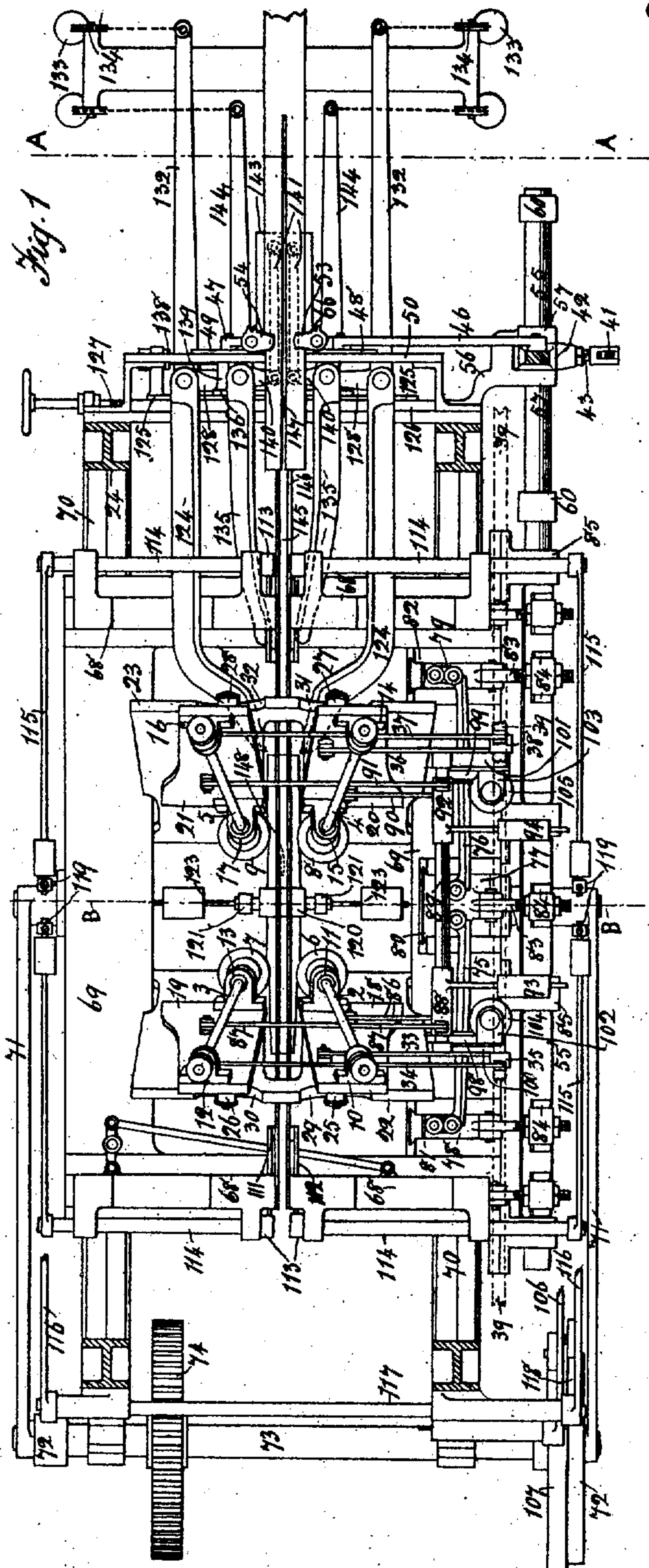


A. DUNBAR.
STAVE JOINTING MACHINE.
APPLICATION FILED OCT. 20, 1902.

6 SHEETS—SHEET 1.



Witnesses

W. B. Johnson
E. Owen.

Inventor

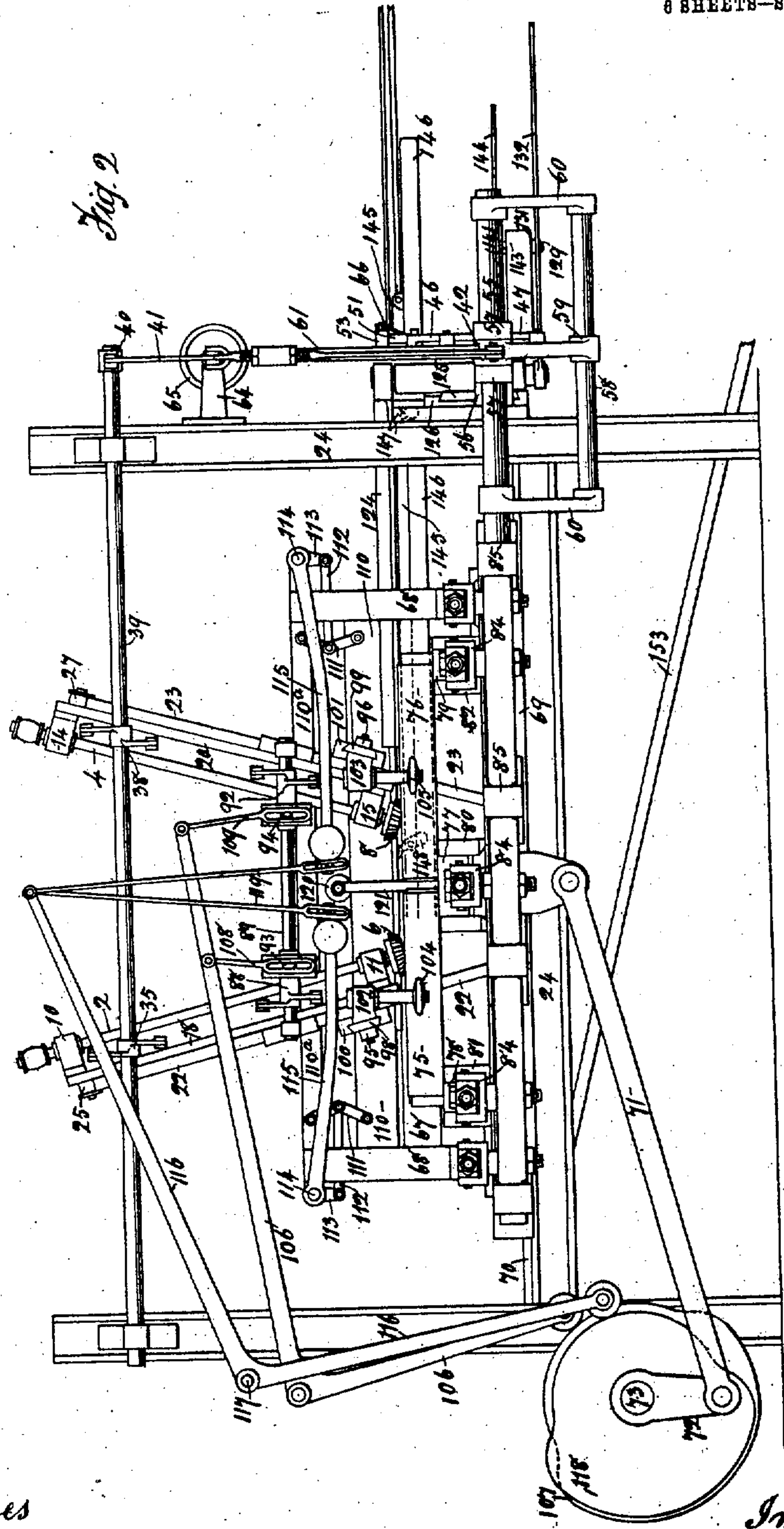
Alexander Dunbar

No. 850,144.

PATENTED APR. 16, 1907.

A. DUNBAR.
STAVE JOINTING MACHINE.
APPLICATION FILED OCT. 20, 1902.

8 SHEETS—SHEET 2.



Witnesses

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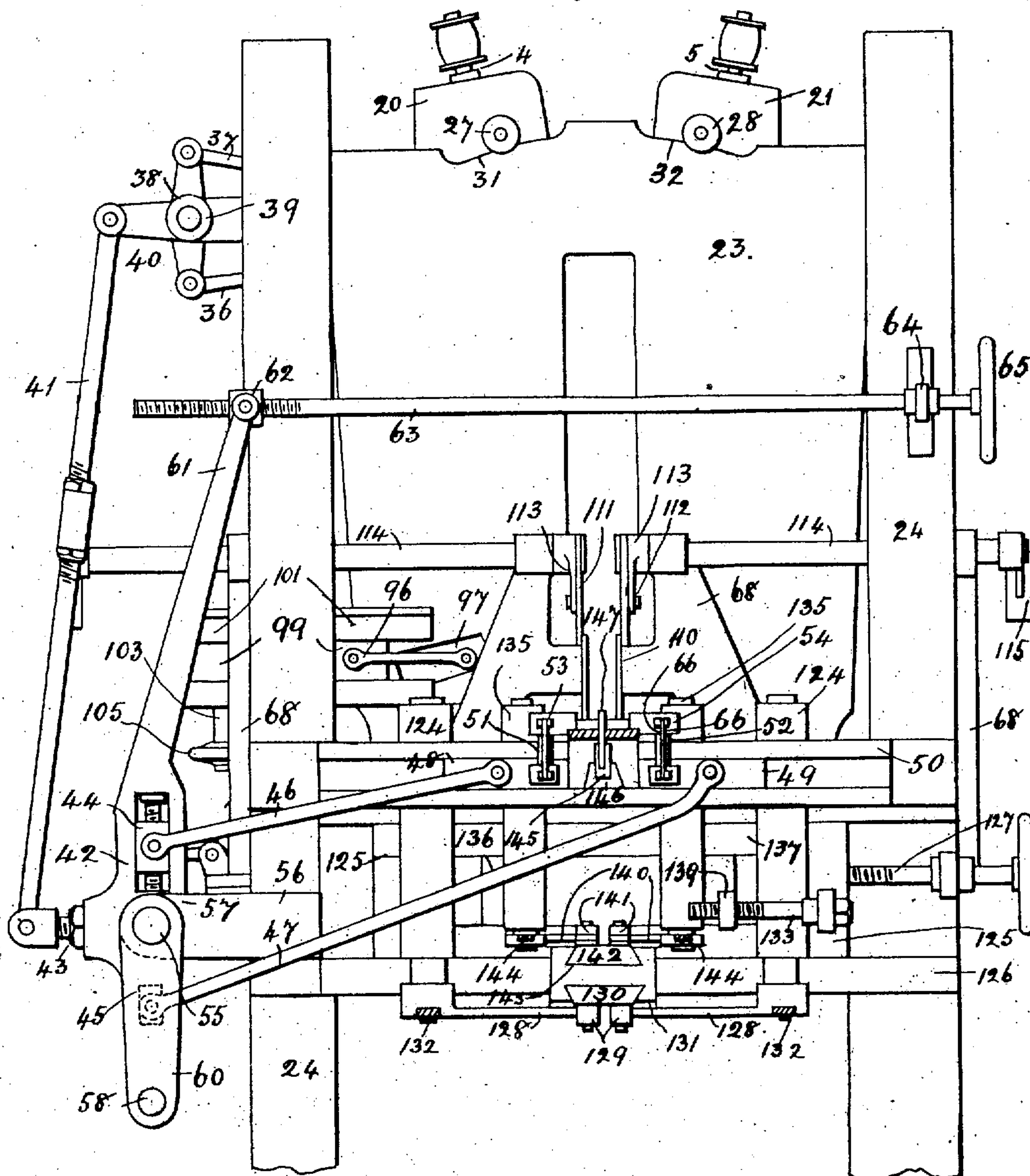
No. 850,144.

PATENTED APR. 16, 1907.

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STAVE JOINTING MACHINE.
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6 SHEETS—SHEET 3.

Fig. 3.



