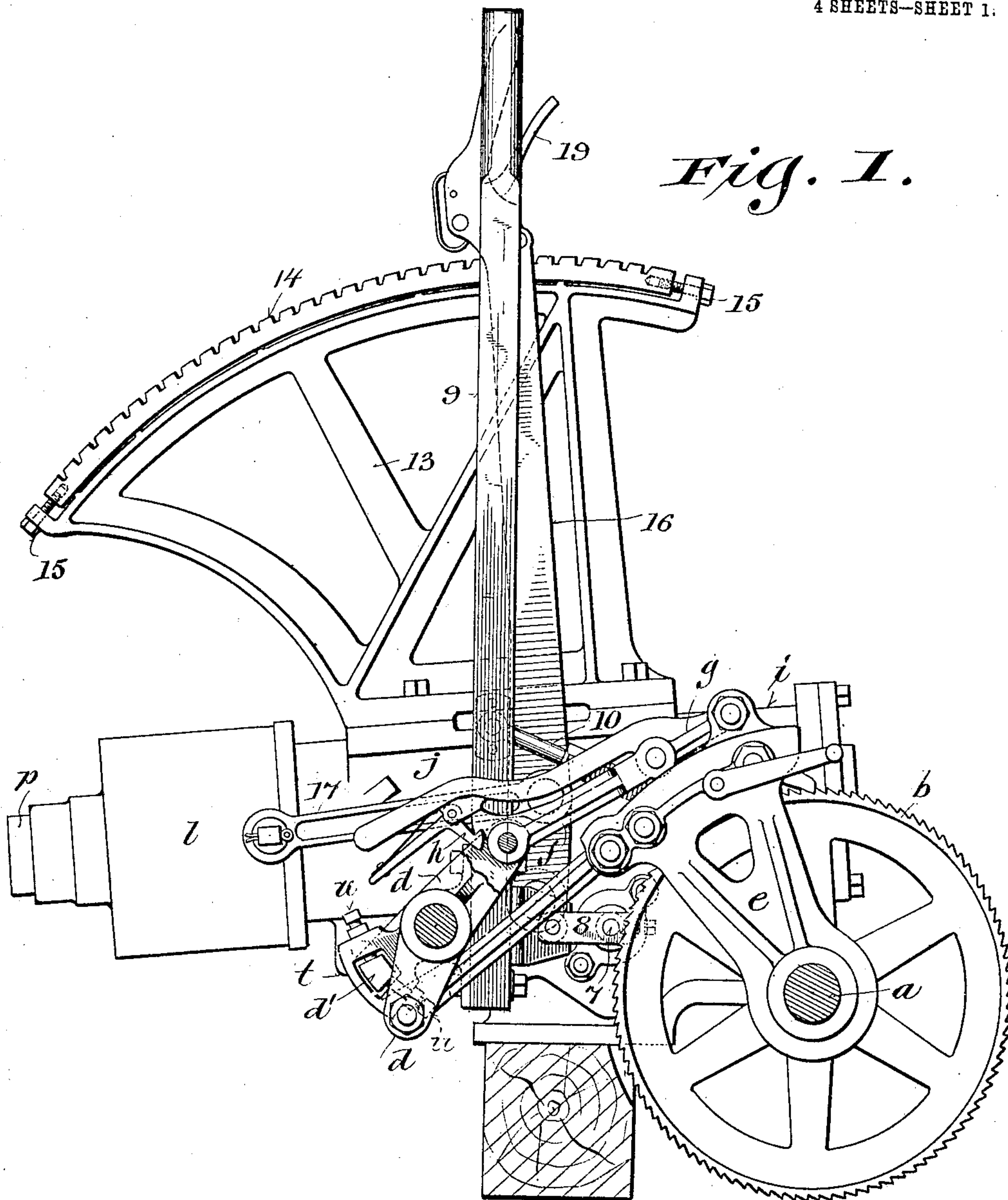


No. 869,627.

PATENTED OCT. 29, 1907.

A. CUNNINGHAM.  
SAWMILL SET WORKS.  
APPLICATION FILED JAN. 2, 1904.

4 SHEETS—SHEET 1.



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Chas. L. Goss.

