(No Model.) 8 Sheets—Sheet 1.

U. S. SJÖSTRAND & C. J. ANDERSSON.

CIRCULAR SAW MILL.

No. 523,241. Patented July 17, 1894.

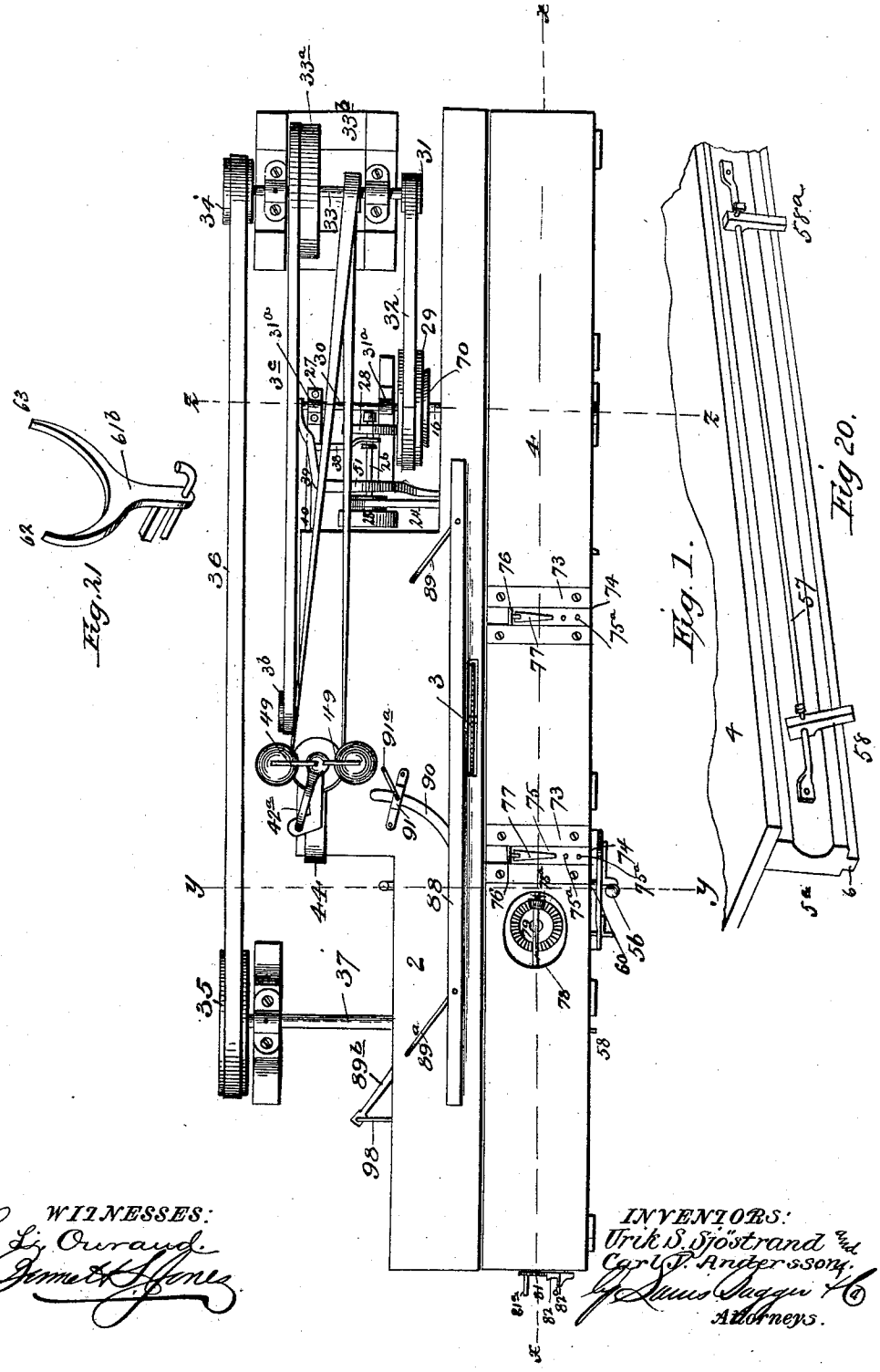

Fig. 21.

Fig. 1.

Fig. 20.

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U. S. SJÖSTRAND & C. J. ANDERSSON.

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No. 523,241. Patented July 17, 1894.

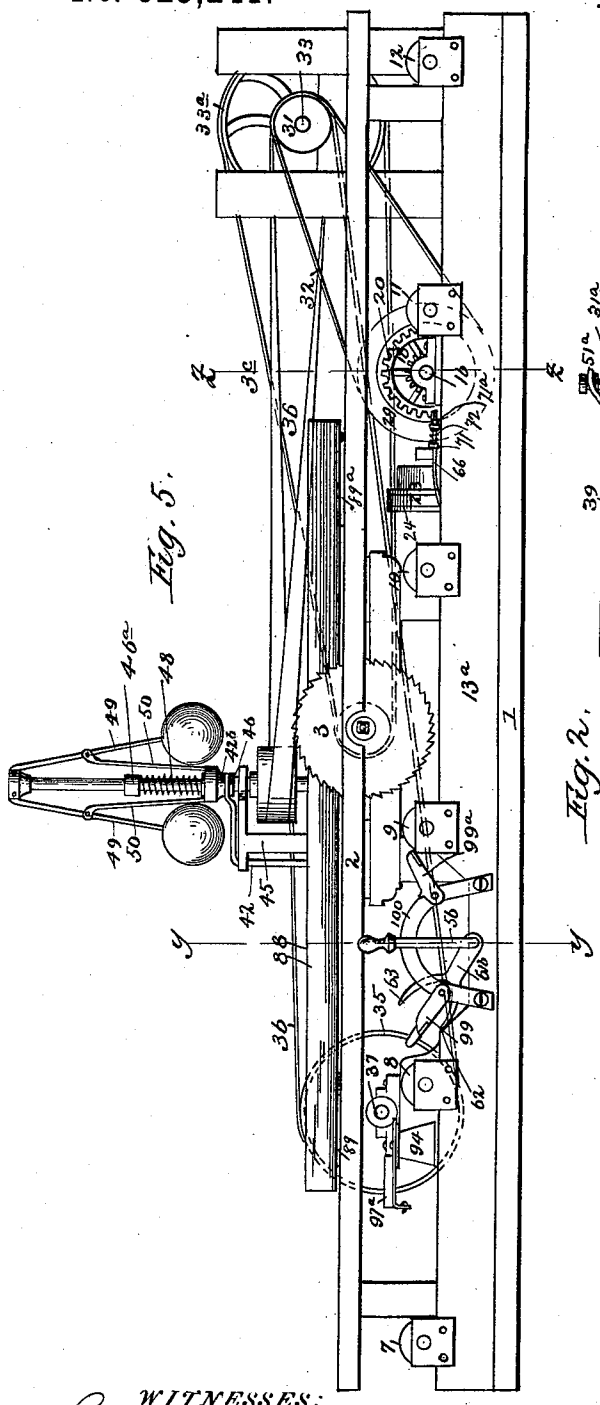

Fig. 5.

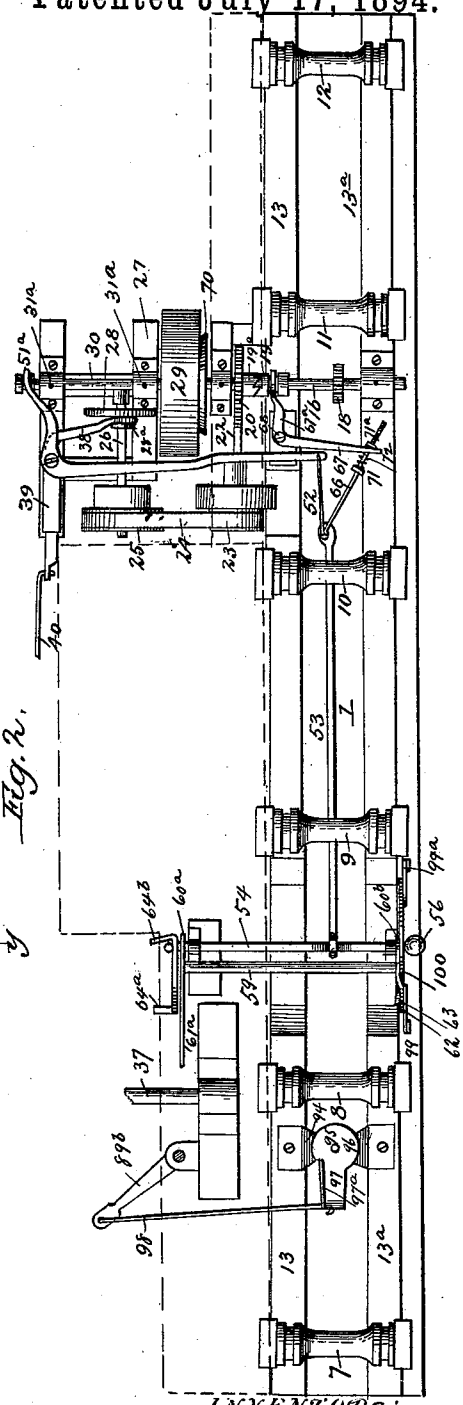

Fig. 2.

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U. S. SJÖSTRAND & C. J. ANDERSSON.

CIRCULAR SAW MILL.

