fig. 2. The lumber 6 is stacked on edge and stickers 7 are interposed between each stacked tier to hold the adjacent sides of tiers in spaced relation in order to expose lateral areas of the boards to the kilning action.

The stakes 5 are shown formed of I-beams and the webs at the upper ends are notched at 8 to receive chain loops 9, the chain loops 9 being connected with chains 10 and 11. In chain 10 there is interposed a contractile spring 12, as shown in Fig. 1. Chain 11 is provided with a toggle lever take-up which comprises a lever 13 pivoted at 14 to one portion of chain section 11 and pivoted at 15 to another section of chain 11. When the carrier has been stacked with lumber each pair or set of stakes is yieldingly connected by this spring take-up when the lever 13 is thrown into the position shown in Fig. 1, with the pivots 14 and 15 beyond dead center relation thereby sustaining the upper ends of a pair of stakes in pressure engagement against opposite sides of the load.

Reference will next be made to the novel means of pocketing, and tension actuating the lower ends of the set of stakes.

Each carrier bolster composed the channels 1 is made rigid by bolts 16 which pass through the webs of the channels 1 and also through abutment spacing members 17 thereby rigidly connecting the channels 1 in suitable spaced relation. The abutment members 17 have upper and lower projections 18 and 19, each provided with adjustable pocket abutments which may be in the form of oval ended screws 20 and 21. A pocket is provided for each stake and as all pockets are identical in structure and operation only one need be described in detail.

Referring to Figs. 5 to 7, each pocket comprises upper and lower tilting members 22 and 23, respectively, through which the stake 5 projects, and the lower member 23 is reduced at 24 in order to limit descent of the stake therein and thereby support the stake. Said tilting members 22 and 23 project laterally in overlapping relation against the flanges of the channels 1 and said members are chamfered off as indicated at 25 and 26, from central fulcrum points 27 and 28, in opposite directions, to permit the stake with its pocket to be tilted in either direction in a single plane with respect to a true vertical position. It will thus be seen that the pocket structure tiltably engages the carrier bolster, above and below the same in such a manner as to be effectively supported thereby.

The pocket comprises stakeholding portions 29 and 30 which extend vertically between the channels 1 and which are preferably formed integral with the upper and lower members 22 and 23. Said holding members 29 and 30 embrace the stake flanges on opposite sides as indicated at 31 and 32. Extending inwardly from the holding member 29, of the pocket, is a yoke having upper and lower lengths 33 and 34 which are joined by a bight 35. The upper length 33 is slotted at 36 and along the member 29 and lower length 34 I arrange elevated cam tracks 37 and 38. The cam 39 is provided with eccentrically disposed trunnions 40 which are journaled in the webs of channels 1, the outer ends of the trunnions being polygonal, as indicated at 41, for application thereto of my improved wrench which will presently be described. Extending from the yoke of each pocket is a pair of lugs 42 in which a threaded spring link ad-

justing member 43 is mounted in such a manner that it may be rotated about its own axis without being shifted axially. To each link adjusting member there is applied a link or strap designated at 44, to the inner ends of which is connected a contractile spring 45 having tension power considerably in excess of spring 12.

The function of the spring 45 is to contract or embrace its set of stakes against opposite sides of the load so that when the latter is subjected to tension the stakes on each side will have take-up actuation and therefore it will not be necessary to shift the entire load laterally in order to take up slack of shrinkage reduction in volume. By having the spring 45 floatingly free, the stakes on opposite sides will each only shift a portion of the load into compact relation.

When the cams are in the position shown in Fig. 3, and also in Fig. 1, the springs 45 are distended and the stakes 5 are positively held by the cams not only in spaced relation but in engagement with the end abutment 17 in such a manner that the stakes will be truly vertical. In this position, the cams will be rotated with their greatest diameters in engagement with tracks 37 and slightly beyond a dead center position, adjustment being limited beyond such dead center position by tracks 38 against which the cams are forced downwardly. When the carrier is loaded and ready to be run into the kiln, then the cams are released in a clockwise direction from the position shown in Fig. 3, to the position shown in Fig. 4. The springs 45 instantly act to move the pockets inwardly from the abutments 17 and in such spaced relation thereto that the pockets will be unrestrained by the abutment plates, and will be free to have exerted thereon such differential action as the springs are adjusted to impart.

I will next describe one of the most important features of the invention whereby unequal tension stress is exerted by the springs 45 to cause one end of one stake of a set to exert a greater pressure on the load than the other end of such stake, and to cause a reverse action or stress tension on the companion stake of such set.