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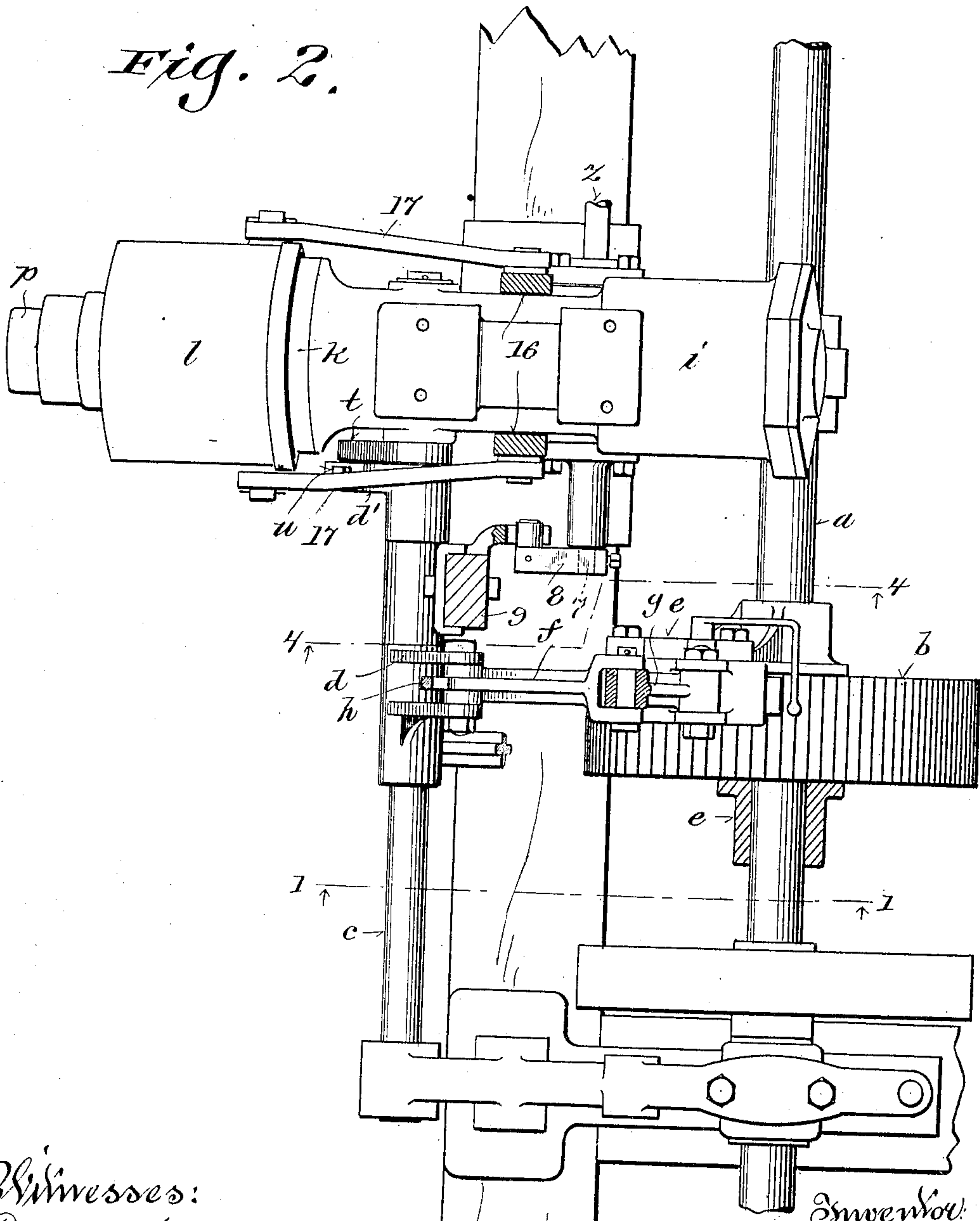
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4 SHEETS—SHEET 2.

*Fig. 2.*



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4 SHEETS—SHEET 3.

