No. 707,370. Patented Aug. 19, 1902.

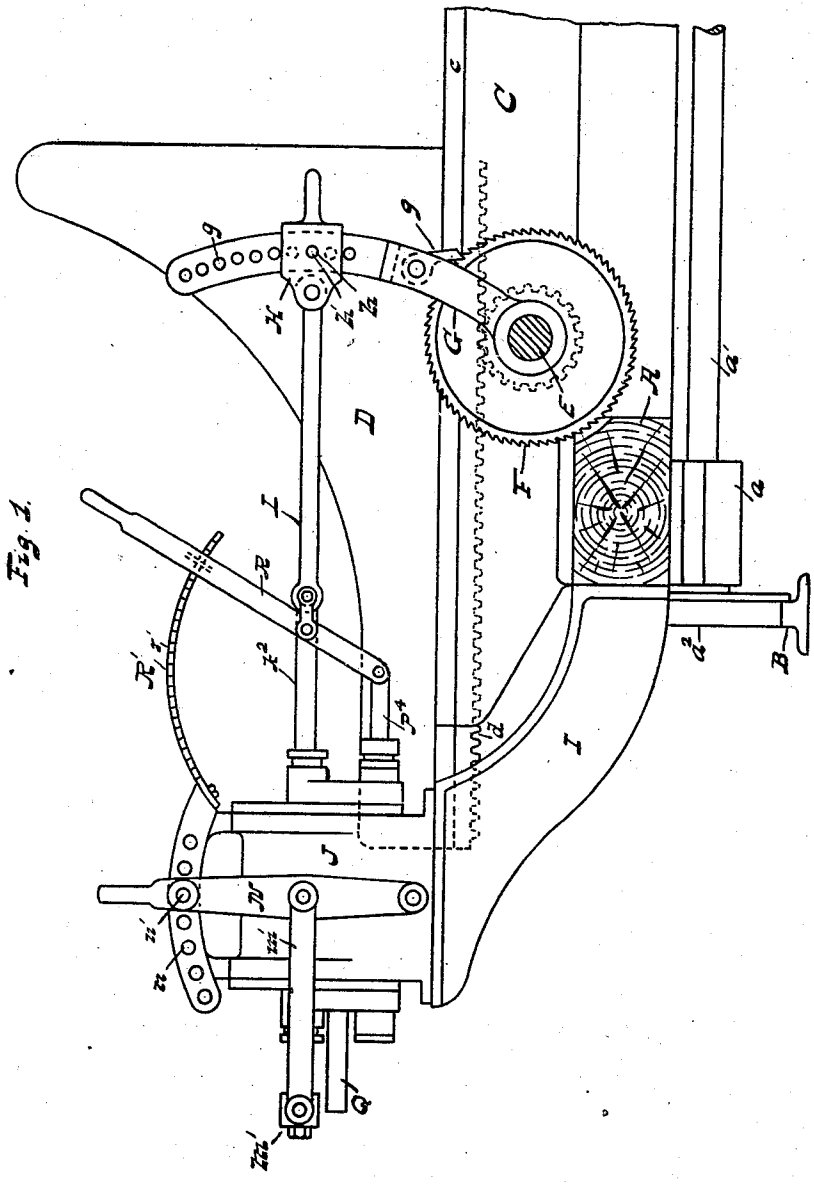
J. WALTON.

SAWMILL SET WORKS.