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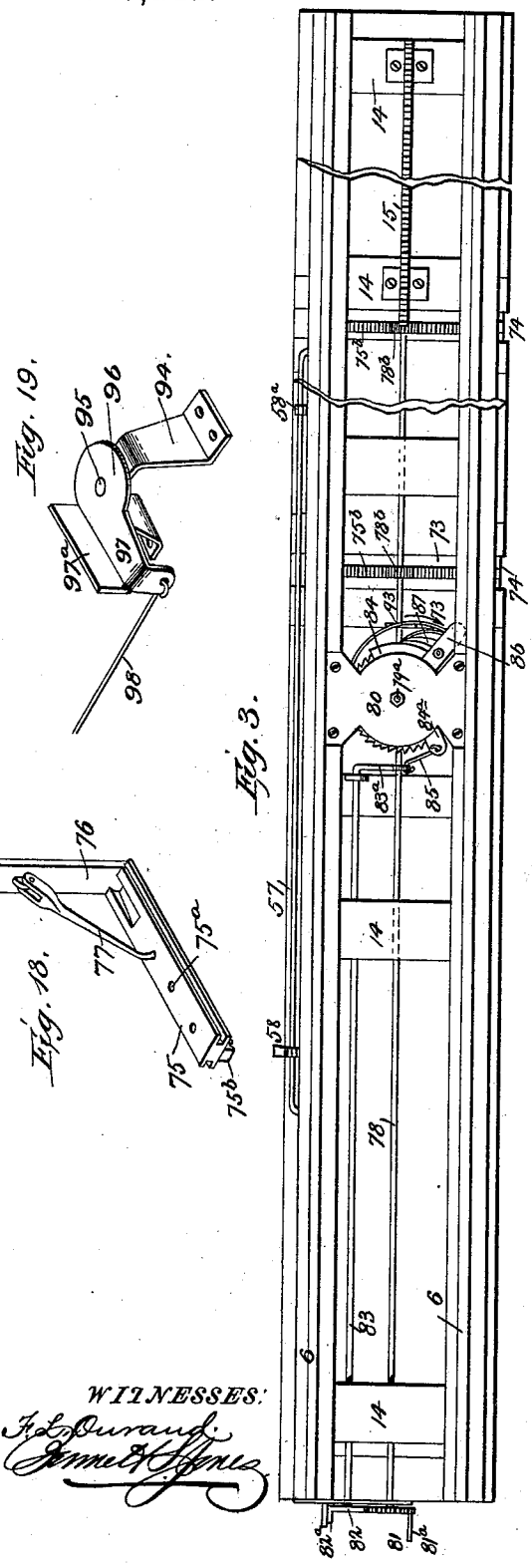

Fig. 3.

Fig. 19.

Fig. 18.

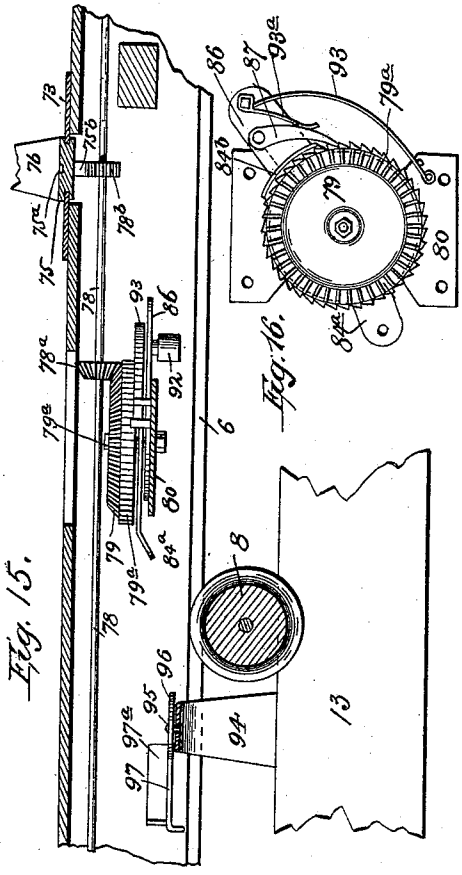

Fig. 15.

Fig. 16.

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(No Model.) 8 Sheets—Sheet 4.

U. S. SJÖSTRAND & C. J. ANDERSSON.

CIRCULAR SAW MILL.

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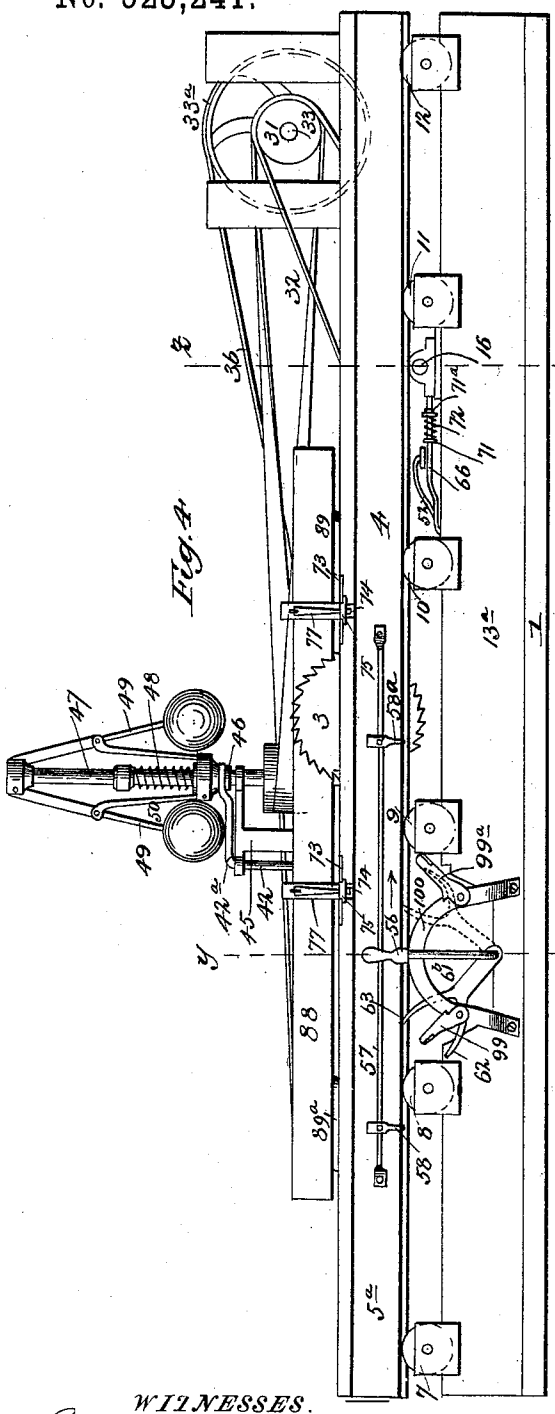

Fig. 4.

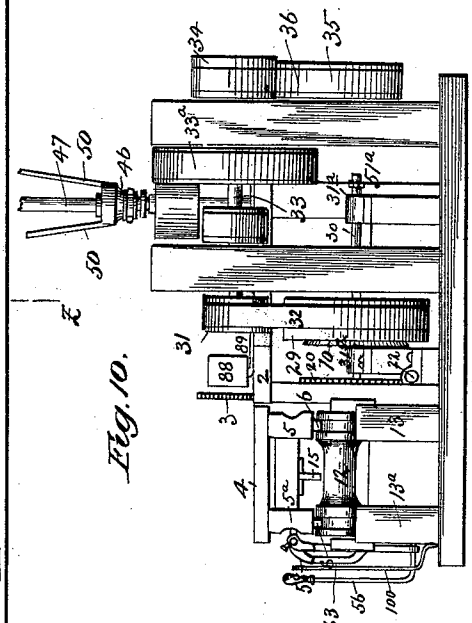

Fig. 10.

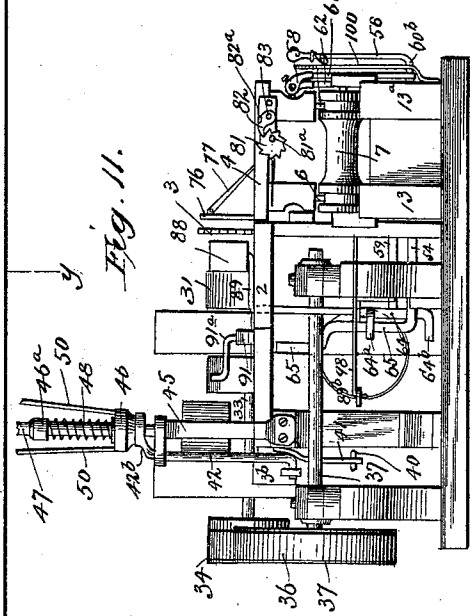

Fig. 11.

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(No Model.) 8 Sheets—Sheet 5.

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CIRCULAR SAW MILL.

