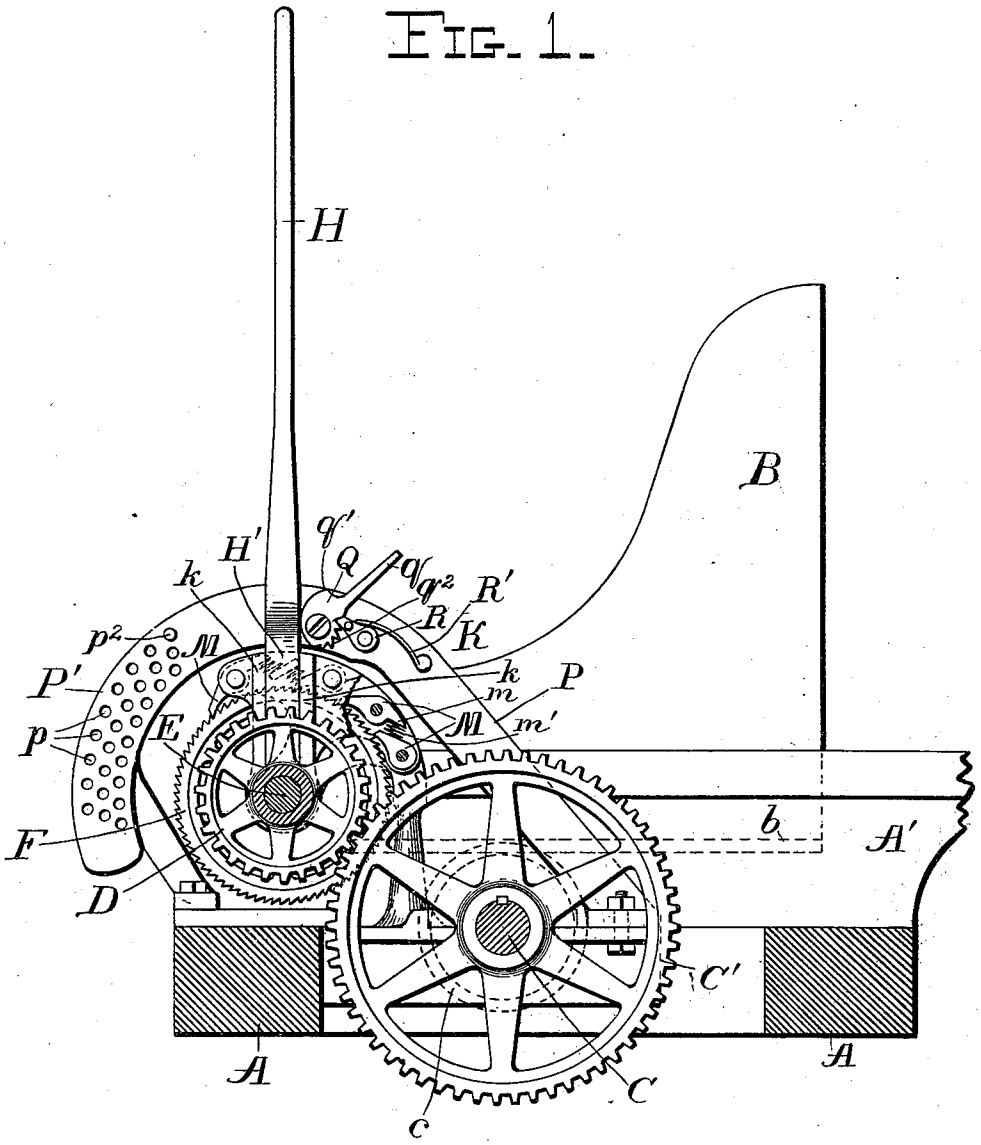
(No Model.) 5 Sheets—Sheet 1.

H. McDERMOTT.

SAWMILL SET WORKS.

No. 564,530. Patented July 21, 1896.

FIG. 1.



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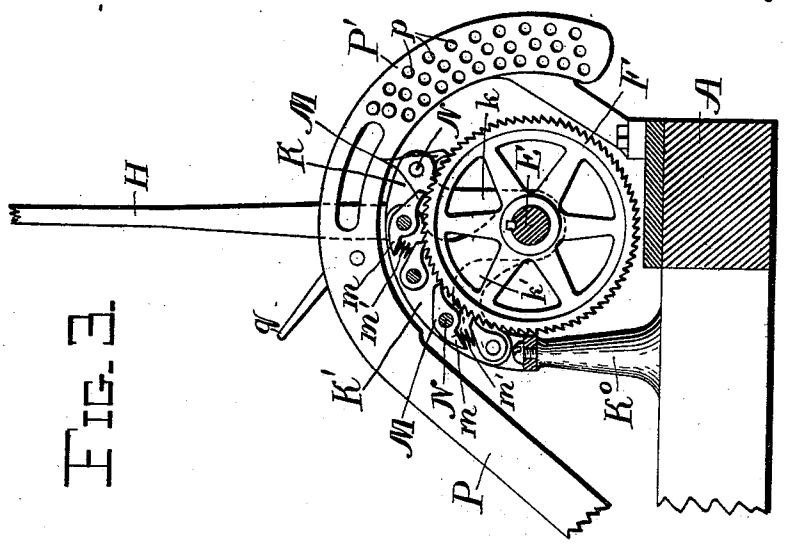

FIG. 3.

