N. E. RICE.

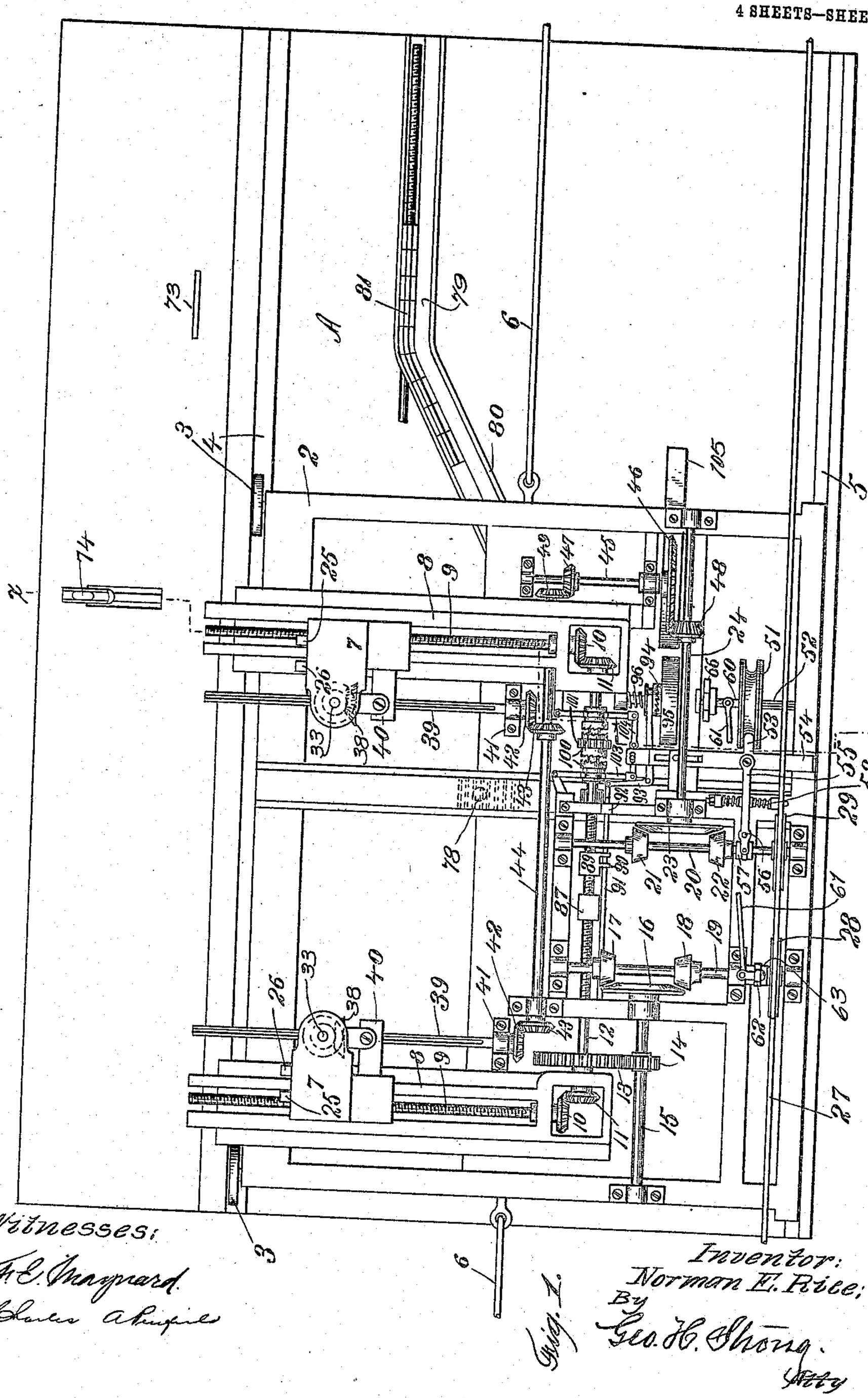
AUTOMATIC POWER SAWMILL SET WORKS AND DOG.

APPLICATION FILED JUNE 24, 1908.

936,944.

Patented Oct. 12, 1909.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

Fig. 2.

