No. 807,636. PATENTED DEC. 19, 1905.

A. NIEDERMEYER.

SAWMILL SET WORKS.

APPLICATION FILED JAN. 19, 1901.

4 SHEETS—SHEET 1.

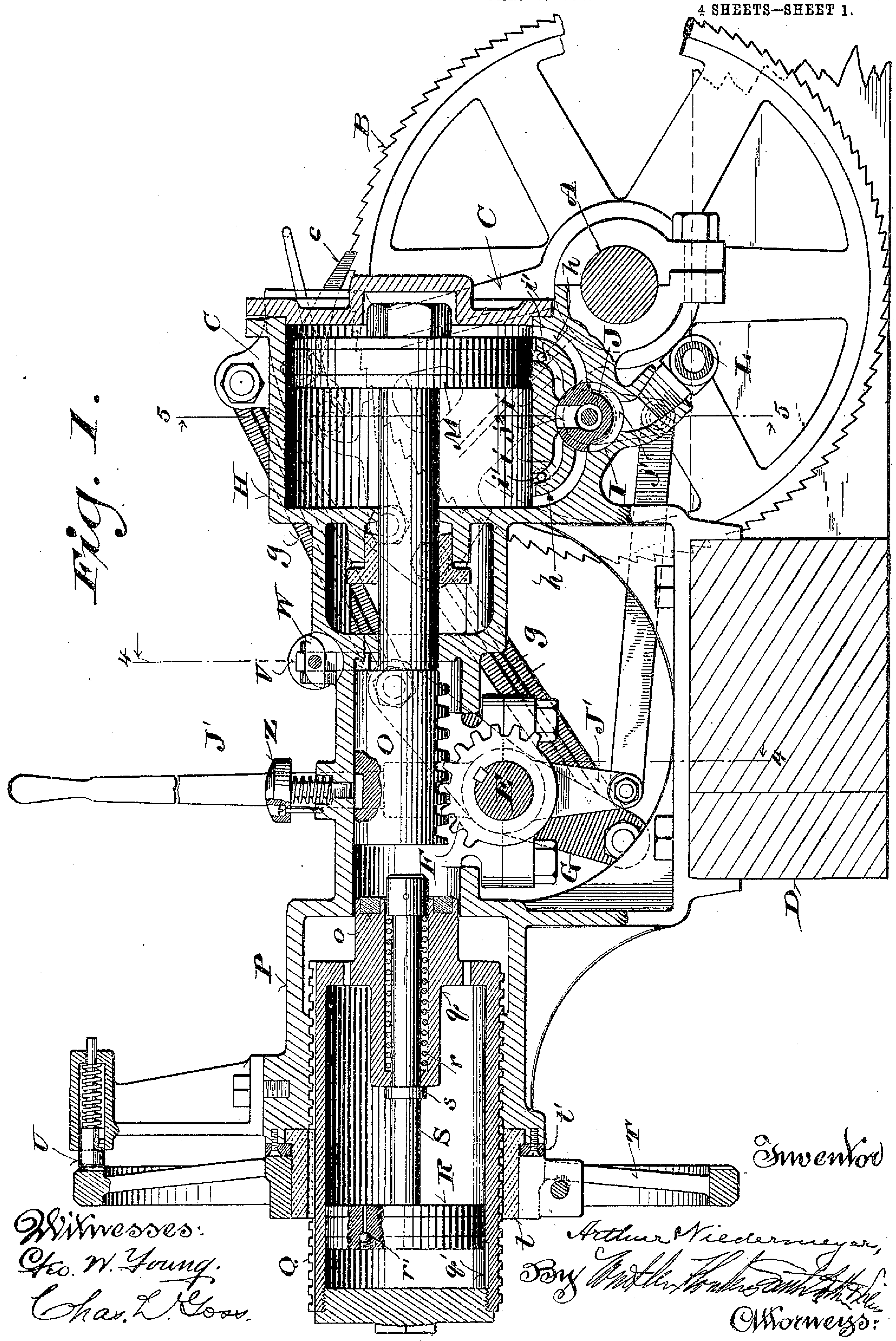

Fig. 1.

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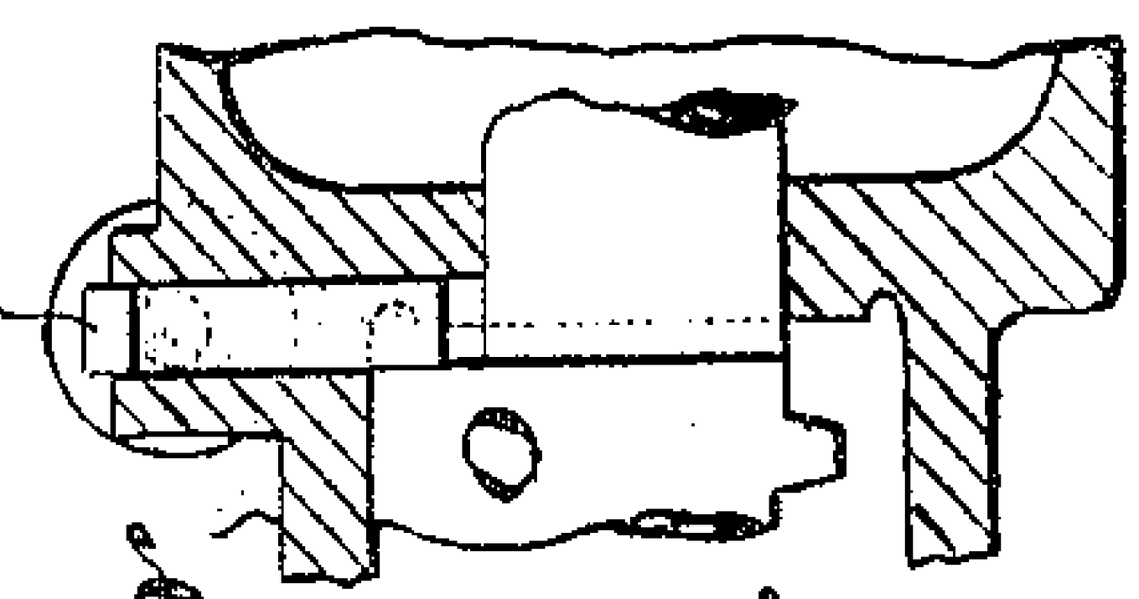