In Fig. 1 the links 44 are adjusted to a true horizontal position because the stakes which this spring actuates are in the middle of the load, longitudinally speaking. Therefore, the central stakes 5, as shown in Fig. 1, will be under tension throughout their entire height to exert a uniform stress against the load. These central stakes are not called upon to correct or prevent twist but merely to prevent warping of the lumber when the same dries.

In Fig. 3 I have shown the adjustment which would be made at one extreme end of the load, such adjustment being effected by turning adjusting screws 43 to elevate the links 44 at one side and correspondingly lower the opposite link so as to dispose the spring 45 at an angle to the horizontal. Now referring to Fig. 3, it will be clear that the upper end of the left hand stake 5 will exert a greater pressure against the load than the lower end of such stake. Inversely, the lower end of the right hand stake of Fig. 5 would exercise a greater stress or pressure against the load than the upper end of said right hand stake. At the opposite end of the load, as will be seen by reference to Fig. 4, the left hand link 44 is adjusted downwardly and the right hand link is adjusted upwardly. Thus the lower end of the left hand stake would exert a greater pressure than the upper end of such stake, and inversely, with respect to the right hand stake of Fig. 4. At this point, I wish to make it clear that the difference of pressure exerted by the stakes at different elevational and longitudinal points along the load is not sufficient to shift the stakes out of a vertical position, except perhaps temporarily, where such shifting movement is caused by the twisting lumber itself shifting the stakes from a normal or true vertical position, the tilting pockets affording this movement. The main point is that the actuating mechanism for each set of stakes is adjusted to impart differential action of said stakes against the load with sufficient pressure to resist distortion of the load at any longitudinal point from a true rectangular position and the adjustment effected will act only to maintain the stakes parallel. Those sets of stakes between the central or neutral stakes, toward the endmost stakes, will be adjusted in graduated degrees from the neutral adjustment shown in Fig. 1 toward the adjustment at one end, as shown in Fig. 3, or reversely toward the other end, as shown in Fig. 4. In other words, the slant of the links 44 of that set of stakes next adjacent the endmost stakes shown in Fig. 3 will be slanted at the same inclination but not to the same degree from the horizontal, as the adjustment in Fig. 3 for the reason that the greater extent of twist will be nearest the end of the load.

In Fig. 10 I have shown a log spirally lined to indicate the direction of twist.

Figs. 11 and 12 graphically illustrate the manner in which the load would twist from a true rectangular cross section if the lumber were not restrained. In this connection, it is desired to emphasize the fact that even if a majority of the boards were of a character to dry flat, the moiety of boards having an inherent twist would distort all of the other boards of the load from true flat condition.

It will be understood that the problem presented, and which this invention has

solved, is not present in cases where lumber is loosely piled to form a load and then subjected to the action of the kiln but only where it is attempted to hold the lumber in flat abutting relation.

By reason of the fact that the springs 45 are much stronger than the springs 12, they will exercise a controlling moment in applying stress to the stakes and the springs 12 will conform and supplement the action of springs 45.

By reason of the fact that the polygonal trunnion ends 41 are not readily accessible after the carrier is loaded, and by reason of the tremendous stress exercised by the springs 45 when the cams are partially released, I find it desirable to provide a special type of cam actuating wrench which is designed to not only take care of the foregoing requirements but also to prevent dangerous kicking which might injure the operator.

Referring more particularly to Figs. 8 and 9, 46 designates a wrench or ratchet frame which may be made in two parts and which is shown suitably connected as by a bolt 47. Looking at Fig. 8, one dimension of said frame is such that the frame will fit snugly between the flanges of the channels 1 to provide a locking anchorage, the purpose of which will presently appear. A ratchet wheel 48, having ratchet teeth, is rotatively mounted in said frame by means of hollow trunnions 49 which extend through spacing blocks 50 and through said frame. The entire ratchet structure 48 is provided with a polygonal board 51 adapted to take over or receive one of the polygonal ends 41 when the wrench is applied against the web of one of the channels 1. The wrench is provided with a handle 52 of sufficient length to project beyond the truck or carrier and be accessible to the operator. Said handle 52 is bolted by bolts 53 to bars 54 and the latter are journaled on the trunnions of the ratchet wheel 48 to loosely oscilate thereon. A ratchet pawl 55 is journaled on a pin 56 so as to be actuated upon movement of the handle. A spring 57, anchored at 58 on the handle, engages said pawl at 59 to hold the pawl in engagement with the teeth of the ratchet wheel. A reversely disposed pawl 60 is journaled on a pin 61 for engagement with the ratchet teeth in opposition to the pawl 55. A spring 62, anchored at 63, engages said pawl 60 at 64, to hold the same in engagement with said ratchet wheel.