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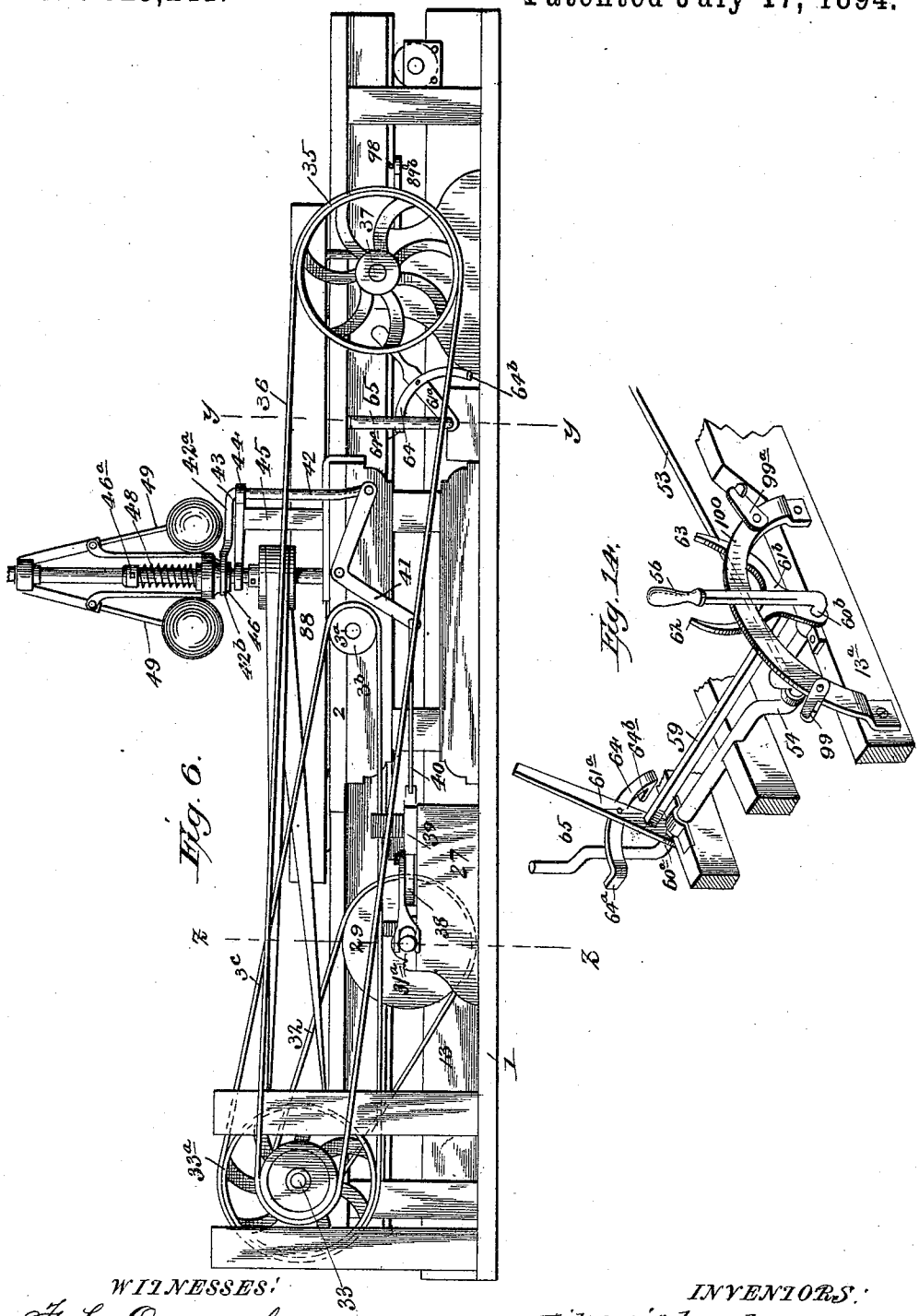

Fig. 6.

Fig. 1A.

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(No Model.) 8 Sheets—Sheet 6.

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CIRCULAR SAW MILL.

No. 523,241. Patented July 17, 1894.

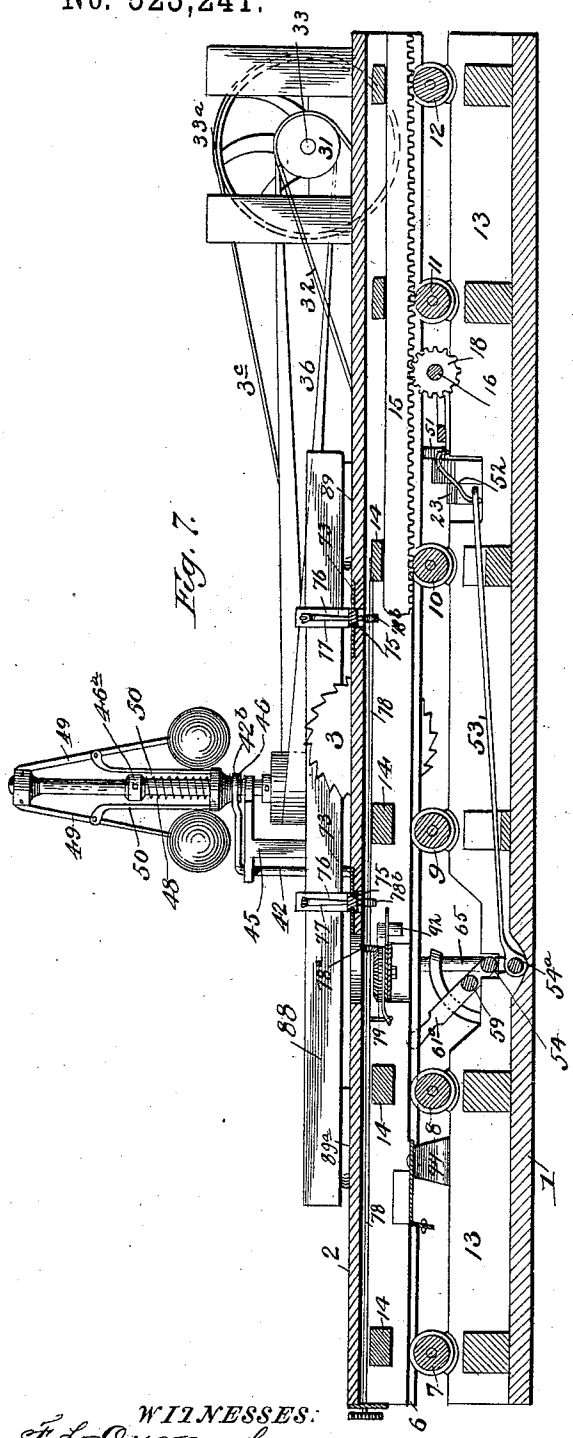

Fig. 7.

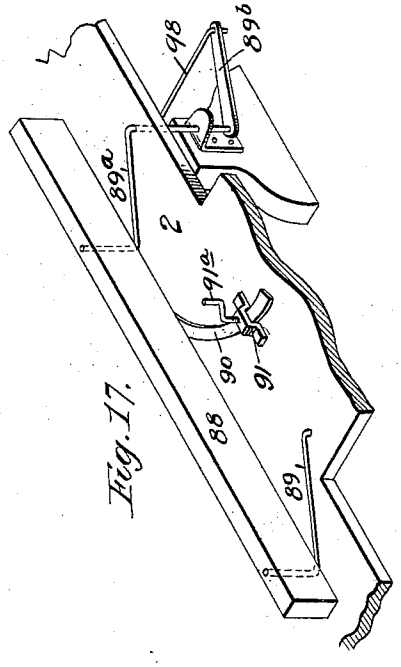

Fig. 17.

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(No Model.) 8 Sheets—Sheet 7.

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CIRCULAR SAW MILL.

No. 523,241. Patented July 17, 1894.

Fig. 9.

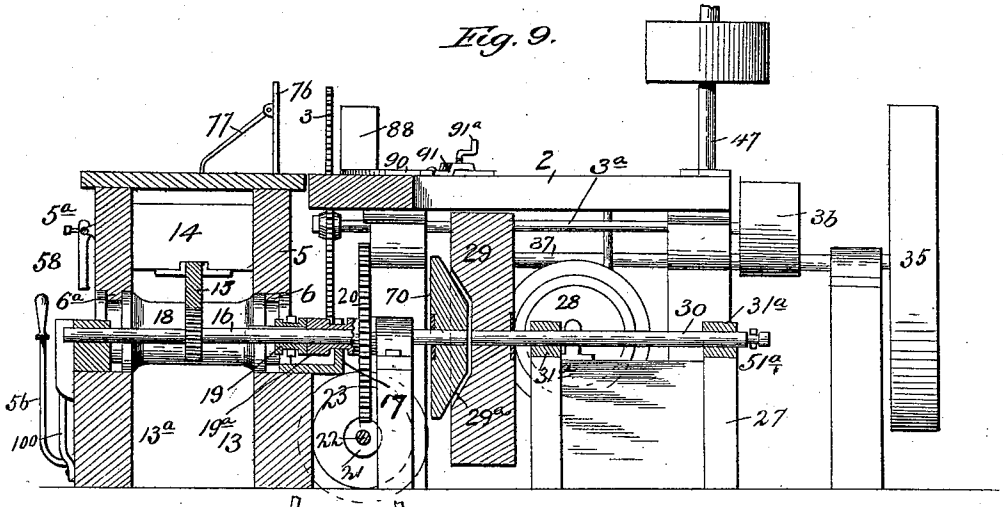
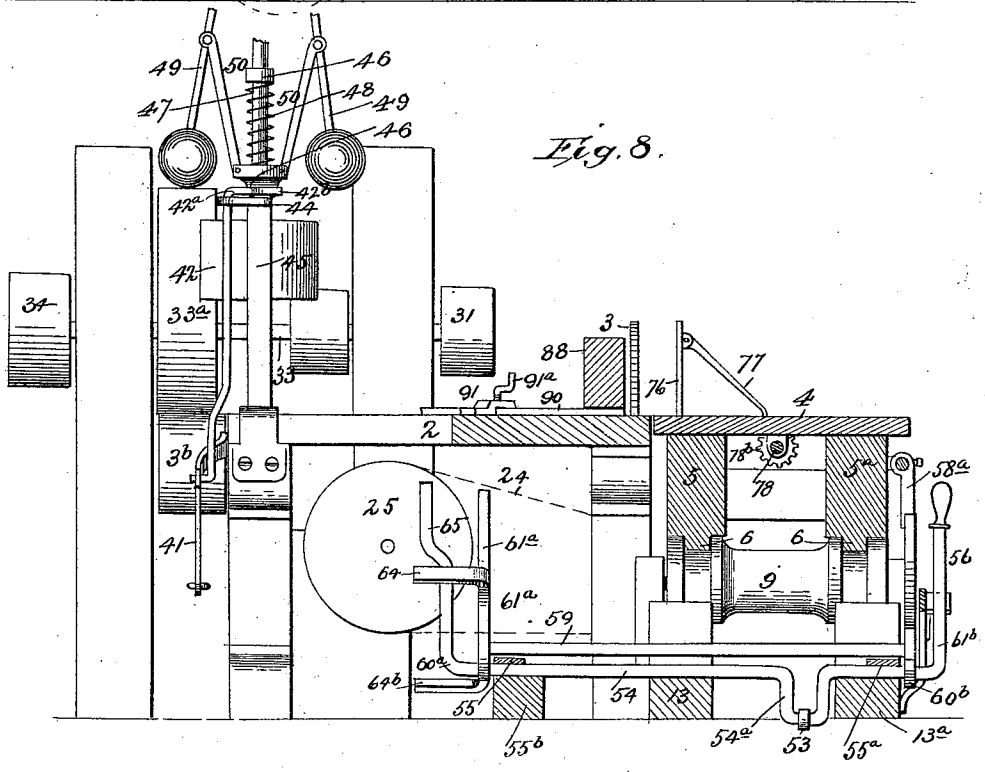