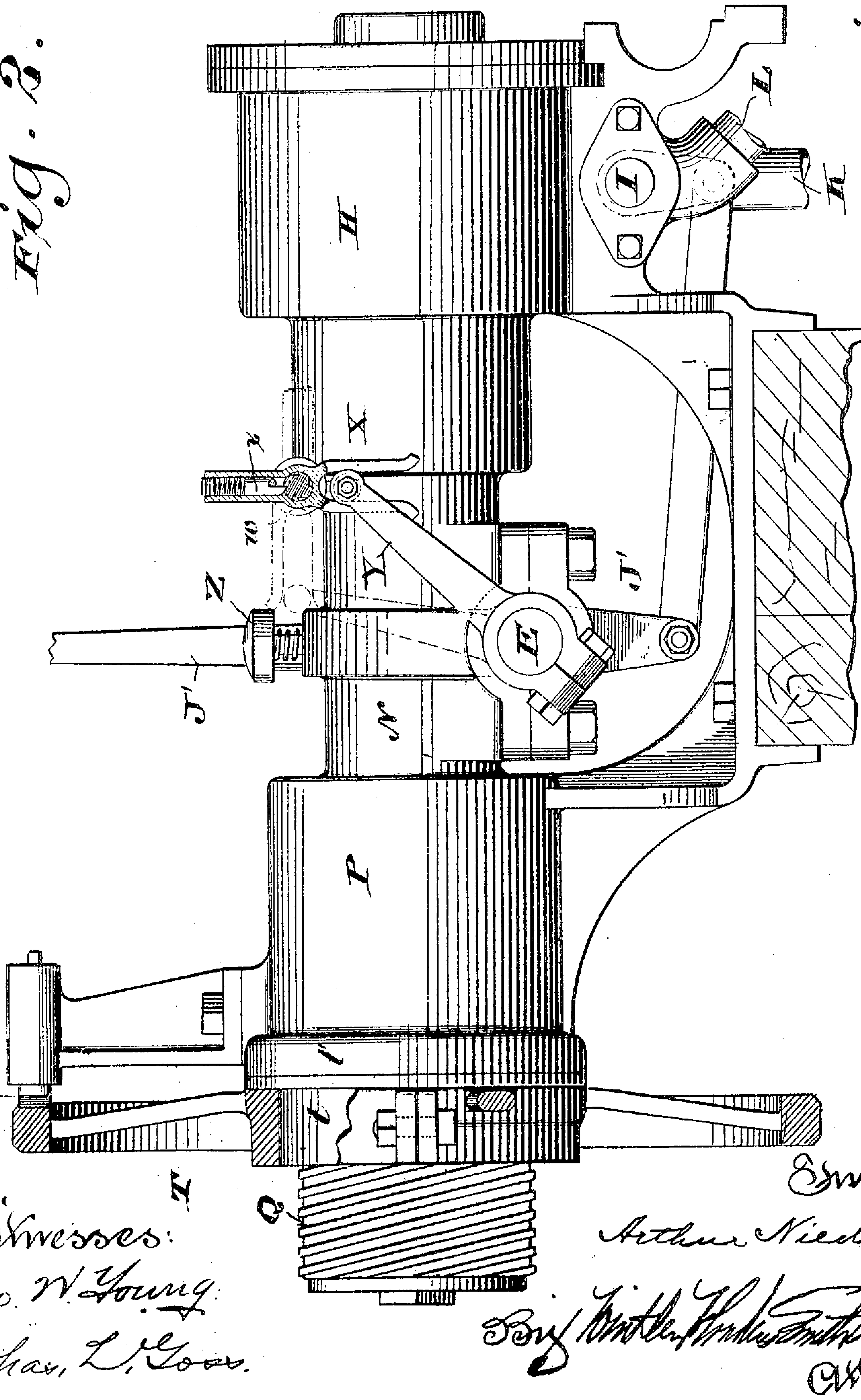

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4 SHEETS—SHEET 3.

Fig. 5.