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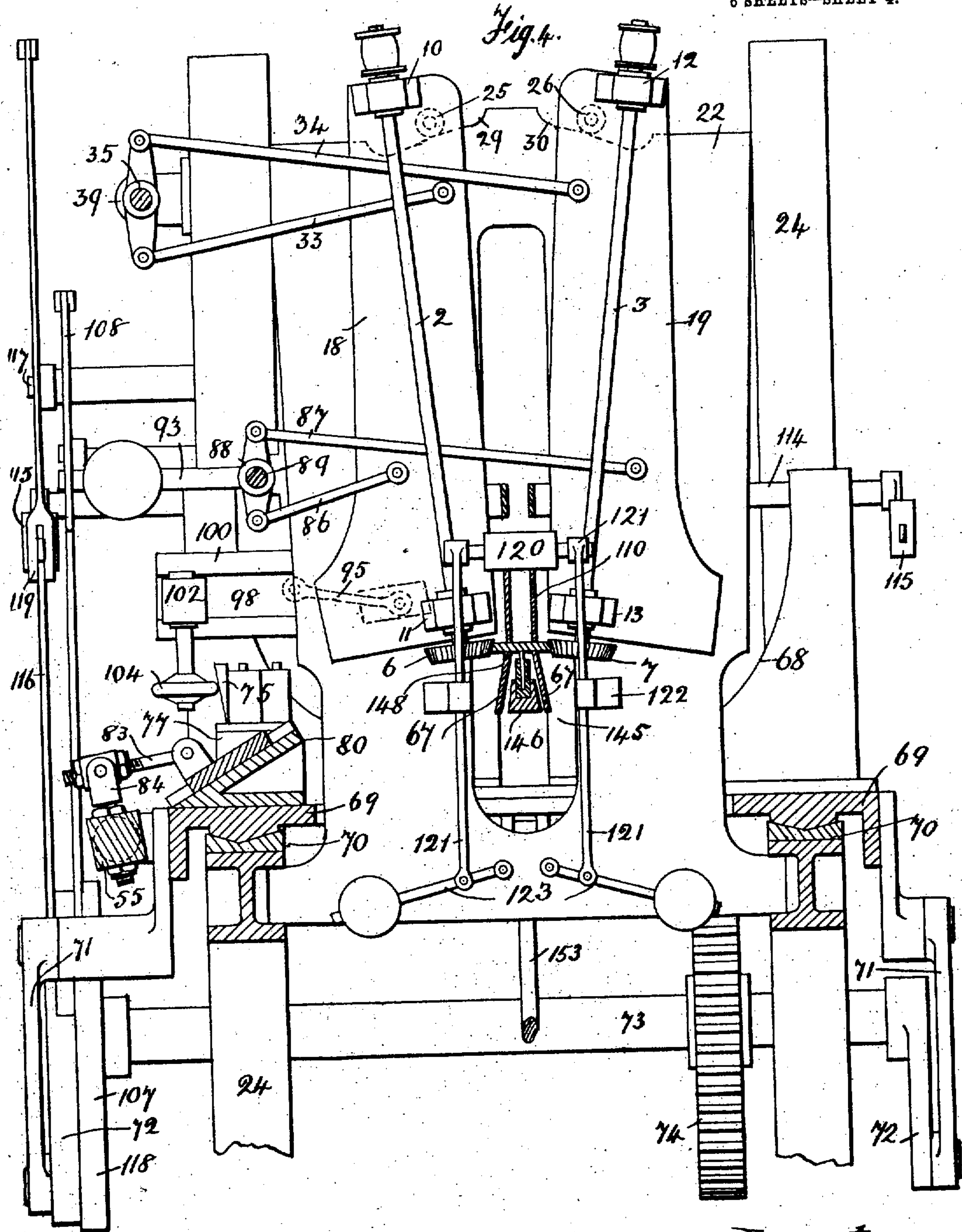
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6 SHEETS—SHEET 4.



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6 SHEETS—SHEET 5.

