J. L. GRAHAM.

GANG SAW MILL.

APPLICATION FILED MAR. 26, 1908.

**1,000,510.**

**Patented Aug. 15, 1911.**

3 SHEETS—SHEET 1.

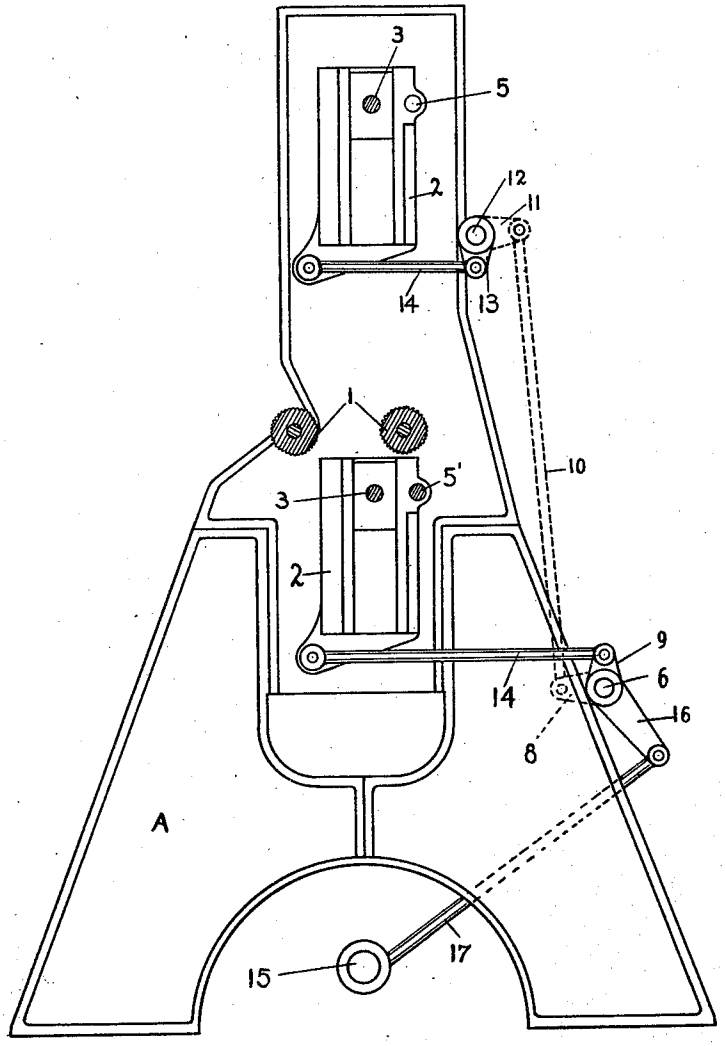


FIG. 1.

WITNESSES:

J. Ray Abbey

Ralph S. Litterfield.