The wrench may be applied with the pawl 55 uppermost or lowermost in accordance with the direction in which the spacing cam is to be rotated. If for instance the spacing cam is to be rotated from the position shown in Fig. 3 to the position shown in Fig. 4, the wrench will be applied with the pawl 55 uppermost. After the cam has been ratcheted by oscillation of handle 52 beyond a dead center position, the cam will be actuated by the tremendous force of spring 45 until it reaches the position shown in Fig. 4. During this spring actuation of the cam, which is very violent, the ratchet wheel 48 will run wild thereby saving the operator from injury. If the cam is to be turned from the position shown in Fig. 4 to the position shown in Fig. 3, then the wrench will be applied to dispose the pawl 55 lowermost and the pawl 60 will lock the ratchet wheel against return movement at each oscillation of the handle 52 in backing the pawl 55 for engagement with an advance tooth.

It will be seen from the foregoing that my improved method consists in imparting differential and varying pressure at spaced longitudinal and elevational points along the lumber load to prevent a load of compact lumber from twisting during the kilning action.

It is believed that my improved method and apparatus will be fully understood from the foregoing description, and while I have shown specific forms thereof, I do not wish to be limited to what is shown and described except for such limitations as the claims may import.

I claim:—

1. In a mechanism for preventing warping and twisting of lumber during drying, apparatus exerting a substantially constant follow-up action at different points along the load of material during shrinkage and irrespective of the reduction of volume thereof and also exerting a variable pressure at different longitudinal and elevational points along the load, whereby the lumber is prevented both from warping and also twisting during the drying operation, substantially as described.

2. In a mechanism for preventing twisting of lumber during drying, apparatus exerting a substantially constant follow-up pressure with variable action at different longitudinal and elevational points along the load of lumber, whereby the lumber is prevented from twisting during the drying operation, substantially as described.

3. In a mechanism for preventing twisting of lumber during drying, apparatus exerting a substantially constant follow-up pressure on both sides of the load of lumber and with variable action at different longitudinal and elevational points on both sides thereof thereby preventing twisting of the lumber while it is drying, substantially as described.

4. In a mechanism for preventing twisting of lumber during drying, apparatus exerting a substantially constant follow-up pressure on both sides of the load of lumber and at the top and bottom of such sides

with a variable action at different longitudinal and elevation points on both sides thereof, thereby preventing twisting of the lumber during drying, substantially as described.

5. In a mechanism for preventing warping and twisting of lumber during drying, apparatus exerting a substantially constant follow-up pressure at different points along both sides of a rectangular load of lumber to be dried and irrespective of variation of shrinkage and reduction of volume and also exerting stress in different directions at opposite ends of the load to prevent twisting during drying of the lumber, substantially as described.

6. In a mechanism for preventing warping and twisting of lumber during drying, apparatus applying pressure to different parts of a lumber load in opposition to shrinkage twisting stress distortion of the lumber during drying to prevent twisting of boards in one portion of the load from distorting boards which would otherwise dry flat, substantially as described.

7. In a mechanism for preventing twisting of lumber during kilning, means for supporting the lumber to be kilned, a plurality of independent sets of actuated stakes gripping the load on opposite sides and at spaced points therealong to take up shrinkage irrespective of variation or volume, and an independent mechanism for each set of stakes for actuating the stake sets near one end of the load to prevent lumber twist in one direction and to actuate stake sets near the other end to prevent lumber twist in a direction opposite from the first named direction, substantially as described.

8. In a mechanism for preventing twisting of lumber during kilning, means for supporting the lumber, a plurality of sets of independent stakes engaging the load on opposite sides thereof, an independent adjusting mechanism for each set of stakes, and means for adjusting the mechanisms of said sets from the central set toward the end sets in increasing gradation to cause those sets on one side of said central set to resist twist shrinkage of the lumber in one direction and those sets on the other side of said central set to resist shrinkage twist in a direction opposite from said first named direction, substantially as described.

9. In a mechanism for preventing twist of lumber during kilning, means for supporting the lumber, a plurality of sets of stakes engaging the lumber load on opposite sides thereof, an independently adjustable stake actuating mechanism for each set of stakes, and means for adjusting the mechanism of one set of stakes to cause the upper end of one stake of such set to exert a greater resistance against lumber twist than the lower end of such said stake, and vice versa as regards the companion stake of such set as regards the upper and lower ends thereof, substantially as described.