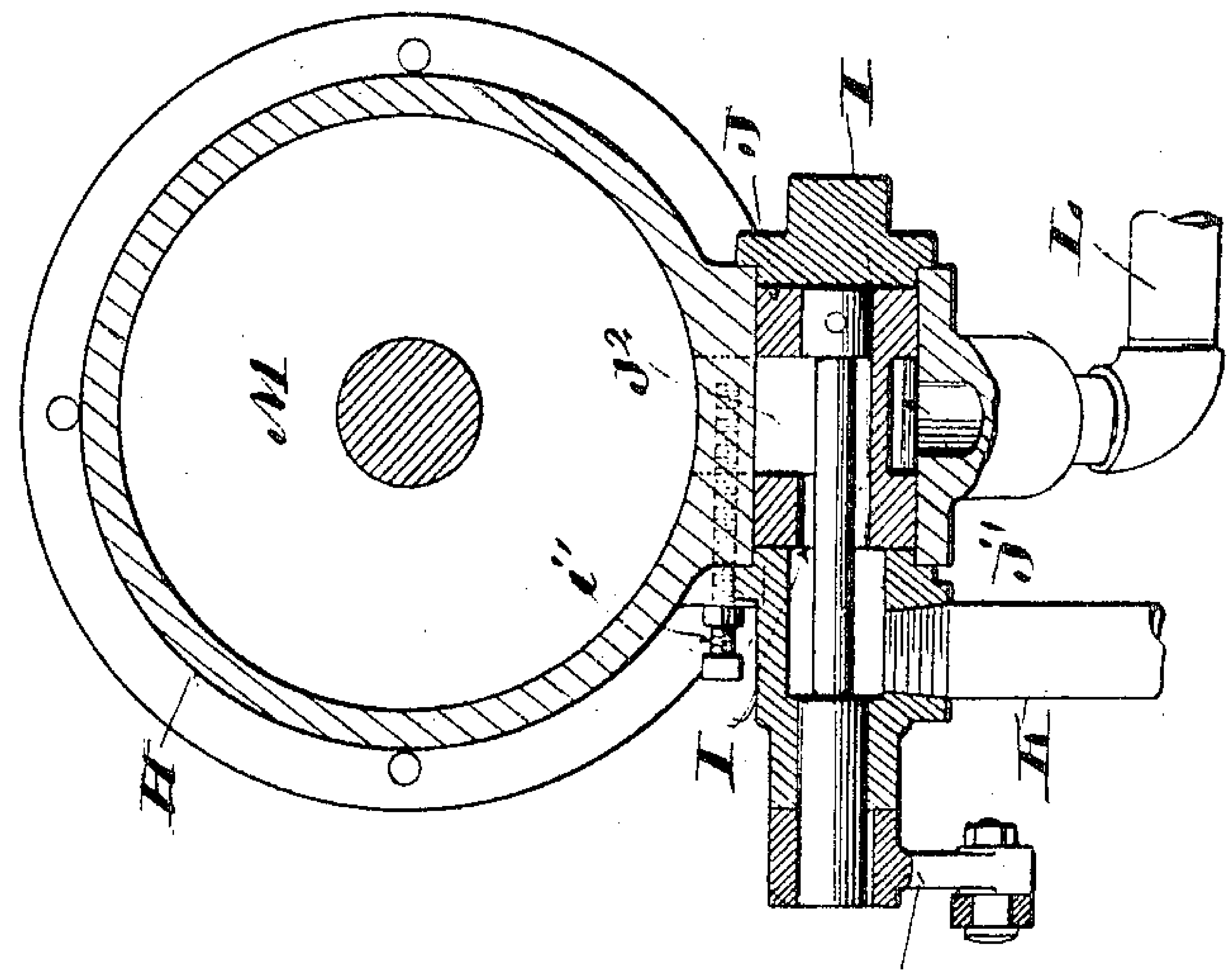
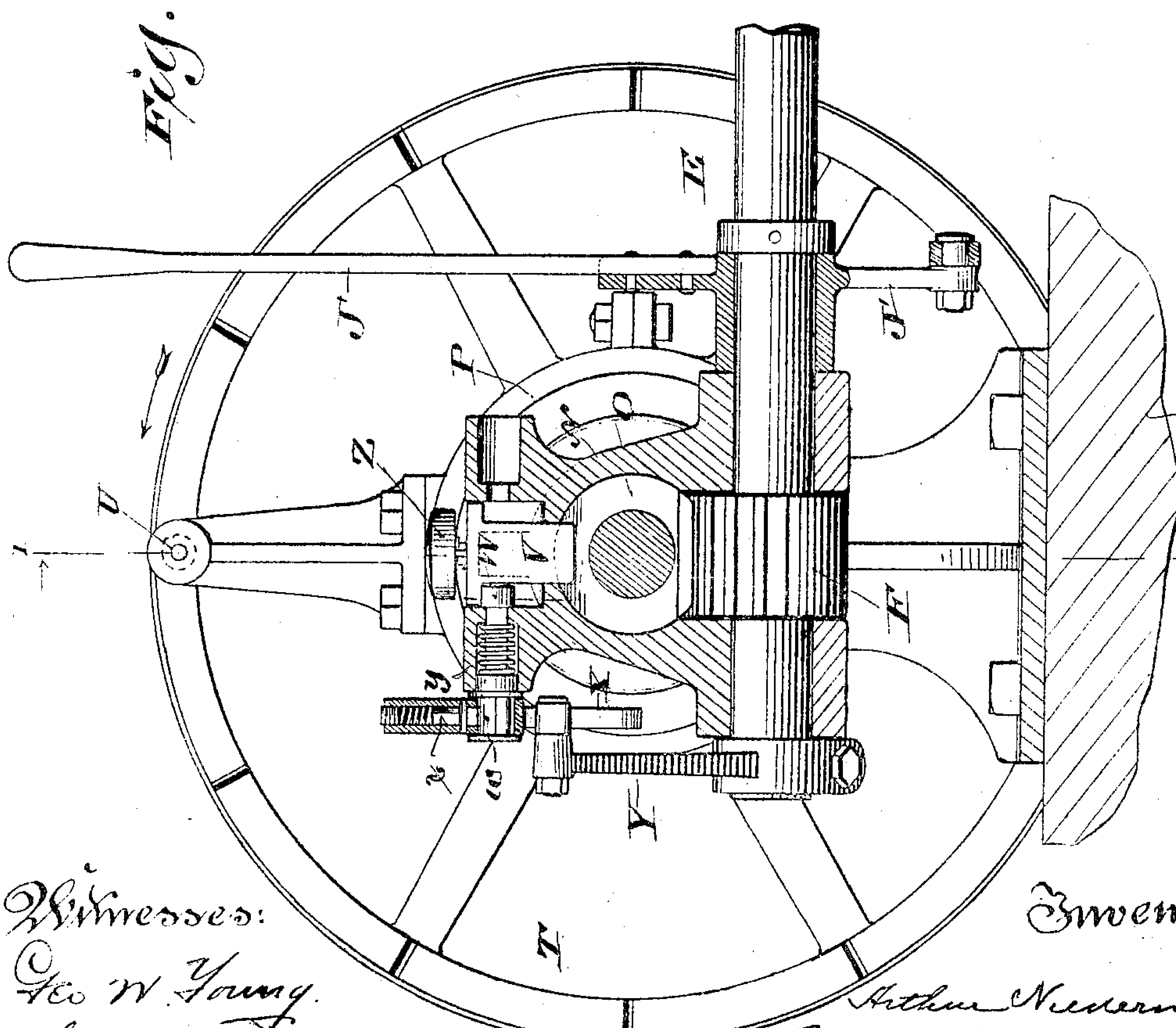