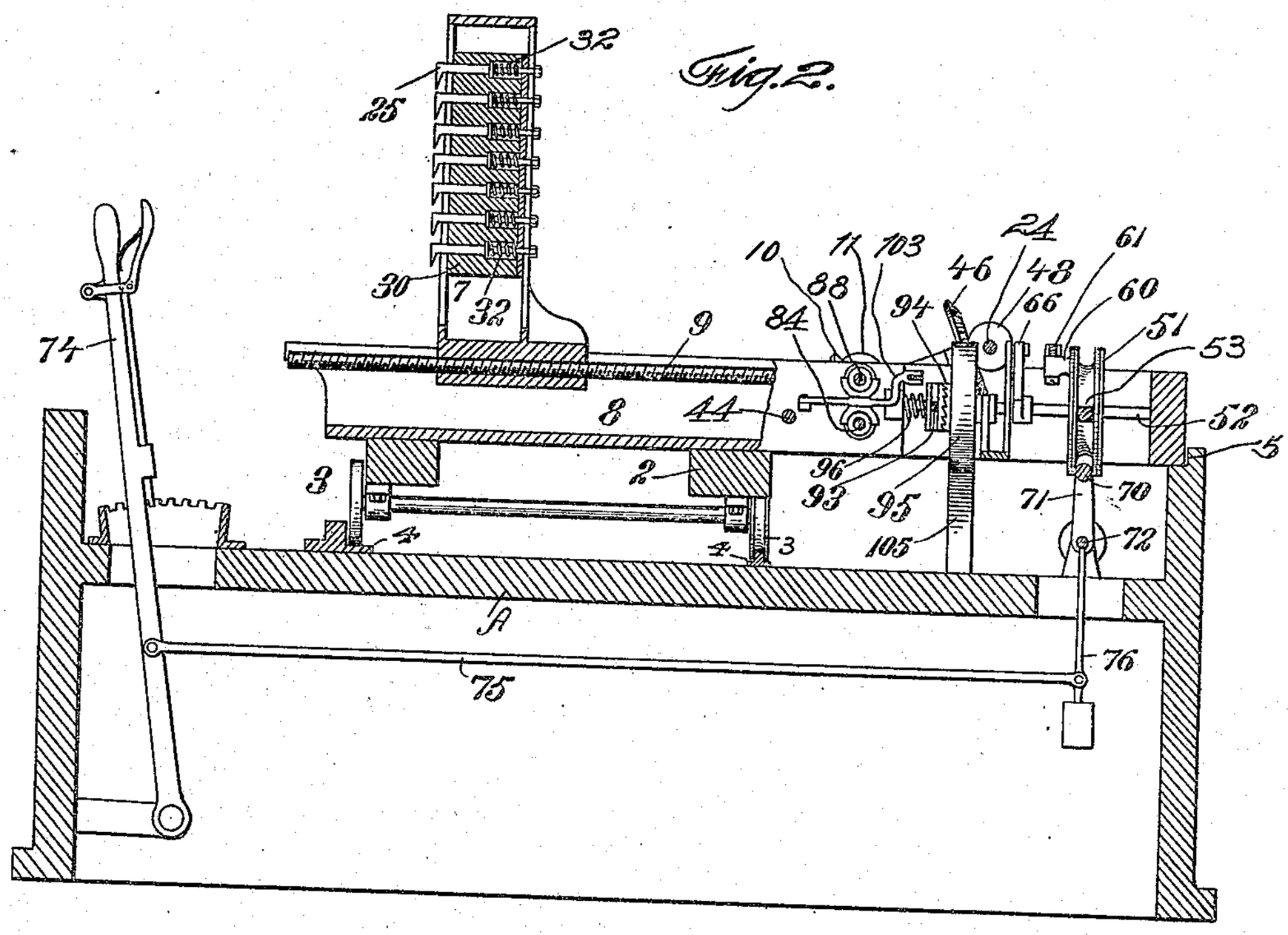
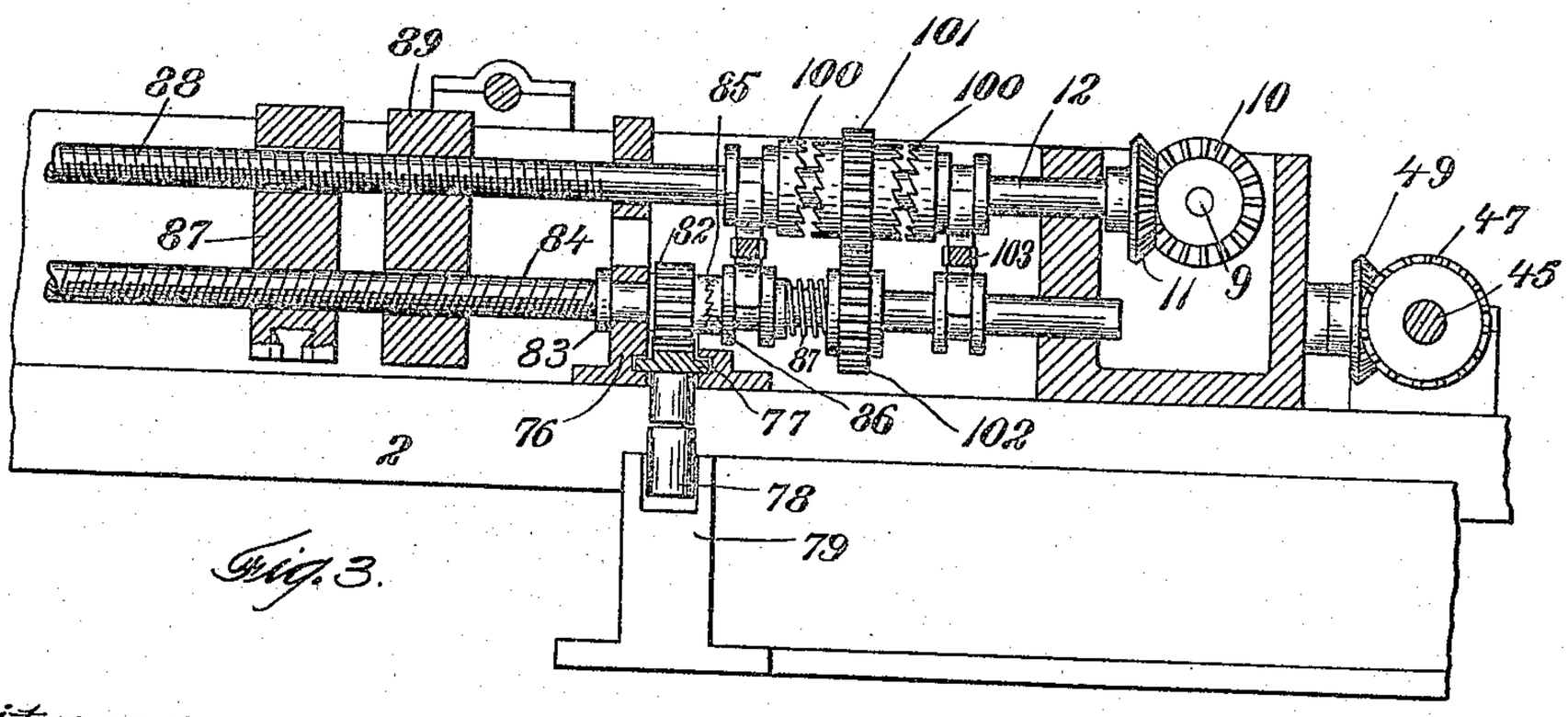


Fig. 3.



Witnesses;

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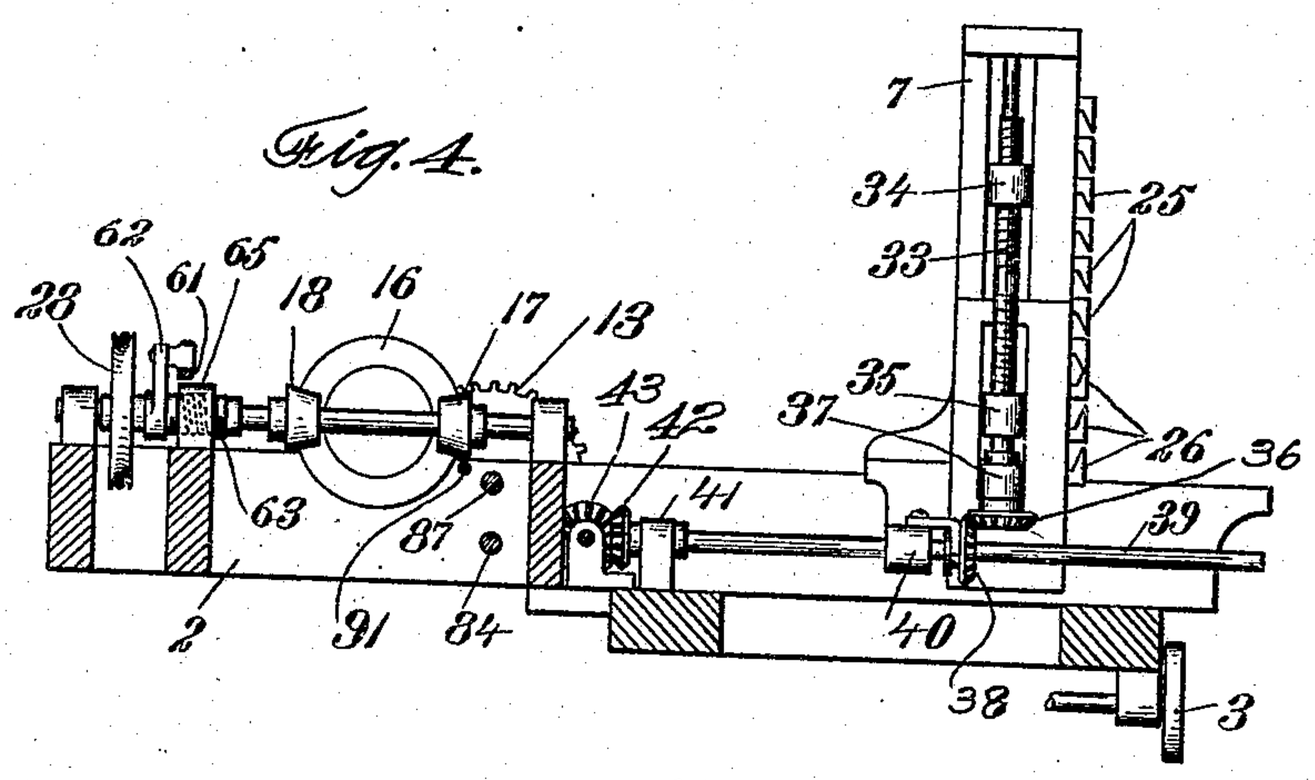
4 SHEETS—SHEET 3.