Fig. 8.



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(No Model.) 8 Sheets—Sheet 8.

U. S. SJÖSTRAND & C. J. ANDERSSON.

CIRCULAR SAW MILL.

No. 523,241. Patented July 17, 1894.

Fig. 12.

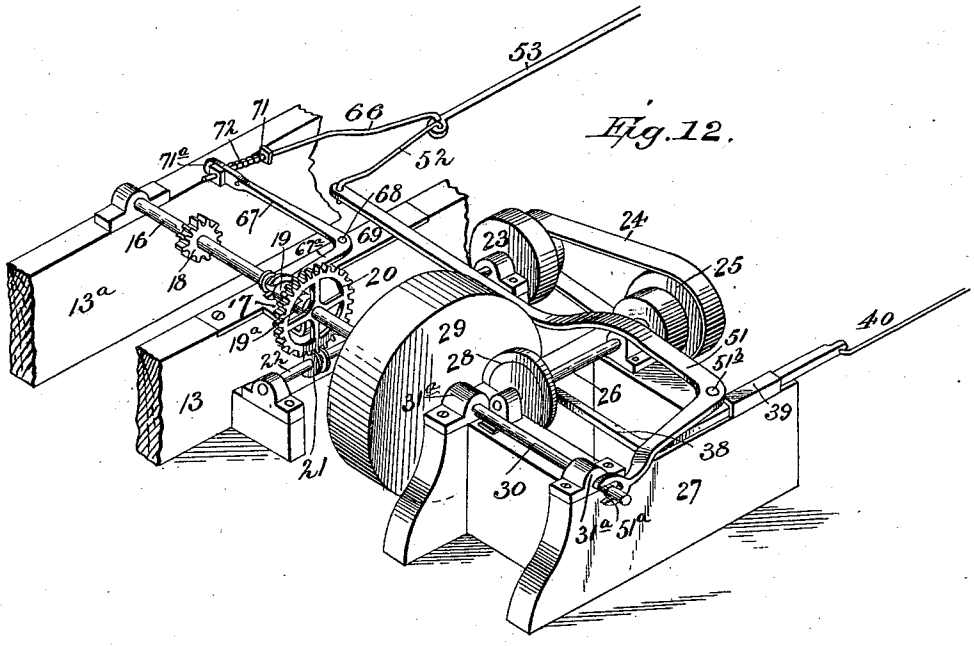
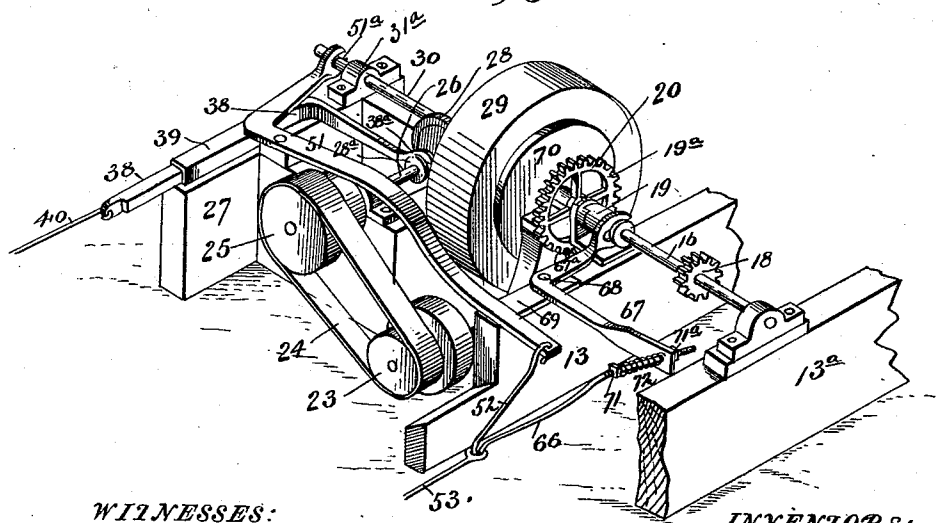


Fig. 13.



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UNITED STATES PATENT OFFICE.

URIK SEVERIN SJÖSTRAND AND CARL JOHAN ANDERSSON, OF STENINGE, SWEDEN.

CIRCULAR-SAW MILL.

SPECIFICATION forming part of Letters Patent No. 523,241, dated July 17, 1894.

Application filed December 14, 1893. Serial No. 493,717. (No model.) Patented in Sweden June 11, 1892, No. 4,088.

To all whom it may concern.

Be it known that we, URIK SEVERIN SJÖSTRAND and CARL JOHAN ANDERSSON, both of Steninge, in the Province of Halland and Kingdom of Sweden, have invented certain new and useful Improvements in Circular-Saw Mills, (patented in Sweden June 11, 1892, No. 4,088;) and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a top view or plan of our improved circular-saw mill or machine. Fig. 2 is a similar view of the same; the movable carriage having been removed. Fig. 3 is an inverted view (*i. e.* a view of the under side) of the movable and automatically adjustable carriage, removed from the other parts of the machine. Fig. 4 is a side elevation of the complete mill or machine, with the carriage in its operative position. Fig. 5 is a similar view of the same side of the machine; but with the carriage removed. Fig. 6 is a side elevation of the opposite side of the complete machine. Fig. 7 is a longitudinal sectional view on the vertical plane indicated by the broken line marked *x*—*x* in Fig. 1. Fig. 8 is a transverse sectional view of the complete machine on the vertical plane indicated by the broken line marked *y*—*y* in Figs. 1, 4 and 6. Fig. 9 is a transverse sectional view of the complete machine on the parallel vertical plane denoted by the broken line marked *z*—*z* in Figs. 1, 4 and 6. Fig. 10 is an end elevation of one end of the complete mill or machine. Fig. 11 is an end elevation of the opposite end of the same. Fig. 12 is a detail view, in perspective, of the mechanism for imparting longitudinal motion, forward and back, to the movable carriage. Fig. 13 is a view of the same mechanism, looked at from the opposite side. Fig. 14 is a detail view of the device or mechanism for shifting the direction of longitudinal travel of the movable carriage, either by hand or automatically, and for stopping the carriage. Fig. 15 is a detail view of the device or mechanism for shifting (either by hand or automatically) the position of the log upon the carriage. Fig. 16 is a detail view of the same device or mechanism, looked at from the opposite side. Fig. 17 is a detail view of the adjustable gage-bar and co-operating device for operating, automatically, the mechanism for shifting the position of the log upon the carriage. Fig. 18 is a detail view of one of the slidable and adjustable log-holders, or dogs, which form part of, and operate in conjunction with, the movable carriage. Fig. 19 is a detail perspective view of the rotatable disk which is connected with the adjustable gage bar. Fig. 20 is a detail perspective view of the movable carriage, the rod secured thereto and the adjustable pawls or detents. Fig. 21 is a detail perspective view of the tilting arms with which the pawls, on the rod secured to the side of the movable carriage, engage, during the reciprocation of said carriage.

Like numerals of reference designate corresponding parts in all the figures.

This invention has relation to circular-saw mills, or sawing machines, of that type which are provided with a movable carriage upon which the log to be sawed up into planks or boards is supported and fed gradually to the circular saw, so arranged and combined with the saw and stationary saw-table that it (the carriage) will feed the log evenly and automatically to the saw without interruption; that is to say: after the log has been once sawed through longitudinally, from end to end, the carriage, with the log, will automatically run back so as to again present the front end of the log to the saw, and at the same time (also automatically, if desired) shift the position of the log laterally upon the carriage, or move it sidewise in the direction of the saw, a space or distance corresponding to the thickness of the next plank or board to be cut from the log;—both the retrograde travel of the carriage, and the lateral motion of the log upon the carriage, being performed automatically (if desired) and consecutively; thus saving both time and labor.