(Application filed Apr. 28, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



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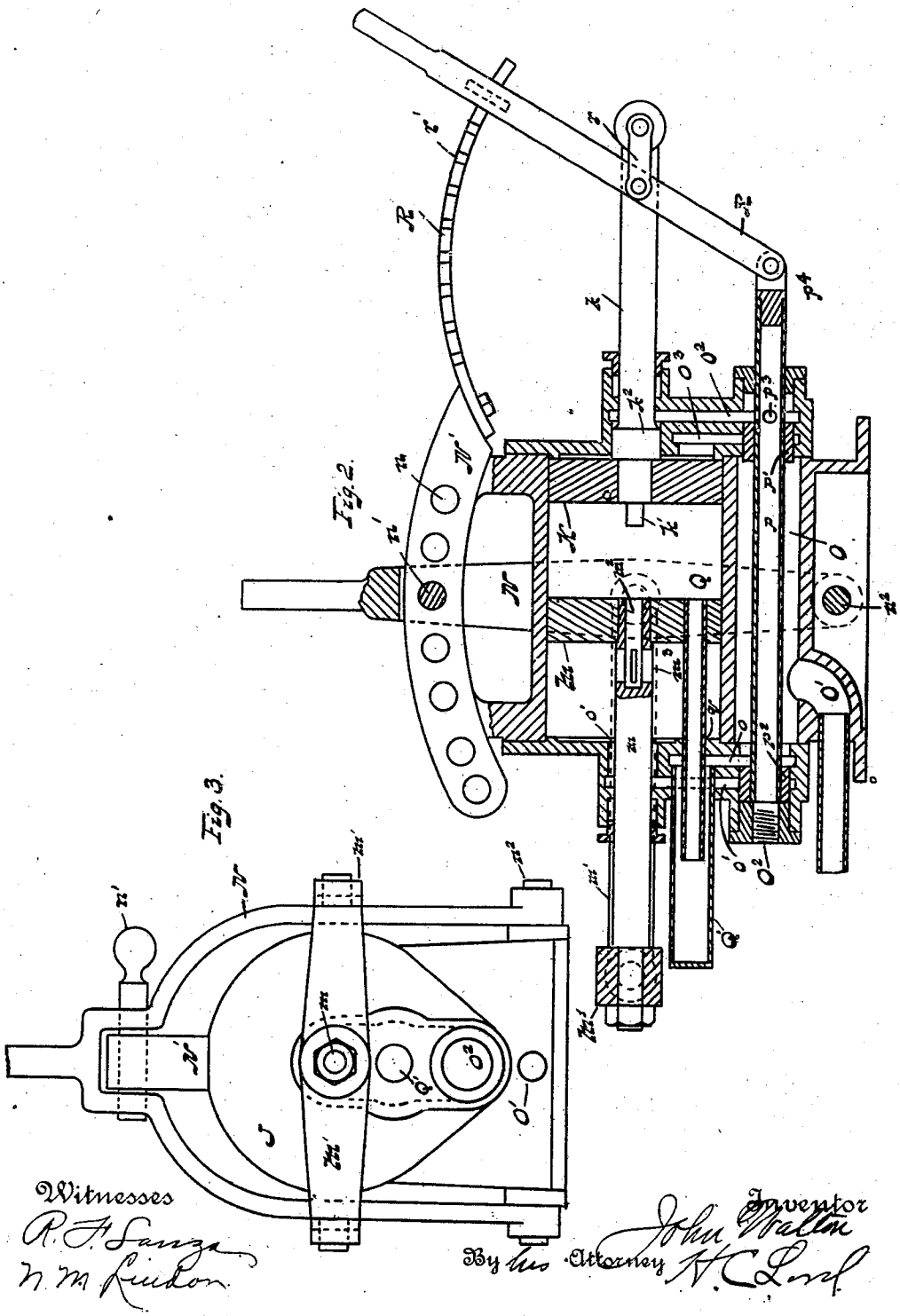


Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

JOHN WALTON, OF ERIE, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO ALLIS-CHALMERS COMPANY, A CORPORATION OF NEW JERSEY.

SAWMILL SET-WORKS.

SPECIFICATION forming part of Letters Patent No. 707,370, dated August 19, 1902.

Application filed April 28, 1900. Serial No. 14,757. (No model.)

To all whom it may concern:

Be it known that I, JOHN WALTON, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Sawmill Set-Works; 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.

This invention relates to sawmill set-works; and it consists in certain improvements in the construction thereof, as will be hereinafter fully described, and pointed out in the claims.

More particularly, the invention relates to that class of set-works which are actuated by steam.

The object of the invention is to provide a set-works which can operate upon the carriage mechanism to produce any desired thickness of boards or lumber with accuracy.