Fig. 5

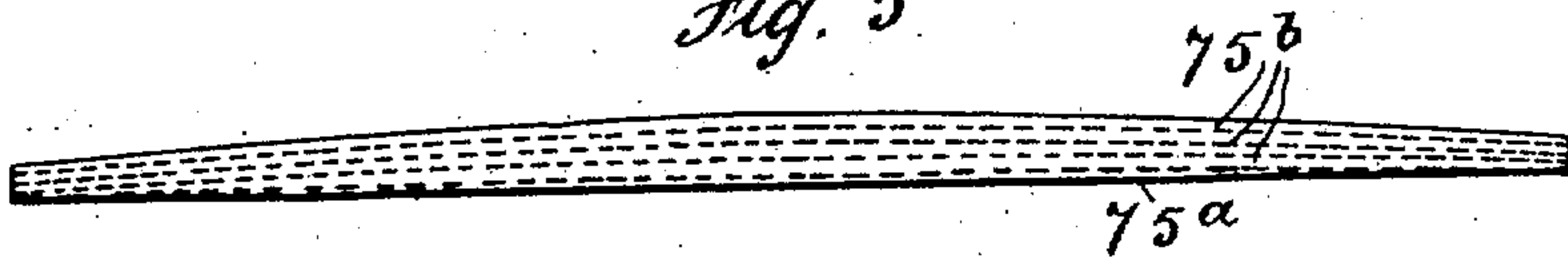


Fig. 6

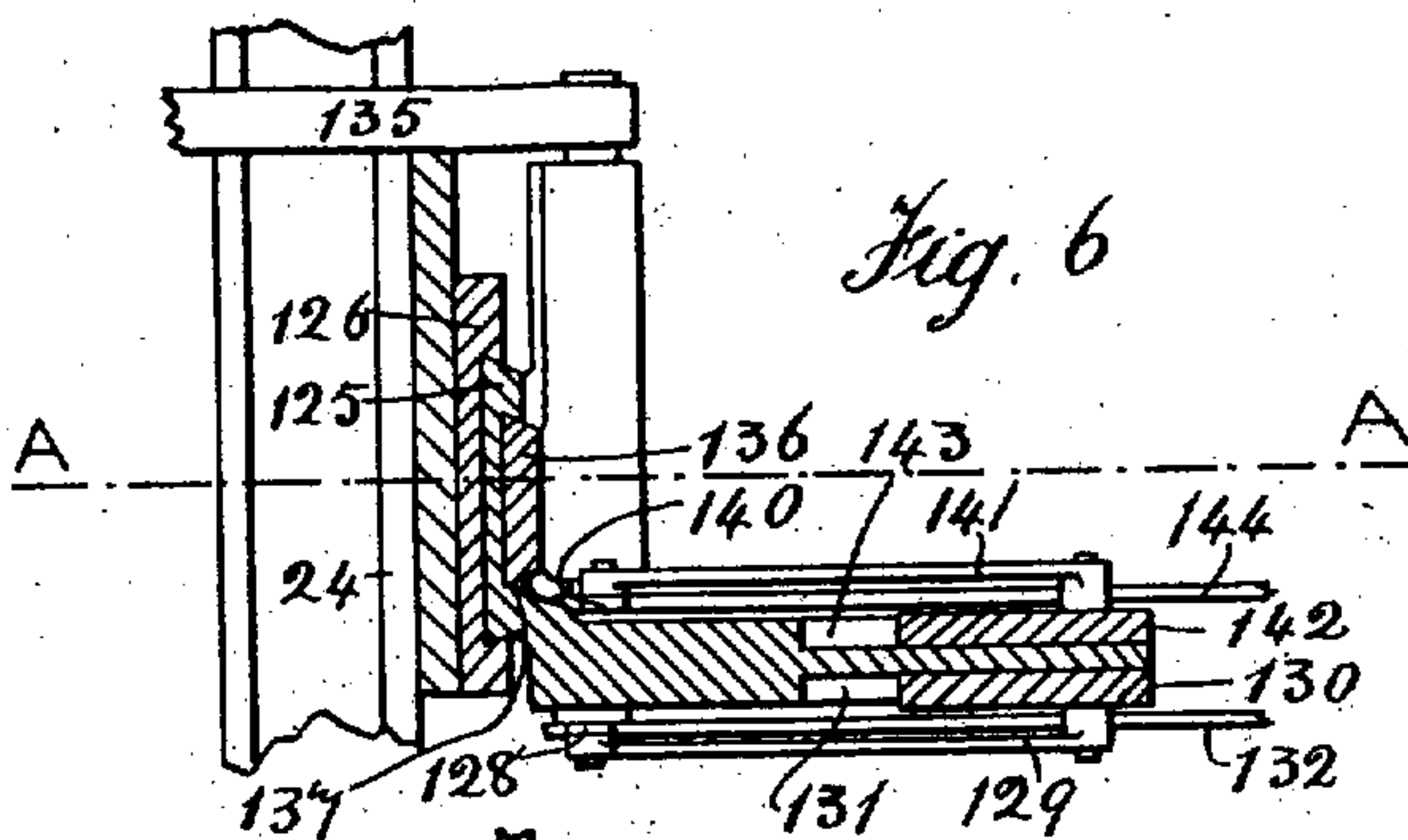