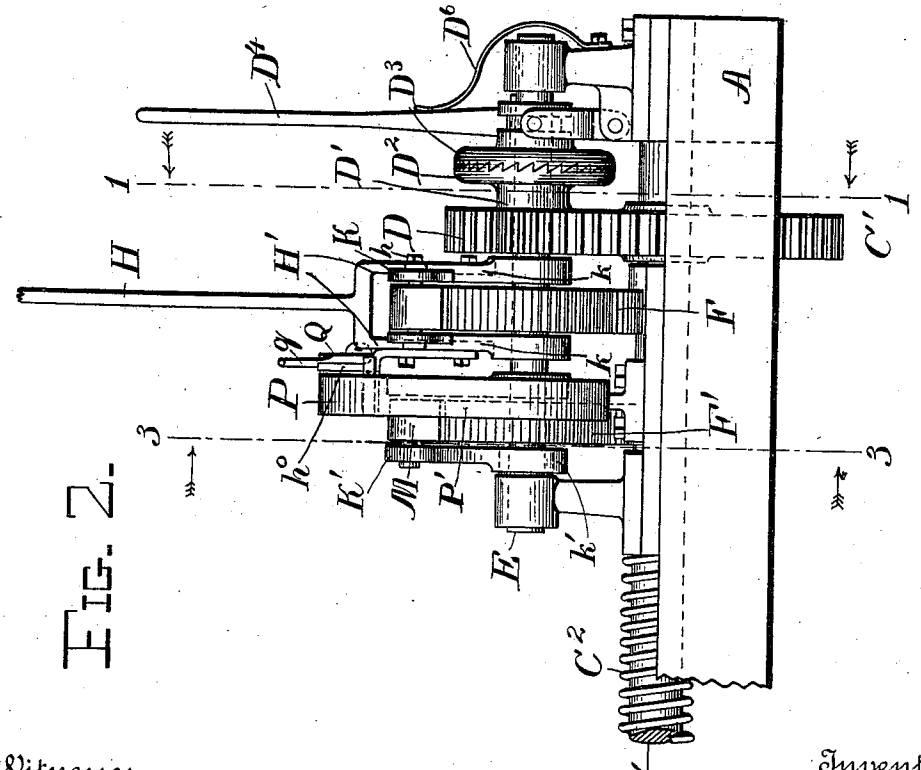

FIG. 2.

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FIG. 4.

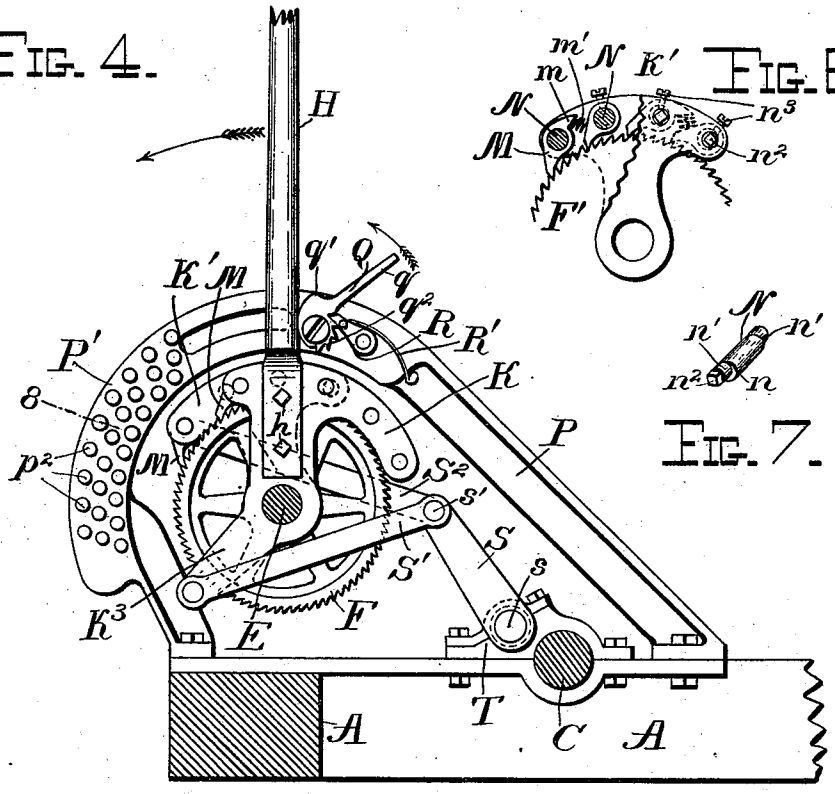

FIG. 6.

FIG. 7.

FIG. 8.

