(No Model.) 4 Sheets—Sheet 1.

E. CULVER.

Sawing-Machine.

No. 226,904. **Patented April 27, 1880.**

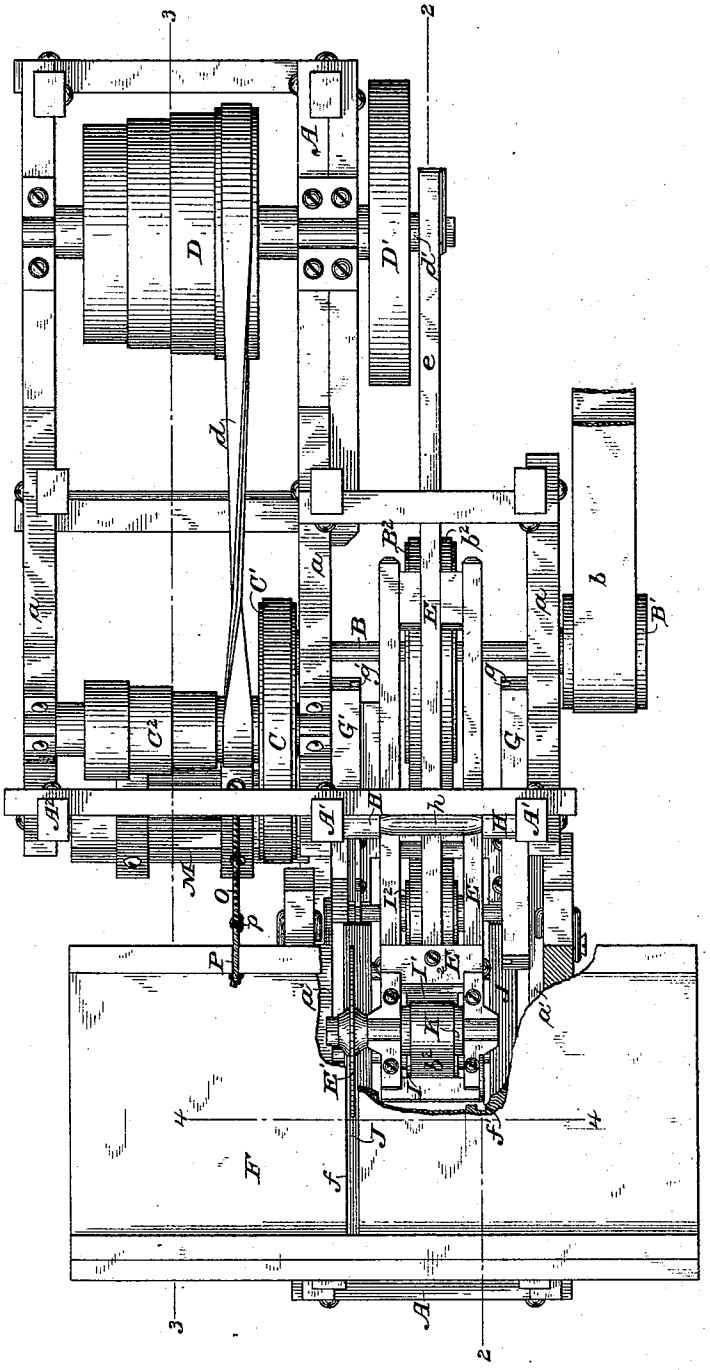


Fig. 1.

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INVENTOR

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E. CULVER.
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Fig. 2.