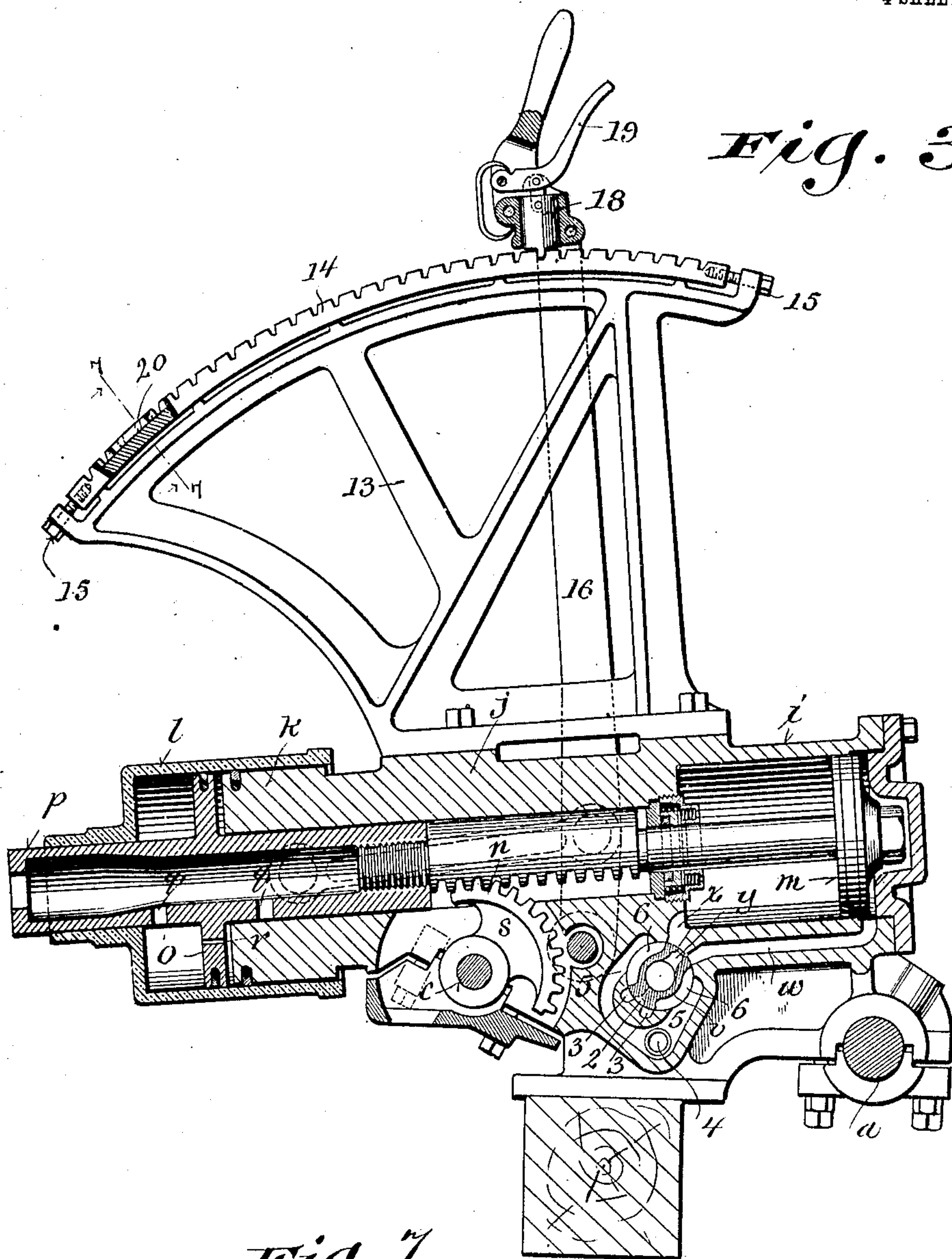
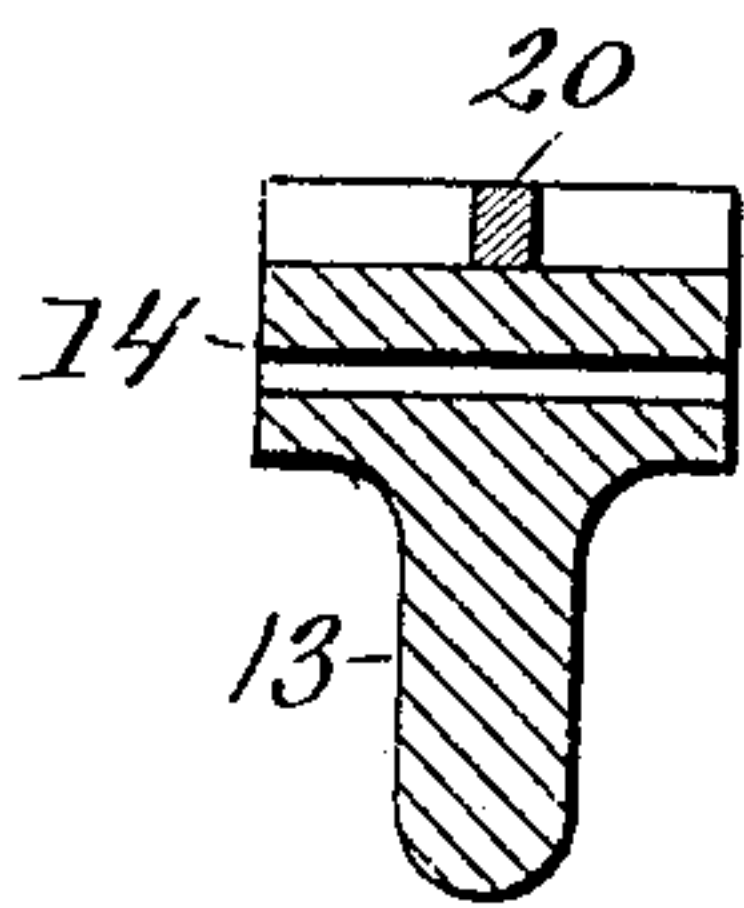