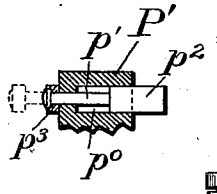

FIG. 5.

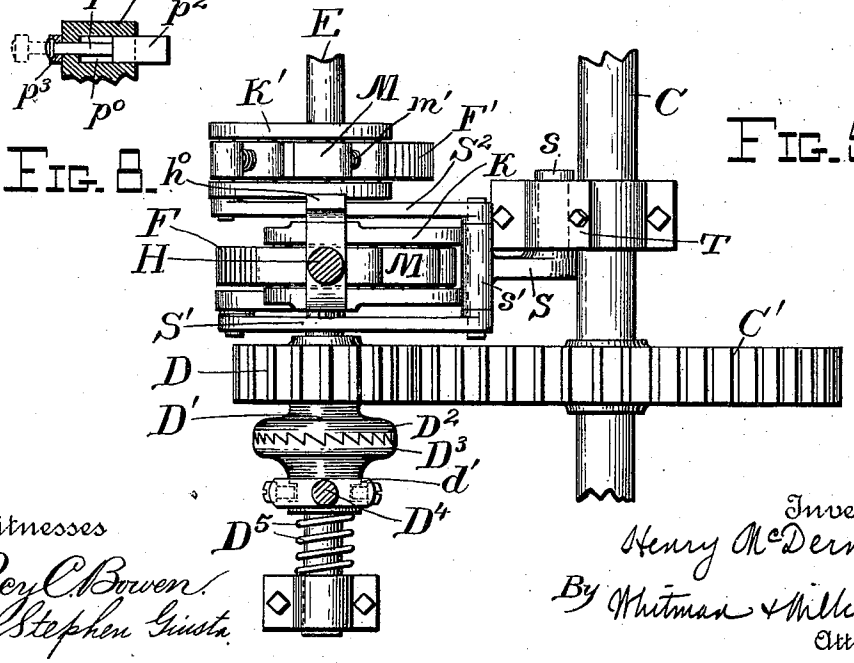

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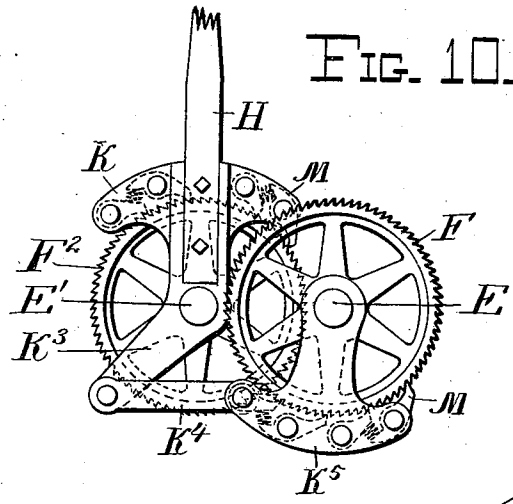
FIG. 10.