Figure 1 shows a transverse section of a sawmill-carriage having the set-works formed according to my invention thereon. Fig. 2 shows a longitudinal section through the steam actuating mechanism of the set-works. Fig. 3 shows an end view, from the left of Figs. 1 and 2, of said steam actuating mechanism.

A marks the sawmill-carriage timber; a, the usual box secured thereto; a', the ordinary shaft or axle; a^2, the carriage-wheel, and B the track on which the carriage runs. Arranged on the carriage-timber is the head-block C, having the usual slides c on top thereof. Arranged to move on this slide c is a knee D, having the usual rack d on the bottom thereof. Running longitudinally of the carriage is a shaft E, and on this is secured a pinion (shown on dotted lines) which is arranged to mesh the rack d and to produce the movement of the knee D. Also secured to this shaft D is a ratchet-wheel F. A ratchet-lever G is journaled on the shaft and is provided with the pawl g in proper position to operate on the ratchet-wheel F as the ratchet-lever is oscillated.

It will be readily observed that for any given oscillation of the lever F a certain movement is given to the knee D and that this movement is varied as the amount of movement on the ratchet-wheel F is varied. If therefore the ratchet-wheel F is given successive movements, each equal, the knee will be given successively a number of equal movements. This will move a log in place so as to produce boards of equal thicknesses. It is of course desirable to have the mechanism arranged so that boards of different thicknesses may be produced and that their thickness be readily controlled. I accomplish this as follows: Extending from the timber A is the bracket I. Secured to this bracket I is the steam-cylinder J, in which is arranged a working piston K. Extending from this working piston K is a piston-rod k. A pitman L extends from the piston-rod k to a block H on the ratchet-lever G. As the piston K is reciprocated the lever G is reciprocating in proportion to the length of movement of the piston K. Arranged in the cylinder J, back of the piston K, is a setting-piston M. Extending from this piston is a piston-rod m, which passes out of the cylinder through a stuffing-box of the usual construction. A cross-head M′ is secured to the outer end of this piston-rod m, and links m' connect the ends of the cross-head M′ with the forked lever N. The forked lever N extends over the cylinder and is pivoted at n^2 at the base of the cylinder. A quadrant N′ is provided and has in the path of the lever N a series of holes n. A similar opening is arranged in the lever N in position to come into register with the openings n as the lever N is moved. A pin n' is passed through the lever and an opening n to lock the lever N in the desired position and to thus lock the piston M in its position. Extending into the end of the piston-rod m is an opening m^2, which, with the ports m^3, forms a means of communication between the two parts of the cylinder at the opposite sides of the piston M. Beneath the cylinder is arranged a steam-chest O, having an inlet O′ and an exhaust-passage O^2. The ends of the steam-chest are arranged to form the working portions, and in these are placed the valves p' and p^2. These are connected by a central hollow portion of the valve p. The ports o o' lead from