Fig. 4.



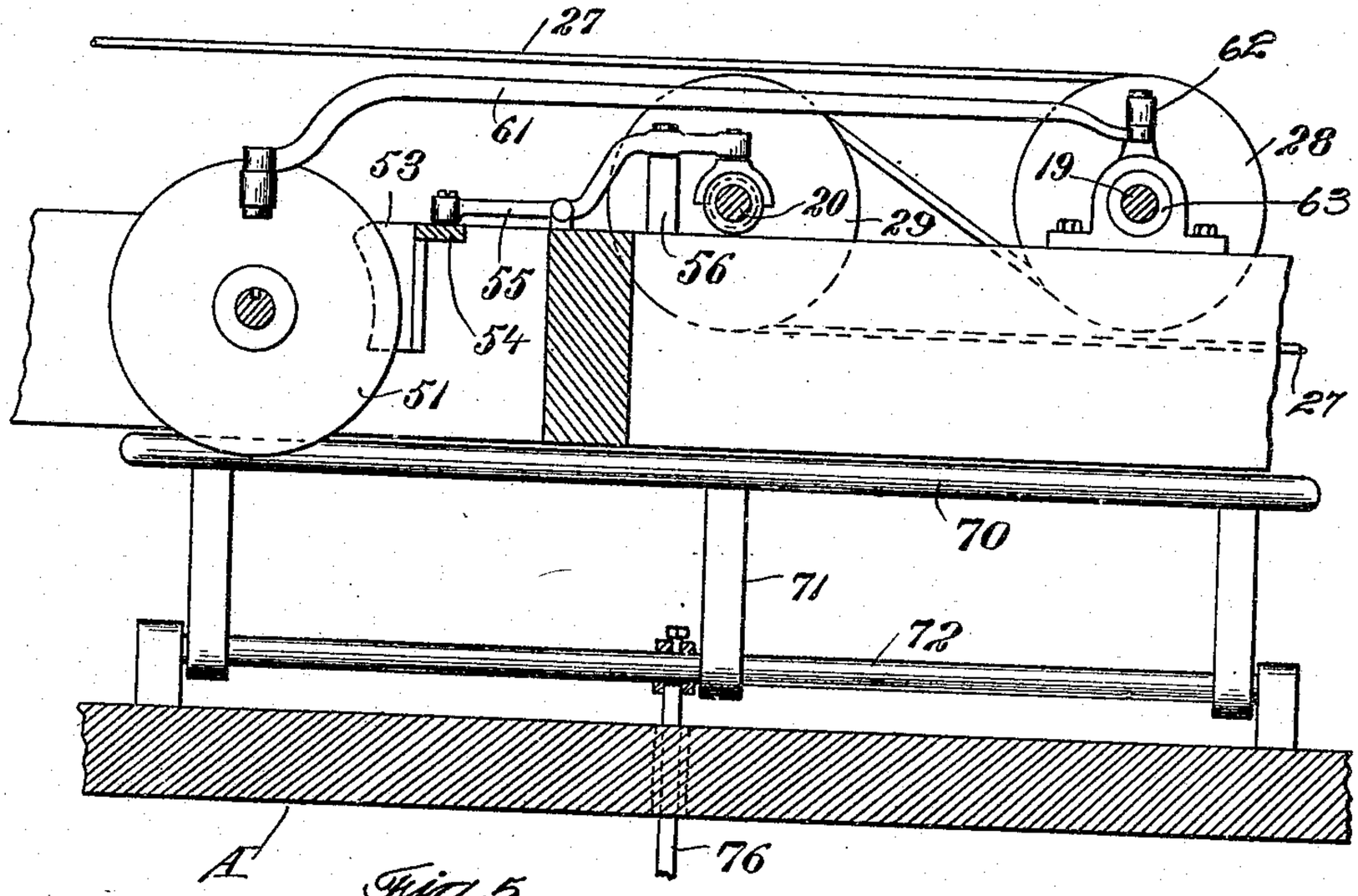


Fig. 5.

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4 SHEETS—SHEET 4.

Fig. 6.

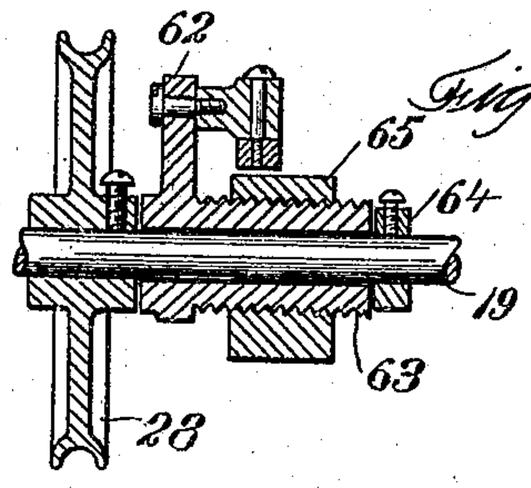


Fig. 7.