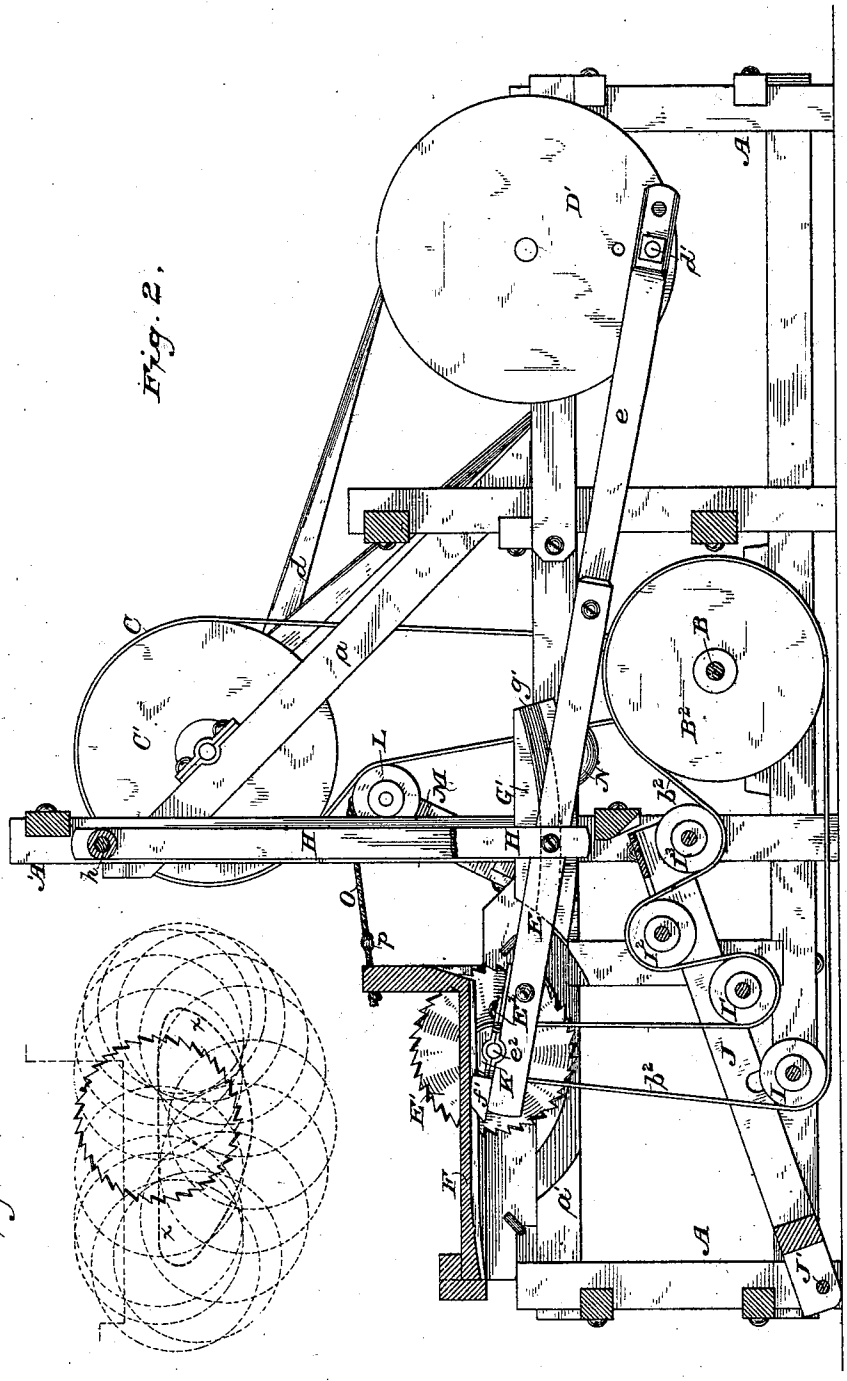


Fig. 5.

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E. CULVER.

Sawing-Machine.

No. 226,904. **Patented April 27, 1880.**

Fig. 3.