Fig. 8

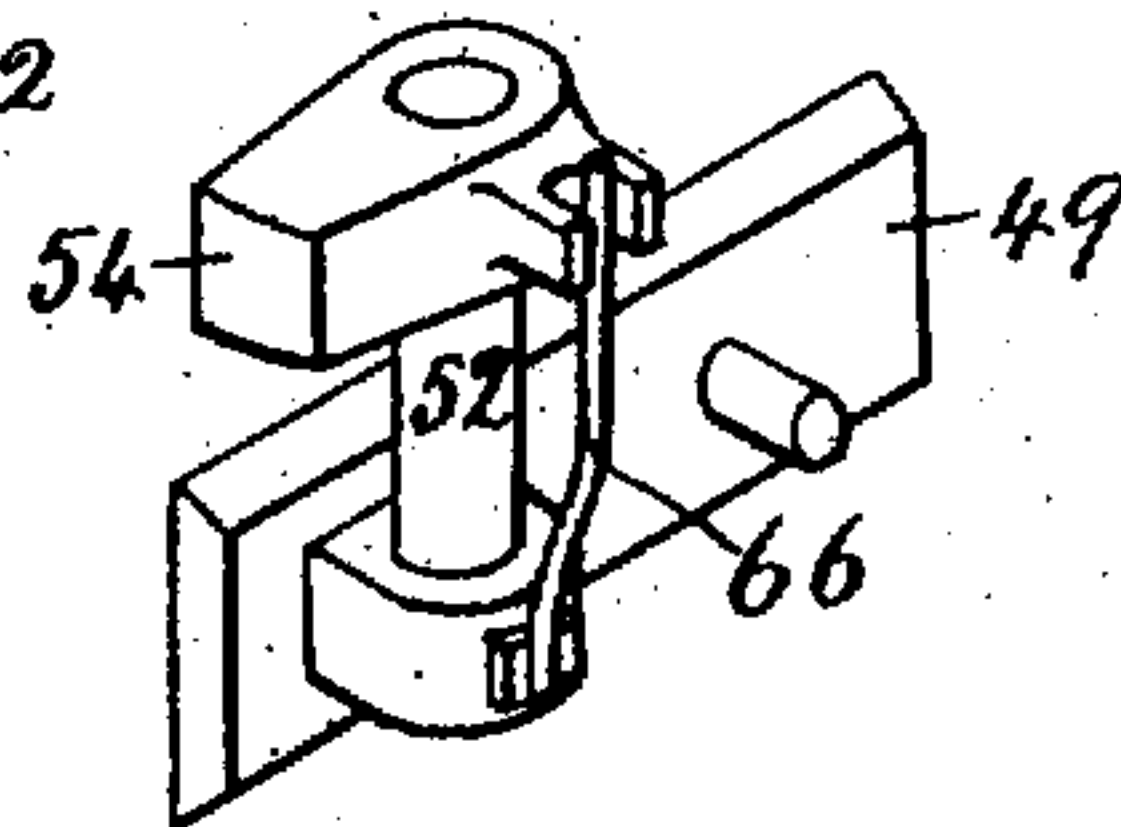
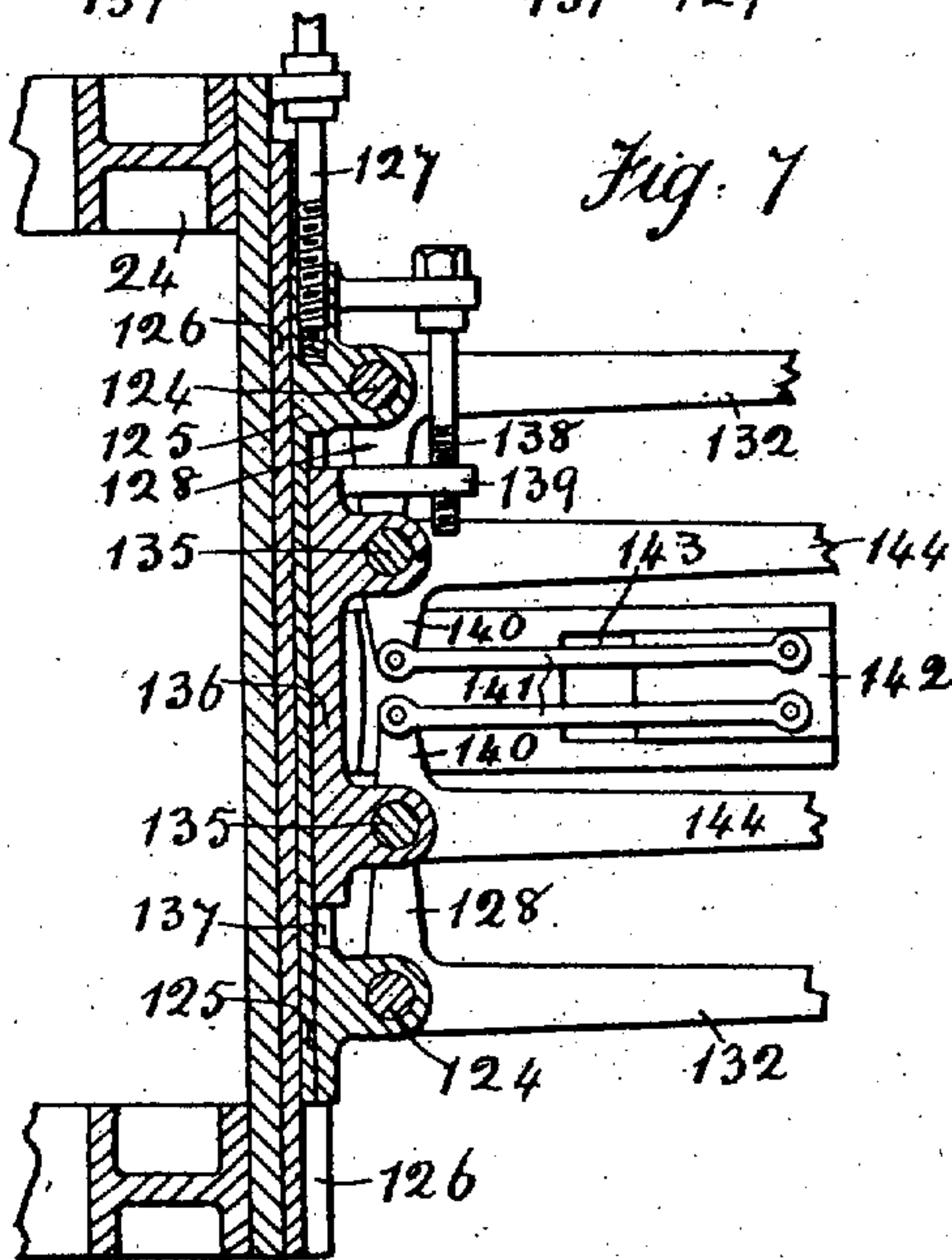