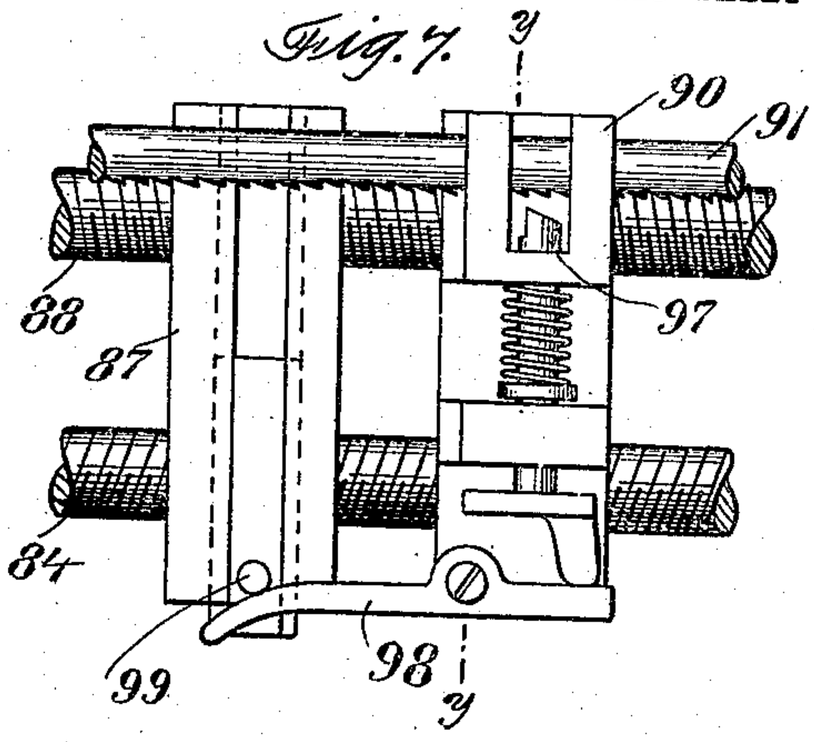
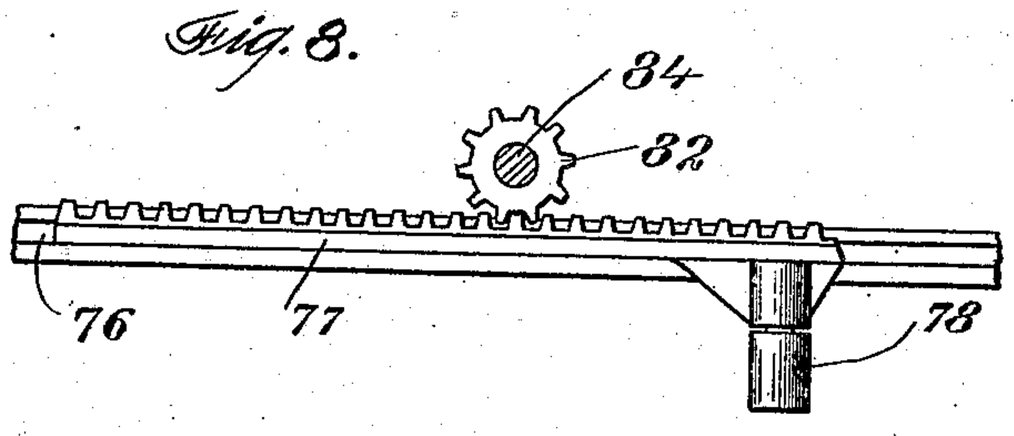


Fig. 8.



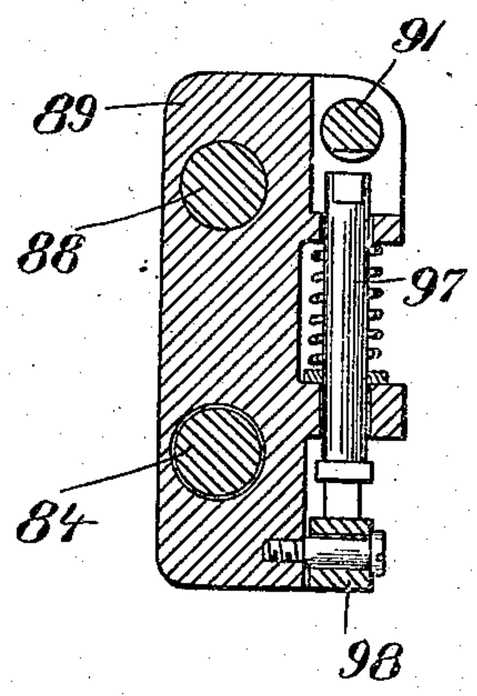
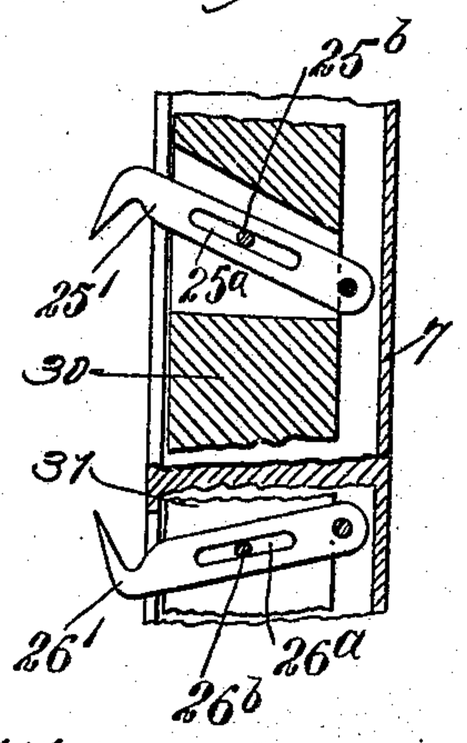
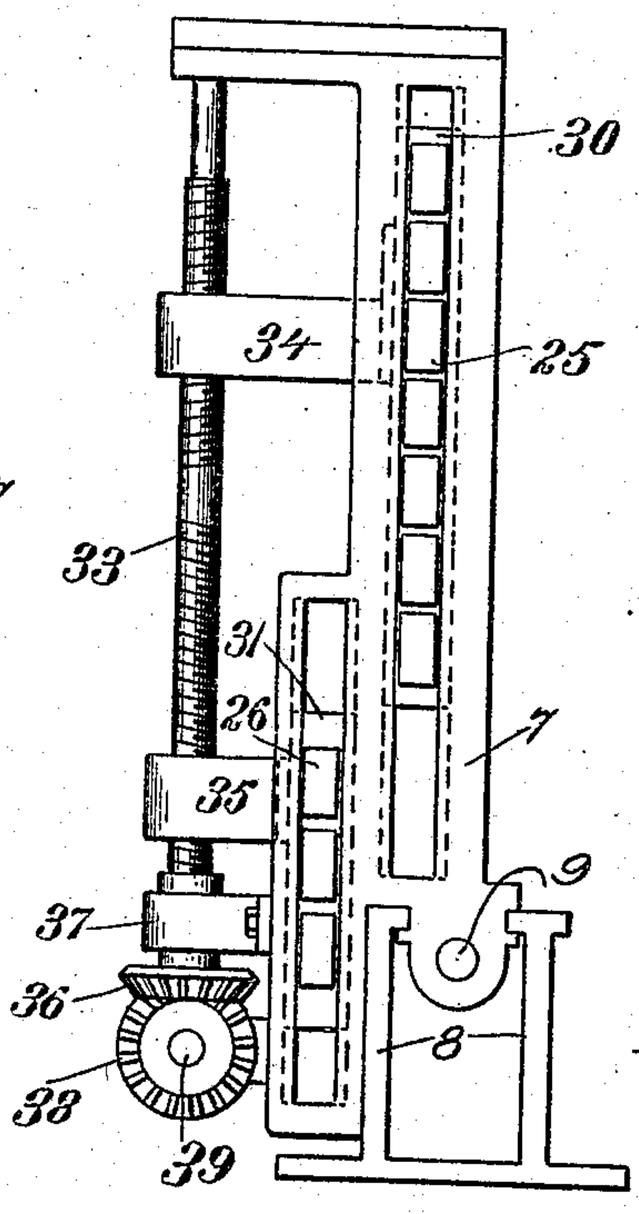


Fig. 9.