INVENTOR

John L. Graham

BY

Geo. B. Willcox

ATTORNEY

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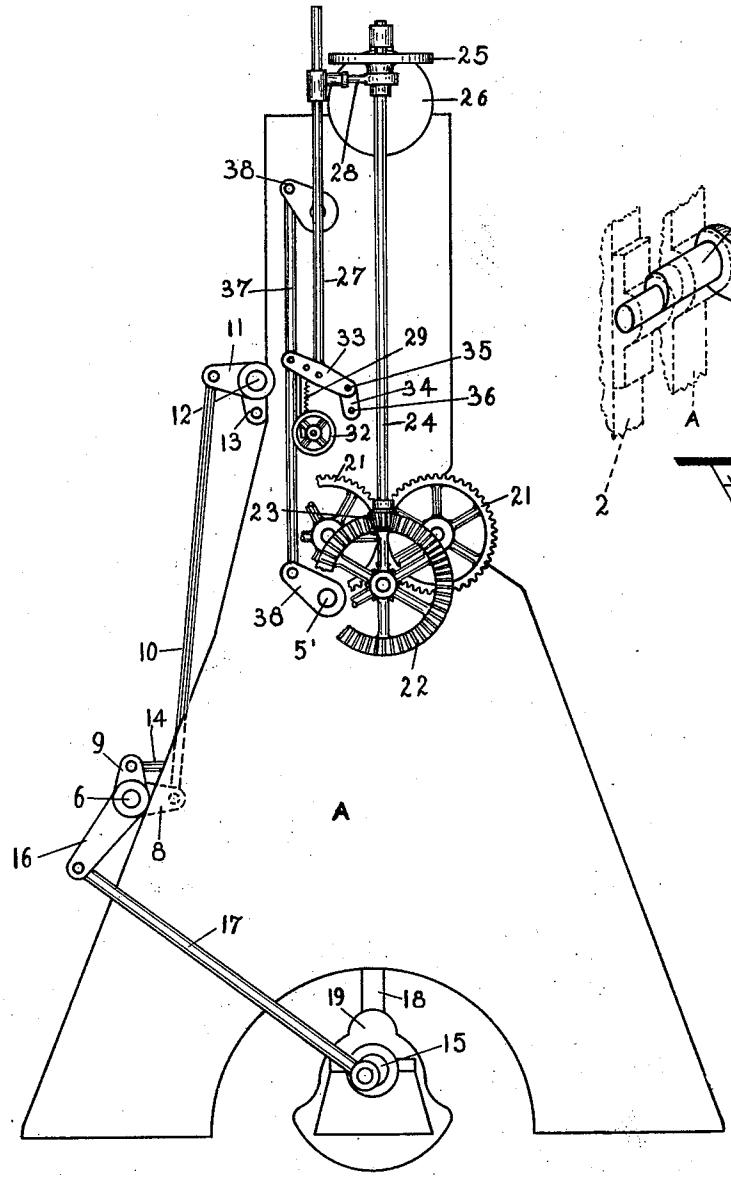


FIG. 2

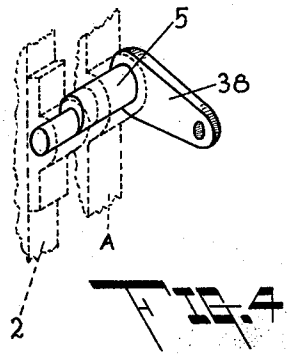


FIG. 4

WITNESSES:

J. Ray Abbey

Ralph S. Warfield.

INVENTOR

John L. Graham

BY

Geo. B. Willcox

ATTORNEY

J. L. GRAHAM.

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3 SHEETS—SHEET 3.