10. In a mechanism for preventing the twisting of lumber during kilning, means for supporting the lumber, a set of stakes for engaging the load on opposite sides thereof, a tiltable pocket for each stake, and means acting through said pockets to apply follow-up tension on said stakes and tilt said pockets to cause the upper end of one stake to exert a greater resistance against shrinkage twist than the lower end of such said stake, and vice versa as regards the upper and lower ends of the other stake of said set, substantially as described.

11. In a mechanism of the class described, means for supporting the lumber to be kilned, stakes engaging the load on opposite sides, and floating means for urging opposed stakes against said load, substantially as described.

12. In a mechanism of the class described, means for supporting the lumber to be kilned, stakes engaging the load on opposite sides, floating means urging opposed stakes against said load, and independent devices for retracting said stakes away from said load, substantially as described.

13. In a mechanism of the class described, means for supporting the lumber to be kilned, stakes tiltably mounted on said means for engaging the load on opposite sides, and floating means urging opposed stakes against said load, substantially as described.

14. In a mechanism of the class described, means for supporting the lumber to be kilned, stake abutments on said means, stakes tiltably mounted on said means, floating mechanism for urging opposed stakes against said load, and independent devices for shifting said stakes away from said load and against said abutments, substantially as described.

15. In a mechanism of the class described, means for supporting the lumber to be kilned, stake abutments on said means, stakes tiltably mounted on said means, mechanism urging said stakes against opposite sides of said load, and devices for shifting said stakes away from said load and into rigid positions against said abutments, substantially as described.

16. In a mechanism for preventing lumber from twisting during kilning, a carrier bolster for supporting the lumber to be kilned, a stake pocket slidably and tiltably mounted on each end of said bolster, a stake mounted in each pocket, a cam for actuating each pocket and rotatively mounted in said bolster, a spring for each pair of pockets to contract said stakes against opposite sides of the load, and devices for adjustably connecting said spring with said pockets to

alter the direction of contracting pull of said spring and thereby vary the action of the stakes on said load to prevent twist of the lumber, substantially as described.

17. In a mechanism for preventing lumber from twisting during kilning, a carrier bolster for supporting the lumber to be kilned, a stake pocket slidably and tiltably mounted on said bolster at each end thereof, a stake in each pocket, a spring for each pair of pockets to contract the stakes thereof against said load, and devices for adjustably connecting said spring with said pockets to alter the direction of pull of said spring and thereby vary the action of the stakes on said load to prevent twist of the lumber, substantially as described.

18. In a mechanism for preventing lumber from twisting during kilning, means for supporting the lumber to be kilned, stakes engaging the load on opposite sides thereof, minor spring take-up means actuating the stakes at one end thereof to compress the load, and major spring take-up means actuating the opposite ends of the stakes to cause the latter to resist and prevent distortion of the load from twist of the lumber, substantially as described.

19. The herein described method of controlling lumber during kilning, which consists, in holding the load under compression during kilning and exerting pressure on certain parts of the load in excess of the pressure on other parts to prevent distortion of the load under twisting action of the lumber during kilning, substantially as described.

20. The herein described method of controlling lumber during kilning, which consists, in holding the load under compression during kilning with a constant pressure uniformly exerted along the load at spaced points to prevent the lumber from warping during kiln shrinkage, and in exerting pressure at selected points along the load in excess of said uniform constant pressure to prevent distortion of the load under twisting action of the lumber during kilning, substantially as described.

21. The herein described method of controlling lumber during kilning, which consists, in holding the load under compression during kilning with a constant pressure substantially uniformly exerted at spaced points longitudinally and vertically along the load to prevent the lumber from warping during kiln shrinkage, and in exerting pressure at selected points along the load in excess of said uniform pressure in different directions and in graduated degrees to prevent distortion of the load under twisting action of the lumber during kilning, substantially as described.

22. The herein described method of controlling lumber during kilning, which consists, in holding the load under different degrees of pressure exerted in different directions and during shrinkage to prevent twisting during shrinkage.

23. In a mechanism for holding lumber under pressure during kilning, a bolster for supporting the lumber comprising channels, stakes mounted on said channels for gripping the load, means rotatively journaled in said bolster for shifting one of said stakes out of engagement with the load, and ratchet wrench mechanism non-rotatively and interchangeably fitting between the flanges of said bolster for rotating said means in either of two directions, substantially as described.

In testimony that I claim the foregoing as my own, I hereby affix my signature.

DANIEL R. TANNER.