Fig. 11.

Fig. 10.





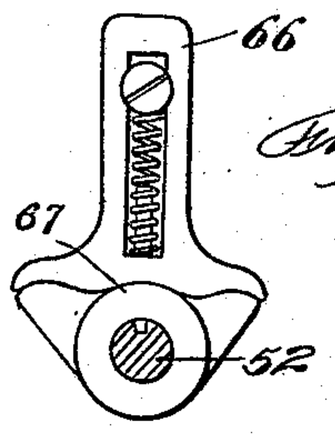


Fig. 12.

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UNITED STATES PATENT OFFICE.

NORMAN EARL RICE, OF ZENIA, CALIFORNIA.

AUTOMATIC POWER SAWMILL SET-WORKS AND DOG.

936,944. Specification of Letters Patent. **Patented Oct. 12, 1909.**

Application filed June 24, 1908. Serial No. 440,173.

To all whom it may concern:

Be it known that I, NORMAN E. RICE, citizen of the United States, residing at Zenia, in the county of Trinity and State of California, have invented new and useful Improvements in Automatic Power Sawmill Set-Works and Dogs, of which the following is a specification.

This invention relates to saw-mill machinery, and pertains especially to mechanism for what is termed dogging the slab or log to be sawed, and for feeding the log to the saw.

The object of the invention is to provide an automatic power saw-mill set works and dog, whereby not only the operation of the knees, but the operation of the dogs may be effected mechanically and automatically; and also to provide suitable mechanism whereby the machine may be set to any required lumber measurement, and thereafter the feed of the lumber to the saw according to this measurement will be automatically taken care of; and in general, it is my purpose to provide a machine of this character in which all the operations of dogging and setting may be controlled by one man, known as the sawyer, without the need of any assistants.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a plan view of the invention. Fig. 2 is a cross-section on irregular line X—X, Fig. 1. Fig. 3 is a detail in partial section of the set screw-shaft and setting nuts. Fig. 4 is an elevation in partial section of one of the knees, and the means for operating the dogs. Fig. 5 is an elevation in partial section of the driving means for the knee-operating shaft and dog-operating shaft, and also showing the clutch roller. Fig. 6 is a detail in section of the screw sleeve for shifting the knee-operating shaft endwise. Fig. 7 is a detail of the saw setting nuts. Fig. 8 is a detail of the rack and pinion for automatically operating the set works. Fig. 9 is a section on Y—Y, Fig. 7. Fig. 10 is a detail in partial section of a modified form of the dogs. Fig. 11 is a front elevation of the knee and dogs. Fig. 12 is a detail of the centering device for the clutch pulley shaft.

A represents a suitable bed on which the saw-mill carriage 2 is reciprocal. The carriage is provided with suitable wheels 3 running on tracks 4, and one edge of the carriage may be supported to slide in suitable side guides 5 of the frame. The carriage is reciprocated by suitable means, as the cables 6, connected with appropriate power mechanism, not necessary here to be shown.

Mounted on the carriage and transverse to the line of reciprocation are the knees 7 which are adapted to slide back and forth on suitable guides 8. The knees have threaded nut portions in which the screws 9 operate, these screws being suitably journaled in the frame and operative to reciprocate the knees backward or forward according to the direction in which the screws 9 are turned. Each screw 9 carries a bevel gear 10 meshing a corresponding gear 11 on a shaft 12. The shaft 12 carries the large gear 13 meshing a pinion 14 on a shaft 15 suitably journaled on the frame of the carriage.

Suitable mechanism is provided for intermittently turning shaft 15 in one direction or the other, in order correspondingly to move the knees out or in. I preferably employ a friction form of drive connection, such as the disk 16 on shaft 15 engageable with one or the other of the friction cones 17—18 on the knee-driving shaft 19. Opposed to shaft 19 is a shaft 20 which carries friction cones 21—22 engageable with a friction disk 23 on a shaft 24. From shafts 20 and 24 power is adapted to be transmitted whenever desired to operate the upper and lower dogs 25—26 carried by the knees 7, all in a manner shortly to be described. Shafts 19 and 20 are adapted to be driven constantly in one direction, as by means of the endless drive rope 27 passing around the grooved pulleys 28—29 on the respective shafts 19—20, as shown more clearly in Fig. 5; the friction rollers 17—18—21—22 being normally maintained out of engagement by their respective friction disks 16 and 23, except when it is desired either to move the knees or raise and lower the dogs. The means for operating the dogs is one of the important features of this invention, because in the present case these dogs are operated entirely by machinery directly under the control of the sawyer.

In Figs. 2 and 11 I have shown the dogs 25—26 mounted in respective blocks 30—31 slidable vertically toward and from each

other in suitable parallel guides on the knees 7. Each dog 25 or 26 is spring mounted in the blocks so that each dog has a limited movement independent of all the others. For instance, as shown in Fig. 2 the dogs 25 are each mounted to slide independently in their blocks, and each dog has a reduced portion surrounded by a spring 32 suitably housed in the block. The purpose of the springs is to push the dogs always outward, and the purpose of mounting the dogs in the manner shown is to permit of a log or slab of any size or shape to be rolled up against the knees, so that while the log may push back some of the dogs, it will leave those dogs above or below the log free to engage and hold the log securely whenever the blocks 30—31 are moved toward each other.