Fig. 4.



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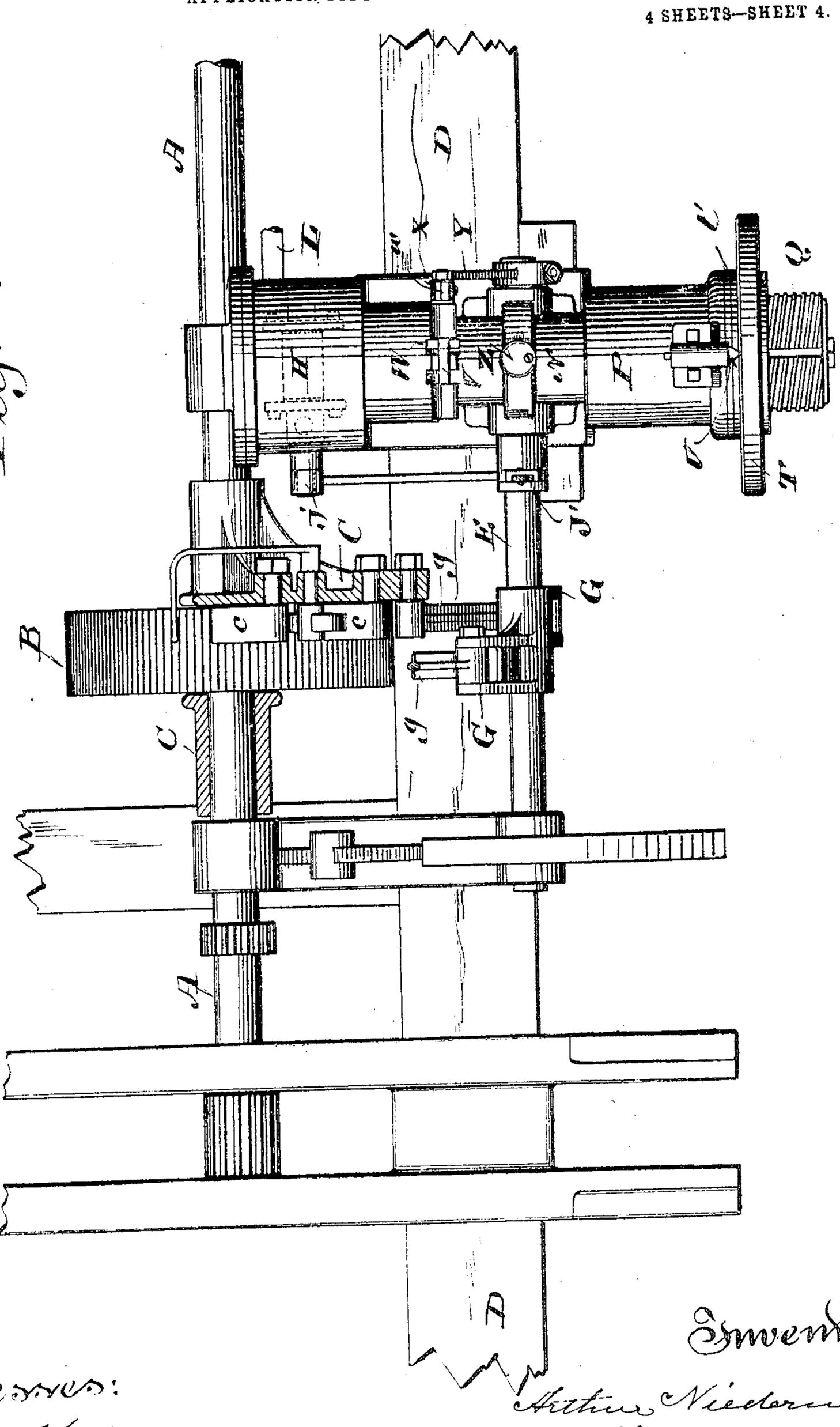
4 SHEETS—SHEET 4.