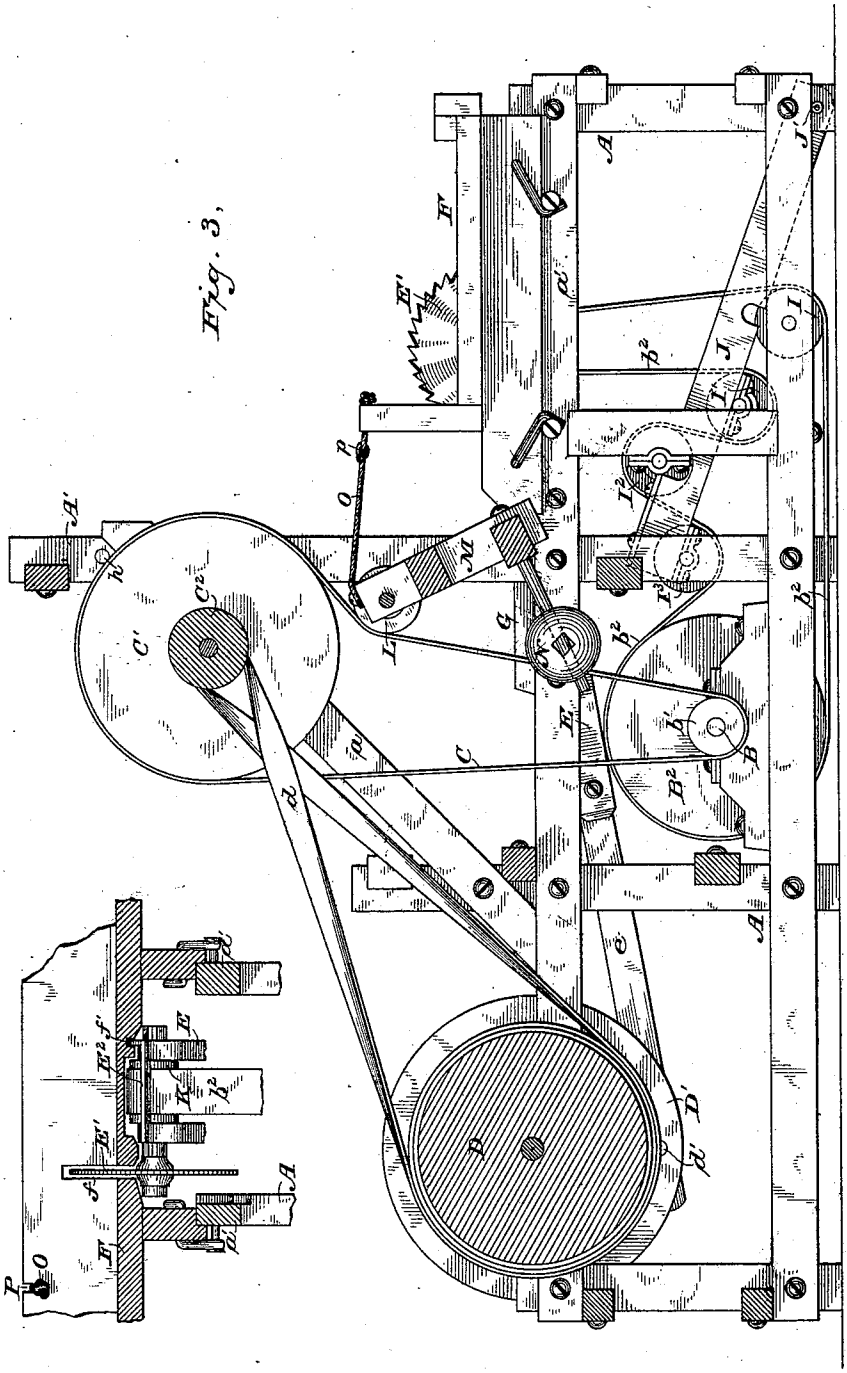


Fig. 4.

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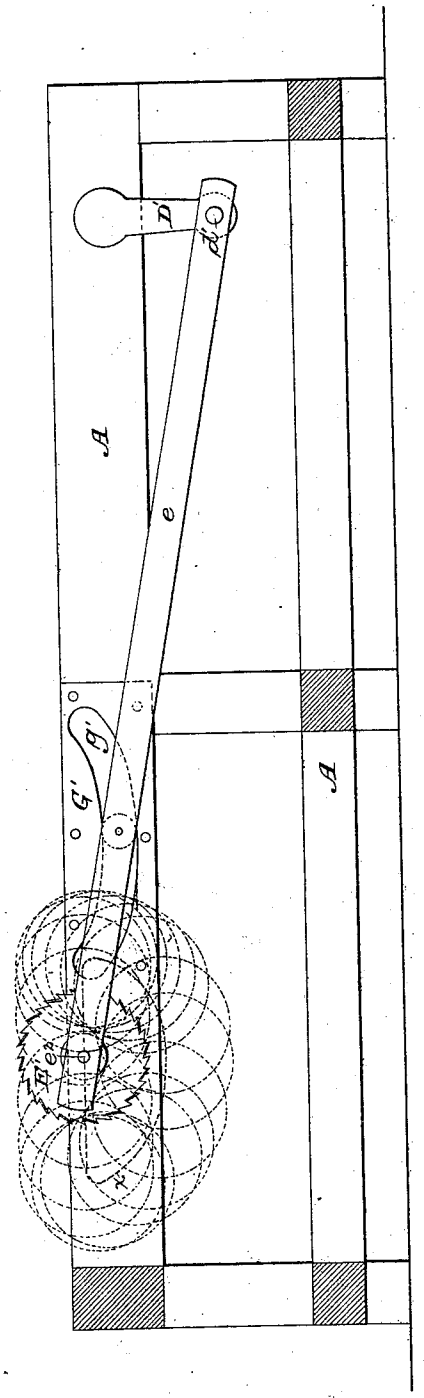
(No Model.)