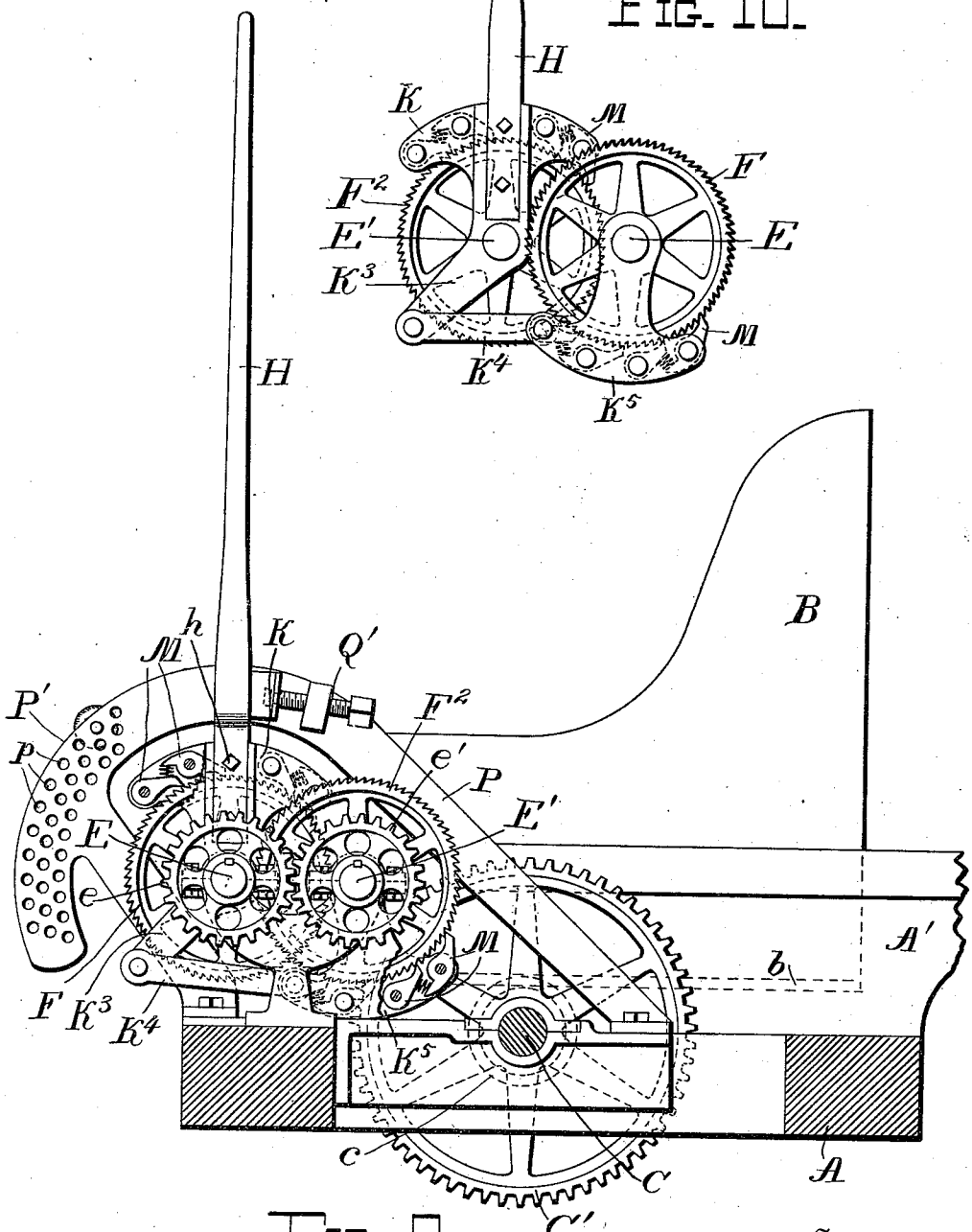


FIG. 9.

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FIG. 11.

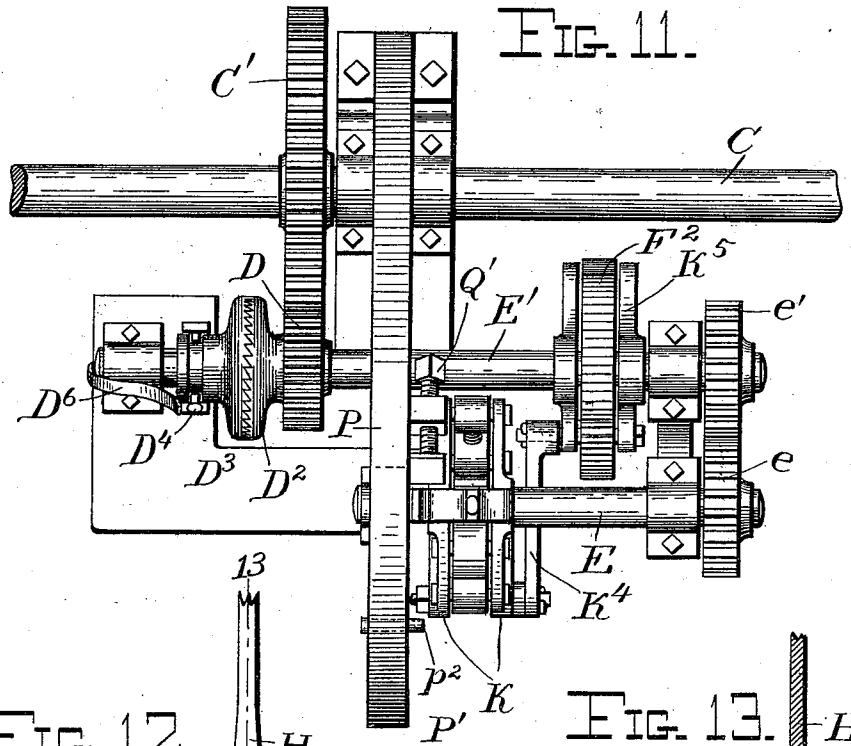


FIG. 12.