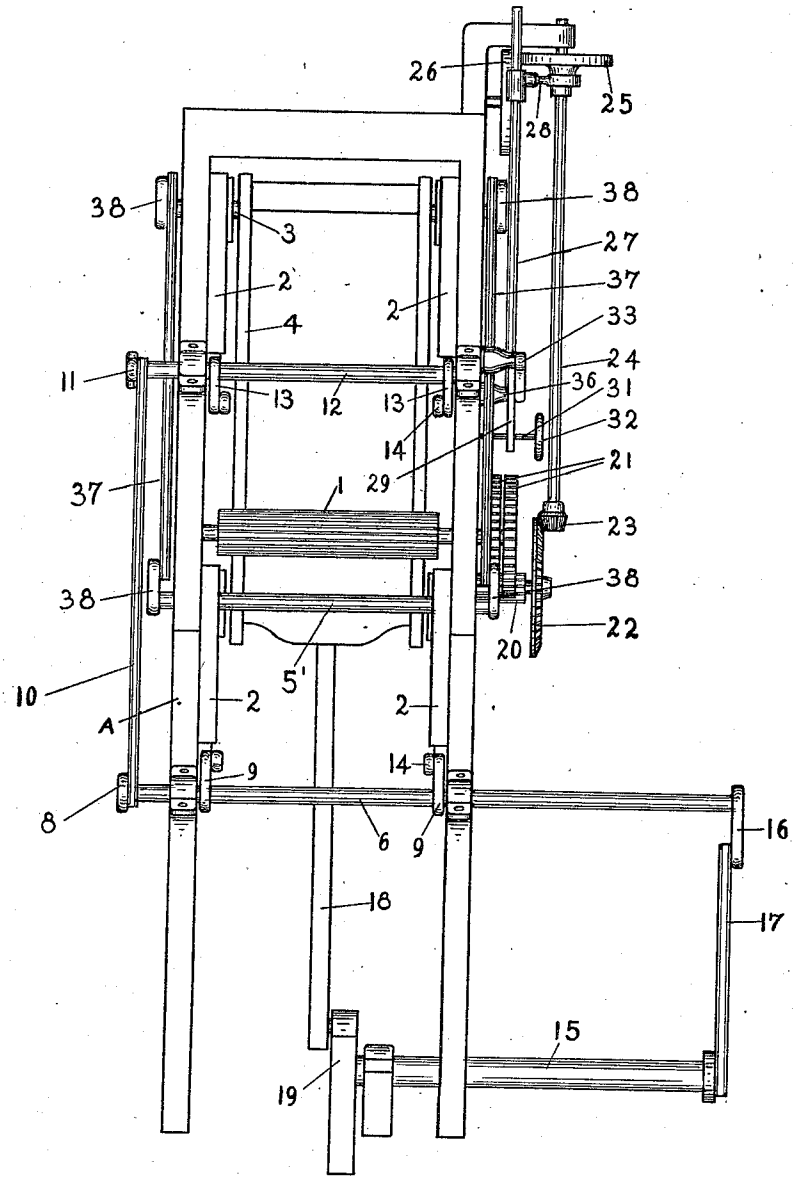


FIG. 2.

WITNESSES:

J. Ray Abbey

Ralph S. Warfield.

INVENTOR

John L. Graham

BY

Geo. B. Willcox

ATTORNEY

# UNITED STATES PATENT OFFICE.

JOHN L. GRAHAM, OF REYNOLDSVILLE, PENNSYLVANIA, ASSIGNOR TO WICKES BROTHERS, OF SAGINAW, MICHIGAN, A CORPORATION OF MICHIGAN.

## GANG-SAW MILL.

1,000,510. Specification of Letters Patent. **Patented Aug. 15, 1911.**

Application filed March 26, 1908. Serial No. 423,486.

*To all whom it may concern:*

Be it known that I, JOHN L. GRAHAM, a citizen of the United States, residing at Reynoldsville, in the county of Jefferson and State of Pennsylvania, have invented certain new and useful Improvements in Gang-Saw Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a new and improved oscillation in gang saws whereby the top and bottom slides, in which the sash or gate holding the saws is made to run, are so pivoted and the oscillatory motion imparted to them is so controlled that they impart an approximately even and uniform advance of the saw frame toward the saws as they descend through the timber. As the rate of feed of the timber is increased or reduced the advance or forward oscillation of the saws is increased or diminished proportionately without changing the extent of the oscillatory movement, either automatically in conjunction with and by the feed, that is, the feed controlling mechanism of the gang or separately and independently.

My invention differs from all other reciprocating sawing machines in that in my invention, first:—The top and bottom slides are pivoted at any point from front to rear on or nearly on a line passing horizontally through the horn pins when the sash is at the highest point reached in the stroke, which position of the pivots or pins on which the slides are hung, permits the slides to be swung from a backward incline to a forward incline while the sash is near the apex of the stroke without perceptibly swinging the sash; thus allowing the crank which operates the saws up and down to pass over the top center without perceptibly changing the position of the sash forward or backward and when the crank which operates the slides forward and backward is properly set, allows the slides to be swung ahead to approximately the proper incline to make the saws descend with but little advance at the start to meet the timber, but gradually increasing to near the middle of the stroke, then decreasing to near the end of the stroke, in such a manner that the saw teeth all receive a uniform depth of cut or length of chip; then recede quickly backward from the constantly in-feeding timber on the ascending stroke. The saws recede alike, both top and bottom, well back from the timber and then go up free and clear.

Second:—The saws do not depend on the overhang or rake to free them on the upstroke from the continually advancing feed, neither do they depend on the rake or overhang for more or less cut, but are entirely controlled by the oscillating mechanism and whether receding or advancing, the saws are plumb.

Third:—I employ a controlling device, by which the amount of incline or forward swing of all the slides is automatically controlled and properly positioned for a given amount of feed and the amount of such forward swing is changed simultaneously with a change in feed.

In machines of this character the timber is fed to the saws at a uniform rate of speed. The saws are reciprocated vertically by a crank and pitman and consequently the speed of the saw is less at the extremities of its stroke than during the intermediate portion. It is necessary in machines of this class to provide means for moving the saw bodily forward or toward the timber during the down or cutting stroke, in order that the saw may cut into the timber a sufficient distance so that it can regain the top limit of travel before the constantly-advancing end wall of the "kerf" in the timber can reach the saw teeth. An additional function of the forward and backward movement is to clear the teeth of sawdust. The forward movement of the saw during the down-stroke has been accomplished in various ways, generally by mounting the reciprocating saw-frame in guides that are forwardly inclined. These guides have heretofore been made in some machines fixed, and in other machines oscillatory.

