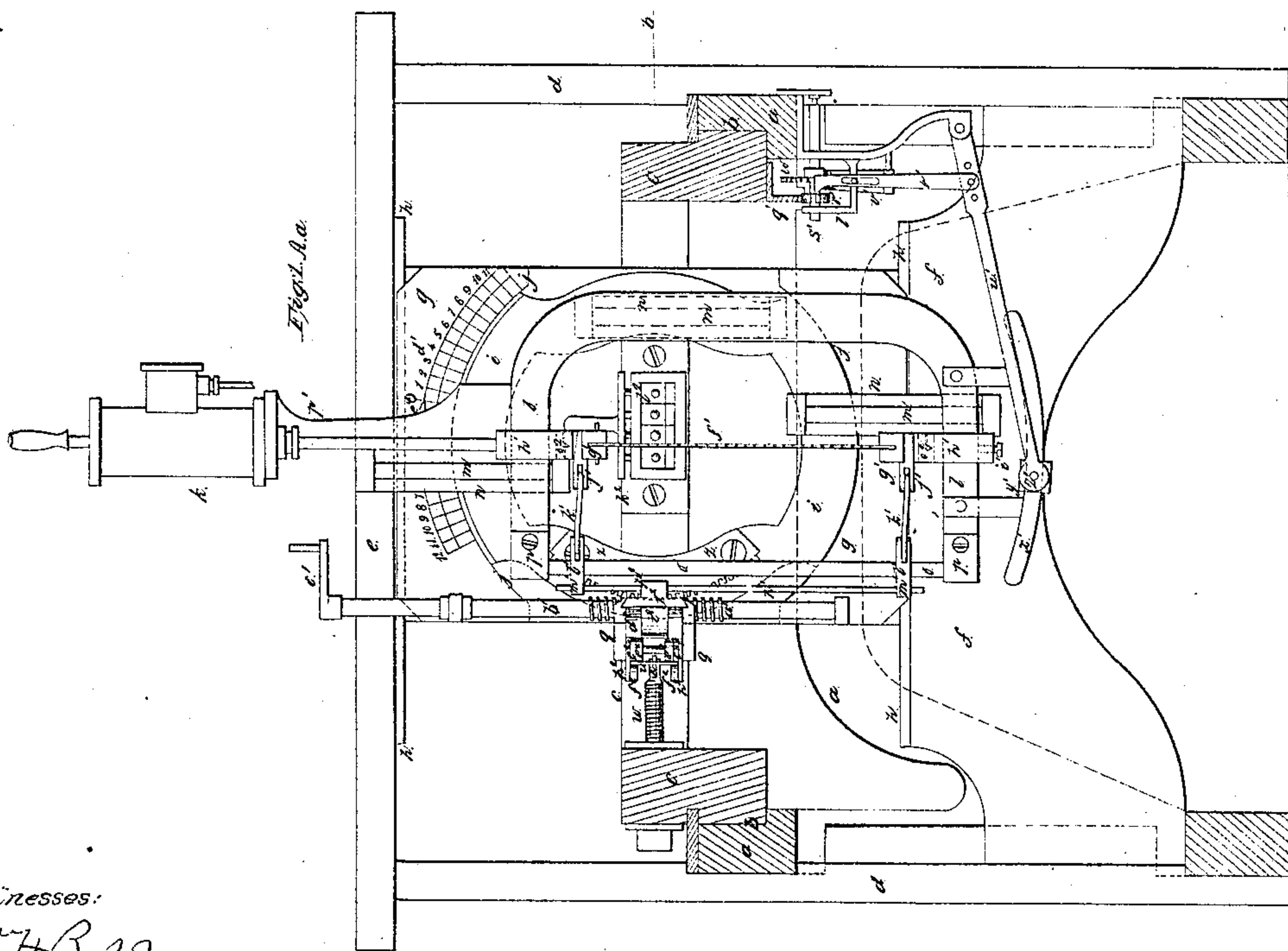