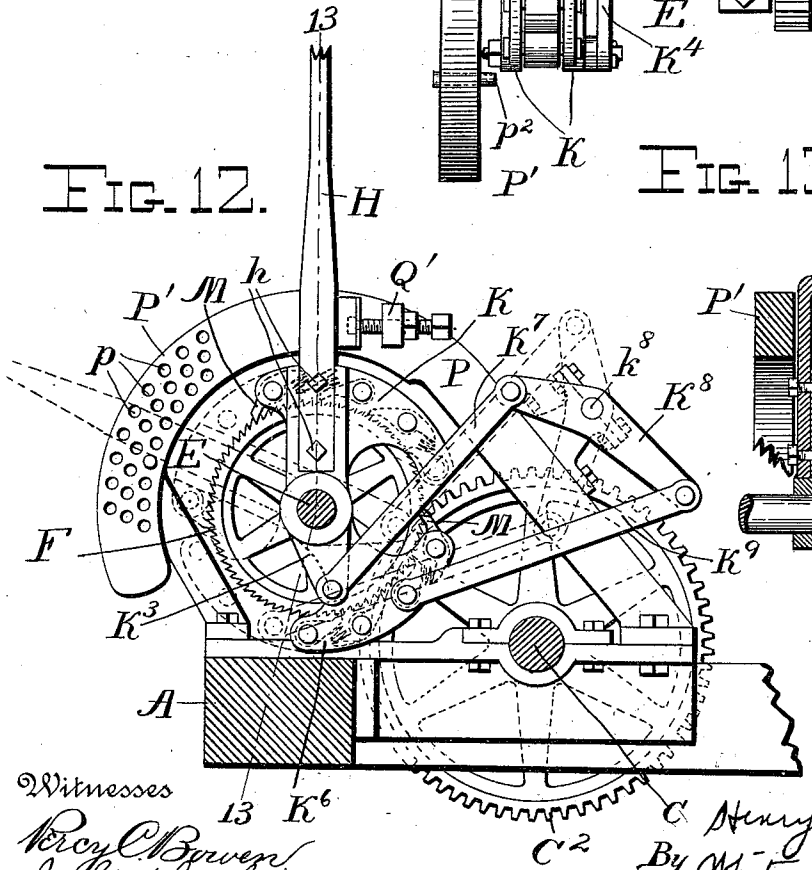
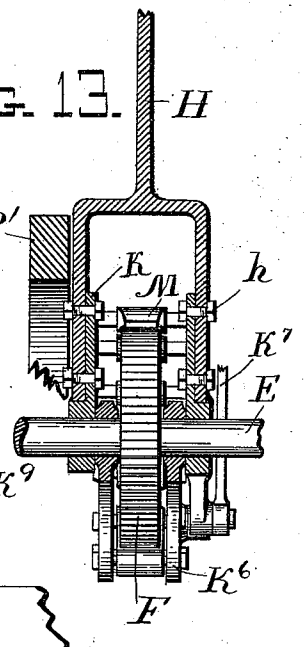


FIG. 13.



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UNITED STATES PATENT OFFICE.

HENRY McDERMOTT, OF MARINETTE, WISCONSIN.

SAWMILL SET-WORKS.

SPECIFICATION forming part of Letters Patent No. 564,530, dated July 21, 1896.

Application filed November 1, 1895. Serial No. 567,647. (No model.)

To all whom it may concern:

Be it known that I, HENRY McDERMOTT, a citizen of the United States, residing at Marinette, in the county of Marinette and State of Wisconsin, 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.

My invention relates to improvements in set-works for sawmill-carriages, and it is intended to provide an improved means of accurately adjusting the set-works so that boards of a uniform thickness may be cut and so that the thickness of the boards may be regulated within extremely narrow limits; and the said invention is also intended to provide against accidental stripping of the ratchet-wheels ordinarily used in sawmill-set-works organizations, and for other purposes that will be hereinafter more fully described.

Reference is had to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 represents my improved set-works, partly in elevation and partly in section, the section being along the line 1 1 of Fig. 2 and looking in the direction of the arrows. Fig. 2 represents an end view of the set-works as seen from the left of Fig. 1. Fig. 3 represents a section along the line 3 3 of Fig. 2 and looking to the right or in the direction of the arrows. Fig. 4 represents a similar view to that shown in Fig. 1, but shows a modified form of mechanism for operating the ratchet-wheels, in which the set-works are operated by each stroke of the hand-lever. Fig. 5 represents a plan view of the device shown in Fig. 4. Fig. 6 represents a detail view showing one of the ratchet-wheels with the pawls in operation. Fig. 7 represents in perspective one of the eccentric-pins on which the pawls are journaled, whereby a nicer adjustment may be given to the said pawls. Fig. 8 is a detail view showing one of the sliding stop-pins used to limit the motion of the hand-lever for operating the set-works, showing a section along the line 8 of Fig. 4. Fig. 9 is a view similar to that shown in Fig. 1, but represents a modification in which two counter-shafts are used and each stroke of the hand-lever moves the set-works. Fig. 10 is a detail view showing the ratchet-wheels and pawls as detached from the rest of the mechanism shown in Fig. 9. Fig. 11 represents a plan view of the device shown in Figs. 9 and 10. Fig. 12 represents a sectional view similar to that shown in Figs. 1, 4, and 9 and represents a further modification of the ratchet-and-pawl arrangement and the means for operating the same and shows the motion given by a single ratchet-wheel; and Fig. 13 represents a section along the line 13 13 of Fig. 12 and looking to the right.

A represents the frame of the sawmill-carriage, provided with the usual head-blocks A′, in which slide the knees B, provided with racks *b*, gearing in the pinion *c* on the set shaft C, by the motion of which shaft the knees are moved in or out toward or away from the saw-line. (Not shown.) This shaft C carries a gear-wheel C′ and a plurality of coil-springs C^2, which are wound up as the knees are moved toward the saw-line, and are under sufficient tension to withdraw the knees to the rear automatically when it is desired to insert a fresh log, at which time the set-works mechanism is thrown out of operation, as will be hereinafter more fully described.