Fig. 7.



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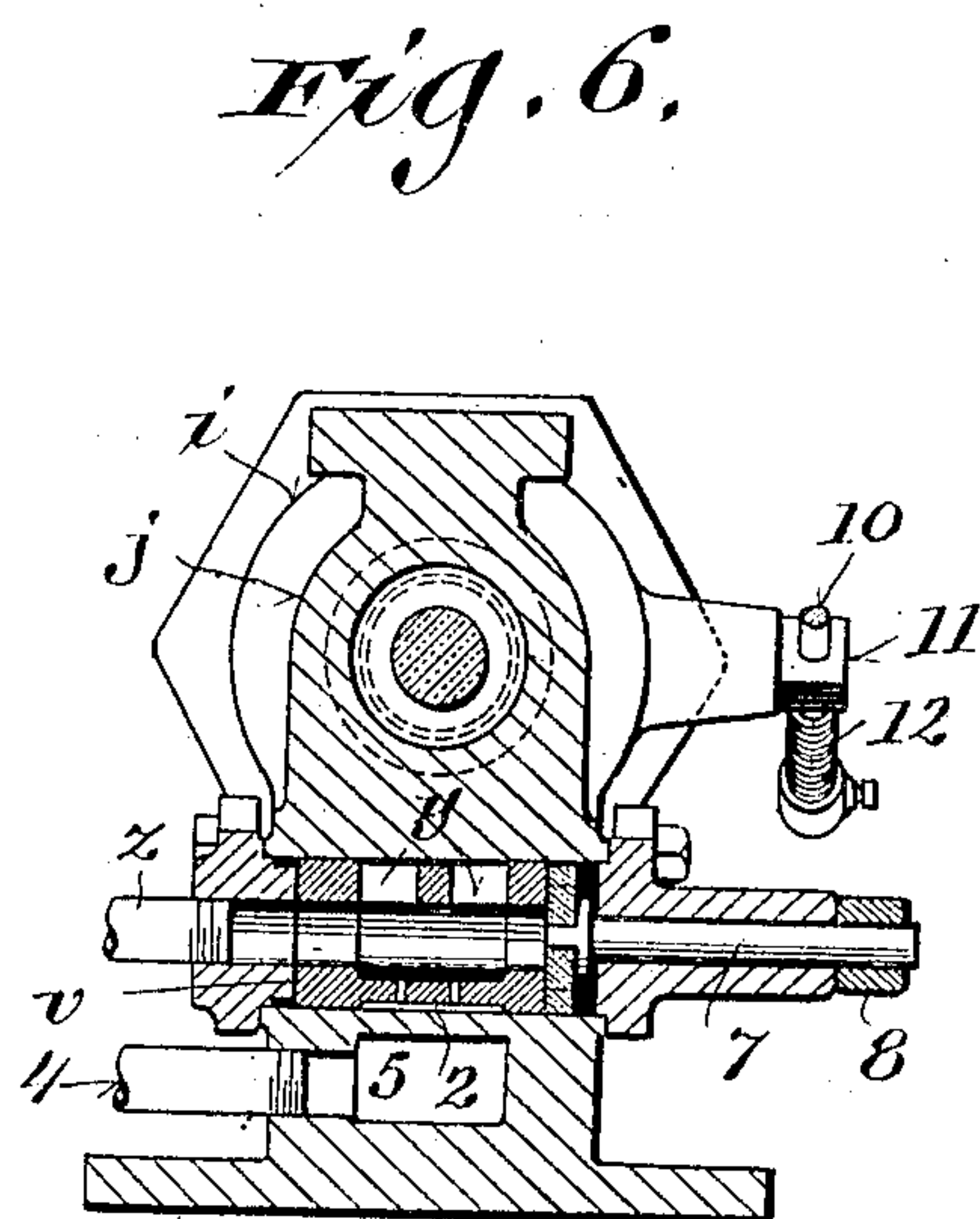