Fig. 7



Witnesses
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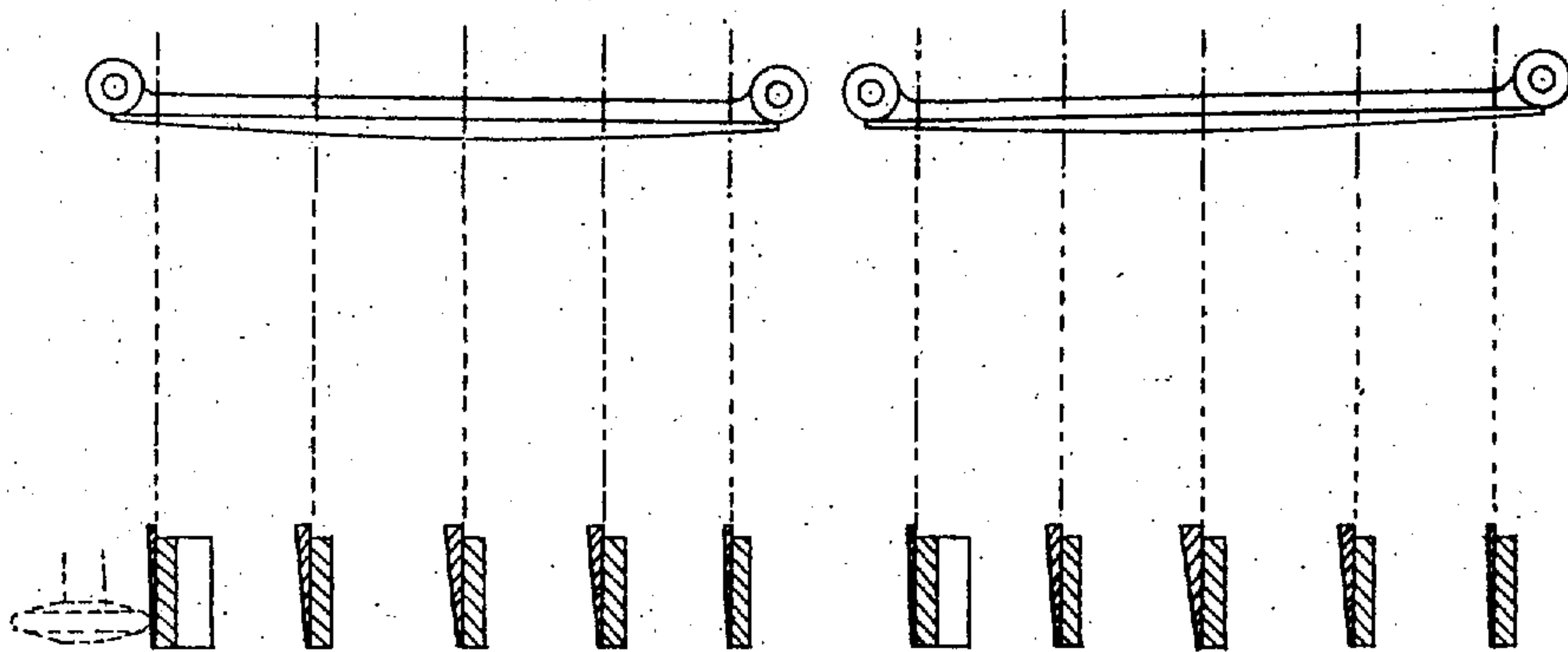
No. 850,144.