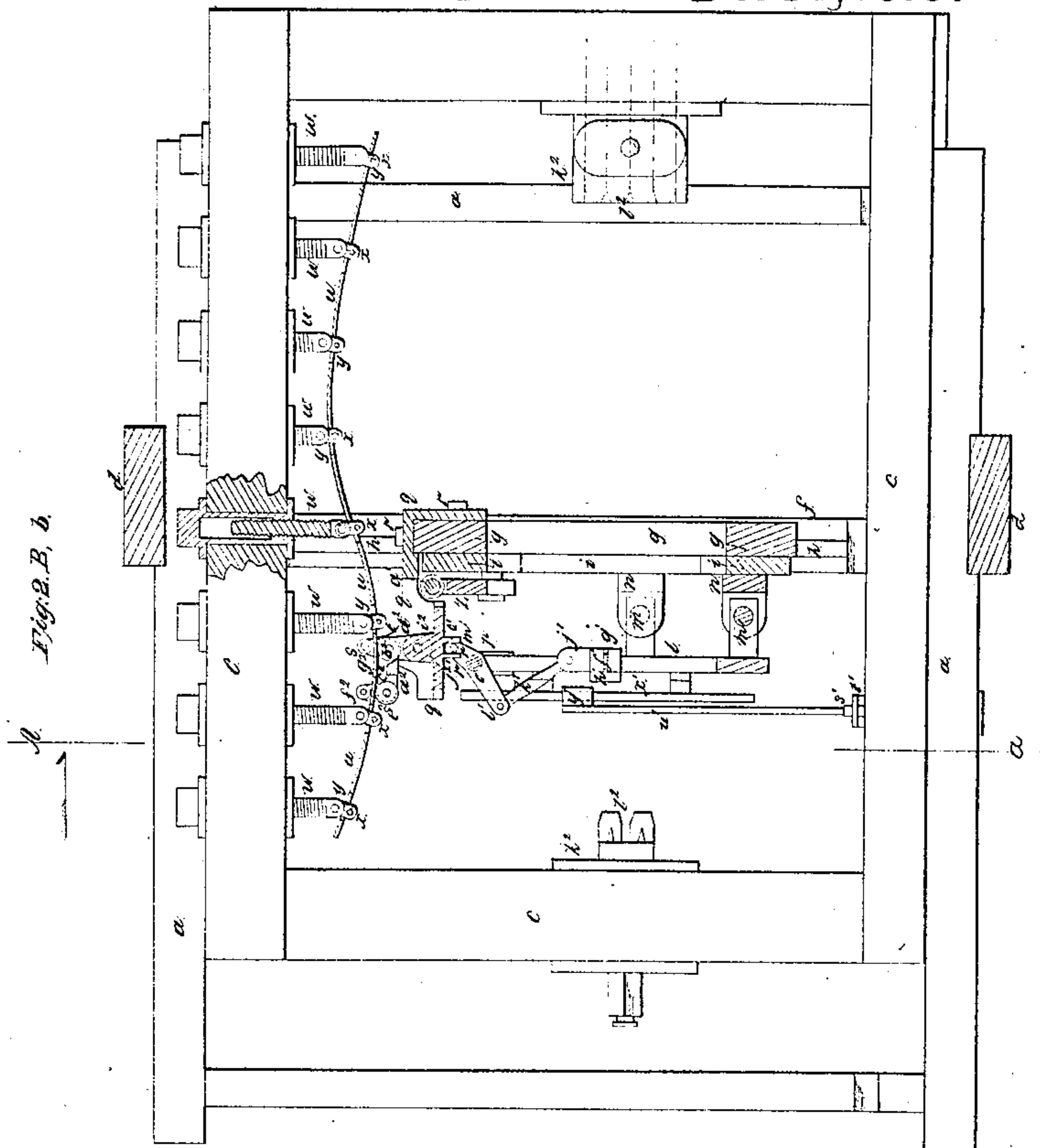