4 Sheets—Sheet 4.

E. CULVER.

Sawing-Machine.

No. 226,904. Patented April 27, 1880.



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UNITED STATES PATENT OFFICE.

EBER CULVER, OF WILLIAMSPORT, PENNSYLVANIA.

SAWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 226,904, dated April 27, 1880.

Application filed March 9, 1880. (No model.)

To all whom it may concern:

Be it known that I, EBER CULVER, a citizen of the United States, residing at Williamsport, in the county of Lycoming and State of Pennsylvania, have invented certain new and useful Improvements in Sawing-Machines, of which the following is a specification.

My invention relates to improvements in circular sawing machines adapted for cross-cutting or for slitting, and is designed for either heavy or light work, as may be necessary, in preparing timber, planks, or boards for various manufacturing purposes.

The object of my invention, chiefly, is to provide an efficient quick-working machine of the class in which the material to be sawed is held stationary while the saw is rotated and advanced into or through it.

My improvements consist in a novel organization of mechanism, whereby the saw while rapidly rotating is caused to advance through a slot in the work support or table in a straight, or substantially straight, line, its axis of revolution moving forward in a path about parallel with the table-top, the saw being then caused to descend and move backward in a curved line and then ascend, partially project through the table-slot, and again advance; also, in certain combinations of mechanism whereby the reciprocating motion or advance and return movement of the saw may be checked at any point, as desired, to enable the attendant to throw the saw out of operation, to use the machine as an ordinary rotating sawing-machine, or for scoring the edges of or partially cutting through the material; also, in minor combinations of devices and arrangements of parts.

My improvements will hereinafter first fully be described preparatory to specifically designating what is claimed.

In the accompanying drawings all my improvements are shown as suitably embodied and in the best form now known to me. Some of my improvements may, however, be used without the others, and changes may be made in constructions of parts and in details of arrangement.

Figure 1 is a plan or top view of so much of a fully-organized machine as is deemed necessary to illustrate my invention. Fig. 2 is a view, partly in side elevation and partly in longitudinal vertical section, in, or about in, the planes of the line 2 2 of Fig. 1. Fig. 3 is a view, partly in elevation and partly in section, on the line 3 3 of Fig. 1, as seen from the side opposite that represented by Fig. 2. Fig. 4 is a view, partly in front elevation and partly in transverse vertical section, on the line 4 4 of Fig. 1, showing the table, the saw, and its immediate connections. Fig. 5 is a diagram illustrating the movements of the saw. Fig. 6 is a view, partly in side elevation and partly in section, designed to show a slightly-modified construction of parts, and in which a swing-support for the saw-frame is dispensed with.

A suitable frame-work or skeleton-frame, A, is provided to support the various parts of the mechanism. As in this instance shown, the frame supports, near its base, a main or driving shaft, B, mounted in proper bearings, so as to rotate freely, and driven by a band, *b*, passing round the pulley B′, fixed on the shaft.

A pulley, *b*′, is fixed on the end of the driving-shaft opposite that to which the main or driven pulley B′ is fixed. Intermediate these pulleys, and at about the middle of the main shaft, a large fixed pulley, B^2, is mounted. A band, b^2, passes around this pulley, for a purpose hereinafter to be explained.

Motion may be communicated to the driving-shaft from any suitable motor and in any well-known desirable way.

A band, C, passes around the pulley *b*′, and thence upward and around a large fixed pulley, C′, on a cone-pulley shaft, C^2, mounted in proper bearings on diagonal pieces or braces *a a* of the frame.