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APPLICATION FILED OCT. 20, 1902.

6 SHEETS—SHEET 6.

Fig. 9.



WITNESSES

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UNITED STATES PATENT OFFICE.

ALEXANDER DUNBAR, OF LIVERPOOL, ENGLAND.

STAVE-JOINTING MACHINE.

No. 850,144.

Specification of Letters Patent.

Patented April 16, 1907.

Application filed October 20, 1902. Serial No. 127,978.

To all whom it may concern:

Be it known that I, ALEXANDER DUNBAR, a subject of the King of Great Britain, residing at Liverpool, in the county of Lancaster, England, have invented new and useful Improvements in Stave-Jointing Machines, of which the following is a specification, reference being had to the accompanying drawings.

10 The invention relates to stave-jointing machines in which a stave clamped upon bearers carried by a reciprocating frame is caused to pass between cutters which cut the edges of the stave to approximately the
15 curves longitudinally and the angles inwardly desired, the latter being technically known as "injoint." In machines as hitherto constructed, while it might be possible to obtain a close approximation to the correct
20 curves and injoint for one definite width of staves, the curves and injoints on other widths of staves were inaccurate, so that when a cask was formed of such staves some joints were open on the inside and some on
25 the outside. This necessitated very great pressure when trussing and hooping, even to the extent of crushing the edges of the staves in order to obtain a water-tight joint.

The objects of my invention are to construct stave-jointing machinery whereby
30 staves of any or varying widths may be accurately jointed and cut to the desired curves on the edges, so that tight joints may be obtained without great pressure in trussing and so that the curve of the bilge of a
35 cask may be continued nearer the ends of the cask than has been practicable hitherto, thus forming a fuller and more regular quarter on the cask, which increases the capacity with-
40 out increasing the diameter at the bilge or heads, also whereby the staves may be more accurately centered before being jointed, whereby stiff crooked staves may be accurately jointed, and, further, to provide simple
45 means for pushing staves into position to be jointed and afterward away from the machine. I attain these objects by mechanism such as is illustrated in the drawings forming part of this specification, in which—

50 Figure 1 is a plan with part of the upper gearing omitted for clearness. Fig. 2 is a side elevation. Fig. 3 is an end view at the line A A on Fig. 1, and Fig. 4 is a transverse

section at the line B B on Fig. 1, all illustrative of one form of machinery constructed
55 under my invention and acting with two pairs of cutters, one pair commencing their cuts at the end of the stave and finishing at the center, and the other pair commencing their cuts at the center and finishing at the
60 other end. Fig. 5 is a bottom plan view of a single-piece templet. Fig. 6 is a longitudinal central section of Fig. 7. Fig. 7 is a section on the line A A of Fig. 6, showing the
65 stave-guide mechanism; and Fig. 8 is a perspective view of one of the feelers with the slide-supporting block, and Fig. 9 is a detail view of the templet and sections.

2 3 4 5 are four cutter-spindles carrying cutters 6 7 8 9, respectively, at their lower
70 ends. The spindles are each mounted in two bearings 10 11, 12 13, 14 15, and 16 17, respectively, and these bearings are attached, respectively, to cutter-frames or carrying-pieces 18 19 20 21, which rest and
75 are free to slide upon plates or supports 22 23, such plates or supports being secured in any convenient way to the main framing 24 of the machine. 25 26 27 28 are antifriction-
80 rollers or like devices, pivoted, respectively, on the frames 18 19 20 21 and rolling on camways 29 30 31 32, thus supporting the cutter-frames in such way that the lower inner
85 edges of the cutters are always approximately about the same level horizontally below the lower side of the stave, notwithstanding that the cutter-frames may be
90 moved in or out laterally to various positions, as hereinafter mentioned. 33 34 are rods, one end of each being pivoted to the upper parts of the frames 18 19, respectively, while the other ends are pivoted to
95 the arms of a lever 35. 36 37 are rods, one end of each being pivoted to the upper parts of the frames 20 21, while the other ends are pivoted to the arms of a lever 38. The levers 35 38 are secured on a rock-shaft 39,
100 carried in bearings on the framework. On the shaft 39 is secured another lever 40, to which is pivoted a rod 41 adjustable in length by right and left hand screws or by
105 other means. The other end of the rod 41 is pivoted to one arm of a lever 42, by the motion of which the upper parts of the cutter-frames and the cutter-shafts are moved in or out, thus varying the angle of the cutters

with regard to the stave, according to the width of the stave. The narrower the stave the more nearly the angle approaches a right angle. This angle is technically known as "injoint," and may be varied for casks of different diameters or for staves of different thicknesses or of different character as to seasoning, hardness of timber, &c., by making this arm, to which the lower end of the rod 41 is pivoted, and the rod 41 adjustable in length by screws and nuts 43 or in other suitable manner so as to vary the motion of the levers 35 38.

It is necessary to allow for varying the in-joint, as the angle for practical purposes will generally differ from the theoretically-exact angle, according to the lateral stiffness of the stave, its condition as to seasoning, or the degree of heat to which it may be afterward subjected. The other arms of the lever 42 are provided with adjustable slide-blocks 44 45, to which are pivoted, respectively, the rods 46 47. The other ends of these rods are pivoted to slide-blocks 48 49, which are movable in a slide 50, attached to the main framework, and carry, pivoted on studs 51 52 feelers 53 54, respectively. The lever 42 is pivoted loosely on a rock-shaft 55 and is held in position by a bracket 56, secured to the main frame, such bracket having collars 57 on each side of the lever to prevent lateral movement of the lever when the shaft 55 slides through it.