the steam-chest and are controlled by the valve p^2, and the ports o^2 and o^3 extend from the opposite end of the steam-chest and are controlled by the valve p'. Extending from the port o is a port extension Q', into which a port-tube Q passes, forming a sliding fit with an opening q in the end of the cylinder. The port o^2 extends from the front end of the working piston and may be termed the "exhaust-port." It forms a connection with the exhaust-opening through the port p^3 and the central part of the valve. In the position that the parts are shown the valves p' and p^2 have closed the ports o' and o^3 and have opened the ports o and o^2. With this position of the parts the steam passes from the steam-chest through the port o, extension Q', port-tube Q into the end of the cylinder J, and from there passes through the opening m^2 and ports m^3 into the rear end of said cylinder. This of course balances the setting-piston M, so that it may be moved to any part of the cylinder. The port o^2 being open at the front end of the cylinder allows all steam to exhaust therefrom, and as the working piston K is subjected to the full force of the steam it is in its extreme forward position. Extending from the valve p is a valve-stem p^4, and secured to this is a hand-lever R. The hand-lever R is connected with the piston-rod K by a link r and is arranged to pass by a quadrant R', on which are a series of notches corresponding to the openings n. By moving the hand-lever along the quadrant R' the valve p is moved so as to open the ports o' and o^3 and at the same time closes the ports o and o^2. This permits of an exhaust from the cylinder back of the working piston and admits steam to the front end of the cylinder, and thus forces the working piston backward. This movement of the piston follows immediately as the valve reaches its forward position, so that the lever R may be moved along with the piston to one of the notches or indications r', corresponding to the opening n, in which the pin n' is placed. This will leave the ports o' and o^3 open until the piston has moved to nearly its extreme rear position, and a slight further movement of the piston closes all the ports o, o', o^2, and o^3. Just before the piston reaches the limit of its rearward movement the plug k', arranged on the cylinder K, enters the opening m^2. It does not form a steam-tight joint therewith, but allows a small leakage of steam. This cushions the working piston K. As this movement takes place the ratchet-lever G is carried backward, the dogs g moving over the ratchet-teeth to the new position. The hand-lever is then moved forward, moving the valve so as to open the ports o and o^2. This allows the steam in the front part of the cylinder to exhaust and admits steam to the rear of the cylinder, thus forcing the working piston K forward, and this operating the lever G moves the ratchet-wheel F. As the piston approaches its extreme forward position the enlarged portion k^2 of the piston-rod k enters the port o^2. It does not form a steam fit with this port but approximately closes the port o^2, and the trapped steam cushions the end of the movement to the working piston K. The hand-lever is moved with the piston movement to the end of the quadrant. It will be readily observed that there is given with each movement of the working piston K an equal movement to the ratchet-wheel F, and consequently the knee D, so that a forward or feeding movement of the log is accomplished with each movement of the working piston. If a thicker board is desired, all that is necessary to accomplish this is to give to the working piston a longer movement, and this is effected by moving the setting-piston toward the rear end of the cylinder and locking it there by means of the pin n'. Practically any thickness desired may be gotten in this way. In order that a great variation of thicknesses may be had, I provide the upper end of the ratchet-lever G with a series of holes g and provide the block H with a hole h', which may be brought into register with these holes. A pin h is passed through the opening h' and a hole g to lock the block in any position. By moving the block H upwardly, so as to lengthen the ratchet-lever G, a given movement of the working piston of course produces a shorter movement of the ratchet-wheel, and consequently a slighter feeding movement. By means of thus varying the position of the block H and the lever N practically any thickness of board can be made, even down to the most minute differences.

The port-tube Q might be dispensed with; but the initial movement of the piston K would be slow, because steam would have to pass by the plug k' through the port m^2, and this is not desirable, as a rapid movement is one of the objects to be attained. By making a separate opening the piston K is immediately subjected to the full steam-pressure.

It will be noted that the valve will be moved by the piston-rod k, if the valve-lever is restrained, in a direction which will close the valve. I prefer to make the valve, so that when brought to normal, it will just close the two inlet-ports, but still have a sufficient lapse but that steam will leak through, thus neutralizing the effect. With this construction, therefore, it is possible to very nearly locate the position of the working piston by simply locking the valve-lever R at the predetermined notch, because with the lever at this notch the valve will be brought to normal with a desired position of the piston, so that the piston is practically locked in this position. It is only because this method lacks that accuracy which is necessary in this device that the setting-piston in other mechanism is added. By so connecting the valve-lever with the piston-rod the speed at which the piston moves may be regulated, because as the valve-lever is moved, opening the port in front of

the piston, the movement of the piston itself tends to close it, so that the travel of the piston follows the movement of the valve-lever and is fast or slow according as the valve-lever is fast or slow.

It will be noted that the cushion device operates only at the end of the stroke, so that the central parts of the stroke may be as rapid as the actuating fluid or steam will move the mechanism. It will also be noted that the knee is moved forward by the ratchet mechanism. The cushion device operating at the end of the stroke slows down the speed of the mechanism before it reaches a positive stop, so that the mechanism actuated by the ratchet is not carried by the position necessary to produce the proper thickness of board and a proper succeeding movement of the mechanism. By a ratchet mechanism I wish to include any mechanism adapted to move into engagement with a movement of the engine in one direction and to move out of engagement with the reverse movement.