D represents a pinion meshing in the gear-wheel C′ and revolubly mounted upon the counter-shaft E. The hub D′ of this pinion is provided with one of the parts D^2 of a clutch-coupling, the other part, D^3, of which is feathered on the counter-shaft E and is held in engagement with the first part by a spring D^5, as shown in Fig. 5, or by a spring, such as D^6, (shown in Fig. 2,) which in this case bears upon the uncoupling-lever D^4, or the said parts may be held in engagement in any other way desired.

It will be obvious that the part D^2 of the coupling may be set against the back of the pinion D or made integral therewith if preferred, but for convenience in manufacture it will ordinarily be preferable to manufacture the gear-wheel D and the said part D^2 as separate pieces, which may be rigidly connected to each other in any convenient way. By means of this clutch-coupling, the motion of

the counter-shaft E imparted thereto by the ratchet-wheels and the pawls operating the same is transmitted to the pinion D, loose on said counter-shaft, and thus to the set shaft C.

It will be understood that in set-works of the ordinary construction several heavy receding-springs, such as those shown at C^2, are placed on the set shaft C, connected and coiled in such a manner that as the set-works are operated and the knees advance these springs are wound up or increased in tension. As the ratchet mechanism is adapted only to advance the knees, the purpose of these coil-springs is to recede the knees preparatory to taking on a new log. These coil or receding springs and the ratchet-pawls act constantly in opposition to each other, and the said clutch-coupling is for the purpose of disengaging the set shaft from the holding effect of the said pawls and to allow the same to withdraw the said knees without rendering it necessary to ease down the set-works mechanism or to touch the pawls. In the usual construction of set-works organization the break between the set shaft and the ratchet-and-pawl arrangement is made by tripping the pawls from their engagement with the ratchet, and in case of careless handling or accident allowing the pawls to drop while the knees are receding, or taking the strain imposed by loading a heavy log on the set-works mechanism, the ratchet wheel or wheels are liable to be stripped, and as these wheels are very expensive and difficult to make, and the value of the entire output of the mill depends in a large measure on the accuracy of the said ratchet-wheels, the preservation of these wheels from accident becomes a matter of considerable importance.

It will be seen that in the herein-described invention both the ratchet-wheels and the pawls are thrown out of the train of mechanism together, removing the field of possible accident to the clutch, which is of cheaper and stronger construction. Independent means for holding the counter-shaft, such as an auxiliary instantaneous clutch, well known in the art, may be adopted, if desired.

In the two forms of device shown in Figs. 1 to 5, two ratchet-wheels F and F′ are employed, both of which are keyed fast on the counter-shaft E and are engaged by the series of differential pawls M, mounted on the segmental pawl-carriers K and K′ and operated by the hand-lever H, which is forked, as at H′, and slides into guides *k* in the said segment K, where it may be either held loosely, as shown in Figs. 1 and 4, or bolted in place, as shown at *h* in Figs. 9 and 12. These segments K and K′ are journaled on the counter-shaft E, and are oscillated by means of the hand-lever H, already referred to.

The pawls M are each set the one in advance of the one next behind it. Thus if there are four pawls, as shown, when the first pawl engages a tooth of the ratchet-wheel the second pawl laps a quarter of the next tooth, the third pawl laps a half of the next tooth, and the fourth pawl laps three-quarters of the next tooth.

Where a less number of pawls are used, each pawl would lap more on the tooth, and where a greater number of pawls are used each pawl would lap less, the position of each pawl being indicated by the distance between the ratchet-teeth divided by the number of pawls used. Since these pawls are apt to wear, in order to provide for a nice adjustment, the said pawls are preferably journaled on eccentric-pins N, having the eccentric portion *n* somewhat larger than the end bearings *n′*, while the projecting end of the said pin is made angular, as at n^2, (see Fig. 7,) to engage a wrench, by means of which the said pin N may be turned. The various pins N are set at the desired position by means of the set-screws n^3. (See Fig. 6.)

In order to provide for each pawl continuously bearing on the face of the ratchet-wheel, alternate pawls are provided with projecting lugs *m*, projecting to the rear of the said pawl, between which and the adjacent pawl a spring *m′* is interposed, as shown most clearly in Fig. 6, and this spring tends to keep both of the adjacent pawls continuously bearing on the ratchet-teeth. It will be seen that by this arrangement of pawls one pawl will always be ready to enter into engagement with one of the teeth of the ratchet-wheel, with little or no lost motion, and thus an exceedingly nice adjustment can be had.

In practice it is found desirable to make the ratchet-teeth of at least one-quarter inch, and without the multiple pawls no adjustment of less than one-quarter inch could be made. For instance, by applying all the operations through a medium of a counter-shaft and reducing any errors which might possibly occur in the same two or three times by spur-gear connections on the main set shaft, (the ratchet-wheel being divided into quarter-inch teeth, with four pawls, as described), then reduced as above, by actual working of the set-works apparatus, about one hundred clicks of the pawls are given to a one-inch board, and if a tooth is slipped by any means the lost motion is one one-hundredth of an inch in the knees, which motion is too insignificant to be considered.