Fig. 6.



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UNITED STATES PATENT OFFICE.

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SAWMILL SET-WORKS.

No. 807,636. Specification of Letters Patent. Patented Dec. 19, 1905.

Application filed January 19, 1901. Serial No. 43,855.

To all whom it may concern:

Be it known that I, ARTHUR NIEDERMEYER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Sawmill Set-Works, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The main objects of my invention are to simplify and improve the construction and operation of power set-works; and it consists in certain novel features of construction and in the arrangement and combination of parts hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a vertical section taken transversely to the set-shaft on the line 1 1, Fig. 4, of set-works embodying my invention. Fig. 2 is an elevation of a part of the mechanism shown in Fig. 1 as viewed in the same direction. Fig. 3 is a detail sectional view of the auxiliary stop for varying the movement of the log or lumber in setting by a fractional part of the smallest variation that can be effected by the main stop. Fig. 4 is a vertical section taken in a plane parallel with the set-shaft and indicated by the line 4 4, Fig. 1. Fig. 5 is a vertical section on the line 5 5, Fig. 1; and Fig. 6 is a plan view, on a smaller scale, of a portion of a sawmill-carriage with my improved set-works, as applied thereto.

Referring to Figs. 1 and 6, A is the set-shaft, provided with the usual ratchet-wheel B and oscillatory pawl-carriers C C, having pawls *c* *c* engaging with said ratchet-wheel and adapted to turn the same in the usual way.

D is the rear side of the carriage-frame on which the actuating and controlling devices of the set-works are mounted.

E is a rock-shaft parallel with the set-shaft A. It is provided with a gear or pinion F and with oppositely-projecting arms G G, which are connected in the usual way by links *g* *g* with the pawl-carriers C C.

The parts above mentioned are like or similar in construction and arrangement to those heretofore employed in both hand and power set-works, and I make no claim thereto *per se*.

H is a cylinder mounted upon the rear carriage side D transversely to the shafts A and E. It is formed on the under side with a centrally-located transverse cylindrical valve-chamber I, connected with each end of the cylinder by two ports or passages *h* and *i*. The exhaust-passages *i* open out of the cylinder at a distance from its heads, so as to produce a cushion for the piston at the ends of its stroke, or more particularly at the front end of the cylinder nearest the set-shaft, and they communicate with the passages *h* through restricted grooves or openings, by which the escape of steam or other fluid from the ends of the cylinder is retarded, and the piston is permitted to complete its stroke in either direction. The exhaust-passages *i* may be restricted by screws or valves *i'*, as indicated in Fig. 1, to check the movement of the piston M more or less, as may be desired. In the valve-chamber I an oscillatory valve J is fitted, the stem of which projects through a recessed head of said chamber and is provided with an arm *j*, as shown in Fig. 5. The valve is formed on opposite sides with supply and exhaust ports j' and j^2, arranged to register with the passages *h* and *i*, respectively. The exhaust-port j^2 communicates through an axial passage in the valve around its stem with the recessed head of the valve-chamber, to which the exhaust-pipe K is attached. The steam or other fluid supply pipe L is attached to the valve-chamber in communication with the port j'.

J' is a lever pivotally mounted on the shaft E and connected by a link with the arm *j* on the valve-stem.

M is a piston fitted to work in the cylinder H. The piston-rod passes through a stuffing-box in the back head of the cylinder and is guided in a housing N, formed with or attached to said cylinder.

O is a rack formed with or attached to the piston-rod and guided in the housing N in engagement with the gear F on the rock-shaft E. Formed with or attached to the end of the housing N on the opposite side of the rock-shaft from the cylinder H is an internally-threaded cylindrical housing P. In this housing is fitted an externally-screw-threaded cylinder Q.

R is a plunger fitted in the cylinder Q. It is provided with a rod S, which passes through and is guided in a long sleeve *q*, formed in the front head of the cylinder Q. A spring *r*, inserted in the sleeve *q* around the plunger-rod S and bearing at its front end against a collar on the front end of said rod, holds the plunger

normally in its forward position in which a shoulder *s* on the plunger-rod bears against the back end of said sleeve, and the front end of the plunger-rod projects a short distance in advance of the front head of cylinder Q, as shown in Fig. 1.