A belt, *d*, passes from any one of the cone-pulleys C^2 backward to the corresponding pulley on the driven cone-pulley shaft D, mounted in bearings on horizontal pieces of the frame A at or near its rear end. A crank arm or wheel, D′, is fastened on one end of this driven cone-pulley shaft D, and an adjustable crank wrist or pin, *d*′, on the wheel serves to joint thereto a connecting-rod or pitman, *e*, for actuating a saw frame or gate, E.

The gate or saw-frame E is rigidly connected with, or in part formed by, the arm or pitman *e*, and carries the saw E′ at its front end.

The saw arbor or shaft e^2 is mounted in bearings in a centrally-slotted metallic plate or skeleton-bracket, E^2, on the top of the forward end of the gate or frame. The saw is located at the side of the gate, and works through a slot, *f*, in a table, F, removably secured in position by suitable means, such as pivoted hooks or catches on the table and studs on the frame-pieces *a' a'*.

Trunnions or short studs, provided with rollers, if desired, at each side of the gate or saw-frame and intermediate its ends—say about midway its length—work, as will hereinafter be explained, in curved guide slots or ways *g g'*, formed in suitable fixed plates or brackets G G', opposite each other and upon the inner sides of the frame-bars *a' a'*.

A swing-frame or vibrating support for controlling the movement of the saw-gate is shown as formed by two bars, H H, jointed at their upper ends by the pivot *h* to and between the frame-uprights A' A', and at their lower ends pivoted to the trunnions of the gate.

The saw gate or frame E is fitted snugly between the slotted pieces G G', so as to prevent horizontal vibration.

As an additional precaution against sidewise movement or horizontal vibration of the gate, a lug or spur, *f'*, on the saw-bearing bracket E^2 is provided to work in a guide-groove on the under side of the table F, as the saw is advanced, in the manner presently to be described.

The band b^2 of the before-referred-to large pulley B^2 on the driving-shaft passes from the under side of said pulley around the foremost and lowermost one, I, of a set of idle and band-tightening pulleys—in this instance four in number, two of which are mounted in a self-adjusting oscillating frame, J, pivoted at its heel end by a pin, J', to the base of the frame of the machine.

From the pulley I the band passes round a pulley, K, fast on the saw-arbor, and revolving in the slot of the bracket in which said arbor is mounted. The band next passes downward around the second and adjustable tightening-pulley I', thence around the remaining non-adjustable and adjustable pulleys I^2 I^3 to the pulley B^2.

Obviously a greater or less number of pulleys might be used, according to the amount of play the self-adjusting pulleys may be given by the vertical vibrations of the pin-jointed frame J and the amount of reciprocating movement to be given the saw.

The weight of the frame J, its pulleys I' I^3, and their bearings and shafts will probably be sufficient to keep the band taut at all times; but a spring or springs acting with a tendency to rock down the outer end of the pulley-frame may be used, if deemed necessary, and I prefer to add the spring.

For the purpose of stopping the to-and-fro movement of the saw, while still leaving it free to rotate, I employ a band-tightening idle-pulley, L, mounted in a rocking frame, M, pin-jointed at its lower end between one of the frame-uprights A' and the frame-upright A^2, and bearing, when in its normal position, against the band C. This pulley is ordinarily held in its working position by a suitable counter-balance or weight, N, or by a spring.

By means of a knotted cord, O, engaging with a slot, P, in the back piece of the work-table F, or in other suitable way, the pulley L may be rocked back from the band C and held out of contact therewith, thus slackening the band, so that no motion is given it by the pulley *b'* on the driving-shaft. When secured by adjusting the cord so that its knot *p* is held by the slot, the pitman *e*, for giving the saw its advance-and-return movement, ceases to work.

In regular operation the saw has the movement imparted to it indicated by Fig. 5 as its gate is worked to and fro, and guided by the swing-frame alone, or in connection with the ways or slots secured to the frame. The axis of the saw travels the path indicated by the heavy dotted line *x*, corresponding somewhat to the outline of a half-oval, or approximating the shape of half, or little more than half, an ellipse.

