

No. 830,116.

PATENTED SEPT. 4, 1906.

E. TYDEN.
SANDING MACHINE.
APPLICATION FILED JAN. 21, 1904.

5 SHEETS—SHEET 1.

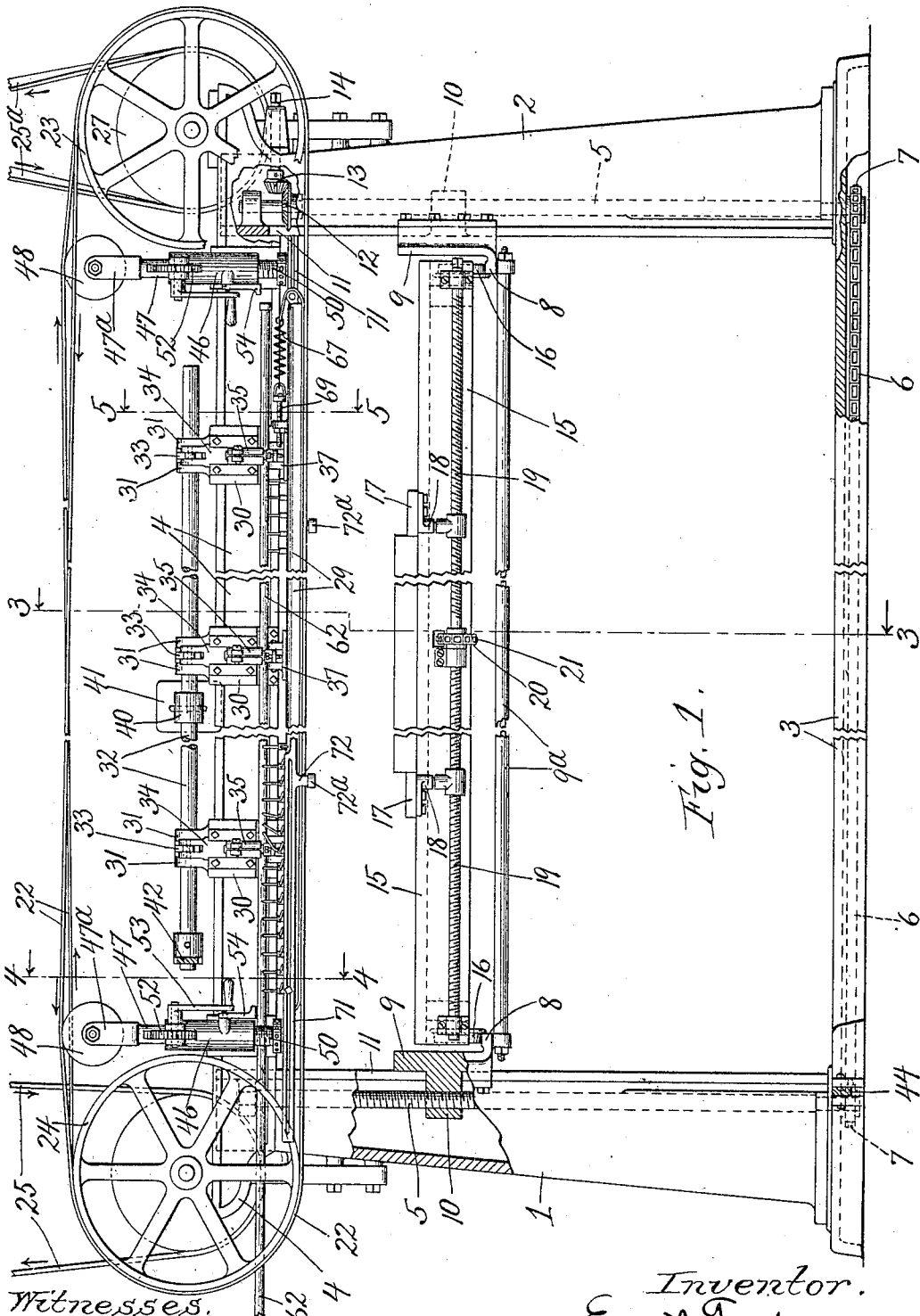


Fig. 1.