What I claim as new is—

1. In a sawmill set-works, the combination with the log-moving mechanism; of an engine for actuating said mechanism comprising a working piston; a cylinder in which said piston operates; and means for lengthening or shortening the working portions of said cylinder for varying the movement of the set-works.

2. In a sawmill set-works, the combination with the log-moving mechanism; a working piston for actuating said mechanism; a cylinder in which said piston operates; a setting-piston in said cylinder; and means for locking the setting-piston in different positions in said cylinder varying the working length of said cylinder.

3. In a sawmill set-works, the combination with the knee; a ratchet-lever for effecting a movement of said knee; a block on said ratchet-lever; means for locking said block at different points upon said lever to vary the movement of said lever with an equal movement of the block; a working piston connected with said block; a cylinder in which said piston is arranged to operate; and means for lengthening or shortening the working portions of said cylinder for varying the movement of said piston.

4. In a sawmill set-works, the combination with the knee; a ratchet-lever for effecting movement of said knee; a block on said ratchet-lever; means for locking said block at different points upon said lever to vary the movement of said lever with an equal movement of the block; a working piston connected with said block; a cylinder in which said piston is arranged to operate; a setting-piston in said cylinder; and means for locking said piston in different positions in said cylinder for varying the working length of said cylinder.

5. A sawmill set-works comprising the combination with a log-moving mechanism; of an engine arranged to operate said log-moving mechanism; and automatic means for causing a variation from the speed at which the log-moving mechanism would be driven but for said means by the active power of the engine from a rapid intermediate movement to a slow end movement.

6. A sawmill set-works involving the combination with a log-moving mechanism; an engine arranged to operate said log-moving mechanism; means for causing a variation from the speed at which the log-moving mechanism would be driven but for said means by the active power of the engine, from a rapid intermediate movement to a slow end movement; and a positive stop for engaging said mechanism during the slow end movement.

7. A sawmill set-works involving the combination with a log-moving mechanism, comprising a ratchet device; of an engine arranged to operate said log-moving mechanism through said ratchet device; and means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement.

8. A sawmill set-works, involving the combination with a log-moving mechanism; of an engine comprising a working piston arranged to operate said log-moving mechanism; and means for causing a variation from the speed at which the log-moving mechanism would be driven but for said means by the active power of the engine from a rapid intermediate action to a slow end movement, by similarly varying the speed of the piston.

9. A sawmill set-works involving the combination with a log-moving mechanism, comprising a ratchet device; of an engine to operate said log-moving mechanism through said ratchet device; and means for causing a variation in the speed at which said log-moving mechanism is driven, from a rapid intermediate movement to a slow end movement, by similarly varying the speed of the piston.

10. A sawmill set-works involving the combination with the log-moving mechanism comprising a ratchet device; of an engine comprising a working piston for operating said log-moving mechanism through said ratchet device; means for causing a variation from the speed at which the log-moving mechanism would be driven but for said means by the active power of the engine from a rapid intermediate movement to a slow end movement; and means for varying the extent of movement of the log-moving mechanism with a single movement of the piston.

11. A sawmill set-works involving the combination with the log-moving mechanism, comprising a working piston for operating the said log-moving mechanism; means for causing a variation from the speed at which the log-moving mechanism would be driven but for said means from a rapid intermediate movement to a slow end movement; means for varying the extent of movement of the

log-moving mechanism with a single movement of the piston; and a positive stop arranged to come into engagement during the slow end movement of the mechanism.

12. A sawmill set-works involving the combination with the log-moving mechanism comprising a ratchet device; of an engine comprising a working piston for operating said log-moving mechanism through said ratchet device; means for causing a variation from the speed at which the log-moving mechanism would be driven but for said means by the active power of the engine from a rapid intermediate movement to a slow end movement by a similarly varying speed of the piston; and means for varying the extent of a single movement of the log-moving mechanism by varying the extent of movement of the piston.