*H. S. Vrooman,
Reciprocating Saw Mill.*

N^o 4,1034.

Patented Dec. 22, 1863.



*Witnesses:
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UNITED STATES PATENT OFFICE.

HENRY S. VROOMAN, OF PATERSON, NEW JERSEY.

IMPROVEMENT IN MACHINES FOR SAWING IRREGULAR FORMS.

Specification forming part of Letters Patent No. 41,034, dated December 22, 1863.

To all whom it may concern:

Be it known that I, HENRY S. VROOMAN, of Paterson, in the State of New Jersey, have invented certain new and useful improvements in machinery for sawing irregular forms of wood, such as are used in building ships and for other purposes; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a transverse vertical section taken at the line A *a* of Fig. 2, and Fig. 2 is a horizontal section taken at the line B *b* of Fig. 1.

The same letters indicate like parts in each of the figures.

My said invention is intended for and adapted to sawing timber for ship-building or other purposes, whether curvilinear, straight, beveling, or winding.

The log or timber during the process of sawing receives but one motion, and that is in a straight line, as in mills for sawing logs into straight lumber, all the other motions, whether for curves or bevels of any degree, being given to the saw.

The saw is strained in a reciprocating gate or sash so that it can be turned therein to any angle desired to follow the intended line of kerf or cut, the motions for so turning the saw being derived from a pattern-guide or templet, which is flexible, and which may be bent and set to any form desired. The saw-gate is mounted to slide on ways attached to a turning frame so mounted that it can be turned to any requisite degree in a vertical plane at right angles to the plane of motion of the carriage which carries the log or timber to be sawed, so that the plane of the reciprocating motion of the saw can be either set or moved during the cutting action to any inclination with the horizon, and thereby make it cut at any angle desired, whether for square, beveled, or winding work; and the turning frame, which carries the ways in which the saw-gate slides, is mounted in a vertical frame capable of sliding with the turning frame and saw-gate at right angles with the plane of motion of the carriage which carries the log or timber to be sawed, the said sliding motion being derived from the same flexible and adjustable pattern or templet, from which are derived the motions for turn-

ing the saw on its longitudinal axis to make it take the direction of the intended kerf.

The steam-engine by which the saw-gate is operated by direct connection is mounted on the turning frame, which carries the ways on which the saw-gate slides, so that the engine and its connections with the saw-gate follow the change of position of the saw-gate whether it be moved to the right or left in sawing curves or turned in a vertical plane to saw bevels; and the connections between the saw-gate and the mechanism for giving the feeding motion to the carriage which carries the log are so arranged that the feeding motion, when set, will not be varied by the change of positions that determine the line of cut, whether curvilinear, beveling, or winding.

In the accompanying drawings, *a* represents a rectangular frame having two ways or guides, *b b*, placed longitudinally on its upper part. *c* is a carriage which works on said ways or guides. *d d* are two uprights placed on each side of the frame *a* at opposite points. The upper ends of these parallel uprights are connected by a cross-piece, *e*, and just below the middle of the frame said uprights are connected by another cross-piece, *f*.

g represents an upright frame fitted to slide laterally between ways *h h*, said ways being connected with cross-pieces *e f*. Frame *g* has an opening in its center through which the timber passes as it is being sawed. To the frame *g* is connected another frame, *i*, having an opening in it corresponding to that in frame *g*. The upper and lower ends of frame *i* are segments of circles fitted to and working within corresponding concave surfaces *j*, so attached to frame *g* as to be easy of adjustment in taking up play or wear. Clasps may be attached to the frame *g* to confine the frame *i* in place; or the concave surfaces *j* may be V-shaped and the segments of the frame *i* correspondingly shaped. Frame *i* may thus be held firmly in position, or left free to be tilted or inclined either way, and at the same time rendered a permanent combination with the frame *g* so far as shaking is concerned from the action of the engine *k* (attached thereto) in driving the saw-sash *l*. The saw-sash or gate *l* is provided with suitable boxes to slide on three parallel rods, *m*, the ends of which are fitted to and secured in projecting pieces from plates *n*, secured to the frame *i*, the parallel rods *m* being in a vertical position when

the frame i is vertical, so that with the said frame the saw can be worked at any desired inclination to suit the bevels required to be sawed. The saw-sash is formed of one upright and two horizontal parts. The outer ends of the said horizontal parts are connected by a rod, o , which is fitted in bearings p (see Fig. 1) at each end, so as to allow of its turning therein.

To the frame g is attached an arm, q , by bolts r , the said arm being provided with rollers s and t , which embrace a flexible pattern or templet u , in manner to be presently described.

u is a spring-steel pattern or guide (see Fig. 2) held and controlled by screws or rods w , which are secured to the carriage by screw-nuts, as represented, or other equivalent means, so that the rods w may be moved and secured so as to obtain the desired form in the pattern u . Pattern u is attached to the screws or rods w by means of small flat bars x riveted loosely in a slot formed in the rounded ends of rods w , said bars passing through slots y , formed in the pattern, (see Fig. 2,) and a pin confined in their ends so as to hold the pattern up against the ends of the screws or rods w . The flat bars x being so secured in the ends of the screws or bars w as to leave their opposite ends free to move horizontally are thus enabled to take any position the pattern may be made to assume, while at the same time the length of the slots in the pattern allows the bars x to slip or move horizontally in said slots, so as to compensate for the lengthening and shortening of the pattern resulting from its being made to assume different forms. To insure graceful and easy curves and shapes in the pattern perforations of the diameter of the width of the slots y may be made through this pattern-plate at intermediate spaces between said slots, so as to make it equally flexible.