Witnesses.
Edward T. Wray.
Fred G. Fischer

Inventor.
Emil Tyden
by Burton Burton
his Atty's

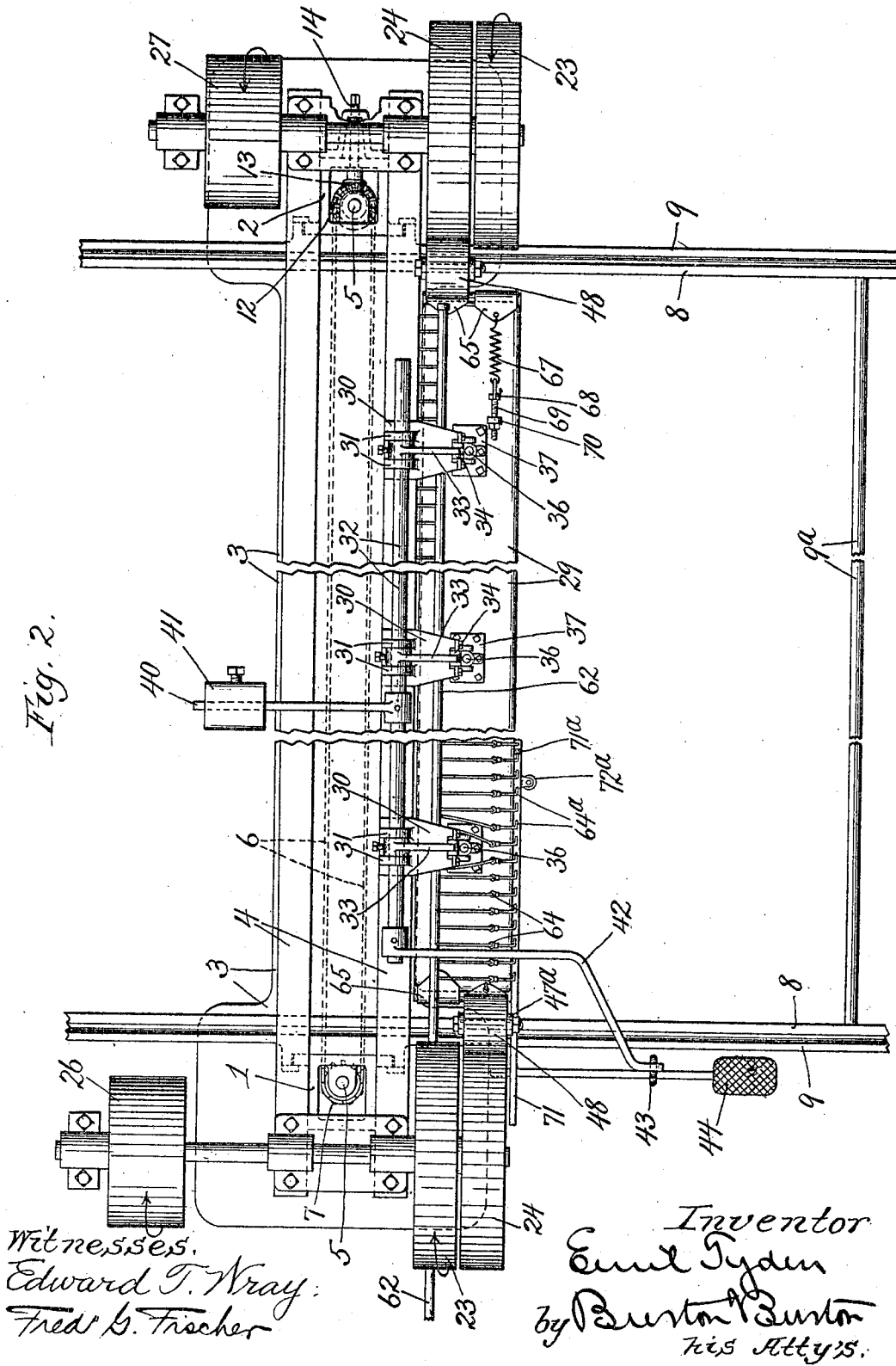
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5 SHEETS—SHEET 2.

Fig. 2.



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Fred B. Fischer

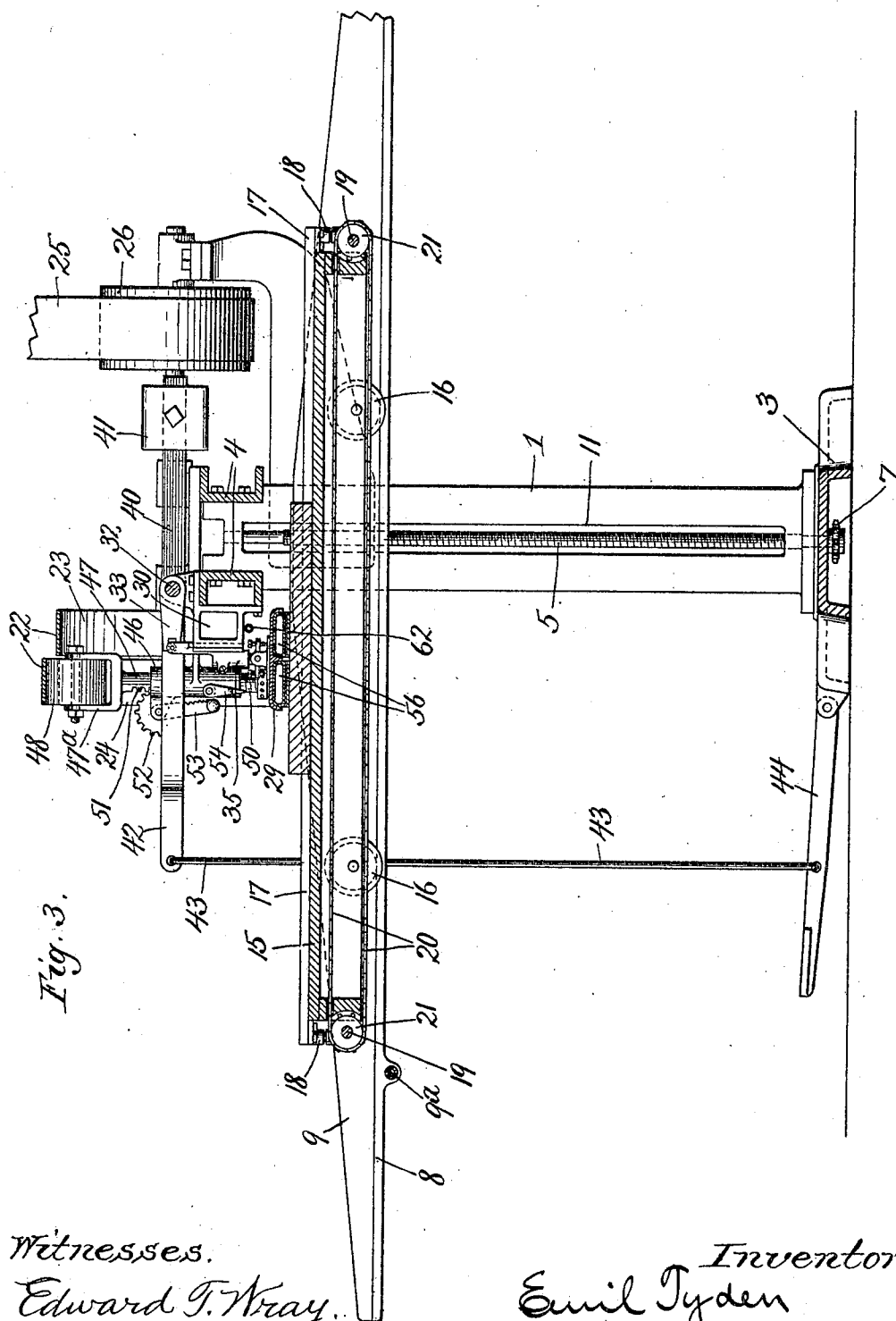
Inventor
Emil Tyden
by *Burton & Burton*
his Attys.