The back end of the cylinder Q is closed by a removable head, and a groove or passage *q'* is formed inside of said cylinder next to its back head to permit the air contained in the rear end of the cylinder to leak by the plunger R when it is thrust backward by the rearward movement of the rack O. The front head of the cylinder Q has a contracted extension which may project more or less into the rear end of the housing N, and in an annular recess formed in the front end of this extension is inserted a ring *o*, of vulcanized fiber or other suitable material, forming a positive stop to receive the impact of the rack O when it is forced against it by the piston M.

T is a hand-wheel having a split hub which is clamped upon a flanged sleeve *t*, fitted upon the cylinder Q and revolubly connected with the rear end of the housing P by a ring *t'*. The sleeve *t* is provided on the inside with a spline which engages with a longitudinal groove in the cylinder Q. A spring-actuated detent U, mounted in a standard on the housing P, yieldingly engages with notches in the rim of said hand-wheel, and thereby holds it in adjusted position and determines the extent of its movement and of the longitudinal adjustment of the cylinder Q, which, with the plunger R and its rod S, constitutes an adjustable air-cushion or yielding stop for limiting the rearward movement of the piston M at different points in its stroke.

The adjusting mechanism is preferably so designed that about half of a turn of the hand-wheel T will be sufficient to effect the widest range of adjustment that is ordinarily required for cutting lumber of various dimensions, from the thinnest to the thickest, and the notches in the hand-wheel are so spaced that by turning the hand-wheel from one notch to the next the smallest variation in the thickness of the lumber that is usually required will be produced. For example, if lumber is to be cut varying by a quarter of an inch from three-quarters of an inch to two inches and a half the notches in the hand-wheel may be arranged substantially as shown in Fig. 4. In forming the notches in the hand-wheel account is taken of the saw-kerf, and a slight addition—for instance, a sixteenth of an inch—to the thickness of the lumber, indicated by the scale marked on the hand-wheel, is usually allowed for planing or dressing.

As it is sometimes desirable to make a smaller variation in the thickness of the lumber (as, for example, to reduce the extra thickness of one-sixteenth of an inch allowed for dressing to one thirty-second of an inch) than can be practicably effected by the adjustment of the plunger-cylinder Q in connection with a ratchet-wheel B, having teeth of sufficient size to afford the requisite strength, an auxiliary stop is provided, the effect of which is the same as would result from the employment of a ratchet-wheel having twice as many teeth. This stop consists of a T-shaped block V, loosely inserted in a recess in the top of the housing N, as shown in Figs. 1, 3, and 4, so as to limit the return movement of the piston M short of its initial position by engaging a shoulder between the piston-rod and rack O. The block V is suspended by one of its cross-arms upon a cam W, the shaft of which is provided at its outer end with a ratchet-wheel *w*, having four teeth, as shown in Fig. 2. Upon the cam-shaft is revolubly mounted a forked arm X, which is provided with a spring-actuated dog *x* in yielding engagement with said ratchet-wheel. A crank-arm Y, mounted on the rock-shaft E, as shown in Figs. 2 and 4, is adapted by engagement with the forked arm X to turn it alternately in opposite directions a quarter of a revolution to each single stroke of the piston M and by the action of the dog *x* on the ratchet-wheel *w* to turn the cam W in one direction a quarter of a revolution to each double stroke of the piston. As the cam W is formed with two diametrically opposite inclined projections, the stop-block V will be lifted out of operative position at every other double stroke of the piston, so that said piston will be arrested a little short of its initial position at the end of every other double stroke. In this way a slight reduction in the thickness of the lumber may be effected independently of the adjustment of the stop-cylinder Q. When this slight variation is not desired, the block V may be removed and the arm X turned up out of the path of the arm Y.

To prevent the cam W from being turned backward with the arm X, a spring *y* is arranged, as shown in Fig. 4, to afford a little resistance to the rotation of the cam.

To compensate for wear of the teeth on the ratchet-wheel B and of the pawls *c*, which tends to reduce the throw of the ratchet-wheel and correspondingly diminish the thickness of the lumber, or to slightly increase the thickness of the lumber over that indicated by the notches in the hand-wheel T, the hub of the hand-wheel may be loosened and turned slightly forward on the sleeve *t*, so that the plunger-cylinder Q will not be advanced toward the cylinder H quite as far by turning the hand-wheel forward till any notch therein indicating a given thickness of lumber engages with the detent U.

After a log has been slabbed or squared it is frequently desirable to set it up step by step toward the saw-line into such a position that it may cut to the best advantage into

lumber of the desired thickness. For this purpose I provide what may be termed a "one-click" stop. This stop consists, as shown in Fig. 1, of a spring-retracted bolt Z, movably held in an opening through the top of the housing N and adapted when depressed to engage with the rack O and limit its backward movement from its initial position, so that each pawl *c* will be moved forward or backward by each single stroke of the piston M an interval corresponding with one tooth on the ratchet-wheel B.