There is a rocker, a^2 , connected with the arm q of the frame g by a vertical fulcrum-pin, b^2 , to which are fitted the rollers t t , that bear against the inner face of the pattern or templet u . This rocker constitutes two arms, c^2 and d^2 , the outer end of the arm c^2 carrying two rollers, e^2 e^2 , that bear like the rollers t t against the inner face of the pattern u , and, as the object is to have this arm of the rocker follow the tangents of the curvatures of the pattern u , both ends of it are connected by links g^2 g^2 and h^2 h^2 with rollers s s and f^2 f^2 , which bear on the outer face of the pattern, so that it (the pattern) is embraced between the four sets of rollers, t t s s and e^2 e^2 f^2 f^2 . The other arm, d^2 , of the rocker a^2 is connected by a joint-pin with a projection, i^2 , of a carrier, j^2 , to be hereinafter described, and which is made to slide in the arm q as the rocker a^2 is vibrated by following the curvatures of the pattern, as will be more fully described hereinafter.

The frames g and i are thus connected with the pattern u by the rollers t and s and con-

trolled by it in their lateral position in the degree corresponding to the "sweep" or irregularity of its form, as it (the pattern) moves along with the carriage to which it is attached. As the links g^2 h^2 at their outer ends accommodate their position to the form of the pattern, and from the bearing of the rollers s and f^2 against the pattern fall in the direction of the movement of the pattern, a close bearing is thus had against both sides of the pattern, and all play or wear thereby automatically taken up. To one edge of the beveling-frame is attached a segment-rack, z , the cogs of which are engaged by the thread of a screw or worm, a' , on a shaft, b' , having its bearings fitted to turn in suitable boxes on the face of the horizontally-sliding frame g , and this shaft is provided with a crank-handle, c' , by which an attendant can turn it to the right or left, and thereby turn the frame i either way to incline the saw-gate, as may be required to suit the desired bevel. In doing this the operator is governed by the graduations d' , marked on the face of the sliding frame g , and an index-hand, e' , or pointer attached to the turning frame i .

f' is a common up-and-down web-saw placed in the sash l . The upper and lower ends of said saw are secured in the usual way in pieces g' . The outer ends of said pieces are bent horizontally and fit into corresponding bent portions of vertical bars h' , embracing the horizontal parts of the saw-sash l . The bent portions of the pieces g' have pivot-points o^2 , (shown in dotted lines in Fig. 1,) which bear in corresponding shaped cavities in the bars h' , which allows of the saw being turned in the saw-sash with but little friction. One or both of the bars h' have screws i' passing through their outer ends, which bear against the saw sash, by means of which the saw can be properly strained for use. The pieces g' have projecting arms j , to which jointed links k' are attached, so as to turn the saw in the sash. These links k' are connected at their opposite ends to arms l of the rod o , before described, the said rod o being provided with other arms m' , and the said arms m' carry a rod, n' , which is parallel with the rod o .

The mode of application of what I denominate the compensating mechanism is composed of the rod n' on the arms m' of the rod o , which, as the saw-sash reciprocates, slides in a slot, o' . This slot is parallel with the saw sash, and is made in a piece, p' , projecting from a carrier, j^2 , fitted to slide in ways in the arm q of the horizontally-sliding frame g , the motion of the said block being at right angles to the plane of motion of the said sliding frame g . The outer face of the said carrier j^2 is formed with a projection, i^2 , which is connected by a hinged pin with inner arms, d^2 , projecting from the rocker a^2 , before described as carrying the rollers t t and e^2 e^2 , which bear against the pattern or templet.

From the foregoing it will be seen that as

the carriage c , with the log to be sawed, moves longitudinally, and with it the pattern or templet, the upper and lower edges of the said templet being embraced by the two sets of friction-rollers t s and e^2 f^2 , which are connected by links g^2 h^2 , one set with the fulcrum-pin b^2 of the rocker a^2 and the other set with the end of the arm c^2 of the said rocker, that the said rocker will be turned on its axis by the curvatures of the templet, the plane of the arms c^2 always following the face of the templet no matter what may be its form. As the rocker a^2 is turned to follow the curves of the templet by reason of its connection with the carrier j^2 it, (the carrier,) and the slot o' , in which the rod n' slides, is moved toward or from the plane of the saw-sash, depending upon the direction of the curve. In this way the rod n' is turned to the right or left, and with it the saw, by reason of the connections before described. In this way the saw is moved so as to have its cutting-edge in the line of the intended kerf; and as the carrier communicates the required motion to the saw by the rod n' , and this rod works in the slot o' of the carrier, and the rod can have any amount of lateral play in this slot, it follows that the required turning of the saw will continue to be performed without reference to the inclination of the saw-sash in bevel-sawing.