The object of my invention is to regulate the advance of the saws toward the timber according to the speed of travel of the saws. In other words, I advance the saws toward the constantly in-feeding timber only a slight amount during the comparatively slow travel of the saws at the beginning of the stroke, then as the speed of travel of the saw nears its maximum rate at the middle of the stroke I advance the saw faster

toward the timber and finally as the rate of speed of the saw decreases toward the lower end of the cutting stroke I gradually reduce the rate of advance, and just before the saw reaches the bottom of the stroke the advance ceases and the saw is quickly drawn back to pull the teeth away from the cut, thereby freeing them of sawdust and permitting the saw to rise free and clear. The saw does not depend upon an overhang or rake to effect its advance into the timber on the down-stroke or to free it on the upstroke from the continually in-feeding timber, but its movement is wholly controlled by the oscillating mechanism and is effected in such a manner that the saw always remains plumb. I accommodate the variable speed of the saw to the constant speed of the timber so that each tooth of the saw that enters the timber cuts a chip of the same length as every other tooth and each tooth cuts the same length of chip continuously while it is in the timber. This is true through practically the entire stroke of the saw. The strain is, therefore, distributed more equally on the teeth and choking of the throats between the teeth is avoided.

Another object of my invention is to cause the saw to make under all rates of feed, a full cut, that is, a cut in which the saw teeth commence cutting immediately when they commence the down stroke. To effect this result I provide means by which I vary the speed of advance of the saw toward the timber as the rate of feed of the timber is varied.

The present device makes it possible to feed the timber through faster because the saw commences cutting at the very beginning of the down stroke. It starts with a full cut at the top of the stroke and maintains that full cut clear to the bottom. By "full cut" is meant that the saw meets the advancing face of the "kerf" just as the saw starts downward and meets that kerf in an upright position os contrasted with the raking or rocking cut in previous machines. The result is that every tooth throughout the depth of the cant is immediately put into action and each tooth does its share of the work.

The ratio of forward thrust to downward speed is maintained practically constant throughout the cutting stroke, thereby insuring that all teeth will cut chips of equal length, which is equivalent to saying that the maximum cutting capacity of the saw is utilized while the strains in the saw are uniformly distributed.

A further object is to effect a variation in the speed of the advance thrust or forward movement of the saw toward the timber automatically and simultaneously with any variation in the speed with which the timber is fed to the saw. That is, I vary the incline of the slides relative to a fixed vertical line. This may be accomplished during the oscillation of the slides.

To these and other ends, my invention consists in certain novel features and combinations, such as will be more fully described hereinafter ano particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical sectional view showing the inner face of one side frame of a gang saw equipped with my invention; Fig. 2 is a side view showing the exterior face of a gang saw; Fig. 3 is a rear view, and Fig. 4 is a detail perspective view.

(A) indicates the side frame of a gang saw in which are journaled the feed rolls (1) (1). To each side frame (A) are pivotally secured one each of a pair of upper and a pair of lower slides (2) (2). These slides comprise ways in which are received the horn pins (3) (3) carried by the vertically-reciprocating saw sash (4). The upper pair of slides are loosely mounted on stub shafts (5) (5). The lower pair of slides are similarly mounted on a shaft (5′) extending between the side frames. The stub shafts and the shaft (5′) are each reduced eccentrically at the points where the slides are journaled, for a purpose hereinafter set forth. The shafts are suitably journaled in the side frames and lie in substantially the same horizontal planes as the horn pins (3) (3) when the latter are at their highest limits of movement.