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6 SHEETS—SHEET 3.



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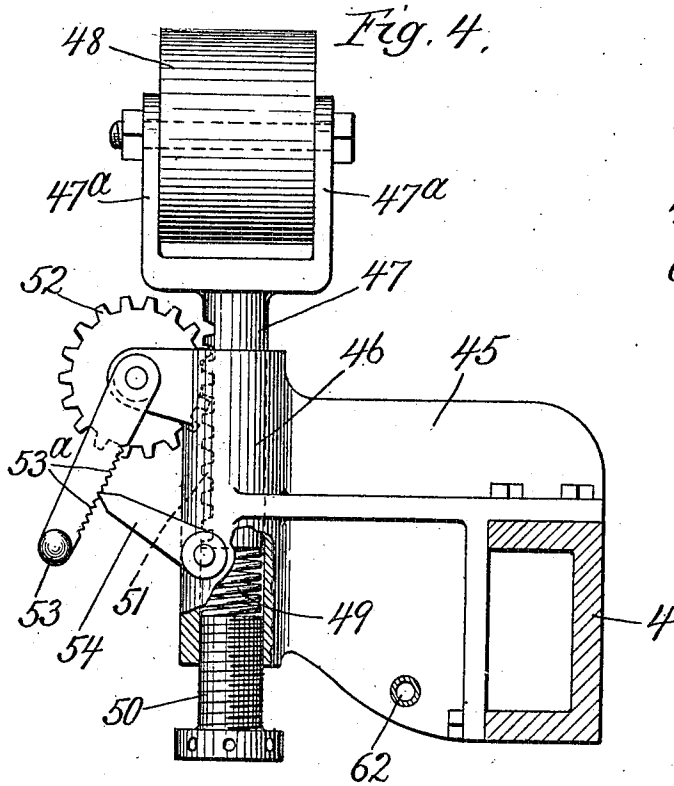
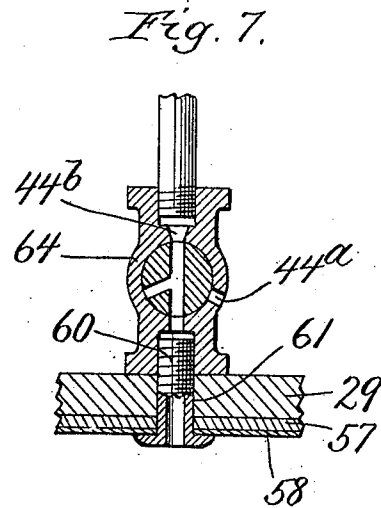
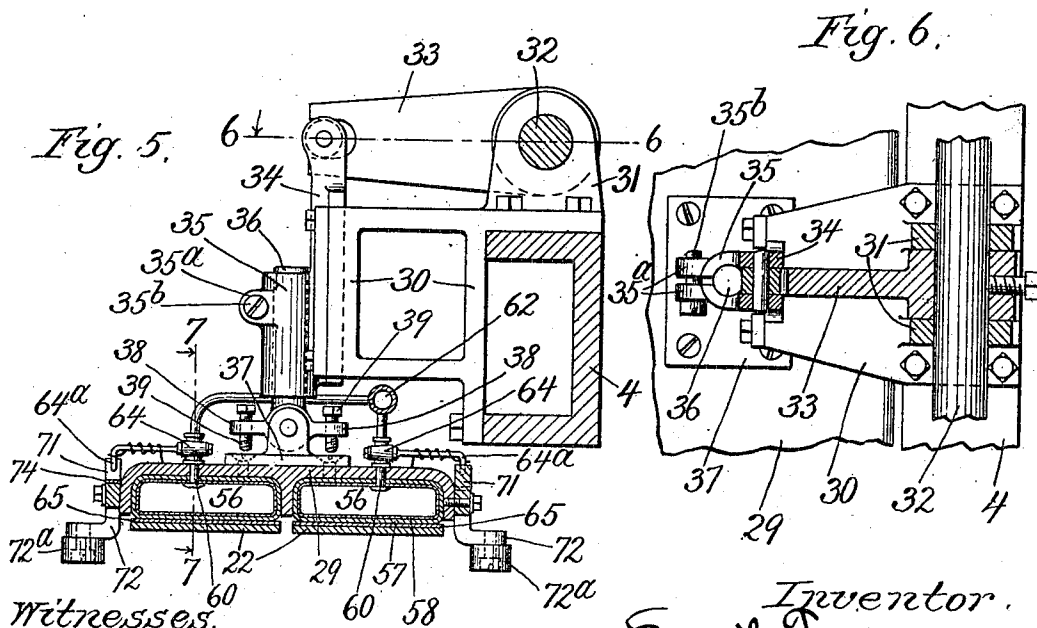


Fig. 6.

Inventor.
Emil Tyden
by *Burton Burton*
Att'y

Witnesses.
Edward T. Wray.
Fred B. Fischer

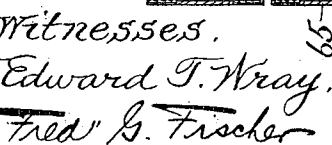
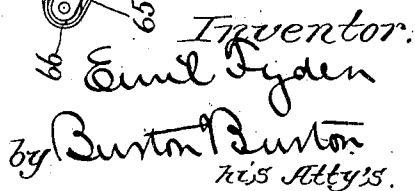
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6 SHEETS--SHEET 6.



UNITED STATES PATENT OFFICE.

EMIL TYDEN, OF HASTINGS, MICHIGAN.

SANDING-MACHINE.

No. 830,116.

Specification of Letters Patent.

Patented Sept. 4, 1906.

Application filed January 21, 1904. Serial No 190,079.