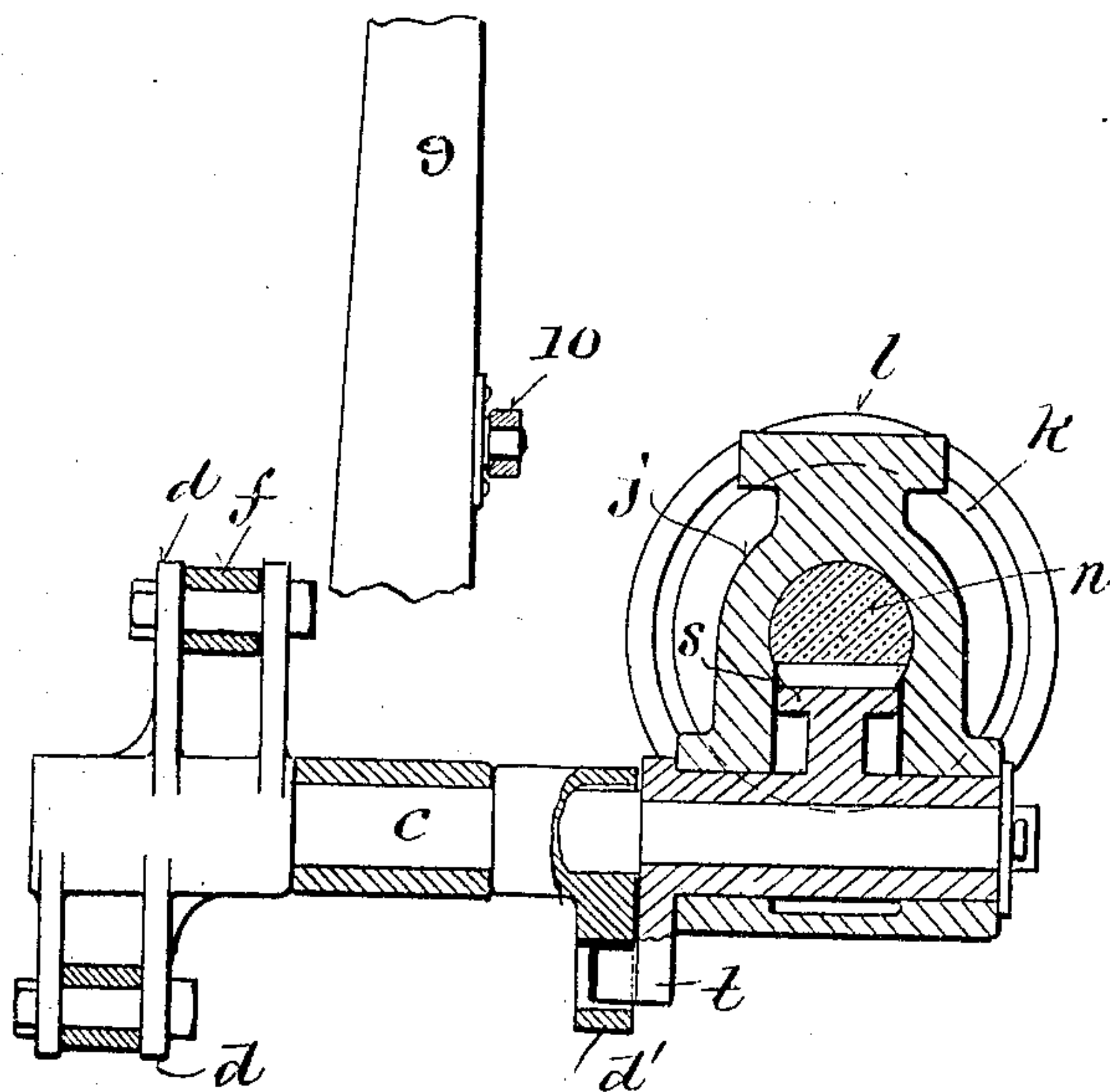
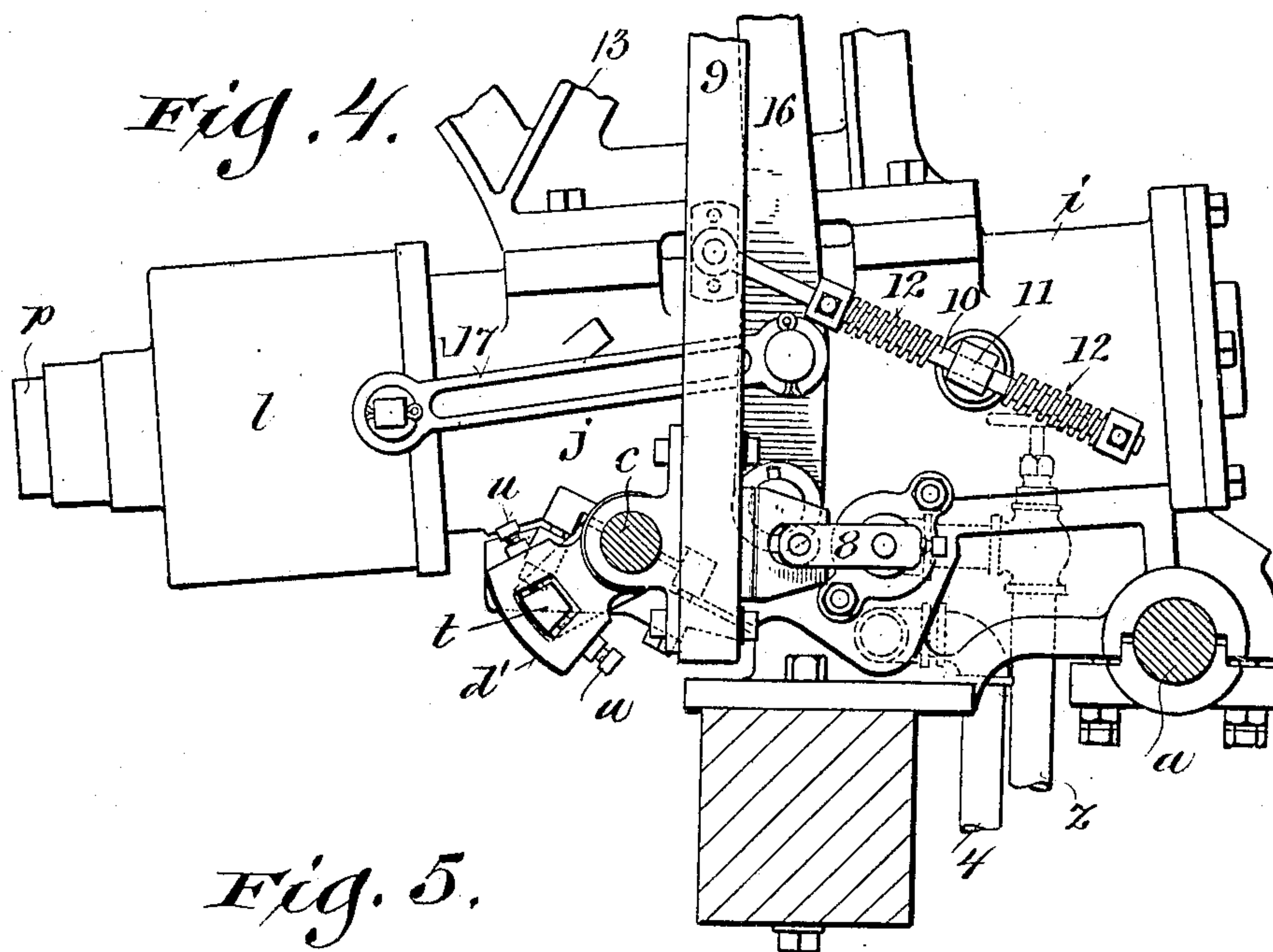
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4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