It will be seen that the saw has imparted to it, while revolving about its own axis, a combined reciprocating and oscillating movement, being caused to advance in a straight, or practically straight, line, and in a path parallel with the table-top, or nearly so, then caused to drop or descend suddenly, move back in a curved path beneath the table, next ascend abruptly, and again move forward. When the saw is on the return movement or back stroke the board or other material being cut up is fed forward or across the path of the saw the desired distance to be cut while stationary as the saw next advances.

By stopping the to-and-fro movement of the saw at the time, for instance, when it is on the commencement of its forward movement, or when it has partially completed its advanced movement and occupies the position in which it is shown by the drawings, the material may be fed up to the saw, thus working as an ordinary circular saw for cutting through or for cutting only part way into the material.

The adaptability of the saw to perform the different kinds of work described renders it highly useful to furniture-makers, box-makers, and for various kinds of light or heavy work.

While I prefer to employ the swinging saw-gate-supporting frame H H, to lessen strain and decrease the frictional contact of parts, it may be omitted, and when dispensed with I deem it preferable to form the guide-slots for the saw-gate as shown in the modified construction, Fig. 6 of the drawings.

The path of movement of the saw is substantially the same in this modified construction as before.

I do not claim giving to a circular saw a motion of rotation independent of its revolution about its own axis, and thus cause it to advance in a path which would be that of

half, or nearly half, of an arc, and return beneath the table while moving in the balance of the circle. Neither do I wish to be understood as confining my invention to the identical devices shown, nor to giving to the saw the precise movements described and shown, for obviously a mode of operation essentially similar to that of my invention would result were the advance movement of the saw in a very slightly curved instead of a horizontal path, and its return movement in an arc of much smaller radius than that described on its forward stroke, or in a path defined by an oval more or less flattened than that shown.

I claim as of my own invention—

1. The combination, substantially as hereinbefore set forth, of the saw frame or gate provided with side trunnions, the rotary saw, and the curved guide ways or slots in which said trunnions work to impart to the gate and saw a combined oscillating and to-and-fro movement, essentially as and for the purpose described.

2. The combination of the saw-gate, the swing-frame or vibrating support to which the gate is pivoted, the rotary saw, the arm or pitman of the gate, and the crank-wheel, these members being and operating substantially as hereinbefore set forth.

3. The combination, substantially as hereinbefore set forth, of the reciprocating and oscillating saw frame or gate, the saw, the pulley on the saw-shaft, the series of band-tightening pulleys, the self-adjusting pulley-carrying frame, and the pulley for imparting motion to the saw-driving band.

4. The combination, substantially as hereinbefore set forth, of the reciprocating and oscillating saw frame or gate controlled in its movement by means essentially such as described, the rotary saw having its revolving motion imparted to it from the driving-shaft by band-and-pulley connections, the crank and pitman for giving the to-and-fro movement to the saw-frame, band-and-pulley connections between said crank and the driving-shaft, and means, substantially such as described, for throwing the crank and pitman into and out of operation, for the purpose set forth.

5. The combination, substantially as hereinbefore set forth, of the saw frame or gate reciprocated and oscillated in the manner and by the means essentially as described, the rotary saw, the slotted table, the rocking frame carrying the band-tightening pulley, the driving-shaft pulley, from which motion is imparted to the mechanism for reciprocating the saw-frame, and means, essentially such as described, for throwing the said band-tightening pulley into and out of contact with the band passing from the driving-shaft pulley.

6. The combination, substantially as hereinbefore set forth, of the oscillating and reciprocating saw frame or gate supported and controlled in its movements by means essentially as described, the rotary saw, the table, the cone-pulley shaft driven by a band from the driving-shaft, the rocking frame carrying the pulley acting on said band, the second cone-pulley shaft, the crank or crank-wheel thereon, and the pitman connecting the saw-frame with said crank.

7. The combination, substantially as hereinbefore set forth, of the crank, the pitman, the saw frame or gate, trunnions thereon, curved guideways in which the trunnions work, the rotary saw, the driving-band, the series of band-tightening pulleys, the driving-shaft, and the pulley thereon around which said band passes.

8. The combination of the reciprocating and oscillating saw frame or gate, the slotted brackets or guideways for controlling the movements of the saw-frame, and the swing-frame for supporting the saw-frame, substantially as hereinbefore set forth.

In testimony whereof I have hereunto subscribed my name.

EBER CULVER.

Witnesses:

H. HINCKLEY,

NEWTON H. CULVER.