To all whom it may concern:

Be it known that I, EMIL TYDEN, a citizen of the United States, residing at Hastings, in the county of Barry and State of Michigan, have invented new and useful Improvements in Sanding-Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved machine for surfacing or smoothing the surface of boards and wooden articles, particularly adapted for such use in finishing table-tops and belonging to the class commonly called "sanding-machines."

It has, further, the specific purpose of avoiding the variations in the pressure at different parts of the work which is observable in most present machines.

It consists in the features of construction set out in the claims.

In the drawings, Figure 1 is a front elevation with parts broken away. Fig. 2 is a plan view with the work-carriage and belts removed. Fig. 3 is a section at the line 3 3 on Fig. 1. Fig. 4 is a detail section at the line 4 4 on Fig. 1. Fig. 5 is a section at the line 5 5 on Fig. 1. Fig. 6 is a section at the line 6 6 on Fig. 5. Fig. 7 is a detail section of the valve at line 7 7 on Fig. 5. Fig. 8 is a top plan view, partly broken away to disclose the interior. Fig. 9 is a partly-sectional edge view of the pressure-bar.

This machine comprises end standards 1 and 2, rigidly joined by the base 3 and upper cross-head 4. Vertical screw-shafts 5 5, journaled in the standards, respectively, are connected within the base by an endless chain 6, passing around sprocket-wheels 7 7 on the lower ends of the shaft, respectively. These vertical screw-shafts hold and adjust the tracks for the work-carriage. These tracks 8 8 are formed as flanges upon the horizontal bars 9 9, which have lugs 10 10, projecting through vertical slots 11 in the inner sides of the standards 1 and 2, respectively, the lugs being apertured and threaded for engagement with the screw-shafts 5. For rotating the screw-shafts 5 to raise and lower the tracks, and thereby the work-carriage, one of said vertical shafts has at the upper end a beveled gear 12, which is meshed with and driven by a beveled pinion 13 on a horizontal shaft 14, journaled on the standard and adapted at its upper end to receive a key for rotating it, and thereby rotating

the screw-shafts in either direction. The two bars 9 9 are rigidly connected together by cross-ties 9^a 9^a, one near each end of the bars. The work-carriage 15 has wheels 16 16 16 16, traveling on the tracks 8 8, and is provided with customary means for clamping the work, such as the jaws 17, from whose under sides lugs 18 18 project for engagement, respectively, with two right and left screw-shafts 19 19, journaled at the ends of the carriage and connected by a chain 20, passing around the sprocket-wheels 21 21 on said shafts, respectively, one or both of said shafts being adapted at one end to receive a key for rotating it, whereby the two shafts are rotated synchronously and equally for moving the jaws toward or from each other equally at both ends.

The sanding devices comprise two endless belts 22 22, passing around pulleys 23 23 and 24 24, which are journaled at the top of the standards 1 and 2 and rotated from counter-shafts (not shown) by belts 25 and 25^a, the former passing about a pulley 26 on the shaft of one of the pulleys 23, while the other belt 25^a passes around a pulley 27 on the shaft of the other pulley 23, the pulleys 24 24 being loose, one upon each of said shafts of the pulleys 23, the two pulleys 26 and 27 being rotated in opposite directions, as indicated by the difference in the belts 25 and 25^a, one of which is shown as twisted and the other as straight, both being understood as driven from shafts having the same direction of rotation. The lower plies of the belts 22 22 overhang the work-carriage, traveling in opposite directions on the work. The reason for driving the belts one from the shaft at one end of the machine and the other from the shaft at the other end is that thereby both the oppositely-traveling operating-plies of the two belts may be actuated by pulling, as is necessary in order to prevent the liability to buckling upon encountering the frictional resistance of the work as they would do if actuated by pushing. For holding them in contact with the work they are caused to pass at their lower plies under the pressure-bar 29.

This pressure-bar is carried by the upper bar 4 of the frame. For supporting it brackets 30 30 are secured to said bar 4, having upon the upper side of said bar bearings 31 for a rock-shaft 32, which extends through all the brackets and has secured to it between the bearings of each bracket a lever-arm 33,

projecting horizontally forward to the edge of the bracket and having pivoted to it at said forward end a suspending and guide link 34, which is vertically guided in parallel
 5 ways formed in the vertical face of the bracket. This guide-link has at the lower part and forward side a split box 35, provided with lugs and bolt 35^a and 35^b for clamping it. In this split box a spindle
 10 held by clamping, said spindle having pivoted to it at its lower end a flange plate or bracket 37, which is riveted or bolted to the pressure-bar for carrying the latter suspended by the link 34. For adjusting the flange-
 15 plate, and thereby the pressure-bar, transversely to level it properly to the work the spindle 36 has two lugs 38 38, projecting at opposite sides of the pivot at which it is connected to the flange-plate, and adjusting-
 20 screws 39 39, set through these lugs, impinge against the top of the flange-plate, and by causing them to protrude more or less the angle of the plate to the axis of the spindle may be adjusted as necessary for leveling the
 25 pressure-bar. The rock-shaft 32 has made fast to it, projecting horizontally in the opposite direction from the lever-arm 33, a lever-arm 40, carrying a weight 41, tending to rock the shaft in direction for lifting the
 30 pressure-bar. Another lever-arm 42, projecting from the rock-shaft at the same side as the arm 33 is connected by a link 43 with a pedal 44, fulcrumed on the base, so that the operator can apply any necessary pressure
 35 for depressing the pressure-bar against the counterweight 41 and the resistance of the work, the counterweight operating when the pedal is relieved of pressure to lift the pressure-bar from the sanding-belts and prevent
 40 them from operating on the work.