My improved set-works operates as follows: The cylinder Q of the air-cushion having been adjusted, by means of the hand-wheel T, for the desired dimension, the setter throws the lever J′ backward, thereby turning the valve J so as to admit steam or other fluid under pressure to the front end of the cylinder H and open the opposite end of said cylinder to exhaust. The piston M is moved backward, turning the rock-shaft E and the set-shaft A through the connections hereinbefore described until the rack O strikes the front end of the plunger-cylinder Q, and thereby arrests the further movement of said rack and piston in this direction. The end of the rack O before striking the end of the plunger-cylinder first engages the protruding end of the plunger-rod S, forcing it and the plunger R backward against the tension of the spring *r* and the air-cushion behind the plunger. The momentum of the piston M and connected parts is thus checked before the rack strikes the cushion-cylinder Q and comes to a positive stop, and the violent shock which would otherwise result from the rack striking a dead-stop with full force is prevented. After throwing the lever J′ backward and the operations above described, which immediately follow, have taken place the setter throws said lever forward, thereby reversing the valve J, admitting the actuating fluid to the rear end of cylinder H and opening the opposite end of said cylinder to exhaust through the passage *i* and the port j^2. The piston M is thus moved back to its initial position in the front end of said cylinder. As it passes over and covers the inner and upper passage *i* a fluid-cushion is produced in the front end of the cylinder, and the escape of steam or other fluid therefrom is retarded by the restricted opening between the passages *h* and *i*. The piston M is thus checked near the end of its return movement and brought back to its initial position without shock or jar to the apparatus. Although it is not necessary to provide for such a cushion in the rear end of the cylinder H, as the piston M is seldom allowed by the adjustment of the plunger-cylinder Q to travel so far in that direction, double ports or passages *h* and *i* are provided for the rear as well as the front end of the cylinder H. If it is desired to cut lumber of less thickness, the plunger-cylinder Q is screwed forward into the housing P by turning the hand-wheel T in the proper direction, or if lumber of greater thickness is to be cut the last-mentioned operation is reversed. In case it is desired to slightly reduce the thickness of the lumber by a smaller variation in the setting than can be accomplished with the adjustable stop-cylinder and plunger the auxiliary stop-block V is placed in position in the opening therefor in the housing N, and the forked arm X is turned into position to be engaged by the crank-pin on the arm Y. The cam W will be turned intermittently a quarter of a revolution at a time to each double stroke of the piston M. This will alternately lift the block V out of and lower it into operative position, so that the piston M will be arrested, as shown in Fig. 1, a little short of its normal initial position at the end of every other double stroke. When a log has been squared or slabbed and it is formed into lumber of what thickness or thicknesses it may be cut to the best advantage, as indicated on the usual dial-wheel, (not shown,) it is frequently necessary to move the log forward step by step a distance corresponding with one or more teeth on the ratchet-wheel B for making the first cut on the desired line in the log. In order to readily advance the knees or standards independently of the stop-cylinder Q into proper position for making such first cut, the setter depresses the bolt Z with one hand and works the lever J′ back and forth with the other, thereby turning the ratchet-wheel B forward one tooth at a time and gradually advancing the log until it is brought exactly into the desired position. The bolt is then released and is returned by its retracting-spring to its normal inoperative position. The movement of the piston M throughout its entire stroke in either direction may be checked more or less, as desired, by the adjustment of the screws *i*′, and a separate check-cylinder and piston for this purpose are thus dispensed with. In its forward movement the piston M is stopped in its normal initial position by the engagement of the shoulder between the piston-rod and rack O with the housing N before said piston quite reaches the front cylinder-head. When the rack O moves forward away from the stop-cylinder Q, the plunger R is permitted to resume its initial position instantly by the opening of a check-valve *r*′, which controls a small passage through said plunger, as shown in Fig. 1.

With the improved stop and adjusting devices hereinbefore described a check-cylinder and piston connected with the actuating-piston and separate and distinct from the adjustable stop according to the arrangement commonly employed heretofore in the construction of power set-works are dispensed with, and an adjustable cylinder and plunger are

made to perform the functions both of a check or cushion and of an adjustable stop to the movement of the actuating-piston.

With my improvements space is economized and the construction and operation of the set-works are simplified and improved.

Various changes in minor details of construction may be made without departing from the spirit and intended scope of my invention.

I claim—

1. In sawmill set-works, the combination with the set-shaft, of a cylinder having valve-controlled fluid supply and exhaust connections, a piston fitted to work in said cylinder and having an operating connection with said set-shaft, and an air-cushion adjustable axially toward and from said piston and adapted to limit its movement at different points, substantially as described.

2. In sawmill set-works, the combination with the set-shaft, of a cylinder having valve-controlled fluid supply and exhaust connections, a piston fitted to work in said cylinder and operatively connected with said set-shaft, and an air-cushion for limiting the movement of said piston in one direction, consisting of a cylinder adjustable axially toward and from said piston, a plunger fitted in said cylinder and a spring tending to return said plunger to its initial position toward said piston, substantially as described.

3. In sawmill set-works, the combination with the set-shaft, of a cylinder having valve-controlled fluid supply and exhaust connections, a piston fitted to work in said cylinder and operatively connected with said set-shaft, an air-cushion for limiting the movement of said piston in one direction, consisting of a cylinder and a plunger fitted to work therein in line with said piston, a hand-wheel for adjusting said air-cushion revolubly connected with the housing of the plunger-cylinder, which has an external screw-thread engaging a screw-thread in one part and a longitudinal groove engaged by a key in the other part, and a detent for holding said hand-wheel and air-cushion in adjusted position, substantially as described.