Our invention, as hereinafter described, (for which Letters Patent of the Kingdom of Sweden, No. 4,088, were granted to us on the 11th day of June, 1892,) consists essentially in the construction and combination of parts

of the mechanical devices whereby the travel of the carriage is accomplished and regulated, and the lateral motion of the log upon the carriage effected, as will be hereinafter more fully described and particularly pointed out in the claims. On the accompanying eight sheets of drawings, the reference numeral 1 denotes the bed or platform of the machine, 2 the stationary saw-table, 3 the saw and 4 the movable carriage. The latter is provided on its under side with two parallel depending side pieces, 5 and 5^a, which are shod longitudinally with rails, 6 and 6^a, fitting into circumferential grooves in the rollers 7, 8, 9, 10, 11 and 12, upon which the carriage is supported and travels. These rollers are journaled in boxes which are mounted in the parallel side-sills 13 and 13^a which, in turn, rest upon the bed or platform of the machine.

The depending sides 5 and 5^a of the traveling or rolling carriage are connected, transversely, by cross-pieces or braces 14, some of which, near one end of the carriage, form bearings for a longitudinal rack or toothed bar 15, by means of which the carriage may be moved forward and back by the following mechanism:

A rotatable shaft, 16, is journaled in a box mounted upon the stationary carriage sill or support 13^a, and in a bearing 17, mounted upon the other sill 13 (see Figs. 9 and 12). This shaft is provided with a pinion 18, and upon it slides a grooved clutch-collar 19, adapted to engage or interlock with a corresponding clutch 19^a, fastened concentrically upon a cog-wheel 20, which revolves upon shaft 16 and is so arranged that, by means of the clutches 19, and 19^a, it may be made to revolve either with, or loosely upon, its shaft 16. That is to say: when the two clutches mesh or engage each other, shaft 16 will revolve with the cog-wheel 20; while on the other hand, when the clutches are uncoupled or withdrawn from each other, wheel 20 will be loose upon the shaft.

Assuming that the clutches 19 and 19^a are in mesh or coupled, as they would be during the forward travel of the carriage in the act of feeding the log to the saw, then, when wheel 20 revolves, it will rotate shaft 16 and pinion 18 with it; and as this pinion meshes with the toothed rack on the under side of the carriage, the latter, with the log upon it, will travel so as to feed the log to the saw. The cog-wheel 20 is rotated by a worm 21 upon a shaft 22, journaled in suitably located boxes on the bed or platform of the machine, and this worm-shaft 22 receives a rotary motion by means of a differential pulley 23, which is connected by a belt 24 with another differential pulley 25, at the outer end of a short shaft 26 (Figs. 1 and 13), which is journaled in boxes supported by a frame 27 erected on the bed of the machine. Shaft 26 has a longitudinal rib or feather on one side not shown, and upon it is placed the slidable friction-wheel 28, which, while it may slide upon the shaft, will always revolve with it, as the feather on shaft 26 fits into a slot made in the central hub of the wheel. The object of making the friction-wheel slidable upon its shaft will be stated later on.

Normally, or when the machine is in motion, the leather or rubber-covered periphery of wheel 28 is in frictional contact with the circular friction-face of a solid disk or pulley 29, which is keyed upon a shaft 30, journaled in boxes 31^a and 31^a mounted upon the box-bearing or frame 27, in such a manner that this shaft 30, with its driving pulley 29, has a limited play or movement in its boxes in the direction of its length; *i. e.*, in alignment with the pinion-shaft 16. In other words: shaft 30, with pulley 29, is longitudinally slidable in its journal-boxes or bearings, as well as rotatable therein, so that the solid face of pulley 29 may be withdrawn from the periphery of friction-wheel 28, with which it is normally in frictional contact. When wheels 28 and 29 are thus in contact, the latter will rotate the former, and, with it, set in motion the described intervening or intermediate mechanism so as to feed the carriage forward.

Pulley 29 is revolved by another pulley 31, by means of a belt 32; and this last-named pulley 31 is one of several which are keyed, or otherwise fastened, upon the drive-shaft 33, which is journaled in boxes supported by a frame 33^b at one end of the machine. The drive-shaft 33 receives motion by a pulley 34, which is connected to the main drive-wheel or master-wheel, 35 of the mill by the endless belt 36. Main-wheel 35 is fastened upon one end of the main drive-shaft 37, which may be revolved by any suitable prime-mover; for example a steam-engine, electric motor, or water-wheel; all the movable parts of the machine being actuated by this main-shaft 37, main-wheel or master-wheel 35, belt 36, drive-pulley 34 and drive-shaft 33.

The circular saw 3 is keyed or otherwise fastened (removably and interchangeably) upon one end of the horizontal saw-arbor 3^a, which is journaled in boxes underneath the stationary saw-table 2, and provided at its opposite end with the drive-pulley 3^b. The latter is revolved (and with it the saw-arbor and saw) by means of the belt 3^c which connects it with a large-diameter, or speed-pulley 33^a, on drive-shaft 33; said shaft being revolved, as already described, by means of the belt pulley 34, belt 36 and master-wheel or main drive-wheel 35 on the main-shaft 37.

Having now described the mechanism whereby the saw is revolved and the carriage made to travel forward so as to feed the log to the saw, it will be proper next to describe the device or mechanism for regulating or controlling, automatically, the speed of the carriage on its forward travel, so that its speed shall at all times conform to the ratio of speed of the revolving saw.

If the saw, during the operation of the ma-

chine, should increase its speed (through an increase in speed of the main drive-shaft) it will be obvious that the speed of the carriage on its forward travel must be correspondingly increased, and vice versa, so that the saw and carriage shall always operate in perfect accord and unison with one another. This is done by regulating the speed of the ribbed shaft 26 (which, as we have seen, imparts motion to the worm-shaft 22, cog-wheel 20 and pinion-shaft 16) as follows. The slidable peripheral friction-wheel 28, which slides upon and revolves with shaft 26, has fastened upon one of its sides a grooved collar 28^a, which is engaged by the bifurcated free end or head of the bent arm or end 38^a of a bar 38 (see Figs. 1, 9 and 13), which slides in a box or keeper 39, mounted upon an extension of frame 27. The other end of this sliding bar is connected by a rod 40 to the lower arm of an elbow-lever or bell-crank 41, the upper arm of which is articulated to a vertical rod 42. The upper end of this rod 42 passes through, and is supported movably in, a box or aperture 43 in the crosshead 44 of the governor-post or upright 45, and is bent horizontally at right angles, as shown at 42^a; the outer end of said bent or right-angled arm 42^a forming a bifurcated head or grip 42^b, which engages a circumferential groove in a collar 46, adapted to slide loosely up and down upon the rotatable governor-stem or spindle 47. Between the vertically slidable collar 46 and another collar 46^a, which is fastened adjustably upon the spindle 47 some distance above the movable collar, is placed a coiled spring 48, bearing with its lower end against the sliding collar, so that the spring-pressure (in a downward direction) upon the latter may be regulated in a well-understood manner by adjusting the position of the stationary collar 46^a upon the governor spindle. The sliding collar 46 is connected to the weighted arms 49 of the governor by a pair of articulated arms, 50, as usual; and it follows that when the speed of the vertical governor-spindle 47 is increased, causing the free ends of the weighted arms to rise by the centrifugal action, collar 46, overcoming the downward pressure of the spring, will rise or slide in an upward direction upon the spindle, carrying arm 42^a, 42 with it upwardly; while, reversely, when the speed of the governor is decreased and the weighted arms drop or come together, the downward pressure of the coiled spring 48 will depress collar 46 upon the spindle, thus moving the bent arm 42^a, 42 in a downward direction. From this it will be observed that when the engine, and with it main-shaft 37, and shaft 33, increase in speed, causing the weighted arms of the governor to rise and spread apart by the operation of the centrifugal force, the slidable friction-wheel 28 will be moved, by its concentric grooved collar 28^a and the forked end of arm 38^a, upon its shaft 26 toward the periphery of the solid pulley 29 from which it receives its revolving motion, thus causing it (wheel 28) to revolve with correspondingly increased speed, increasing the speed of the traveling carriage 4 at the same ratio. Reversely, when the machine "slows up" or lessens its speed, the weighted arms of the governor will drop and approach each other, depressing collar 46 and, by the intervening connections and mechanism, moving wheel 28 upon its shaft 26 toward the center of pulley 29 from which it receives motion by frictional contact, and thus decrease the speed of the traveling carriage in precisely the same ratio as the speed of the revolving saw is lessened.

When it is desired to stop either the forward or the retrograde travel of the carriage, this is done by disengaging the friction-wheels 28 and 29 from each other; *i. e.* move them apart so that they will not be in contact with or touch each other. This is accomplished by the mechanism which it will be next in order to describe.

We have already seen that shaft 30, which revolves with pulley 29, has a longitudinal motion in its journal boxes 31 and 31^a, permitting pulley 29 to be withdrawn from contact with the peripheral friction-wheel 28, from which the traveling carriage derives its reciprocatory (forward and back) motion, so that when wheels 28 and 29 are not in frictional contact with each other, the carriage will remain stationary. The outer end of the longitudinally slidable shaft 30 has a circumferential groove, into which is fitted loosely the bifurcated shorter free end or head 51^a of a bent arm or elbow-lever, the longer arm or lever 51 of which has its fulcrum, at the corner or angle 51^b, upon the box-frame or support 27 already referred to. The other or free end of arm 51 is connected by an intermediate short link or coupling-rod 52 (see Figs. 2, 8 and 14) to the long connection rod 53, the other end of which is articulated to the crank 54^a of a crank-shaft 54, which rocks in bearings, 55 and 55^a, in the stationary carriage-sills 13 and 13^a, and in an additional or supplemental box or support, 55^b, underneath the saw table.