For tightening the sanding-belts there is provided at the inner side of each end standard a bracket 45, secured to the cross-head 4 and having a vertical bearing 46, in which
 45 there is vertically mounted a plunger 47, carrying in its fork 47^a at the upper end a tightener-pulley 48. The plunger rests upon a spring 49, lodged in the bearing and resting in turn upon the upper end of a screw 50,
 50 which is screwed into the lower end of the bearing and provided at its protruding end with means for conveniently rotating it to tension the screw. The plunger has one side within the bearing formed with rack-
 55 teeth 51, and on the bracket 45 there is mounted a spur-gear 52, meshing with the rack-teeth for raising and lowering the tightener when the gear is rotated, as may be done by means of the crank 53, applied to the pro-
 60 truding shaft of the gear. The detent-dog 54, pivoted on the side of the bearing 46, engages a ratchet edge 53^a on the side of the crank for locking it at a position to which it may be rotated for withdrawing the tight-
 65 ener-pulley from the belt.

The pressure-bar 29 is formed with two longitudinal pockets 55 55 from its lower side facing the plies of the belts, respectively. In each of these pockets there are lodged
 70 short pneumatic cushions 56 in sufficient number to fill the pocket. Each cushion comprises an outer case 57 and an inner elastic tube or pouch 58 for inflation. The inner element 58 has a nipple 60, extending through
 75 the casing and through an aperture 61 in the pressure-bar, all the nipples being connected with an air-pipe 62, which leads from the source of compressed air. An inlet and vent valve 64 is interposed between each pneumatic cushion and the air-pipe 62, so that
 80 each cushion may be inflated and deflated independently of all the others. The entire quantity of consecutive cushions in each pressure-bar channel constitute a substantially continuous air-cushion facing down-
 85 ward and tending to protrude from the mouth of the pocket. The pocket-mouth is, however, closed, and the pneumatic cushions are retained in said pocket by a flexible steel strap or band 65. This strap or band 65
 90 passes around two pulleys 66 66, which are mounted upon the upper side of the pressure-bar. One end of each band is made fast, and the other end is secured to one end of a spring 67, whose opposite end is connected
 95 by a swivel-eye 68 to a tension-screw 69, screwed through a lug 70, formed upon the upper side of the pressure-bar for that purpose, so that by means of said screw the band may be drawn taut against the under side of
 100 the cushion protruding at the mouth of the channel in the face of the pressure-bar.

It is well understood that a belt driven in the manner of the sanding-belts herein described for the purpose of dressing the sur-
 105 face of wood against which it operates tends to sag below the plane of that surface at the edge at which the belt runs onto the wood. This results in rounding that edge, defeating the formation of an accurate corner and
 110 tending to destroy the accuracy of any corner which may have been produced by the plane or molding-machine in the previous steps of manufacture. To avoid this result, means is provided for deflating the pneu-
 115 matic cushions from the end of the pressure-bar back to and including the first one inward from the edge of the board which is to be dressed or in some cases farther inward, so that the steel band 65 is not held down and
 120 does not hold the sanding-belt down to the surface at any point outside of or beyond that edge. This causes a slight sag of the belt outward from the point at which the first inflated pneumatic cushion operates to give the
 125 belt a contact with the surface out to the edge, but does not cause it to droop over the edge as when it is held in contact for sanding by pressure operating clear to the edge; but the slight droop or tendency to droop which is
 130

caused by the drag of the belt—that is, the resistance of the work to its progress over it—extends the pressure sufficiently for sanding outward from the last-inflated cushion sufficiently to finish the wood clear to the edge. For deflating or controlling the inflation of the pneumatic cushions, as and for the purpose above indicated, when such control is to be effected merely by adjusting the device for a particular width of board having a straight edge—that is, an edge which, as mounted in the machine, is parallel with the travel of the carriage—it is only necessary that the valves 64 of each of the cushions outward from the edge of the board at the side at which the belts respectively run onto it should be set for cutting off the supply of compressed air and venting the pneumatic. The construction of the valves in this respect is familiar, being, however, illustrated in Fig. 7, involving a vent-port 44^a, which is opened by the movement of the valve which closes the inlet-port 44^b. For yielding the same result when dressing boards having irregular or lateral edges which are not parallel with the travel of the carriage—as, for example, round table-tops—means is provided for automatically controlling the deflation and inflation of the pneumatic cushions by opening and closing their valves as required by the varying position of the edge in the travel of the board past the sanding-belt. This means for each of the sanding-belts consists in a shoe or slide-bar 71, which is mounted for longitudinal sliding upon the upper side of the pressure-bar immediately under the stems of the valves 64, whose operating lever-arms 64^a at the open position of the valves depend in the path of said slide-bar. The bar has its forward end beveled at 71^a from a point up to a maximum thickness, which is sufficient to cause it to swing the lever-arms of the valves to closed position of the valves when the bar is thrust against and on under them, lifting them from vertical toward horizontal position. This bar has at the outer end a depending arm 72, on which there may be mounted a roller 72^a in position for bearing against the lateral edge of the work. A spring device is provided tending to draw the bar inward, pressing the roller against the edge of the work and causing it to follow the deflections of that edge. A desirable form of such spring device consists of a drum 73, suitably mounted on the upper side of the pressure-bar, having a strap or chain 74 secured at one end to it and rotated about it and having the other end secured to the inner end of the slide-bar, a helical spring 75 being secured to and coiled about the stud-axis 76, on which the drum is journaled, the outer end of the spring being attached to the drum, the spring being coiled in such direction that the outward movement of the slide-bar 71 coils the spring, rotating the

drum, and the reaction of the spring tends to draw the bar inward, holding its roll against the edge of the work, as desired.

It is a matter of experience and well understood in the art that the process of dressing lumber by what is commonly called “sanding”—that is, rubbing it with a surface roughened by sand or other material adapted to cut the grain of the wood—in order to be efficient for the purpose must operate in two directions over the wood, because its movement in one direction, while cutting some protruding fibers, tends to lay the great mass of the fibers over in one direction, producing an apparently smooth surface, but one which becomes rough at once upon the application of any finishing material—varnish, oil, or paint—which moistens the fibers which have been prostrated by the one-way sanding process and causes them to erect themselves again from the surface. It is for this reason that there are provided in this machine the two oppositely-traveling sanding-belts 22 and 22. These belts, lying close together and traveling in opposite directions across the table, performing their function upon the work under the same pressure, one immediately succeeding the other, cause every portion of the work to receive exactly equal dressing in opposite directions in once traveling through the machine. Usually, however, it is desirable to repeat the process merely for thoroughness, and the work-table is therefore caused to make a complete reciprocation, carrying the work twice under both belts and returning to the initial position for removal of the work.