13. A sawmill set-works involving the combination with the log-moving mechanism, comprising a ratchet device; of an engine comprising a working piston for operating said log-moving mechanism through said ratchet device; means for causing a variation from the speed at which the log-moving mechanism would be driven but for said mechanism by the active power of the engine from a rapid intermediate movement to a slow end movement; means for varying the extent of movement of the log-moving mechanism with a single movement of the piston; and a positive stop for engaging said mechanism during a slow end movement.

14. A sawmill set-works, involving the combination with a log-moving mechanism, comprising a ratchet device; an engine for actuating said mechanism through said ratchet device comprising a working piston; and a means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement comprising a cushion device arranged to operate only at the end of the stroke of the piston.

15. A sawmill set-works involving the combination with a log-moving mechanism, comprising a ratchet device; an engine for actuating said mechanism through said ratchet device comprising a working piston; and means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement, comprising a cushion device arranged to operate only at the end of the stroke of the piston; and a positive stop for the engine.

16. A sawmill set-works involving the combination of a log-moving mechanism, comprising a ratchet device; an engine for actuating said mechanism, comprising a working piston; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement, comprising a cushion device arranged to operate only at the end of the stroke of the piston; and means for varying the movement given to the log-moving mechanism by a single stroke of the piston.

17. A sawmill set-works involving the combination of a log-moving mechanism comprising a ratchet device; an engine for actuating said mechanism through said ratchet device, comprising a working piston; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement, comprising a cushion device arranged to operate only at the end of the stroke of the piston; and means for varying the stroke of the piston to vary the movement given to the log-moving mechanism.

18. A sawmill set-works involving the combination of the log-moving mechanism; an engine for actuating said mechanism, comprising a working piston; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement, comprising a cushion device arranged to operate only at the end of the stroke of the piston; a positive stop; and means for adjusting the position of said stop to vary the stroke of the piston.

19. A sawmill set-works involving the combination with the log-moving mechanism, comprising a ratchet device; an engine for actuating said mechanism through said ratchet device, comprising a working piston; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement, comprising a cushioning device arranged to operate only at the end of the stroke of the piston; a positive stop; and means for adjusting the position of said stop to vary the stroke of the piston.

20. A sawmill set-works involving the combination of the log-moving mechanism; an engine for actuating said mechanism, comprising a working piston; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement, comprising a cushioning device arranged to operate only at the end of the stroke of the piston; a positive stop; and means for adjusting the cushion device and positive stop to vary the stroke of the piston and the point in the stroke of the piston at which the cushion device begins to operate.

21. A sawmill set-works involving the combination with the log-moving mechanism comprising a ratchet device; an engine for actuating said mechanism through said ratchet device comprising a working piston; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement, comprising a cushioning device arranged to operate only at the end of the stroke of the piston; a positive stop; and means for adjusting the cushioning device

and positive stop to vary the stroke of the piston and the point in the stroke of the piston at which the cushioning device begins to operate.

22. A sawmill set-works involving the combination of the log-moving mechanism comprising a ratchet device; an engine for actuating said mechanism, comprising a working piston; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement, comprising a cushion device arranged to operate only at the end of the stroke of the piston, said cushion device comprising a plunger and fluid-chamber arranged to be brought into action only at the end of the stroke of the piston, and to imprison a cushioning fluid by said action; means for permitting a gradual escape of said cushioning fluid to allow the mechanism to move to a positive stop; said stop; and means for adjusting said stop to vary the stroke of the piston and the action of the log-moving mechanism.

23. A sawmill set-works involving the combination of the log-moving mechanism; an engine for actuating said mechanism, comprising a working piston; a positive stop arranged to limit the stroke of the piston; means for adjusting said stop to vary the stroke of the piston and the action of the log-moving mechanism; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement, comprising a cushioning device on said stop arranged to be brought into action only at the end of the stroke of the piston, said cushion device being arranged to be adjusted with the stop.