4. In sawmill set-works, the combination with the set-shaft, of a cylinder having two valve-controlled fluid supply and exhaust ports arranged to produce a fluid-cushion in one end of the cylinder for retarding the movement of its piston in one direction, a piston fitted to work in said cylinder and operatively connected with said set-shaft, and an air-cushion for limiting the movement of said piston in the other direction, consisting of an axially-adjustable cylinder provided with a plunger in line with said piston, substantially as described.

5. In sawmill set-works, the combination with the set-shaft provided with a ratchet-wheel and oscillatory pawl-carriers having pawls adapted to engage with and turn said ratchet-wheel, a rock-shaft provided with a gear and with arms which are connected by links with said pawl-carriers, a cylinder arranged transversely to said rock-shaft and having valve-controlled fluid supply and exhaust connections with its ends, a piston fitted to work in said cylinder and attached to a rack which engages with the gear on said rock-shaft, a cylindrical housing arranged in line with said cylinder on the opposite side of said rock-shaft, a cylinder adjustable endwise in said housing and provided with a plunger forming therewith a yielding stop for limiting the movement of said piston, and means for adjusting the plunger-cylinder toward and from the piston-cylinder, substantially as described.

6. In sawmill set-works, the combination with the set-shaft of a cylinder having valve-controlled fluid supply and exhaust connections, a piston fitted to work in said cylinder and operatively connected with said set-shaft, an adjustable cushion-stop for limiting the movement of said piston in one direction, a movable auxiliary stop for limiting the movement of said piston in the opposite direction short of its initial position, and means for automatically withdrawing said auxiliary stop from operative position on every alternate double stroke of said piston, substantially as described.

7. In sawmill set-works, the combination with the set-shaft, of a fluid-motor having a pawl and ratchet-wheel connection with said set-shaft and consisting of a cylinder having valve-controlled supply and exhaust connections and a piston fitted to work in said cylinder, a cushion-stop consisting of a cylinder and plunger arranged in line with and adjustable toward and from said piston, an auxiliary stop for limiting the return movement of said piston short of its initial position, and a cam operated by the movement of said piston for withdrawing said auxiliary stop from operative position on every alternate return stroke of said piston, substantially as described.

8. In sawmill set-works, the combination with the set-shaft, of a cylinder having valve-controlled fluid supply and exhaust connections, a piston fitted to work in said cylinder and operatively connected with the set-shaft, a removable stop-block for limiting the movement of said piston in one direction short of the extreme limit of its movement in that direction, and mechanism for automatically moving said block alternately into and out of operative position, substantially as described.

9. In sawmill set-works, the combination with the set-shaft, of a cylinder having valve-controlled fluid supply and exhaust connections, a piston fitted to work in said cylinder and operatively connected with said set-shaft, a movable stop-block for limiting the return movement of said piston toward its initial po-

sition, a cam for alternately raising and lowering said stop-block, a ratchet-wheel on the cam-shaft, a forked arm revolubly mounted on the cam-shaft and provided with a yielding dog in engagement with said ratchet-wheel and a part connected with said piston and adapted by engagement with said forked arm to turn the same back and forth through a part of a revolution, substantially as described.

10. In sawmill set-works, the combination with the set-shaft, of a cylinder having valve-controlled fluid supply and exhaust connections, a piston fitted to work in said cylinder, a rock-shaft connected with the set-shaft and with said piston and provided with a crank-arm, a movable stop-block adapted by engagement with a shoulder on the piston-rod to limit the movement of said piston toward its initial position, a cam for alternately raising and lowering said stop-block, a ratchet-wheel on the cam-shaft, and a forked arm revolubly mounted upon said cam-shaft with its fork in the path of the crank-pin on said arm, and provided with a dog held by a spring in yielding engagement with said ratchet-wheel, substantially as described.

11. In sawmill set-works, the combination with the set-shaft and a parallel rock-shaft having a pawl and ratchet-wheel connection therewith, of a cylinder and cylindrical housing mounted in line with each other on opposite sides of and transversely to said rock-shaft, a piston fitted to work in said cylinder and connected with said rock-shaft by a rack and gear, a cylinder having an external screw-thread engaging a screw-thread in said housing, a hand-wheel revolubly connected with said housing around said threaded cylinder and provided with a key in engagement with a longitudinal groove in said threaded cylinder, a plunger fitted in said threaded cylinder and having a rod guided in the head of said cylinder toward and in line with the piston-rod, and a spring normally holding the plunger-rod projecting from the head of the plunger-cylinder toward the piston-cylinder, substantially as described.

12. In sawmill set-works, the combination with the set-shaft, of a cylinder having valve-controlled fluid supply and exhaust connections, a piston fitted to work in said cylinder and having an operating connection with said set-shaft, and yielding and positive stops adjustable together axially toward and from said piston and adapted to check and limit its movement at different points, substantially as described.

13. In sawmill set-works, the combination with the set-shaft, of a motor-cylinder, a piston fitted therein and having an operating connection with said shaft, and an air-cushion and positive stop both adjustable toward and from said piston to check and limit its movement at different points, substantially as described.

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

ARTHUR NIEDERMEYER.

Witnesses:
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CHAS. L. GOSS.