With set-works as now ordinarily constructed the closest work claimed is from one-sixteenth to one thirty-second of an inch for every click of the pawls, involving an error of a like distance in the motion of the knee when one of the pawls skips a tooth.

P represents a metal plate or frame, the rear end P′ of which is in the form of a quadrant struck with the same center as the counter-shaft E, which quadrant is perforated with a plurality of holes *p*, adapted to receive one or more stops. These stops may be simple pins put into these holes and shifted from one hole to the other when desired; but I prefer the construction of stop shown in Fig. 8

and indicated in Fig. 4, where p^2 represents a stout pin fitting in the chamber P^0 in the face of the quadrant P', to the back of which pin is attached a guide-shank p', passing through the hole in the quadrant P' and terminating in a suitable head p^3, which, for convenience of manufacture, would preferably be in the form of a nut or washer or both. These pins are preferably permanently mounted in the quadrant P', and are pressed back out of the travel of the arm h^0, carried by the lever H, all except the pin that is intended to be used as a stop, which pin serves to limit the travel of the hand-lever, and thus of the ratchet wheel or wheels.

In addition to the adjustment afforded by these pins p^2, as shown in Fig. 4, a more refined adjustment is given on the opposite side of the lever H by means of the adjustable stop Q (shown in Figs. 1 and 4) or Q', as shown in Figs. 9 and 12. I prefer, however, the form of stop shown in Figs. 1 and 4, in which Q represents a cam-plate having the cam-surface q' and the teeth q^2 and the handle q. In these teeth the pawl R engages, and the said pawl is held in engagement by means of the spring R'. By throwing the handle q in the direction of the arrow, (see Fig. 4,) the outward travel of the handle-lever H, or of the arm h^0 carried thereby, may be shortened by any desired small fraction of an inch, and the outward travel of the knees may be lessened by a corresponding amount. The travel of the knees will then depend directly upon the length of the stroke, or rather the angular distance through which the hand-lever H is turned. Now as the movement of the lever and knees must include not only the thickness of board desired, but also the kerf of the saw, both of which elements are variable, it becomes desirable to make the governing stroke of the lever variable, and to adjust this stroke so that extremely small variations may be provided for. To this end the pins p^2 are placed according to the standard thickness of board desired, and the adjustable stop Q or Q' is adjusted according to the variations in the saw-kerf, and also according to the slight variations from standard thickness of boards that may be desirable in certain classes of lumber. It will be noticed that this adjustability of the stop Q is of especial importance in connection with the differential-pawl system, as, if one pawl only were used and the stops were set so that a stroke of the lever would give an advance of the knees for an inch board plus the saw-kerf, and a thinner saw were put on the mill, each stroke of the lever would still advance the knees the same amount as before, and the difference in the decreased thickness of the saw would be lost to the manufacturer, as this would only add to the thickness of the lumber. Now, if the adjustable stop were set out to compensate for this, it would be of no avail, as on the return stroke of the lever the pawl would fail to catch on the tooth of the ratchet by the amount the stop had been set out, and on the next stroke the pawl would fail to catch until the next tooth was reached, the knees would not be advanced the requisite amount, and the value of the board would be lessened on account of being too thin; but with my system of multiple pawls in combination with the adjustable stop, in the exigency above set forth, the second pawl would come into play, on the next stroke the third, on the next the fourth, and on the next the action of the series would commence again.

The operation of the apparatus is substantially the same in all the various modifications shown in the drawings, but there are slight differences in the mode of operation of the ratchet-and-pawl arrangement which will now be more specifically described.

In the device shown in Figs. 1 to 3 the ratchet-wheel F feeds on the forward stroke of the hand-lever H, while the ratchet-wheel F' holds on the return stroke, the segment K' being held stationary by standard K^0, and the pawls imparting motion to the knees only on moving the hand-lever H in one direction. This, under certain conditions, is desirable, as the "sawyer" can go ahead as soon as he sees the "setter" throw the hand-lever down, the return motion of the hand-lever, or lifting the same up, being done at the leisure of the setter, while the sawmill-carriage is in motion and the saw in operation.

In the device shown in Figs. 4, 5, and 6 the hand-lever operates both on the down and the up stroke, the segment K being provided with an arm K^3, connected by the link S' to the crank S, journaled on the rock-shaft s in the bearing T, which may also be part of one of the set-shaft bearings, as shown in Fig. 4, if preferred. This crank is provided with a cross-head s', to which both the link S' and the link S^2 are pivotally connected. The latter link is pivotally connected at its opposite end to the movable segment K', which in this case is also pivoted on the counter-shaft E, and it will be seen by an inspection of Fig. 4 that if the hand-lever H be moved in the direction of the arrow the segment K will turn the ratchet-wheel F, while the segment K' will slide back over the teeth of the ratchet-wheel F', which ratchet-wheel is behind and hidden by the ratchet-wheel F in Fig. 4, but is shown in Fig. 5. The motion of the hand-lever H in the opposite direction will cause the segment K' to turn the ratchet-wheel F', while the segment K will slide over the teeth of the ratchet-wheel F, and thus it will be seen that a reciprocating motion of the hand-lever H will cause a continuous rotary motion of the counter-shaft E, and in this way an adjustment practically twice as fine as that obtained where the hand-lever only operates in one direction may be secured. This is specially applicable when sawing heavy timber, where the power may be doubled by altering the gearing without corresponding loss of time.