By pivoting the top and bottom pairs of slides at any point from front to rear of the slides, on or nearly on a line passing horizontally through the horn pins carried by the sash and received in the slides, when the horn pins (and consequently the sash) are at the highest point reached in their stroke, the slides can be swung from a rearwardly inclined position to a forwardly inclined position without perceptibly swinging the sash itself. Therefore, when the saws start down they move on an easy, gradual forward incline, producing a smooth easy entrance of the teeth into the timber at the commencement of the down stroke. When the linkage connecting the slides to the rock shaft is properly adjusted, the slides are swung to their forwardly-inclined position as the crank passes over its top dead center. At least one slide of each pair is connected by a linkage to an oscillatory member, in order that the slides may be swung simultaneously back and forth. As one such linkage I may provide the following construction: Journaled on and extending between the side frames is a main rock shaft (6) provided with radial arms (8) (9) located at an angle to each other. A connecting link (10) extends from the arm (8) to a similar arm (11) on a sec-

ondary rock shaft (12) journaled on and extending between the side frames parallel with the main rock shaft. The second rock shaft is provided with a radial arm (13) and rods (14) connect the arms (9) and (13) with at least one member of the respective pairs of slides (2) (2). Motion imparted to the main rock shaft is transmitted through the above-described linkage to the slides to swing them back and forth.

The sash (4) carrying the saws is connected to the main drive shaft (15) by a pitman (18) and crank (19). In order to connect the rock shaft to the drive shaft, whereby to synchronize the movement of the saws with the movement of the slides, I actuate the main rock shaft by means of a crank arm (16) eccentrically connected to the drive shaft by means of a link (17). Preferably the rock shaft is so arranged that the slides operated by it reach the limit of their forward oscillation and start on their backward movement before the saws have quite reached the limit of their down stroke. The above-described mechanism effects a simultaneous forward or backward swing of the upper and lower slides as the saws travel down on their cutting and up on their idle strokes respectively, the saws themselves remaining vertical during their entire movement. The forward inclination of the slides will advance the saws but little toward the timber at the commencement of their down stroke, because the horn pins are in approximately the same horizontal planes as are the shafts (5) (5′) supporting the slides. As the saws continue on the first half of their downward stroke, however, the constantly-increasing inclination of the slides toward the timber causes the saws to advance toward the timber more rapidly than they advanced at the commencement of the cutting stroke. After the saws have attained and passed their highest rate of speed the forward oscillation of the rock shaft (6) is first checked while the pitman (18) is on its dead center and the direction of oscillation is then reversed, swinging the slides and the saws rapidly away from the timber as the saw approaches and reaches its lower limit of movement.

The speed of the timber is constant for any given rate of feed, but the speed of the saw is variable, being slower at the commencement and ending of its cutting stroke than during the intermediate portion. The timber is being constantly fed in while the saws are traveling upward on their idle stroke, as well as when the saws are on their cutting stroke. If, as in previous devices, the saw is quickly advanced at the beginning of the cutting stroke toward the constantly infeeding timber, the first teeth engaging the timber have more work to do and cut a larger chip than do those teeth that engage the timber later in the stroke. This necessitates making the saws heavy enough and strong enough to withstand the strain of cutting such an excessively long chip. In my invention the speed of advance of the saw toward the timber is at all times proportioned to the varying speed of travel of the saw and the rate of feed of the timber so that each tooth cuts a practically uniform length of chip as long as it engages the timber, and the strain is evenly divided. Furthermore, as above noted, the saws are not inclined relative to the timber, but remain plumb throughout their stroke.

It is often desirable to vary the rate of feed of the timber to the saws and hence it becomes necessary to vary the speed of advancement of the saws toward the timber on their cutting stroke simultaneously with the change in the rate of feed of the timber. While this adjustment may be accomplished by hand, I may prefer to connect the feed-controlling mechanism with a means for varying the speed of advance of the saws toward the timber by adjusting the position of the arc of travel of the slides. This may be done by shifting the pivotal support of the slides, resulting in what I shall term a change in the incline of the slides or by varying the location of the arc of oscillation of the slides. This latter arrangement is attained by varying the position of the arc traversed by the cranks 9 and 13 and is fully set forth in my co-pending applications, Serial Nos. 423,484, and 423,485, filed March 26, 1908.

As one means for shifting the location of the pivotal points of the slides and consequently shifting the incline of the slides, I may provide the following mechanism. The feed rolls (1) (1) are rotated by a pinion (20) meshing with gears (21) (21) on the roll shafts. The pinion is driven by a bevel gear (22), which in turn meshes with a bevel pinion (23) on a shaft (24). A friction-wheel (25) is slidably feathered on the shaft and the wheel engages a driving disk (26). A slidingly-actuated rod (27) is provided with an arm (28) engaging the hub of the friction-wheel (25). The rod controls the position of the friction-wheel relative to its driving disk. The location of the friction-wheel relative to its disk controls the rate of feed of the timber toward the saws.