In Fig. 10 I have shown a slight modification of the dogs, in which both sets of dogs 25′—26′ are fulcrumed in the knees and are longitudinally slotted, as at 25^a—26^a to accommodate pins 25^b—26^b carried by the blocks 30—31. The dogs 25′—26′ thus swing in an arc toward and from each other to grip or to release a log, according as their respective blocks are moved up or down. This movement of the head blocks 30—31 toward and from each other synchronously is effected by means of a right and left threaded screw-shaft 33 having one threaded end engaging a correspondingly threaded boss or projection 34 on block 30, and the oppositely threaded end of the screw engaging a correspondingly threaded boss or projection 35 on the lower block 31. The lower end of the screw-shaft 33 carries a bevel gear 36 having a grooved hub portion suitably supported in a fixed bearing 37 to prevent endwise movement of the shaft 33. Gear 36 engages a corresponding gear 38 which is arranged concentric with the shaft 39. This gear 38 is supported by a bracket 40 fixed to and movable with the knees, and each shaft 39 has a feather to engage a corresponding feather-way in its respective gear 38, so that the gears 38 may slide back and forth on their shafts 39, but always turn with the shafts, and correspondingly raise or lower the blocks 30—31 and open or close the dogs. The shafts 39 are journaled in suitable bearings 41 at their inner ends, being supported at their other ends in the gears 38. Shafts 39 adjacent to the bearing 41 carry bevel gears 42 meshing corresponding gears 43 on the cross shaft 44. Shaft 44 is driven from shaft 24 by means of the interconnecting shaft 45, with its gears 46—47 engaging corresponding gears 48—49 on the respective shafts 24—44. It will thus be seen that with the cable 27 traveling always in the same direction, if shaft 19 is shifted to carry roller 17 into frictional contact with the friction disk 16, the knees will be moved simultaneously in one direction; while if the shaft 19 is shifted to carry roller 18 into friction connection with the disk 16, the knees will be simultaneously operated in the opposite direction. Also, if shaft 20 is moved to carry roller 21 into friction contact with the disk 23, the dogs will be opened, for example, while if the roller 22 is moved up to the friction disk 23, the dogs will be correspondingly closed. It is, therefore, apparent that by providing suitable clutch mechanism for the purpose of operating the friction drive connections 16—17—18—21—22—23, the setting of the knees out or in and the opening and closing of the dogs will easily be manipulated. In order to accomplish these results, I employ a grooved roller 51 mounted to turn with, but slide on, a shaft 52 suitably journaled on the carriage. Engaging in the grooves of this clutch roller 51 is an arm 53 rigid with the sliding bar 54. By sliding the roller 51 back and forth on its shaft 52, the bar 54 is made to slide correspondingly. Pivoted at one end to bar 54 is a clutch lever 55 fulcrumed to a fixed part of the carriage frame, as 56, and engaging a collar 57 which is suitably keyed to shaft 20. Springs 58 engage opposite sides of the lever 55 to maintain the rollers 21—22 in normally neutral inoperative position. It is understood that both the shafts 20 and 19 have limited endwise movement in their bearings sufficient to carry the rollers 17—18—21—22 into or out of operative engagement with the corresponding friction drive disks 16—23.

From the foregoing it will be observed that if friction roller 51 is moved in one direction along shaft 52, that the lever 55 will be rocked to carry one or other of the rollers 21—22 into contact with disk 23 and operate the latter in one direction; likewise, if the clutch roller 51 is rocked in the opposite direction, the operation of the disk 23 will be reversed. The means for effecting this sidewise shifting of the roller 51 will be described shortly.

The endwise shifting of shaft 19 to turn the disk 16 forward or back is effected by rocking the clutch roller 51 and its shaft 52 either forward or back. Roller 51 has a wrist-pin 60 to which is pivoted a link 61 running back and connecting to a crank 62 which is rigid with the sleeve 63 concentric with shaft 19. The shaft 19 is free to turn in sleeve 63, but endwise movement of the shaft in the sleeve is prevented by the roller 28 abutting against one end of the sleeve, and a collar 64 fast to the shaft and abutting against the other end of the sleeve. This sleeve is exteriorly threaded and adapted to turn in a threaded journal box 65. Turning sleeve 63 in one direction will cause it to move endwise in the box 65 and carry the shaft 19 in a corresponding direction; and turning the sleeve the other way will corre-

spondingly shift the shaft 19 and rollers 17—18 in the opposite direction, and thereby reverse the movement of the disk 16 and its operating parts. A spring-actuated centering cross-head 66 bearing on a corresponding portion 67 on shaft 52 operates to turn the grooved pulley 51 into normal neutral position with respect to the sleeve 63, so that rollers 17—18 will normally be out of friction contact with the disk 16. This rocking of the grooved pulley 51 will also be described in due course.

I will first describe the means for shifting the roller 51 lengthwise of shaft 52. Suitably supported on the bed or foundation A is a rocking switch rail 70 carried by the arms 71 which are fixed to the rock-shaft 72. This rocking switch rail 70 has an oscillatory movement transverse to the line of reciprocation of the carriage, and it normally stands in the plane of the peripheral groove of the clutch pulley 51 when the latter is in normal neutral position on its shaft 52. This rail 70 extends only a portion of the length of the total path traversed by the carriage, and is arranged at such a location that the grooved pulley 51 may have its peripheral groove engaged with the rail 70 before the carriage is moved forward to carry the log into engagement with the saw, represented at 73, Fig. 7. Any appropriate means may be employed to rock the rail 70 in order to shift the clutch pulley 51 lengthwise of the shaft 52; this operation of the switch rail 70 being effected by the sawyer, who is located adjacent to the saw 73. As here shown, I have simply represented a lever 74 suitably fulcrumed in the bed A, with a link 75 connecting the lever with a crank-arm 76 on rock-shaft 72. The rail 70 is thus rocked to shift the clutch pulley 51 by appropriately moving the operating lever 74 in one direction or the other.

With the carriage at rest and with the grooved pulley 51 engaged with rail 70 and in such position that the rollers 17—18 are out of engagement with the disk 16, a simple rocking of lever 74 in one direction will cause the dogs on the knees to open, and a movement in the opposite direction will close the dogs. If, while the roller 51 is engaged with the rail 70, the carriage is started forward, the frictional contact of the side of the groove of roller 51 with rail 70 will turn the roller 51 in one direction, so as to throw one or the other of the friction rollers 17—18 into driving contact with the disk 16, and so move the knees outward. A reverse movement of the carriage with the roller, and still maintaining the roller 51 in frictional side contact with the rail 70, will act to retract the knees; in either case the rail 70, when pushed to one side or the other, and the carriage set in motion, will act as a brake to the roller, and will force the same to turn forward or backward according to the way in which the carriage is moved. It is thus apparent that by means of the single operating lever 74 I am able to shift the friction roller 51 sidewise to operate the dogs in either direction, or to rock the roller one way or the other, so as to reciprocate the knees in either direction, and the dogs may be operated without moving the knees, or the dogs and knees may be operated together; all from the one lever 74, which is handled by the sawyer.

The setting up of the knees and the operation of the dogs by lever 74 takes place only when the log is first dogged and adjusted to the saw, and again subsequently when the log or slab is sawed up and the knees are retracted in order to allow for a fresh log to be placed in position against the knees.