The slot o' , I prefer to have lined with wood, so that the guide-rod n' may operate in it at any degree of speed with but little friction or wear.

A reciprocating motion of the saw and saw-sash is obtained by the action of the engine k , which is bolted firmly to the bracket or seat p' , said bracket being attached to the upper part of the beveling-frame i , the piston-rod of the engine being attached directly to the saw-sash.

The valve of the engine is operated in any suitable manner.

The carriage is fed in the usual way by rack q' and pinion r' underneath the carriage, the pinion being attached to and driven by the transverse shaft s' , said shaft being supported by the frame t' .

Feed-motion is imparted to the carriage by the reciprocating motion of the saw-sash l through lever u' , pawls v' , and ratchet-wheel w' .

On the lower part of the saw-sash is secured a sector bar, x' . On this bar is fitted a sliding sleeve, y' , and on a pin, z' , projecting out from and forming a portion of sleeve y' , the end of the feed lever w' works. As the sleeve y' is free to slide either way on the sector-bar x' , the saw-sash may be thrown in oblique positions either way, and an up-and-down movement still be given to the end of the feed-lever w' from the action of the saw-sash.

The upper end of the saw is inclined forward to give it "rake," so that when it is moved up the timber is moved or fed forward and the saw changed in its position to agree

with the form of the pattern, and when it is moved downward the timber is at rest and the saw does its work. Thus it will be seen that the beveling and lateral movements of the saw are obtained when all the parts are free from strain or binding consequent upon the cutting of the saw, and therefore but little force is required to be exerted by the guide or pattern to produce the desired effect upon the saw.

h^2 are head and tail blocks inserted in the transverse timbers of the carriage c . l^2 are dogs in the head and tail blocks for the purpose of securing the timber in the usual way.

The timber, after having the lines described upon its upper surface, showing the form of curves or crook required, and the figures marked thereon indicating the degree of bevel required at the different points, is firmly secured in the carriage. The crooking pattern is then set to conform to the lines marked on the timber by so moving the screws or rods w longitudinally as to produce a uniform distance between the said pattern and lines marked on the timber throughout their entire length.

Having thus described the construction and adjustment of my invention as represented, I will now describe its operation. Steam is admitted into the engine which moves the saw up and down. The carriage is fed with the pattern in the proper direction to feed the stuff to the saw, causing the pattern u to move the frames g and i and the saw laterally in the degree corresponding to the form of the pattern, and at the same time guide the teeth of the saw in the intended direction of the kerf or cut, while by the aid of the index and pointer, and turning the worm that acts on the cogged sector, the operator can turn the saw to give the required windings and bevels.

I claim—

1. In the mechanism for turning the saw to guide it in the direction of the intended kerf or cut, giving a compensating play to the mechanism between the pattern and the saw substantially as described, so that the turning of the saw on its longitudinal axis by the pattern shall not be affected by the change of position of the saw-gate in bevel-sawing, as set forth.

2. The reciprocating saw and saw-sash, the turning or bevelling frame to give the required inclination for bevel-sawing, and the horizontally sliding frame for curvilinear sawing, in combination with the application of the power for driving the saw, constructed substantially as described, so that it shall at all times operate in line with the saw, whatever may be its change of position in curvilinear and bevel sawing, as described.

3. The flexible templet or pattern for turning the saw on its longitudinal axis, in combination with the friction rollers or surfaces which embrace it, and which communicate the turning motion to the saw when the rollers or surfaces which bear against the outer

surface of the templet or pattern are connected with the friction rollers or surfaces that bear against the inner surface thereof, and connected by joint links or arms free to turn, substantially as described, whereby the action resulting from the motion of the templet or pattern on the said outer rollers will cause them automatically to take their proper position relatively to the pattern and the inner rollers and take up any play which may arise from imperfect construction or wear of the parts, as set forth.

4. In combination with the saw-gate, the turning frame for bevel-sawing and the sliding frame for curvilinear sawing, connecting the feeding mechanism with the saw-gate by a sliding mechanism, substantially as de-

scribed, so that the feeding operation will continue to be derived from the reciprocating motion of the saw-gate irrespective of its change of position, as set forth.

5. The segment-rack attached to the beveling frame, and the worm or screw mounted in the horizontally-sliding frame, substantially as described, in combination with the index-hand attached to the beveling-frame and the index on the horizontally-sliding frame, constructed and operated substantially as and for the purpose described.

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Witnesses:

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A. DE LACY.