In my invention, I provide the following mechanism as one of a number of possible means for connecting the timber-feed-controlling mechanism and the mechanism controlling the oscillation and speed of advance of the saws toward the timber. A rack (29) meshes with a gear (not shown) on a shaft (31) controlled by the hand-wheel (32). This rack is connected to a broken lever consisting of sections (33) (34) pivotally

connected as at (35). The free end of section (34) is pivotally secured to the side frame, as at (36). The rod (27) is pivotally connected to the remaining section (33) of the broken lever on one side of the pivotal connection of the rack (29) and the section (33). The free end of section (33) is pivotally secured to a bar (37) connecting the free ends of arms (38) (38) fastened to the projecting ends of the eccentrically journaled shaft (5′) and the stub shafts (5) respectively supporting the slides (2). Similar arms and a connecting bar are located on the opposite side of the frame. The bar (37) lies parallel with the rod (27). It is understood for the purposes of this application that the words "eccentrically journaled" as applied to the shafts embrace any means for supporting the shafts, whereby a back-and-forth movement may be given them.

The operation of the adjustment is as follows: When it is desired to change the rate of feed of timber to the saws the hand wheel (32) is rotated in one direction or the other to shift the position of the friction wheel (25) relative to the disk (26) through the rack (29), the broken lever and the rod (27). Movement of the broken lever will move the connecting bar (37) in one direction or the other to swing the arms (38) which control the position of the shafts (5) and (5′). The arms are thereby caused to oscillate the shafts (5) and (5′). Oscillation of the shafts will tilt the upper and lower slides (2) (2) simultaneously toward or from the advancing timber on the pivotal connections of the rods (14) with the slides as centers, thereby shifting the angle of inclination of the slides toward or from the in-feeding timber in synchronism with the rate of feed of the timber without materially changing the position of the arc of movement traversed by the free ends of the slides. The length of the arc described by the free ends of the slides is always the same, but the above-described adjustment suitably shifts the angle of inclination of the slides relatively to a vertical line so that, as previously described, the saw is caused to cut chips of uniform length throughout its full stroke, because the proper relation is maintained between the forward advance of the saw and the rate of feed of the timber.

The advantages gained by the above adjustment are—first, that the forward advance of the saws is synchronously adjusted with any alteration in the rate of feed of the timber. Second, that the mechanism for adjusting the slides is not affected by the oscillation of the slides, but remains stationary unless the hand-wheel is actuated, thus obviating unnecessary wear and friction. The adjusting mechanism for varying the inclination of the slides is wholly independent of the slide or oscillating mechanism. The parts remain in their adjusted positions until reset. Furthermore, by connecting the slides to the oscillating mechanism and to the mechanism for varying the inclination of the slides the latter are moved evenly and simultaneously without strain on the sash.

In former machines, if the rate of feed of the timber is reduced, the speed of travel of the saw remaining unchanged, the timber will not reach the saw until the latter has partially completed its cutting stroke, thus wasting a portion of the stroke without correspondingly easing the strain on the saw. In my invention, the angle of inclination of the slides is automatically changed simultaneously with the rate of feed of the timber so that the saw will engage the timber at the commencement of the cutting stroke, and the inclination of the slides may be shifted while the machine is in operation. The changing of the angle of inclination is obtained by shifting the vertex of the angle (the pivotal point of the slide) laterally.

Having thus fully disclosed my invention, what I claim as new is—

1. A gang saw mill comprising a plurality of pairs of pivotally supported slides, means for oscillating the slides through a constant arc of movement, and means independent of the oscillating means for shifting the positions of the angles of movement of all the slides simultaneously.

2. In a gang saw, a plurality of pairs of swinging slides, eccentric bearings on which the slides are pivotally supported, means for swinging the slides through a constant arc, and means connecting the eccentric bearings for simultaneously shifting the positions of the angles of movement of such slides.

3. In a gang saw, a plurality of pairs of pivotally supported slides, means for oscillating the slides through a constant arc of movement, feed mechanism, and means independent of the oscillating mechanism and connected with the feed mechanism to automatically shift the positions of the angles of movement of the slides when the rate of feed is changed.