It has heretofore been customary in sanding-machines to bring the work and the sanding-belt together by advancing the former against the latter, the table or work-carrier being for that purpose arranged so as to be held upward with such force as the operator judges desirable to produce the necessary pressure and the pressure-bar back of the belt having a cushion to properly soften or distribute the pressure and yielding only for that purpose, but being otherwise in fixed position. In the construction of my machine as above described it will be noticed that the pressure is applied by the operator not through the medium of the table or work-carrier, but through the medium of the cushioned pressure-bar, which is pressed downward to carry the belt against the work instead of having the work pressed upward against the belt. This feature of my construction is of considerable importance, because when the belt is thus pressed toward the work for operating upon it it is carried outward from its normal plane of travel and trends away from the surface of the work to the drums or pulleys on which it is carried, whereas when the work is advanced against the belt the latter is thereby forced inward,

and to reach the drums or pulleys it tends to fold more or less about the edge of the work, making it very difficult to avoid rounding such edges and thus tending to defeat one of the purposes of its specific structure already explained in the construction of the cushion. This feature of my construction is independent of the plurality of the sanding-belts and is applicable equally without regard to the number or direction of travel of such sanding-belts.

I claim—

1. In a sanding-machine, in combination with two endless sanding-belts and their driving and carrying wheels respectively, said belts having their operating-surfaces for sanding substantially parallel to the axes of their respective wheels, mechanism for rotating the wheels to drive the belts in opposite directions at their corresponding plies, and means for holding said plies to the same surface of the work.

2. In a sanding-machine, in combination with means for supporting the work, two parallel sanding-belts and their respective carrying and operating wheels; means for holding corresponding operating-plies of the two belts with their surfaces which are parallel to their respective operating-shafts against the same surface of the work, and means for driving the shafts to propel said corresponding plies of the belts simultaneously in opposite directions.

3. In a sanding-machine, two parallel endless sanding-belts and mechanism for driving them in opposite directions; a cushion-faced pressure-bar for holding them to the work, and a longitudinally-flexible element interposed between the cushion on the one end and the oppositely-traveling belts on the other end.

4. In a sanding-machine, two parallel endless sanding-belts, and mechanism for driving them in opposite directions; a pressure-bar for holding the lower ply of the belts to the work; a longitudinally-flexible element corresponding to each belt, and a cushion carried by the pressure-bar back of each such flexible element.

5. In a sanding-machine, in combination with a sanding-belt and means for driving it, a carrier for the work opposed to the operating-ply of the belt, and means for giving it movement transverse with respect to the movement of the belt; a pressure-bar at the opposite side of said operating-ply from the work extending longitudinally with respect to the belt, and a pneumatic cushion carried in the face of the bar toward the belt for transmitting the pressure of the bar to the belt.

6. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a pneumatic cushion carried by such

pressure-bar for transmitting the pressure, and a longitudinally-flexible element interposed between the pneumatic cushion and the belt.

7. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a cushion carried by the pressure-bar for transmitting the pressure; a longitudinally-flexible element interposed between the cushion and the belt, and means for longitudinally straining said flexible element.

8. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a cushion carried by such pressure-bar for transmitting the pressure; a longitudinally-flexible element interposed between the cushion and the bottom, and a spring in the connections of such longitudinal element for yieldingly straining it longitudinally.

9. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a cushion carried by the pressure-bar for transmitting the pressure; a flexible element interposed between the cushion and the belt; means about which the flexible element is deflected away from the work at the ends of the pressure-bar; a spring connected with such flexible element beyond the guides for yieldingly straining it around the latter, and means for tensioning the spring.

10. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a cushion carried by the pressure-bar for transmitting the pressure to the belt; a longitudinally-flexible element interposed between the cushion and the belt for distributing the pressure, and means for protruding the cushion against the flexible element over a selected part of the latter.

11. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a cushion carried by the bar for transmitting the pressure; a flexible element interposed between the cushion and the belt for distributing pressure, and means for relaxing the cushion's pressure against the flexible element progressively from the end back toward the middle of the bar.

12. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a cushion carried by the bar for transmitting the pressure; a flexible element interposed between the cushion and the belt for distributing the pressure; an element movable longitudinally with respect to the bar having an abutment bearing against the edge of the work for following the deflections of such edge, and means operated by said ele-

ment for relaxing the cushion's pressure progressively from the end back toward the middle of the bar.

13. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a pneumatic cushion in such pressure-bar comprising a multiplicity of separately-inflated short cushions in a longitudinal series; a flexible element interposed between such pneumatic cushion and the belt, and means for controlling separately the inflation and deflation of the component short cushions.

14. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a pneumatic cushion carried by the pressure-bar composed of a multiplicity of short cushions in a longitudinal series; a flexible element interposed between such pneumatic cushion and the belt; a source of compressed air for inflating the cushions, each short cushion having independent communication with such source; separate valves controlling said communications respectively, and means for operating said valves to effect the inflation of said short cushions progressively from the end of the bar back toward the middle.

15. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a pneumatic cushion carried by the pressure-bar consisting of a multiplicity of short cushions in a longitudinal series; a flexible element interposed between the cushions and the belt; a source of compressed air for inflating the cushions, the several short cushions having each an independent communication with such source and a valve controlling such communication; a slide-bar mounted on the pressure-bar; operating-handles for said valves, which, at corresponding positions of the valves, stand in the path of the slide-bar, and means for operating the slide-bar for encountering successively said valve-handles to operate the valves progressively from the end back toward the middle of the pressure-bar.

16. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a pneumatic cushion carried by the pressure-bar consisting of a multiplicity of short cushions in a longitudinal series; a source of compressed air for inflating said cushions, each of the latter having an independent communication with said source, and a valve controlling such communication; a slide-bar mounted on the pressure-bar having an abutment adapted to bear against the lateral edge of the work; handles for the valves respectively projecting in the path of such slide-bar for encounter thereby as the

bar slides, and means for yieldingly holding the abutment to the edge of the work to cause it to follow the deflections of said edge.

17. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a pneumatic cushion carried by such pressure-bar consisting of a multiplicity of short cushions in a longitudinal series; a source of compressed air for inflating the cushions, each cushion having an independent communication with such source and a valve controlling such communication; a slide-bar mounted on the pressure-bar for movement longitudinally thereof; handles for the said valves projecting in the path of such movement of the bar, the bar having an abutment adapted to bear against the lateral edge of the work for following the deflections thereof; a drum mounted for rotation on the pressure-bar; a flexible connection from the periphery of the drum to the slide-bar, and a spring coiled within the drum having the inner end connected to the bearing thereof, and the outer end to the drum.

18. In a sanding-machine, in combination with a sanding-belt and means for driving it, a pressure-bar for holding the belt to the work; a pneumatic cushion carried by such pressure-bar consisting of a multiplicity of short cushions in a longitudinal series; a source of compressed air for inflating the cushions, each cushion having an independent communication with such source and a valve controlling such communication; a slide-bar mounted on the pressure-bar for movement longitudinally thereof; handles for the several valves projecting in the path of such movement of the bar, the bar having an abutment adapted to bear against the lateral edge of the work for following the deflections thereof; a drum mounted for rotation on the pressure-bar; a flexible connection from the periphery of the drum to the slide-bar, and a spring coiled within the drum having the inner end connected to the bearing thereof, and the outer end to the drum, said drum-shaft being rotatable independently of the drum and protruding from the drum and adapted to receive a key for rotating it, and a pawl and ratchet to retain it for tensioning the spring.

19. In a sanding-machine, in combination with two parallel sanding-belts and mechanism for driving them in opposite directions, a pressure-bar back of the operating-plies of said belts extending over the width of both of them; separate longitudinally-extending cushions carried by said bar for transmitting pressure to the two belts respectively, and separate longitudinally-flexible elements for distributing the pressure to the belts respectively.

20. In a sanding-machine, in combination

with two parallel sanding-belts and mechanism for driving them in opposite directions; a pressure-bar for holding the belts to the work; separate longitudinally-extending cushions
 5 carried by the pressure-bar for transmitting pressure to the belts respectively; separate longitudinally-flexible elements interposed between the cushions and their respective belts, and separate means for protruding the
 10 cushions against their respectively flexible elements over selected parts of their respective lengths.

21. In a sanding-machine, in combination with two parallel sanding-belts and mechanism for driving them in opposite directions, a
 15 pressure-bar back of the operating-plies of said belts; separate cushions carried by the bar for transmitting the pressure to the belts respectively; separate longitudinally-flexible
 20 belts interposed between the cushions and their respective belts for distributing the pressure, and separate means for withdrawing the cushions' pressure from their respective flexible elements progressively from the
 25 opposite ends back toward the middle of the pressure-bar.

22. In a sanding-machine, in combination with two parallel sanding-belts and mechanism for driving them in opposite directions,
 30 separate pneumatic cushions carried by the pressure-bar for transmitting the pressure to the belts respectively, and separate longitudinally-flexible elements interposed between the cushions and their respective belts for
 35 distributing such pressure.

23. In a sanding-machine, in combination with two parallel sanding-belts and mechanism for driving them in opposite directions; a
 40 pressure-bar back of the operating-plies of said belts; separate pneumatic cushions carried by the pressure-bar for the belts respectively, each of said separate cushions consisting of a multiplicity of short cushions in a
 45 longitudinal series; separate flexible elements interposed between said cushions and their respective belts for distributing the pressure to the latter; a source of compressed air for inflating said cushions, each of the short
 50 cushions having an independent communication with said source and a valve controlling such communication, and separate longitudinally-flexible elements interposed between the belts and their respective cushions.

24. In a sanding-machine, in combination with two parallel sanding-belts and mechanism for driving them in opposite directions, a
 55 pressure-bar back of the operating-plies of said belts; separate pneumatic cushions carried by the pressure-bar for transmitting the pressure to the belts respectively; separate
 60 longitudinally-flexible elements interposed between said cushions and their respective belts, each of said pneumatic cushions consisting of a multiplicity of short cushions in a
 65 longitudinal series; a source of compressed

air for inflating said short cushions, each of the latter having an independent communication with such source and a valve controlling such communication; operating connections for said valves and separate means for
 70 the valves of the two series respectively mounted and movable on the pressure-bar for encountering said operating connections successively to cause the inflation or deflation of said short cushions successively along
 75 the longitudinal extent of the bar from the opposite ends.

25. In a sanding-machine, in combination with two parallel sanding-belts and means for driving them in opposite directions, a
 80 pressure-bar back of the operating-plies of said belts; separate pneumatic cushions carried by the pressure-bar for transmitting pressure to the belts respectively; separate longitudinally-flexible elements interposed
 85 between the cushions and their respective belts, each of said cushions consisting of a multiplicity of short cushions in a longitudinal series; a source of compressed air for inflating said short cushions, the latter having
 90 independent communication with said source, and means controlling such communication; separate elements having respectively abutments adapted to bear upon the opposite lateral edges of the work for following the deflections thereof, and connections from such
 95 elements respectively for operating respectively the compressed-air communications of the short cushions of the two series progressively from the opposite ends toward the middle of the pressure-bar according to the degree of deflection of said opposite edges respectively.

26. In a sanding-machine, in combination with two parallel sanding-belts having their
 105 corresponding operating-plies running side by side, edge toward edge; mechanism for driving them to propel such corresponding plies in opposite directions; means for holding the faces of said plies which are substantially parallel with the axes of the operating-shafts in contact with the same surface of the work; a tightener for each of the two belts and means for separately adjusting and operating such tighteners.