Rock-shaft, or crank-shaft 54 is provided with a hand lever 56 for rocking it in its bearings, and it follows that when this lever 56 is pushed to the right (see Fig. 4) or in the direction of the arrow, shaft 54, crank 54^a, connecting-rods 53, 52, and bent lever 51, 51^a will shift or slide shaft 30 in its boxes, longitudinally, so as to push the face of pulley 29 away from the periphery of wheel 28; thus instantly stopping the revolution of this wheel, and, with it, the forward travel of the carriage. On the other hand, when lever 56 is tilted in the opposite direction, or to the left (in Fig. 4), pulley 29 will be pushed up against the rubber or leather-covered periphery of the friction-wheel 28 and thus again start travel or motion of the carriage in a forward direction so as to feed the log to the saw; the speed of this forward travel of the carriage depend-

ing upon the distance of the periphery of wheel 28 from the center of its drive-pulley 29. But instead of stopping forward travel of the carriage by hand, by shifting the position of lever 56 by hand, as we have just described, this may be done automatically in the following manner:

Upon the outside of the outer depending flange or side 5^a of the carriage 4 is placed a rod 57, which is fastened in the carriage side or flange at both ends (see Figs. 4 and 8) so as to stand out a little to one side of the carriage. Upon this rod are fastened, adjustably, two pawls or detents, 58 and 58^a, in such a manner that the position of said pawls upon rod 57 may be changed at will, but so that, after they have been adjusted upon the rod 57 the proper distance apart, they may be securely fastened thereon. The free ends of these pawls or detents 58 and 58^a project downwardly and outwardly from the adjacent side of the carriage; one of them (58) projecting beyond the other, (58^a) as will appear more clearly on reference to the end view, Fig. 11. Upon the rock-shaft 54 (see Figs. 8 and 14) is hung, or hinged, another rock bar 59, by means of its apertured downward extensions, 60^a and 60^b, on each of its right-angled end-arms 61^a and 61^b, so that this secondary rock-shaft 59 will rock upon the first or lower cranked rock-shaft 54, with it as its fulcrum or bearing. End arm 61^b, adjacent to lever 56, is bifurcated at its free end, so as to form two separate arms, designated respectively by the reference-figures 62 and 63. One of these two arms (62) is set a little back of the other; that is, they do not both lie in the same vertical plane, but arm 62 projects in a vertical plane a little back of or receded from the vertical plane in which arm 63 lies, so that the lower end of pawl 58 will play forward and back, as the carriage moves, in the same vertical plane as that in which the free end of arm 62 lies; while, conversely, the free end of pawl 58^a plays forward and back, with the traveling carriage, in a parallel vertical plane which is coincident with the vertical plane in which the free end of arm 63 projects. It follows from this, that on the retrograde motion of the carriage (*i. e.*, when it carries the log, after sawing, back or away from the saw), the carriage-pawl or detent 58 will pass by arm 62, which will, however, be struck and tilted by pawl 58^a when that reaches it; while on the forward or reverse motion of the carriage, (arm 61^b having been tilted to the left by pawl 58^a and arm 62) pawl 58^a will pass inside or back of arm 63 without engaging it, whereas the other pawl, 58, as soon as that reaches it, will strike against or engage the upper free end of arm 63, tilting or rocking it, and with it the end-arm 61^b and rock-shaft 59, to the right. These motions of shaft 59, with its arms 61^a, and 61^b, 62 and 63, are indicated in Figs. 4 and 14 in dotted lines.

Pawls 58 and 58^a are placed at such a distance apart from each other upon rod 57, that rock-bar 59 will be tilted in alternately opposite directions at the end of each "stroke" or movement (forward or back) of the traveling carriage. As bar 59 is thus tilted or rocked in its bearings, arm 61^a is tilted with it, or swung forward and back in unison with the forked arm 61^b at the opposite end; and upon this inner end-arm 61^a is fastened a segment 64 (see Figs. 6 and 14), the outer ends of which are bent at right angles, as shown at 64^a and 64^b, so as to form "keepers" between which plays an arm or lever 65, formed by bending the outer end of the lower rock-shaft 54 upward at right angles; or this arm 65 may be made in a separate piece and suitably fastened at right angles upon the outer end of rock-shaft 54 so as to move with it. As arm 61^a with its segment 64 is tilted to one side or the other, the bent ends of the segment will strike, alternately, one side or the other of the centrally disposed independent arm 65, so as to tilt or rock it in alternately opposite directions, or to opposite sides; and as arm 65 is connected rigidly to one end of the rock-shaft 54 (or, which amounts to the same thing, forms an integral part of it), it follows that shaft 54 will also be rocked in alternately opposite directions; and this will occur each time one of the carriage-pawls or detents 58 or 58^a strikes and tilts its appropriate co-operating shaft-arm 63 or 62, as has been hereinbefore described. This tilting of rock-shaft 54, therefore, whether performed automatically by the carriage (through the medium of pawls 58 and 58^a) or by hand (through the medium of lever 56) results in the stopping and starting of the carriage, through the intervention of crank 54^a, rod 53, link 52, lever 51, 51^a, slidable shaft 30, pulley 29, friction-wheel 28, &c.; but when this is done automatically, as just described, provision must also be made for the automatic starting, or setting in motion, of the carriage. That is to say: after the carriage, impelled by its feed-rack 15 and revolving intermeshing drive-pinion 18, has reached the end of its forward stroke or movement and has been stopped (automatically) by the carriage-pawl 58 striking and tilting arm 63, it must then be immediately, and automatically, started on the return trip or retrograde movement, which is accomplished in the following simple manner:

To the forward end of rod 53 (*i. e.*, the same end to which the connecting-link 52 is hinged) is hinged or articulated another link or short rod 66 (see Figs. 2, 9 and 12), the other end of which is screw-threaded and inserted loosely through a hole bored through the outer end of a bent arm or elbow-lever 67, which plays in a horizontal plane and has its fulcrum, 68, upon a plate 69, supported upon one of the stationary side-sills or supports for the carriage rollers. The other or short arm 67^a of elbow-lever 67 is bifurcated at its free end, so as to clasp and engage the sliding clutch-collar 19, which (as has already been described) slides on and revolves with pinion-shaft 16,

and is adapted to mesh with a concentric clutch 19^a upon cog-wheel 20. We have also seen that when the two parts 19 and 19^a of the clutch are in mesh, the cog-wheel 20 will revolve with the pinion-shaft 16; but not otherwise. This shaft 16, upon which pinion 18 is keyed while cog-wheel 20 is loose on it when the clutch is out of mesh, has fastened upon its inner end a beveled friction-disk 70, which faces a concentric circular recess 29^a, cut into the adjacent side of the slidable drive-pulley 29 (see Fig. 9). The rim of this shallow depression or recess 29^a is also beveled, at an angle corresponding to the beveled rim or periphery of disk 70, so that part of this disk will fit into the adjacent circular and concentric recess 29^a when pulley 29 is pushed up against disk 70. But this can only happen when forward motion of the carriage has ceased and it has come to a stand-still; that is to say, when wheel or pulley 29 has been (by the intervention of the mechanism which has already been described in detail) pushed away from contact with the periphery of the friction-wheel 28. When, however, the recessed side of pulley 29 is pushed up against the adjacent beveled face of the friction-disk 70, the latter will revolve with pulley 29; and as clutch-sleeve 19 upon shaft 16 is, at this time, in mesh with the clutch-collar 19^a appertaining to cog-wheel 20, it follows that the latter will revolve with shaft 16 in the direction of the arrow shown in Fig. 5, *i. e.*, it will be reversed and revolve pinion 18 so as to propel the carriage-rack 15 in the opposite direction and thus cause the carriage, with the log supported on it, to travel back from the saw, until this retrograde movement is stopped automatically by the depending end of the carriage-pawl 58^a striking against and tilting arm 63 appertaining to the rock-shaft 59.

The timely engagement or mesh of the sliding clutch-sleeve 19 with clutch-collar 19^a appertaining to the cog-wheel 20 is, as we have seen, effected by rock-shaft 59, in conjunction with rods 53 and 66, and elbow-lever 67, 67^a; and in order to avoid all slack or jar at the moment when forward travel of the carriage is stopped and the mechanism started from which it derives its retrograde or backward movement, the screw-threaded end of the short connecting-rod 66 has some play in the aperture in lever-arm 67 through which it is inserted, between the adjustable stop-nuts 71 and 71^a; a coiled spring 72 being placed upon the threaded end of connecting rod 66, between the nut 71 and the apertured end of the arm through which the rod is inserted and plays. This spring will "take up" and cushion the push of rod 66 against lever 67, and relieve the latter of all jar during the practically simultaneous operations of stopping and reversing the direction of travel of the carriage.

When the carriage has reached the end of its retrograde movement or backward travel, it is again stopped automatically and started on its forward journey, automatically, by the operation of the carriage-pawl or detent 58^a in conjunction with its co-operating arm 63 of the rock-shaft 64, as hereinbefore described; and when it again reaches the end of its forward "stroke" or travel, the other pawl 58, operating in conjunction with arm 62 and rock-shaft 64, &c., will again stop it automatically and start it on its rapid return travel; and so on, the carriage moving alternately forward and back; both movements being entirely automatic, if desired, until the log has been sawed up completely and the machine is stopped for good, to permit of a fresh log being placed upon the carriage. The object in making the pawls or detents 58 and 58^a (by which, as we have seen, the automatic movements of the carriage are primarily effected) adjustable upon rod 57, is to enable them to be placed a distance apart corresponding, approximately, to the length of the log placed on the movable carriage, so that the carriage will not be fed or run forward its entire length, but only far enough to permit of the log being sawed completely through longitudinally, or from one end to the other. The adjustability of these pawls or detents is, therefore, an important feature of our improvement, as, through it, the carriage will feed a short log to the saw as well as one of extreme length; the carriage being stopped and again started on its retrograde movement the very instant that the log (whether long or short) has been sawed completely through.