58 is a bar free to slide through an eye 59 in the lever 42 and secured at each end to arms 60, fixed to the rock-shaft 55, so that such shaft 55 can slide freely through the lever 42, but must turn axially when such lever is moved. One of the arms of the lever 42 has an extension 61, provided with a pivoted nut 62, into which gears a screwed rod 63, carried in a bearing 64 and provided with a hand-wheel 65, by turning which the lever 42 may be moved in one direction or another. The feelers 53 54 are provided with springs 66, or weights, which tend to keep the feelers in the position shown should they be moved aside by any irregularity in a stave pushed between them, as hereafter mentioned.

67 are supporting-bars of the usual kind for the staves. The bars 67 are carried by slide-blocks 68, movable to and from each other in slides on a frame 69 in the usual way by reverse levers and links or otherwise, as desired. The frame 69 is reciprocated on slides 70 on the main framework 24 by connecting-rods 71, operated from crank-disks 72, secured to a shaft 73, carried in bearings on the main frame and rotated by a gear-wheel 74 or by other convenient means.

75 76 are templets each pivoted at one end to a slide-block 77 and at the other ends to slide-blocks 78 79, respectively. The blocks 77 78 79 are movable in and out in slides 80

81 82, respectively, by means of links 83, pivoted to the said blocks and to levers 84, secured to the rock-shaft 55, which is journaled in bearings 85 on the frame 69 and reciprocated therewith. The slides 80 81 82 are also carried on the frame 69 and are set at an angle so that as the templets are moved in or out such templets rise or fall accordingly for the purpose hereafter mentioned.

86 87 are rods, one end of each being pivoted to the lower parts of the cutter-frames 18 19, respectively, the other ends being pivoted to two arms of a lever 88, mounted loosely on a shaft 89, secured to the framework.

90 91 are rods, one end of each being pivoted to the lower parts of the cutter-frames 20 21, respectively, the other ends being pivoted to two arms of a lever 92, also mounted loosely on the shaft 89. The levers 88 92 have also weighted arms 93 94, whereby the lower parts of the cutter-frames and the cutters are continually pressed inward toward the center.

95 96 are links, one end of each being pivoted to the lower parts of the frames 18 20, respectively, through openings 97 in the plates 22 23, the other ends being pivoted, respectively, to slide-blocks 98 99, which are movable in slides 100 101, attached to the plates 22 23. 102 103 are brackets or studs secured to the slide-blocks 98 99, respectively, each bracket carrying an antifriction-roller 104 105, which rest upon the templets 75 76, respectively, thereby regulating the distance to which the cutters can be pressed in by the weighted arms 93 94. The templets 75 76 are of varying contour, being straight, or nearly so, at the lower edge corresponding to the narrowest stave, while at the upper edge they are curved to correspond to the fullest curve required on the quarter of the stave. When a single templet is used instead of a jointed one, the curve at the upper edge is the fullest required for both bilge and quarter of the widest stave, so that the stave is cut to the exact curve longitudinally corresponding to its width and to the position of the rollers 104 105 with regard to the templets which is regulated by the rise or fall of the templets as they are moved in or out, the rollers bearing on the lower part of the templets for the narrowest staves and on the upper part for the widest staves.

106 is a lever pivoted to the main frame and actuated by a cam 107 on the shaft 73.

108 109 are rods pivoted to the lever 106 and provided with slotted ends, passing over the ends of the weighted arms 93 94, whereby, through the action of the cam 107, the arms 93 94 may be raised and the cutters withdrawn when a stave has been finished so far as to allow ample clearance for another stave to be pushed into position and the fin-

ished one pushed out. Instead of the cutters being pressed inward by the weighted arms 93 94 they may be arranged to be drawn out, and in this case the templets would be reversed and the rollers 104 105 would rest on the inner sides of the templets, which would regulate the extent to which the cutters could be drawn out, or by having two pair of rollers inside and outside motion in both directions could be given by the templets to the cutters. These arrangements are, however, not so good as those illustrated on the drawings.

110 are clamping-bars suspended by toggle-links 111 from bars 110^a, carried by the slide-blocks 68, as shown in Fig. 2. 112 are links connecting the toggle-links to levers 113 on shafts 114, journaled on the slide-blocks 68. 115 are weighted arms secured on the shafts 114, whereby the clamping-bars are pressed down on a stave between them and the supporting-bars 67. 116 are levers secured on a shaft 117 and actuated by a cam 118 on the shaft 73 and provided with slotted rods 119, whereby the arms 115 may be raised and the clamping-bars raised off the stave to release it when finished. These parts are of any well-known construction.

120 is a roller bearing upon the clamping-bars 110 and journaled in rods or bars 121, which pass down through guides 122 and are connected to weighted levers 123, pivoted on the plates 22 23, so that an extra downward pressure is exerted by the roller 120 on the clamping-bars between the cutters, so that when a very thick crooked stave is being cut which cannot be straightened on the supporting-bars by the usual clamping mechanism the parts of such stave which are being acted on by the cutters will nevertheless be kept in or nearly in proper position to be accurately jointed, although the other parts of the stave may be out of position for the time until they come to the cutting-point, each clamping-bar being, owing to the freedom of the weighted arms 115, capable of an independent rocking motion vertically without releasing its pressure on the stave.

124 are a pair of guides for centering the middle of the stave on the supporting-bars. Each one of the pair is pivoted separately to a slide-block 125, movable in a slide 126 by a screw 127 or other convenient means. The slide 126 is attached to the main framework. In order to insure more accurate simultaneous movement of the pair, I make use of levers 128, attached to the pivots of the guides and connected at their outer ends by links 129 to a slide-block 130, movable in a slide 131, secured to the slide-block 125. The pivots of the levers, links, and guides may be conical or otherwise made so that there is no slack or backlash. 132 are arms also attached to the pivots of the guides 124 and

provided with weights 133, attached to chains passing over pulleys 134, so as to press the outer ends of the guides toward each other.

135 are a second pair of guides for centering the hinder end of the stave. These guides are pivoted separately to a slide-block 136, movable in a slide 137, which is formed in the slide-block 125. A screw 138, mounted on the slide-block 125 and taking into a nut 139 on the block 136, may be used for moving and securing the guides 135 laterally relatively to the guides 124, so as to obtain exact parallel adjustment, both pairs of guides being thereafter moved together by the screw 127, as required, when it is desired to cut more off one side of a stave than off the other.