24. A sawmill set-works involving the combination of the log-moving mechanism comprising a ratchet device; an engine for actuating said mechanism through said ratchet device, comprising a working piston; a positive stop arranged to limit the stroke of the piston; means for adjusting said stop to vary the stroke of the piston and the action of the log-moving mechanism; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow end movement, comprising a cushioning device on said stop arranged to be brought into action only at the end of the stroke of the piston, said cushioning device being arranged to be adjusted with the stop.

25. A sawmill set-works involving the combination of the log-moving mechanism comprising a ratchet device; an engine for actuating said mechanism through said ratchet device, comprising a working piston; means for causing a variation in the speed at which the log-moving mechanism is driven, from a rapid intermediate movement to a slow movement at each end, comprising a cushioning device arranged to operate only at the ends of the stroke of the piston; positive stops at both ends of the stroke of the piston for controlling the length of the stroke; and means for adjusting the position of one of said stops to vary the stroke of the piston and the action of the log-moving mechanism.

26. A sawmill set-works involving the combination of the log-moving mechanism comprising a ratchet device; an engine for actuating said mechanism through said ratchet device, comprising a working piston; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow movement at each end, comprising a cushioning device arranged to operate only at the ends of the stroke of the piston; positive stops at the end of the stroke of the piston for controlling the length of the stroke; means for varying one of said stops and the cushion device to vary the stroke of the piston and the point in the stroke of the piston at which the cushion device is brought into action.

27. A sawmill set-works involving the combination of the log-moving mechanism comprising a ratchet device; an engine for actuating said mechanism through said ratchet device comprising a working piston; means for causing a variation in the speed at which the log-moving mechanism is driven, from a rapid intermediate movement to a slow movement at each end, comprising cushion devices arranged to operate only at the ends of the stroke of the piston, said cushion devices each comprising a plunger and fluid-chamber arranged to be brought into action only at the ends of the stroke of the piston and to imprison a cushioning fluid by said action; means for permitting a gradual escape of said cushioning fluid to allow the mechanism to move to positive stops for each end of the stroke; and means for adjusting one of said stops to vary the stroke of the piston and the action of the log-moving mechanism.

28. A sawmill set-works involving the combination of the log-moving mechanism comprising a ratchet device; an engine for actuating said mechanism through said ratchet device comprising a working piston; stops arranged at each end of the piston and in position to limit the stroke of the piston; means for causing a variation in the speed at which the log-moving mechanism is driven from a rapid intermediate movement to a slow movement at each end, comprising cushioning devices carried by said stops, said cushioning devices each comprising a plunger and fluid-chamber, arranged to be brought into action only at the ends of the stroke of the piston and to imprison a cushioning fluid by said action; means for permitting a gradual escape of said cushioning fluid to allow the mechanism to move to a positive stop; and means for adjusting one of said stops and the cushioning mechanism to vary the stroke of the piston at the point at which the cushion device is brought into action.

29. In a sawmill set-works, the combination

of the log-moving mechanism; a working piston for actuating said mechanism; a cylinder in which said piston operates; a setting-piston arranged in said cylinder; means for locking the said setting-piston in different positions in said cylinder; an exhaust-port extending through said setting-piston; a plug on the working piston arranged to enter said exhaust-port, said port and plug being of such size relatively to each other that the plug approximately but not entirely closes said port.

30. In a sawmill set-works, the combination with the log-moving mechanism; of an engine for actuating said set-works comprising a working piston, and a cylinder in which said piston operates; means for lengthening or shortening the working portions of said cylinder for varying the movement of said working piston; a valve for controlling the movement of fluid to and from said cylinder; a valve-lever for operating said valve; a connection for connecting said lever with the working piston, whereby said piston forms a moving fulcrum for the lever.

31. In a sawmill set-works, the combination with the log-moving mechanism; of an engine for actuating said set-works comprising a working piston and a cylinder in which said piston operates; means for lengthening or shortening the working portions of said cylinder for varying the movement of said working piston; a valve for controlling the movement of fluid to and from said cylinder; a valve-lever for operating said valve; a connection for connecting said lever with the working piston; and means for locking said lever at various positions in proper relation to the means varying the length of the working cylinder to effect a secondary movement of the valve after the setting of said valve-lever to bring the valve to normal.