In the form of device shown in Figs. 9 to 11 there are two counter-shafts E and E′, carrying two ratchet-wheels F and F^2, operated by the upper segment K and the lower segment K^5, connected together by the link K^4, pivoted at one end to the arm K^3 and at the other to the segment K^5. These two counter-shafts carry equal-sized gear-wheels *e* and *e′*, and the counter-shaft E′ transmits its motion to the set shaft C in the manner already described with reference to Figs. 1 to 5.

By an inspection of Fig. 10 it will be seen that the reciprocating motion of the hand-lever H will give a continuous rotary motion to the counter-shaft E′, and thence to the set shaft C, and thus the nicety of adjustment claimed for the construction shown in Figs. 4 to 6 may also be obtained for that shown in Figs. 9 to 11.

In the form of device shown in Figs. 12 and 13 a single ratchet-wheel F is used, engaged *seriatim* by the upper and lower segments K and K^6, which are connected together by the arm K^3, the links K^7 and K^9, and the bell-crank lever K^8, pivoted at k^8.

It will be obvious from an inspection of Fig. 12 that a reciprocating motion of the hand-lever H will impart a continuous rotary motion to the counter-shaft E, and hence to the set shaft C, and thus the nice adjustment claimed for Figs. 4 to 6 and 9 to 11 may be obtained for this construction.

In Figs. 9 to 11 I have shown an adjustable stop Q′, which may be either in the form of a simple screw, as shown, or may be replaced by the adjustable stop shown in Figs. 1 and 4, or by any other suitable adjustable stop that may be adopted.

It will thus be seen that I provide a cheap, simple, efficient, and exceedingly exact method of operating and adjusting the motion of the knees, and thus of regulating the thickness of the board cut from the log.

The various other advantages of the herein-described construction would readily suggest themselves to any one skilled in the art.

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

1. In a sawmill-set-works organization, the combination with a main set shaft and rack-and-pinion gearing connecting said shaft with the knees, of receding springs placed under tension on said shaft and normally tending to withdraw said knees away from the saw-line, a counter-shaft outside of and parallel to said set shaft, a pinion loose thereon, with gearing connecting said pinion with said set shaft, a clutch-coupling normally connecting said pinion to said counter-shaft, means for releasing said clutch-coupling, when desired, a pair of ratchet-wheels fast on said counter-shaft, and segments provided with spring-operated differential pawls engaging in said ratchet-wheels, with means pivoted to said counter-shaft for operating said segments simultaneously in opposite directions, substantially as described.

2. In a sawmill-set-works organization, the combination with a main set shaft and rack-and-pinion gearing connecting said shaft with the knees, of receding springs placed under tension on said shaft and normally tending to withdraw said knees away from the saw-line, a counter-shaft outside of and parallel to said set shaft, a pinion loose thereon, with gearing connecting said pinion with said set shaft, a clutch-coupling normally connecting said pinion to said counter-shaft, means for releasing said clutch-coupling, when desired, a pair of ratchet-wheels fast on said counter-shaft, segments pivoted on said counter-shaft and provided with spring-operated differential pawls engaging in said ratchet-wheels, and a hand-lever also pivoted to said counter-shaft with connections adapted to operate said segments alternately and to cause the reciprocating motion of the hand-lever to develop a continuous rotary motion in said counter-shaft, substantially as and for the purposes described.

3. In a sawmill-set-works organization, the combination with a ratchet-wheel and a pair of differential pawls, one of said pawls being provided with a rearwardly-projecting lug, of a spring interposed between the base of this lug and the top of the adjacent pawl, whereby both pawls are pressed toward the teeth of said ratchet-wheel, substantially as described.

4. In a sawmill-set-works organization, the combination with the set shaft engaging the knees by rack-and-pinion gearing, a counter-shaft in rear of and parallel to said set shaft connected thereto by disengageable gearing, and carrying a ratchet-wheel, of a pawl-carrier adapted to swing about said ratchet-wheel, and provided with pawls arranged in pairs, one of each pair of said pawls being provided with a rearwardly-projecting lug and a spring interposed between the base of this lug and the top of the adjacent pawl, whereby both pawls are pressed down on said ratchet-wheel, substantially as described.

5. In a sawmill-set-works organization, the combination with a ratchet-wheel of a pawl-carrier adapted to swing about said ratchet-wheel, a plurality of eccentric-pins set across said pawl-carrier, a system of differential pawls pivoted on said pins, means for adjusting said pins a lever for actuating said pawl-carrier, and a quadrant, provided with set stops limiting the lever stroke in one direction and an adjustable stop limiting it in the other direction, substantially as and for the purposes described.

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

HENRY McDERMOTT.

Witnesses:

JOHN CHALMERS WILSON,

J. STEPHEN GINSTA.