140 are levers attached to the pivots of the guides 135 and connected at their outer ends by links 141 to a slide-block 142, movable in a slide 143, which may be formed in the same piece as the slide 131 or in a separate piece attached to the slide-block 136. 144 are arms also attached to the pivots of the guides 135 and provided with weights similar to 133, attached to chains passing over pulleys similar to 134, so as to press the outer ends of the guides together.

The staves may be pushed into position on the supporting-bars 67 by any well-known or convenient mechanism.

Instead of the two bearings of each cutter-shaft being secured to one frame they may be pivoted or secured to separate frames, the frames for the upper bearings being movable in or out on cam ways or slides by rods similar to 33 34 36 37 and connections, while the frames for the lower bearings are also movable in or out on other cam ways or slides by rods and links similar to 86 87 90 91 95 96 and connections. Further, the cutter shafts and frames might be arranged below the level of the stave instead of above, and the desired lateral and angular motion may be communicated to the cutters by any other convenient arrangement of mechanism operated from or in conjunction with the mechanism which operates the feelers 53 54. I prefer, however, an arrangement similar to that shown on the drawings. Instead of the templets being carried on inclined slides they may, as will be obvious, be raised or lowered by any other convenient mechanism while being moved in or out, or instead of the templets being movable up and down the rollers 104 105 or the equivalent devices may be moved up or down, say by sliding the rollers on their spindles attached to the brackets or by carrying such rollers on arms pivoted to the slide-blocks 98 99, such up or down motion being given to the rollers, &c., by connections to levers or arms on the rock-shaft 55 in a similar manner to the connections to

the templet slide-blocks before described or in other convenient way.

Instead of having templets jointed in the center, as shown, a single templet corresponding to the full length of a stave may be used, and such templet is contoured from a straight line, or nearly so, at one edge to the fullest curve required for the bilge and the quarter on the widest finished stave, the bilge being the difference in width of the center of a finished stave from the width at the end, while the quarter is the variation of the edge of a stave from a straight line drawn from one end of the edge to the center of the edge, and the position of such templet and the antifriction-rollers or the like resting thereon may be adjusted with relation to each other by automatic mechanism, as above described, or by hand or in other convenient way, as desired.

Although I have described and shown all the cutter-frames being operated from templets on one side only of the machine by means of reverse levers and rods, these levers and rods might be dispensed with, and duplicate templets, such as 75 76, might be arranged on the other side of the frame 69 to control the motion of the cutter-frames 19 21, such templets being mounted on slides and operated from a second rock-shaft, such as 55, mounted on the other side of the frame and operated from the feeler mechanism or from the rock-shaft 55 by a rod and reverse-lever or in any convenient way. Further, instead of two pairs of cutters only one pair might be used, and in such case they would be arranged and movable in a vertical transverse plane at the center of the machine, a single templet and reverse-levers or a templet on each side being employed to control the motion of the cutter-frames, as before described.

When the greatest accuracy is required in the cutter-angles, so as to obtain correct joint from the center to end of staves, and especially when it is desired to use short cutter-shafts, I prefer to employ for controlling the lateral motion of the upper part of the cutter-frame a templet supported on slides fixed to the movable frame 69, such templet having antifriction-rollers resting thereon and connected by slides and links to the upper part of the cutter-frames, reverse weighted levers and links being also used to keep the rollers against the templets in a similar manner to that above described for the lower part of the cutter-frame. In fact, to obtain a theoretically-correct angle the whole length of the edge of the stave the templet should be an exact duplicate of that for the lower part of the cutter-frame; but this may be varied, if desired. The templet is to be moved in or out on its slides by connections from the arm of the lever 42, as above described for the levers 35 38, and links 33 34 36 37 or

other convenient mechanism may be used for giving a small parallel lateral motion to the cutter-frames, while the mechanism first described may be used for giving the motion which varies the angle of the cutter-shafts.

What I claim is—

1. In combination with stave-jointing machinery a templet of contour varying from nearly a straight line longitudinally at one edge to any desired curve at the other edge, a movable frame carrying a cutter-shaft, connections from the movable cutter-frame bearing on the templet adapted to regulate the lateral position of the cutter, mechanism adapted to maintain the cutter-frame connections in contact with the templet, and mechanism adapted to vary the position of the cutter-frame connections and templet relatively to each other and transversely to the longitudinal travel of the templet, substantially as described.

2. In combination with stave-jointing machinery, a pair of feelers arranged to touch the center of the edges of a stave, a templet of contour varying from nearly a straight line longitudinally at one edge to any desired curve at the other edge, a movable frame carrying a cutter-shaft, connections from the movable cutter-frame bearing on the templet adapted to regulate the lateral position of the cutter, mechanism adapted to maintain the cutter-frame connections in contact with the templet, and mechanism connected with the feelers and adapted to vary the position of the cutter-frame connections and templet relatively to each other and transversely to the longitudinal travel of the templet, substantially as described.

3. In combination with stave-jointing machinery a pair of pivoted centering-guides provided with lever-arms, a link connected to the outer end of each arm the other ends of said links being connected to a common block movable in a slide, as described.

4. In combination with stave-jointing machinery a slide-block carrying a pair of guides for centering one part of a stave, a second slide-block mounted and movable in the first slide-block and carrying a second pair of guides for centering another part of the stave, means for adjusting the second slide-block relatively to the first, and means for moving the slide-blocks laterally, substantially as described.

5. In stave-jointing machinery, cutter-shaft carriers supported at one point on camways, which are adapted to maintain one edge of the cutters at a certain perpendicular distance with relation to the flat side of the stave, mechanism for regulating the position of the cutter-shaft carriers on the camways, and mechanism for moving a different part of the cutter-shaft carriers and the cutters laterally; substantially as described.

6. In combination with stave-jointing machinery, stave-clamping bars mounted and arranged to receive a rocking motion, and a weighted roller arranged to press on the
5 stave-clamping bars near the cutting-point, substantially as described.

In testimony whereof I have signed my

name to this specification in the presence of two subscribing witnesses.

ALEXANDER DUNBAR.

Witnesses:

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E. OWEN.