Having in the foregoing described the mechanisms for operating the saw, automatically regulating the speed of the carriage on its forward travel, in conformity to the speed of the saw; and, finally, stopping the carriage at the end of each of its movements and starting it immediately (and also automatically, if desired) on the return travel, the next step will be to describe the devices or mechanisms whereby the log is moved laterally or sidewise upon the carriage at the end of the retrograde movement, so as to so present the end of the log to the saw that a fresh plank or board may be cut from it, parallel to the last, and (if desired) of precisely the same thickness. This lateral shifting of the log upon the carriage may be effected either by hand, or automatically by the machine, by the following devices; reference being now had, more particularly, to Figs. 1, 2, 3, 7, 8, 15, 16 and 17:

Into each of two slots or openings 74, made transversely in the top of the carriage 4, is inserted or inlaid a metal plate 73; or rather, two separate and parallel plates, the contiguous parallel sides of which slightly overlap the rectangular slots or openings 74, which are cut entirely through the top of the carriage, so as to form ways or guides for a flat, rectangular metal plate 75, which slides and is confined between the pair of guide-plates 73, 73, so as to cover its appropriate top-open-

ing 74 in the carriage. The parallel sides of each of these two sliding plates 75 and 75, are grooved longitudinally, so that the beveled overlapping edges of each pair of side plates 73 will fit into said grooves and thus, while holding the transversely sliding plates upon the carriage flush or even with its smooth and flat top, will also permit of a free sliding motion of said plates 75 toward or from the adjacent side of the stationary saw-table 2. Upon the inner end of each of these two slidable plates 75 and 75 is hinged another plate or rectangular flap 76, the free end of which is provided with a hinged brace or prop 77. The free end of this hinged brace is bent and pointed somewhat, so that it may be stepped into any one of a series of holes or recesses, 75^a, in the smooth and flat top of its appropriate plate 75; thus permitting the angle of the flap 76, when placed in an upright position supported by its prop, to be regulated at will, in such a manner as to bear closely against the adjacent side of a log placed upon the carriage.

The under side of each of the slidable plates 75 is provided with a longitudinal rack or toothed bar 75^b, which meshes with a small pinion 78^b fastened upon a rotatable shaft 78, which revolves in suitable boxes, placed underneath the top of the carriage. This shaft 78 is also provided with a bevel-pinion 78^a, which meshes with a horizontal bevel-wheel or miter-wheel 79, the stub-journal 79^a of which is boxed in a flat plate 80, located some distance below the flat top of the carriage and supported by and between the parallel depending sides of the same. In order to gain ready access, for oiling, cleaning or other purposes, to the miter-wheel 79, pinion 78^a, and other parts of this device, we prefer to cut an opening in the carriage top immediately above, as represented in Fig. 1; and this opening may either be left open, or it may be provided with a hinged or removable cover, so as to exclude dirt and saw-dust, &c., from the machine.

One end of shaft 78 projects beyond the end of the carriage and is provided with a toothed hand-wheel 81, having a handle 81^a for rotating it see Fig. 11. The teeth or ratchets of wheel 81 are adapted to engage the free end of a pawl 82, upon the outer end of another parallel shaft or rod 83, which rocks in bearings also located on the under side of the flat carriage top; the two shafts 78 and 83 being parallel and lying in the same horizontal plane. By means of a projecting knob or handle 82^a upon the pawl 82, shaft 83 may be rocked or tilted in its bearings, but does not revolve therein, as does the parallel shaft 78; and by gravity, the free end of pawl 82 will normally interlock with or engage the ratchets in the hand-wheel 81 at the outer end of the rotatable shaft 78.

Upon the flat bearing-disk or supporting-plate 80, between it and the under side of the horizontal rotatable miter-wheel, is placed a movable guard or segmental cap 84, consisting of a thin, flat metal plate having an arm or extension 84^a on one side, which is connected by a link 85 with the free end of a crank or right-angled arm 83^a on the inner end of the rock-shaft 83. Opposite, or nearly so, to this arm, the rim of plate 84 is bent upwardly so as to form a flange 84^b, which overlaps a part or segment of the toothed and beveled periphery of the horizontal miter-wheel 79. As the flanged guard-plate 84 is pivoted upon the central axle or journal of miter-wheel 79, between it and the stationary supporting-plate 80, it may be rocked forward and back in a horizontal plane by means of its arm 84^a, in conjunction with link 85 and rock-shaft 83. Below this movable guard-plate 84, 84^b; *i. e.*, between it and the flat top or upper side of plate 80, is journaled, also upon the vertical stub-axle or journal of miter-wheel 79, a flat metal arm 86, which projects to one side of the periphery of wheel 79 and is provided with a spring-actuated pawl 87, adapted to interlock or mesh with a circumferential row of ratchets 79^a upon the lower part of the miter-wheel 79, below and concentric with its toothed and beveled rim. But when the movable guard-plate 84 is so disposed that its segmental guard or flange 84^b overlaps or crosses the adjacent ratchet-segment of wheel 79, then the spring-pawl 87 appertaining to arm 86 cannot come in contact with the wheel-ratchet 79^a, but will, when the parts are in that position, press against the smooth convex outside of the guard-flange 84^b, which, in the juxtaposition of the several parts, is interposed between the miter-wheel ratchet 79^a and pawl 87. On the other hand, when the flanged guard-plate 84 is tilted horizontally (by means of rock-shaft 83 and its connections) so as to withdraw the segmental guard-flange 84^b to one side, pawl 87 is free to engage the ratchets appertaining to the horizontal miter-wheel 79.

What still remains to be described of the construction of these several co-operating devices will find a place in the description of their operation, which is as follows: Assuming that the log has been sawed through completely, from end to end, and that the carriage is about to start on its return trip so as to again feed the log to the saw, the log must first be moved or shifted sidewise upon the carriage, so as to present a fresh part or section of its front end to the periphery of the saw for the next cut. When the log is placed upon the carriage at the beginning of sawing, the hand wheel 81 is turned (the pawl 82 having been first released from the ratchets in the wheel) so as to revolve shaft 78 and its pinions 78^b, and thereby force the holding-flaps or dogs 76 (which have been placed in an upright position upon the sliding plates 75 by means of their appropriate props 77) up against the adjacent side of the log, with sufficient pressure to force the opposite side of the log up against the gage-bar 88. The

latter consists of a bar of wood or metal, or wood faced with metal on the side facing the log, which is fastened adjustably and movably upon the top of the stationary saw-table 2 by means of two parallel links or arms, 89ª and 89, in the same manner as the links or blades of a so-called parallel ruler, so that the gage-bar 88 may be set back at varying distances from the adjacent straight front side of the saw-table and face of the saw, and yet always retain its parallelism with the same. After proper adjustment, the gage-bar 88 is fastened or locked down upon the table in its adjusted position by means of a segmental arm 90, one end of which is pivoted to the under side of bar 88, while its free end is inserted through a keeper 91, fastened upon the top of the table and provided with a binding-screw 91ª, so that by tightening down this screw, the free end of segment 90 may be fastened down upon the top of the table, and, with it, the gage-bar 88. Said gage-bar 88 having been set back from the adjacent face of the saw a space or distance corresponding to the thickness of the plank to be cut from the log on the next forward travel of the carriage, it will be seen that in order to bring the side of the log up against the face of the gage-bar, all that is necessary is to release pawl 82 and revolve the toothed hand-wheel 81 of shaft 78. After the log has been "forced home," or brought up close against the adjacent face of the gage-bar, against which it slides during its progress to and past the saw, shaft 78, and with it the dogs or holding-plates 75—76, will be again and instantly locked in position by the spring actuated pawl 82 dropping into mesh or engagement with hand-wheel 81. But besides effecting this lateral adjustment of the log upon the carriage by hand, in the manner described, it may be effected automatically by the machine itself, as follows:

The arm 86, which as we have seen, is pivoted upon the axle of the combined miter and ratchet-wheel 79, is provided on its under side with a depending friction-roller 92; and a stiff spring, 93, is so placed or arranged relatively to said arm that it will press against the free end of the same and impel it in the direction of the small arrow shown in Fig. 3. Upon a bridge or support 94, shown more clearly in Figs. 2 and 19, which is placed upon and connects the stationary carriage-sills 13 and 13ª, is pivoted, on a central fulcrum-pin 95, a flat disk 96, provided with an arm or extension 97 on one side, which is bent so as to form a vertical flange 97ª. The free end of this flanged arm 96 is connected by a rod 98 to an arm 89ᵇ, which is integral with, or rigidly connected to, the lower end of the arm or link 89ª appertaining to the adjustable gage-bar 88; so that when said link or gage-arm 89ª is moved, arm 89ᵇ will move with it, and, by means of the connecting-rod 98, also move or shift the free end of the flanged arm 97, thereby changing its angle relative to the adjacent side of the saw-table.