4. In a gang saw, a plurality of pairs of swinging slides, eccentric bearings on which the slides are pivotally supported, means for swinging the slides through a constant arc of movement, feed mechanism, and means controlled by the feed mechanism and connected to the eccentric bearings for simultaneously shifting the positions of the angles of movement of the slides when the rate of feed is changed.

5. In a gang saw, a sash, horn pins carried by the sash, slides in which the horn pins are received, the slides being pivotally supported on the frame at points in substantially the same horizontal plane with the horn pins when the latter are at their upper limit of movement, means for swinging the slides

through a constant arc, and means for simultaneously shifting the pivotal supports of said slides laterally to vary the angle of inclination of said slides and consequently the amount of advance imparted to the saw.

6. The combination with a gang saw frame, and a sash, of a plurality of pairs of slides, and horn pins carried by the sash and traveling in the slides, the slides being pivotally mounted on eccentric pins at a point substantially in the same horizontal plane with the horn pins when the latter are at the upper end of their stroke.

7. In a gang saw, a sash, horn pins carried by the sash, a pair of upper and a pair of lower slides pivotally secured to the frame at points in substantially the same horizontal plane with the horn pins when the latter are at their upper limit of movement, and means connecting the pairs of slides to swing them simultaneously.

8. The combination with a gang saw frame, and a sash carrying horn pins, of pairs of slides in which the horn pins are received, the slides being pivotally mounted at points in substantially horizontal alinement with the horn pins when the latter are at the upper limits of their movement, means for oscillating at least one pair of the slides, and means for simultaneously shifting the pivotal points of the slides substantially horizontally.

9. The combination with a gang saw frame, and a sash carrying horn pins, of a pair of slides in which the horn pins are received, the slides being pivotally mounted at points in substantially horizontal alinement with the horn pins when the latter are at the upper limits of their movement, the saw remaining plumb at all times, means for oscillating the slides, feed mechanism, means controlling the rate of feed, and means for simultaneously shifting the pivotal points of the slides forward or backward synchronously with a change in the rate of feed.

10. A gang saw mill comprising pivotally supported slides, saws guided by the slides and held plumb at all times, means for feeding the timber to the saws at any desired speed, means for swinging the slides through a constant arc to advance the saws toward and cause their recession from the timber, and means for varying the effect of the swing of the slides upon their inclination from the vertical, to change the speed of advance and amount of advance of the saws toward the timber simultaneously with the variation in the rate of feed of the timber to the saws and without varying the arc of movement of the slides.

11. In a gang saw, a pair of upper and a pair of lower pivotally-supported slides, a saw sash received and traveling in the slides, means for simultaneously swinging both pairs of slides through an arc of constant length, and means apart from the oscillating means for varying the effect of such oscillation on all of the slides simultaneously.

12. A gang saw mill comprising a frame, a plurality of pairs of pivotally-supported slides, a saw sash slidingly received and traveling in the slides, means connecting the slides to maintain them in fixed relation with each other at all times, and impart a swinging movement through an arc of constant length simultaneously to them all, a feed roll, means for driving the feed roll, and mechanism for varying simultaneously the speed of rotation of the roll and the positions of the angles of movement of the slides to increase or lessen the advance of the saw.

13. In a gang saw, pairs of pivotally supported slides, a saw sash slidably received in the slides, a rock shaft, a linkage connecting one of each pair of slides and the rock shaft, means for oscillating the rock shaft, and means for simultaneously shifting the positions of the angles of movement of the slides to increase or lessen the advance of the saw.

14. A gang saw comprising pairs of slides, pivotally supported shafts on which the slides are eccentrically pivoted, means for simultaneously swinging the pairs of slides, mechanism for feeding in the timber and adjusting means independent of the slide swinging means for changing the positions of the shafts and therefore of the angles of movement of the slides to increase or lessen the advance of the saw, the adjusting means connected to the timber feeding mechanism.

15. A gang saw comprising pairs of slides, shafts on which the slides are eccentrically pivoted, means for oscillating the slides, mechanism for feeding in the timber, and adjusting means connected to the shafts for simultaneously varying the positions of the shafts and therefore of the angles of movement of the slides to increase or lessen the advance of the saw.