32. In a sawmill set-works, the combination of a log-moving mechanism; the working piston, K, for moving said mechanism; a cylinder in which said working piston operates; a setting-piston in said cylinder; piston-rod, m, extending from said setting-piston; the lever, N; means for connecting said lever with the piston-rod, m; the quadrant, N'; means for locking the lever, N, with the quadrant, N'; a valve for controlling the movement of steam to and from the cylinder; a lever, R, for operating said valve; a connection between said lever and the working piston; the quadrant, R'; means for setting the lever, R, on said quadrant at different positions relatively to the different positions of the setting-piston, M, to effect a secondary movement of the valve, through the movement of the lever, as effected by the movement of the working piston, after the setting of the lever, R, to bring the valve to normal.

33. In a sawmill set-works, the combination of the log-moving mechanism; the working piston, K, for effecting the movement of said mechanism; a cylinder in which said piston operates; a setting-piston, M; piston-rod, m, extending therefrom; the lever, N; means for connecting said lever with said rod, m; a quadrant, N'; means for locking the lever, N, with said quadrant; steam-chests having ports leading therefrom to the opposite ends of the cylinder; means for conveying the steam by the setting-piston, M; a valve in the steam-chest; and means for actuating said valve.

34. In a sawmill set-works, the combination of a log-moving mechanism; a working piston for effecting the movement of said mechanism; a cylinder in which said piston operates a setting-piston in said cylinder; means for locking said setting-piston in various positions in said cylinder; means for conveying the live steam by said setting-piston; an exhaust-port extending through said setting-piston; a plug on the working piston arranged to enter said exhaust-port and to approximately but not entirely close said port.

35. In a sawmill set-works, the combination of the log-moving mechanism; a working piston, K, for effecting the movement of said mechanism; a cylinder in which said piston operates; a setting-piston arranged in said cylinder and having the opening, m^2; means for locking said setting-piston in various positions in said cylinder; a port-tube, Q, arranged in the setting-piston; a steam-chest; means for connecting the port-tube, Q, therewith; the plug, k', arranged in relation to the opening, m^2, as described.

36. In a sawmill set-works, the combination of the log-moving mechanism; a working piston, K, for effecting the movement of said mechanism; a cylinder in which said piston operates; a setting-piston arranged in said cylinder and having the opening, m^2, and port, m^3, connecting the portions of the cylinder on the opposite sides of the setting-piston, M; means for locking said setting-piston in various positions in said cylinder; a port-tube, Q, arranged in the setting-piston; a steam-chest; and means for connecting the port-tube, Q, therewith.

37. In a sawmill set-works, the combination with the log-moving mechanism; the ratchet-lever, G, for effecting this movement; the block, H, thereon; the connecting-rod, L, secured to said block; the piston-rod, k, secured to said connecting-rod; the piston, K, also secured to the piston-rod; the cylinder, J, in which the said piston operates; the setting-piston, M, also in said cylinder; piston-rod, m, extending from the setting-piston and having the opening, m^2, and port m^3, therein; the lever, N; means for connecting the piston-rod, m, with said lever; the quadrant, N'; means for locking the lever, N, with said quadrant; the port-tube, Q, extending through the piston, M; steam-chest, O, having the ports, o, o' and o^3, leading therefrom to the ends of the cylinder; the port, o, connecting with the port-tube, Q, the port, o', with the rear end of the cylinder, the port, o^2 and o^3, with the front end of the cylinder; the valves, p' and

p^2, controlling said ports; the central portion, p, into which the port, p^3, enters; the lever, R, connected with said valve; the link, r, connecting said valve-lever with the rod, k; the quadrant, R′, having the notches, r, arranged as described and for the purposes described.

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

JOHN WALTON.

Witnesses:
G. S. WALTON,
C. D. REED.