27. In a sanding-machine, in combination with two parallel sanding-belts having their
 115 operating-plies traveling side by side, edge toward edge, and with the surfaces of said plies which are parallel to the axes of their
 120 operating-wheels in contact with the same surface of the work; mechanism for driving the belts to carry said plies in opposite directions comprising such operating-wheels; separate tighteners for the two belts; springs
 125 which hold the tighteners against their respective belts and means for separately withdrawing the tighteners against the tension of their respective springs.

28. In a sanding-machine, in combination 130

with a sanding-belt and mechanism for driving it, a carrier for the work opposed to the outer surface of the belt, and means for giving it movement transverse to that of the belt; a cushioned pressure-bar at the inner side of the operating-ply of the belt extending longitudinally with respect to the latter; and means for supporting and carrying such pressure-bar adapted to be operated at will to press the bar outward against the operating-ply of the belt to press the latter bodily toward the work.

29. In a sanding-machine, in combination with a sanding-belt and mechanism for driving it, a carrier for the work adapted to hold the same opposed to the operating-ply of the belt; a pressure-bar at the inner side of the operating-ply of the belt; means for carrying said pressure-bar and for moving it toward and from said operating-ply, adapted to be operated at will to move the bar toward and from the belt, and a yielding take-up operating on the opposite ply of the belt.

30. In a sanding-machine, in combination with two parallel sanding-belts and mechanism for driving them in opposite directions, a carrier for the work adapted to hold the same opposed to the outer surface of the belts; a cushioned pressure-bar operating against the inner side of the operating-plies of both belts; means for supporting such pressure-bar, and for moving it bodily toward and from the operating-plies of both belts, adapted to be operated at will for advancing said operating-plies against the work.

31. In a sanding-machine, in combination with a sanding-belt and the mechanism for driving it, a work-carrier adapted to hold the work opposed to the outer surface of the operating-ply of the belt; a pressure-bar and means for supporting it movably between the two plies of the belt, and guiding it toward and from said operating-ply; a lever fulcrumed on the pressure-bar support, and connections from such lever to the pressure-bar for moving it at will by means of the lever toward and from the operating-ply.

32. In a sanding-machine, in combination with the work-carrier, a frame by which it is upheld, comprising ways on which the carrier is movable to carry the work past the sanding devices, said frame comprising a cross-head extending above the carrier in direction transverse to the ways on which the carrier moves; a sanding-belt overhanging the work-carrier, and means for driving it in a direction transverse to said ways; a pressure-bar and supports for the same extending from said frame cross-head between the two plies of the belt, and comprising means for guiding the pressure-bar toward and from the operating-ply; a lever-arm fulcrumed on the cross-head, and connections therefrom to the pressure-bar for moving the pressure-bar toward and from the operating-ply.

33. In a sanding-machine, in combination with the work-carrier, a frame by which it is upheld, comprising ways on which the carrier is movable to carry the work past the sanding devices, said frame comprising a cross-head extending above the carrier in direction transverse to the ways on which the carrier moves; a sanding-belt overhanging the work-carrier, and means for driving it in a direction transverse to said ways; a pressure-bar and supports for the same extending from said frame cross-head between the two plies of the belt, and comprising means for guiding the pressure-bar toward and from the operating-ply; a lever-arm fulcrumed on the cross-head, and connections therefrom to the pressure-bar for moving the pressure-bar toward and from the operating-ply; a pedal at the bottom of the frame, and connection therefrom to said levers for operating the pressure-bar by the foot.

34. In a sanding-machine, in combination with the means for carrying the work, a sanding-belt and means for operating it; a pressure-bar back of the operating-ply of the sanding-belt; guides for the pressure-bar for directing its movement toward and from the belt, the pressure-bar stems which operate in said guides connected to the pressure-bar at a pivotal line extending longitudinally with respect to said bar between its lateral edges, and adjustable stops on the guide-stems at opposite sides of said pivotal line for limiting the accommodating movement of the pressure-bar about its pivots to said stem.

35. In a sanding-machine, in combination with two parallel sanding-belts; corresponding wheels about which they are driven respectively at the two ends of their course mounted on the same shafts, said belts having their corresponding plies traveling side by side and edge toward edge with their respective surfaces which are substantially parallel to said shafts operating for sanding in contact with the same surface of the work; mechanism for driving the two belts in opposite directions; a tightener for each of the two belts and means for separately adjusting and operating such tighteners.

36. In a sanding-machine, in combination with two parallel sanding-belts, corresponding wheels about which they are driven respectively at the two ends of their courses, said belts having their corresponding plies traveling side by side and edge toward edge, with their respective surfaces which are substantially parallel to said shafts operating for sanding in contact with the same surface of the work, said belts having their driving-pulleys at opposite ends of their respective courses.

37. In a sanding-machine, in combination with two parallel sanding-belts, corresponding driving and idling wheels for said belts at the two ends of their respective courses, the

two driving-wheels being at opposite ends of
said courses and means for rotating said driv-
ing-wheels in opposite directions to cause the
corresponding plies of the belt to travel in op-
posite directions, said belts having their said
corresponding plies traveling side by side and
edge toward edge with their respective sur-
faces which are substantially parallel to said
shafts operating for sanding in contact with
the same surface of the work.

38. In a sanding-machine, in combination
with two parallel sanding-belts, correspond-
ing driving and idling wheels for said belts re-
spectively, the driving-wheels for the two

belts being at opposite ends of the courses of
said belts and being fast on their respective
shafts; means for rotating said shafts in op-
posite directions, the idling-wheel for each
belt being loose on the shaft of the driving-
wheel for the other belt.

In testimony whereof I have hereunto set
my hand, in the presence of two witnesses, at
Chicago, Illinois, this 15th day of December,
1903.

EMIL TYDEN.

In presence of—

CHAS. S. BURTON,
FREDK. G. FISCHER.