The automatic step by step setting of the knees forward after each cut by the saw according to the desired timber measurement, is done by the following means: (By "timber measurement" is meant the width of the board or other timber sawed off from the slab at each forward movement of the carriage.) Slidably mounted on the under side of the carriage in transversely extending guides 76 is a rack 77 carrying the roller 78 which is designed to engage in a diagonal trackway or guide 79 suitably supported on the bed. This trackway 79 has a rigid longer wall 80 designed to intercept the roller 78 on each forward reciprocation of the carriage, and so move the roller and rack 77 at right angles to the path of the carriage. On the return movement of the carriage, the roller engages the opposite wall 81, and so moves the rack 77 in the opposite direction; the two walls 80—81 thus operating to reciprocate the rack 77 back and forth. The wall 81 is preferably made up of a series of articulated movable sections, similarly as embodied in my prior patent No. 877,662, January 20, 1908. Suitable means, not necessary here to be shown or described, are employed to move the movable wall 81 back and forth, so as to shorten or lengthen its diagonal length, and thereby vary the length of the stroke of the rack; all as similarly described in the patent aforesaid.

The rack 77 is engaged by a pinion 82 carried by a sleeve 83 which is loose on a set shaft 84 suitably mounted on the carriage. The sleeve 83 carries ratchet teeth engageable with similar ratchet teeth on a clutch 86 which turns with, but is slidable on, the shaft 84. A spring 87 normally maintains clutch 86 in engagement with the ratchet 85 on sleeve 83. The loose mounting of the sleeve 83 permits the sleeve to turn free on the set shaft 84 when rack 77 is moved in one direction, but when the rack is moved in the opposite direction the ratchet teeth are engaged by the clutch 86 and the shaft 84 is made to turn in unison with the pinion 82.

Shaft 84 has a left-hand thread and carries a nut 87, which nut is perforated to freely pass the right threaded portion 88 of shaft 12, which carries a nut 89. Nut 89 in turn is perforated to freely pass the lower set screw-shaft 84. Thus, it will be seen that if shaft 84 is turned in one direction, and shaft 12 remains stationary, the nut 87 will be moved away from nut 89; or if shaft 84 remains stationary, and shaft 12 is turned in the proper direction, the nut 89 will be made to travel toward the nut 87. It will be remembered that shaft 12 is geared to the friction disk 16 and to the knee-driving screws 9. The nut 89 which is threaded to turn on the threaded portion 88 of shaft 12 has a perforated bifurcated boss 90, through which extends a notched bar 91, which latter is suitably supported parallel with shaft 12, to slide lengthwise in guides 92. This bar 91 connects with a bell-crank 93 which operates a clutch 94 on shaft 52. This clutch 94 has ratchet teeth to engage corresponding ratchet teeth on a friction roller 95, which latter is free to turn on shaft 52 except when engaged by the teeth on clutch 94. A spring 96 normally presses the clutch against the roller 95. The nut 89 is normally free to slide back and forth on bar 91, but may be locked thereto by means of a sliding pawl 97 carried by nut 89 and supported on the lower end of a lever 98 which is also fulcrumed on nut 89. If the opposite end of lever 98 is pressed down, it will push up on the pawl 97 to cause the latter to engage the teeth in the bar 91, and so lock the bar and cause it to move in unison with the nut 89 when shaft 12 is turned, and so release the clutch 94 from the roller 95. The operation of the lever is effected automatically by carving the forward end of it to present a cam surface which will engage a projection 99 on nut 89, when either nut is moved toward the other a sufficient distance to effect the proper depression of the lever 98 and the raising of the pawl 97.

Shaft 12 carries a set of double clutches 100 which slide on and turn with the shaft and are designed to be moved toward and from each other to engage and disengage a loose pinion 101 on shaft 12; this pinion 101 meshing in turn a pinion 102, which is fixed to the set screw-shaft 84. The clutches 100 are operated by a pair of clutch levers 103 fulcrumed to a fixed support at one end, and pivotally connected at the other to a toggle 104, which toggle has a pin engaging a slot in the sliding bar 54. The double set of clutches 100 is for the purpose of securing the pinion 101 fast to shaft 12, so that both shaft 12 and set screw-shaft 84 will turn simultaneously, so that the head block knees are moved to set the slab over any desired distance, or to pull the knees back, and at the same time simultaneously moving the nuts 87—89 on their respective shafts and preserving the relation between the nuts 87—89.

The friction roller 95, in conjunction with the nuts 87—89, is for the purpose of automatically setting the knees forward a definite desired distance according to the lumber measurement, and operates as follows: This roller 95 is adapted at each forward reciprocation of the saw-mill carriage to engage a fixed track or friction surface 105 to cause the roller to turn forward, rock shaft 52, correspondingly rock the grooved pulley 51, pull over on link 61, turn the worm sleeve 63, and move friction roller 18 into friction contact with the disk 16. This will transmit motion from the constantly turning shaft 19 to the shaft 12, and thence through the gears 11—10 and screws 9, to move the knees forward and set the slab outward so as to be in the path of the saw 73, ready for the next cut. The distance, however, that the knees are set out depends on the distance apart of the nuts 87—89. Their adjustment, one to the other, having been suitably effected, corresponds precisely to the thickness of the board or other timber which is to be sawed off. Thus, with the roller 95 in friction contact with the underneath friction surface 105 so as to turn the grooved clutch roller 51 in the manner just described, the shaft 12 will continue to turn, and since clutches 100 are released from the loose pinion 101, the set screw-shaft 84 will remain stationary, and likewise the nut 87 will remain stationary; and the nut 89 will approach nut 87 until the lever 98 engages the pin 99, lifts the pawl 97, locks it and the shifting bar 91, and throws out the clutch 94, thereby releasing the roller 95 from shaft 52; whereupon the tension on roller 51 being released allows it, through the medium of the spring centering device 66, immediately to swing back into normal neutral position, disconnecting roller 18 from disk 16, stopping shaft 12, and correspondingly stopping the forward movement of the knees.

The operation of the machine is briefly as follows: The knees having been run back on their guides to allow a log to be rolled up against the knees, the dogs are set into the log by properly manipulating the shafts 39 which control the right and left threaded screws 33. This operation of shafts 39 is accomplished by throwing the lever 74 when rail 70 is engaged with pulley 51, so as to move the latter along shaft 52 and carry the friction roller 22 into engagement with the friction disk 23. It is preferred to use friction drives in the places herein indicated, so that when the dogs are set in sufficiently tight, or the knees moved to the limit in either direction, slippage will occur, so as to prevent breakage. Whenever the roller 51 is shifted lengthwise of shaft 52, the