The operation of the mechanism just described for shifting the log laterally, by the movement of the carriage is as follows. The pawl 82, is thrown upwardly out of engagement with the ratchet wheel 81, thereby causing shaft 83, to be partly rotated, which through the medium of the crank 83ª and link 85, will actuate plate 84, and cause its flange 84ᵇ, to be moved from between the pawl 87 and the periphery of the ratchet wheel 79, and the pawl to be thrown into engagement with the teeth of said wheel by the spring 93ª. The carriage will now move toward the saw and when it reaches the end of its forward stroke, its movement will be automatically reversed and it will begin its return stroke. When near the end of this retrograde or return movement, the roller 92, will strike the front side of flange 97ª, causing the arm 86, to be moved inwardly or in the direction indicated by the arrow in Fig. 4. This will cause the pawl 87, to rotate the combined ratchet and miter wheel a distance corresponding with the angle of the flange 97ª, which in turn will through pinion 78ª rotate shaft 78, and the latter will by means of the pinions 78ᵇ move the plates or dogs 76, and with them the log, laterally against the gage bar 88, so as to present a fresh part or section to the action of the saw when the carriage again moves forward. During this retrograde movement of the carriage, the roller 92, will not move past the flange 97ª, as before it reaches the end thereof, the movement of the carriage will be reversed by the shifting mechanism, and it will again move forward or toward the saw.

When, for any reason, it is not desired to operate this part of the mechanism automatically, but by hand, the first thing to do is to partly rotate or rock shaft 83, by means of the pawl disk 82 and its handle 82ª, so as to pull upon arm 84ª of plate 84 and thus tilt or move this plate horizontally and thereby interpose its guard-flange 84ᵇ between the periphery of the ratchet-wheel 79ª and the spring actuated pawl 87 on arm 86. This throws arm 86 out of play, *i. e.* prevents it from operating wheel 79, which can now only be turned, so as to work the pinions 78ᵇ, 78ᵇ, and their appropriate slidable dogs, by operating the hand-wheel 81 at the end of the carriage.

In order to confine the movements of the rock-shaft 54 within its proper operative limits, the lateral play of the free end of the handle-lever 56, appertaining to said rock-shaft, is regulated by means of stop arms, 99 and 99ª, which are pivoted upon a vertical segment 100 (see Fig. 4), the ends of which are bolted to the front sill, 13ª, of the carriage support. The free ends of these pivoted arms 99 and 99ª are bent at right angles, so that, when they are turned down into the position illus-

trated in dotted lines in Fig. 4, they will bind against lever 56 from opposite sides, and thus lock the same in its vertical or upright position and prevent movement to either side of both the lever and its rock-shaft.

Having, now, in the foregoing fully and clearly described the construction and combination of co-operative parts of our improved saw-mill or machine, what we claim as new, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination in a saw mill of the described type, with the stationary saw table and the circular saw, of a movable carriage and an adjustable gage bar for determining and regulating the thickness of the planks or boards to be cut from the log, so constructed and combined that the lateral adjustment of said gage bar upon the stationary table will automatically operate a device for moving the log laterally upon the carriage, and also determine and regulate such lateral movement of the saw log upon the carriage, substantially as and for the purpose shown and set forth.

2. In a saw mill of the described type, the combination with the movable carriage provided on its under side with a longitudinal toothed bar or rack, of the mechanism for operating, (*i. e.* moving forward and back) the carriage, comprising the following co-operating elements viz: the rotatable shaft 16, having pinion 18 and provided with the slidable grooved clutch collar 19 and beveled friction disk 70; cog wheel 20 fastened loosely upon shaft 16 and provided with the eccentric clutch 19^a; longitudinally slidable and rotatable shaft 30 provided with friction pulley 29 having a concentric circular recess 29^a facing and fitting disk 70; drive shaft 33 having pulley 31 and endless belt 32 connecting pulleys 31 and 29; all constructed and combined substantially as and for the purpose shown and set forth.

3. In a saw mill of the character described, the combination with the rotatable and slidable shaft 30, provided on its inner end with a concentrically recessed pulley 29 by which it is rotated, and having a circumferential groove in its outer end; the elbow lever 51^a, 51, the short arm 51 of which engages with the said groove, the connecting rod or link 52, the long connecting rod 53, the rock shaft 54 having an operating bar 56 and a crank with which rod 53 is connected; the shaft 26 having a friction wheel 28 and a pulley 25, the shaft 22, having a pulley 23, connected by belt 24, with pulley 25, and the worm 21 on shaft 22 of the rotatable shaft 16, having a friction disk 70 engaging with pulley 29, the loose cog wheel 20, having a clutch, the sliding clutch collar 19, the bifurcated elbow lever connected with clutch 19, the rod 66 connecting said lever with rod 53, the pinion 18 on shaft 16, and the reciprocating carriage having a rack bar with which said pinion engages, substantially as described.

4. In a saw mill of the described type, the combination with the rotatable and slidable shaft 30, provided at its inner end with a pulley 29, by which it is rotated; the shaft 16, having a cog wheel 20, at inner end which is loose on said shaft; the clutch 19^a carried by said wheel; the horizontally slidable clutch 19, the bifurcated lever 67 connected therewith; the rod 53, connected with said lever; the pinion on shaft 16, and the reciprocating carriage having a rack bar engaging with said pinion; of the shaft 26, having a horizontally slidable friction wheel contacting with the side of pulley 29; the elbow lever 38, connected with said wheel, the rod 40 connected therewith and with the governor; the pulley 25 on shaft 26; the shaft 22 parallel with shaft 26, having a pulley 23 connected with pulley 25, by belt 24, and the worm 21 on shaft 22, meshing with cog wheel 20, substantially as specified.

5. The combination with the rotatable shaft, having a pinion 18; the reciprocating carriage having a rack bar engaging therewith; the cog wheel 20 loose on the end of said shaft and having a clutch 19^a; the slidable clutch 19; the elbow lever 67 connected therewith; the short screw threaded coupling rod 66, provided with the adjustable stop nuts 71 and 71^a and coiled cushion spring 72, and connecting rod 53; of the worm shaft 22 having pulley 23; shaft 26 having pulley 25 on one end and a slidable friction wheel at its other end; the pulley 29, shaft 30, elbow lever 38, and rod 40 connecting the same with a governor, substantially as described.

6. In a saw mill of the described type, the combination with the reciprocating carriage, provided with a rod 57 and adjustable pawls or detents 58 and 58^a; and having a rack bar on its under side; the shaft 16 having a pinion 18 engaging with said rack bar; the friction disk 70, the cog wheel 20 loose on said shaft having a clutch 19^a; the slidable clutch 19, the elbow lever connected therewith; the connecting rod 53; and the rock shaft 54, having a crank 54^a, with which rod 53 is connected, and an upwardly extending lever 65 at its inner end; of the slidable shaft 16 having a recess with which disk 70 engages, the elbow lever 51^a, 51, engaging with a groove in said shaft and connected with rod 53; the shaft 26 having a friction wheel 28 engaging with pulley 29, and a pulley 25; the shaft 22 having a worm 21 engaging with cog wheel 20 and a pulley 23 connected by belt 24 with pulley 25; the rock bar 59, having upwardly extending arm 61^a at its inner end provided with a segment 64 with its ends bent outwardly forming keepers 64^a 64^b; and the arm 61^b having upwardly extending arms 62 and 63 in different vertical planes with which the pawls in the reciprocating carriage engage, said arms 61^a and 61^b being pivoted on shaft 54, substantially as specified.

7. The combination with the movable carriage, of the slidable dogs 76, provided with

racks on their under sides; the rotatable shaft 78, provided with the toothed hand wheel 81, pinions 78^b and bevel pinion 78^a; combined miter and ratchet wheel 79, 79^a; movable guard plate 84 provided with the flanged segment 84^b and arm 84^a; connecting link 85, and rock shaft 83, provided at its outer end with a pawl 82, adapted to engage the toothed hand wheel 81, of shaft 78, substantially as described.

8. The combination with the reciprocating carriage; of the slidable dogs provided with racks on their under sides; pinions 78^b and bevel pinion 78^a; combined miter and ratchet wheel 79, 79^a; the pivoted spring actuated arm 86 provided with a spring actuated pawl and a downwardly depending roller 92, and the disk 96, provided with an arm 97, having a flange 97^a, substantially as described.

9. The combination with the reciprocating carriage; of the slidable dogs provided with racks on their under sides; pinions 78^b and bevel pinions 78^a; combined miter and ratchet wheel 79, 79^a; the pivoted spring actuated arm 86, provided with a spring actuated pawl and a downwardly depending roller 92, the pivoted disk 96, provided with an arm 97, having a flange 97^a; the gage bar 88, pivoted by means of links to the saw table, the arm 90, pivoted to said bar, the keeper, the binding screw and the rod 98, connecting one of said links with arm 97, substantially as described.

10. The combination with the movable carriage, of the rotatable shaft 78, provided with bevel pinion 78^a, and pinions 78^b; combined miter and ratchet wheel 79, 79^a; pivoted guard plate 84 provided with the flanged segment 84^b and arm 84, link 85; rock shaft 83 provided at its outer end with the pawl disk 82; the pivoted spring actuated arm 86, provided with depending friction roller 92, and the disk 96 provided with an arm 97, having a flange 97^a, substantially as described.

11. The combination with the movable carriage, of the rotatable shaft 78, provided with bevel pinion 78^a and pinions 78^b; combined miter and ratchet wheel 79, 79^a; pivoted guard plate 84 provided with the flanged segment 84^b and arm 84; link 85, rock shaft 83, provided at its outer end with the pawl disk, 82; the pivoted spring actuated arm 86, provided with depending friction roller 92; the pivoted disk 96, provided with arm 97 having a flange 97^a; the gage bar 88, pivoted by means of parallel links to the saw table, the arm 90 pivoted to said bar, the keeper; the binding screw and the rod 98 connecting one of said links with arm 97, substantially as described.

In testimony that we claim the foregoing as our own we have hereunto affixed our signatures in presence of two witnesses.

URIK SEVERIN SJÖSTRAND.
CARL JOHAN ANDERSSON.

Witnesses:
AXER SJÖSTRAND,
JOHN ALBERT ANDERSSON.