16. A gang saw comprising pairs of slides, shafts on which the slides are eccentrically pivoted, a saw sash, horn pins carried by the sash and received in the slides, the shafts lying in substantially the same horizontal planes as the horn pins when the latter are at their upper limits of movement, means for oscillating the slides, arms fast on the shafts, bars connecting the arms, and means for actuating one of the bars to impart movement simultaneously to the shafts.

17. A gang saw comprising pairs of slides, shafts on which the slides are eccentrically pivoted, means for oscillating the slides, a timber feeding mechanism, means for varying the rate of feed of the timber, arms on

the shafts, a bar connecting the arms, and a lever actuated by the feed controlling means and secured to the bar.

18. The combination with a gang saw, of a plurality of pairs of pivotally supported slides, means for positively oscillating at least one pair of the slides, and means apart from the oscillating means for shifting the pivotal centers of both pairs of slides laterally and simultaneously to change the amount of advance of the saw toward the cant.

19. The combination with a gang saw, of pairs of pivotally supported slides, a sash carrying saws, horn pins carried by the sash and receivable in the slides, the slides being pivoted at points approximately in a horizontal plane with the horn pins when the latter are at or near the upper limit of their movement, means for oscillating the slides through a constant arc, and means independent of the oscillating means for changing the positions of the centers of the arcs of movement of the slides simultaneously.

20. The combination with a gang saw, of pairs of pivotally supported slides, a sash carrying saws, horn pins carried by the sash and receivable in the slides, the slides being pivoted at points approximately in a horizontal plane with the horn pins when the latter are at or near the upper limit of their movement, means for oscillating the slides through a constant arc, means for feeding a cant to the saws, means controlling the rate of feed, and means independent of the oscillating means and connected with the feed controlling means for changing the positions of the centers of the arcs of movement of the slides simultaneously and synchronously with a change in the rate of feed.

21. In a gang saw, a plurality of pairs of slides, a sash, horn pins on the sash and receivable in the slides, eccentrics on which the slides are pivoted, the eccentrics located on a plane approximately in horizontal alinement with the horn pins when the latter are at the top of their stroke, and means for simultaneously swinging the eccentrics.

22. A gang saw comprising pairs of slides, shafts on which the slides are eccentrically pivoted, means for oscillating the slides, a timber feeding mechanism, means for varying the rate of feed of the timber, arms on the shafts, a bar connecting the arms, and a connection between the feed controlling means and the bar.

23. The combination with a gang saw frame, and a sash, of a plurality of pairs of slides, and horn pins carried by the sash and traveling in the slides, the slides being pivotally mounted on laterally shiftable supports at points on substantially the same horizontal planes with the horn pins when the latter are at the upper limits of their movement.

24. The combination with a gang saw frame, and a sash, of a plurality of pairs of slides, and horn pins carried by the sash and traveling in the slides, the slides being pivotally mounted on laterally shiftable supports at points on substantially the same horizontal planes with the horn pins when the latter are at the upper limits of their movement, and means for shifting the pivotal supports of the slides while maintaining the arc of movement traversed by the free ends thereof, practically constant.

25. A gang saw comprising a sash, horn pins carried by the sash, slides in which the horn pins are received, means for reciprocating the sash, feed mechanism, means controlling the rate of feed, the slides being pivotally mounted on laterally shiftable supports at points on substantially the same horizontal planes with the horn pins when the latter are at the upper limits of their movement, means for swinging at least one pair of slides, and means for shifting the pivotal supports of the slides simultaneously with a change in the rate of feed while maintaining the arc of movement of the free ends of the slides practically constant.

26. The combination with a gang saw frame, pairs of slides, a sash, means for reciprocating the sash, and horn pins carried by the sash and received in the slides, of pivot shafts each comprising a suitably journaled cylindrical portion and a projection eccentric thereto, the slides journaled on the eccentric projections, and means for at least partially rotating the shafts.

27. The combination with a gang saw frame, pairs of slides, a sash, means for reciprocating the sash, and horn pins carried by the sash and received in the slides, of stub shafts in the upper ends of the opposite sides of the frame, a through shaft extending between the sides of the frame below and parallel with the stub shafts, eccentrics on the inner ends of the stub shafts and on the through shaft, the slides journaled on the eccentrics, and means connecting the shafts to operate them in unison.

In testimony whereof, I affix my signature in presence of two witnesses.

JOHN L. GRAHAM.

Witnesses:
RALPH S. WARFIELD,
NELLIE M. ANGUS.