clutches 100 are interlocked with the loose gear 101, so that shaft 12 and set screw-shaft 84 will turn together and cause both nuts 89—87 to travel uniformly together in the same direction. It is only when pressure on rail 70 is released to allow roller 51 to return to normal neutral position, that the clutches 100 are thrown out, allowing an independent movement of either shaft 12 or the set screw-shaft 84. With clutches 100 thrown out, a turning movement of either shaft 12 or shaft 84 alone will cause the nuts 87—89 either to approach or move from each other, according to the way in which those shafts are turned. The knees may be set forward along their guides to carry the log outward into position with the saw, simultaneously with the dogging of the log, by moving the carriage forward slightly, while the rail 70 is pushed over to keep roller 22 and disk 23 in contact; this forward movement of the carriage causing a sufficient friction between the rail and the side of the groove in pulley 51 to turn pulley 51 and throw friction roller 18 into contact with the disk 16, whereupon shaft 12 will be set in motion and the knees will be moved outward. Thus it will be seen that by means of the single lever 74 I can set the knees and also operate the dogs at the one operation. Correspondingly, I can rock the lever 74 in the opposite direction and move the carriage backward so as to simultaneously shift pulley 51 the opposite way along shaft 52, and at the same time turning the pulley 51 backward, I can open the dogs and also retract the knees. As before stated, the frictions will always slip whenever the dogs are fully opened or closed, while the knees will continue to move to the desired distance back and forth; or the knee frictions will slip if the knees reach their limit of movement before the dogs are fully set or retracted. The nuts 87—89 having been adjusted a suitable distance apart on shafts 12—84, according to the desired lumber measurement, the carriage is then started forward, the pressure on lever 74 being released, since thereafter, until the slab is released, the dogs remain stationary and the knees are only moved forward intermittently to set the slab forward the desired lumber measurement before each cut. As before described, this intermittent setting of the logs forward a predetermined distance is accomplished by the roller 95 engaging the fixed rail 105, thereby turning roller 51 and correspondingly carrying the friction roller 18 into contact with the knee-driving disk 16. This causes shaft 12 and its threaded continuation 88 to revolve to move the nut 89 toward the temporarily stationary nut 87. At the proper instant lever 98 engages the stop 99, locks the pawl 97 to the shifting rod 91, and releases the clutch 94 from roller 95, whereupon the clutch roller 51 swings back to normal inert position, and shaft 12 stops turning. This all happens before the log comes to the saw. In the forward movement of the carriage past the saw, the roller 78 engages the diagonal track-guide 79 and shifts the rack 77 transversely of the carriage, but without turning the set screw-shaft 84, since in this movement of the rack the pinion 82 rides free over its clutch 86. After the cut is made by the saw, the direction of motion of the carriage is reversed, and on this return movement of the carriage the roller 78 is engaged by the diagonal articulated guide wall 81, to reciprocate the rack 77 in a reverse direction, and correspondingly turning the set screw-shaft 84 and moving the nut 87 forward and away from nut 89, which latter remains stationary, a distance corresponding to the desired lumber measurement. It will thus be seen that the turning movement of the shafts 12 and 84 during the sawing operation takes place alternately; the nut 89, when shaft 12 is turned, moving toward nut 87 to release the friction roller 95, and when shaft 84 is turned and shaft 12 is stationary, the nut 87 is sent forward a fixed distance away from the nut 89. All this takes place automatically by the simple reciprocation of the carriage back and forth until the slab is sawed up, or it is desired to change the width of cut.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. The combination of a saw-mill carriage suitably mounted for reciprocation, a knee adjustable on said carriage, dogs carried by the knee, mechanism on the carriage for operating the knee and mechanism on the carriage for operating the dogs, and means whereby the dog and knee-operating mechanisms may be operated conjunctively from a point remote from the carriage, said means including a member on the carriage having a motion in one plane to control the dog mechanism and having a movement in a different plane to control the knee operating mechanism.

2. The combination of a saw-mill carriage suitably mounted for reciprocation, a knee adjustable on said carriage, dogs carried by the knee, mechanism on the carriage for operating the knee and mechanism on the carriage for operating the dogs, and means whereby said dog and knee-operating mechanisms may be operated either independently or conjunctively from a position independent of the carriage, said means including a member on the carriage having a motion in one plane to control the dog mechanism and having a movement in a different plane to control the knee operating mechanism.

3. The combination of a saw-mill carriage suitably mounted for reciprocation, a knee adjustable on said carriage, dogs carried by the knee, mechanism on the carriage for operating the knee and mechanism on the carriage for operating the dogs, and means for controlling the movements of said mechanisms, said means including a member on the carriage having motion in one plane to control the dog mechanism, and having a motion in a plane transverse to the first plane of movement to control the knee-operating mechanism.

4. The combination of a saw-mill carriage suitably mounted for reciprocation, a knee adjustable on said carriage, dogs carried by the knee, mechanism on the carriage for operating the knee and mechanism on the carriage for operating the dogs, means for controlling the movements of said mechanisms, said means including a member on the carriage having motion in one plane to control the dog mechanism, and having a motion in a plane transverse to the first plane of movement to control the knee-operating mechanism; and means mounted independent of the carriage for operating said last-named member.

5. The combination of a saw-mill carriage suitably mounted for reciprocation, a knee adjustable on said carriage, dogs carried by the knee, mechanism on the carriage for operating the knee and mechanism on the carriage for operating the dogs, means for controlling the movements of said mechanisms, said means including a pulley mounted on the carriage, with suitable connections with said operating mechanisms, and means mounted independent of the carriage for operating said pulley.

6. The combination of a saw-mill carriage suitably mounted for reciprocation, a knee adjustable on said carriage, dogs carried by the knee, mechanism on the carriage for operating the knee and mechanism on the carriage for operating the dogs, means for controlling the movements of said mechanisms, said last-named means including a pulley mounted on the carriage, with suitable connections between said pulley and said operating mechanisms, and means including a rockable rail member for controlling the movements of said pulley.

7. The combination with a saw-mill carriage mounted for reciprocation, of a knee adjustable in guides thereon, dogs on the knee, mechanism on the carriage for operating the knee and mechanism on the carriage for operating the dogs, means on the carriage whereby said mechanisms may be operated independently or together, said means including a member having a motion in one plane to control the dogs, and having a motion in a plane transverse to the first plane of movement to control the knee, and means independent of the carriage for operating said controlling means for said mechanisms.

8. The combination of a saw-mill carriage mounted for reciprocation, a knee adjustable thereon, dogs adjusted on the knee, mechanism on the carriage for operating the knee and mechanism on the carriage for operating the dogs, a member having both a rocking movement for controlling one of said mechanisms and a sliding movement for controlling the other mechanism, and means independent of the carriage for operating said rocking and sliding member.

9. The combination of a saw-mill carriage, a knee adjustable thereon, dogs adjustable on the knee, a knee-operating drive-shaft on the carriage, a dog-operating drive-shaft on the carriage, means for driving said shafts constantly, engageable and disengageable friction drive connections between the knee and its respective drive-shaft, and between the dogs and their respective drive-shaft, means for engaging and disengaging the friction connections, and mechanism independent of the carriage for operating said last-named means.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

NORMAN EARL RICE.

Witnesses:
CHARLES EDELMAN.
C. C. COOK.