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## SAWMILL SET-WORKS.

No. 869,627.

Specification of Letters Patent.

Patented Oct. 29, 1907.

Application filed January 2, 1904. Serial No. 187,397.

*To all whom it may concern:*

Be it known that I, ALBERT CUNNINGHAM, 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 drawing, forming a part thereof.

This invention relates particularly to power set-works for saw-mill carriages. Its main objects are to prevent overthrow of the knees and secure accurate setting under varying conditions without loss of time, to provide for manually adjusting the knees without operating or disconnecting the motor, and generally to improve the construction and operation of set-works of this class.

It consists in certain novel features of construction and in the peculiar arrangement and combinations of parts or of their equivalents as hereinafter particularly described and defined in the appended claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a side elevation of saw-mill set-works embodying my improvements, the rocker and set shafts being shown in cross section on the line 1 1, Fig. 2; Fig. 2 is a plan view of the set-works, parts of which are broken away and shown in section; Fig. 3 is a vertical longitudinal section of the motor and cushion cylinders; Fig. 4 is a section on the line 4 4, Fig. 2, showing in detail the adjustable stop lever, the valve operating lever and their connections, and the adjustable driving connection of the rocker shaft; Fig. 5 is a detail sectional view taken in a plane lengthwise of the rocker shaft, showing the adjustable connection between the rocker shaft and its driving pinion; Fig. 6 is a detail sectional view of the motor valve taken in a plane lengthwise of the valve stem and crosswise of the piston rod; and Fig. 7 is an enlarged cross section on the line 7 7, Fig. 3.

Referring particularly to Figs. 1, 2 and 3, *a* designates the set shaft, which is provided with a ratchet wheel *b*, and is connected with the knees or standards on the head blocks in the usual or any suitable way.

*c* is a rocker shaft parallel with the set shaft and provided with oppositely projecting crank arms *d* and a crank arm *d'*, which are keyed or otherwise fastened thereon. The crank arms *d* are connected by links with pawl carriers *e*, which are loosely sleeved on the set shaft and are provided with pawls adapted to engage with the ratchet wheel and to turn the set shaft forward, thereby advancing the knees in the usual way. One of said links is composed of two members *f* and *g*, which are pivotally connected with each other and constitute a toggle lever for manually operating the set works. The member *g* is extended beyond its pivot

connection with the member *f*, to form a handle and afford proper leverage to enable the setter to easily turn the set shaft and set up the knees by short intervals. The member *g* is normally locked to the member *f* by a spring actuated latch *h*, and when the two members are thus locked together, they constitute in effect a simple link connection between the crank arm and pawl carrier.

*i* is the motor cylinder which may be conveniently cast with a base for attaching it to the carriage, and with an extension forming a guide *j* for the piston rod, and a head *k* for the cushion cylinder.

*l* is the cushion cylinder, which is fitted and adjustable endwise upon the head *k*, and is formed or provided with a head having a central externally flanged opening through it.

*m* is the motor piston which is connected by a rod passing through a stuffing box in the inner head of the motor cylinder with a rack *n*, fitted in the guide *j*.

*o* is the cushion piston which is formed or provided with a tubular rod *p*, fitted and guided in the openings in the cylinder heads and attached at one end to the rack *n*. The rod *p* is open at its outer end to the atmosphere, and has one or more lateral ports *q* on each side of the piston *o*, which has a restricted opening or passage *r* through it. The motor and cushion pistons are provided with suitable packing and the stationary head *k* of the cushion cylinder is also provided with packing to form a fluid tight joint between it and said cylinder.

*s* is a segmental pinion meshing with the rack *n* and formed with a long hub which is provided with bearings in the under side of the guide *j* and is loosely mounted on a reduced extension of the rocker shaft *c*. At one end the hub of said pinion is formed or provided with a crank *t*, which has a flat faced stud projecting laterally therefrom and adjustably secured in an opening of the adjacent crank arm *d'* by opposing set screws *u*, as shown most clearly in Figs. 4 and 5.

*v* is a hollow rotary valve fitted in a transverse cylindrical chamber which may be formed in the base or extension of the motor cylinder adjacent to its inner head, and is connected by ports or passages *w* and *x*, with opposite ends of said cylinder. The valve is formed in one side with a port *y*, communicating through an axial passage with the steam or motive fluid supply pipe *z*, and adapted to register with one or the other of the ports or passages *w* and *x*. In its opposite side the valve is formed with a cavity 2, corresponding in area with the port *y* and connected with the axial passage in the valve. The valve chamber is formed diametrically opposite the ports or passages *w* and *x* with cavities 3 3, of corresponding area, as shown in Figs. 3 and 6.

4 is the exhaust pipe connected by a branching passage 5 with cavities 6 in the opposite sides of the valve.



At the end opposite the supply pipe *z*, a stem 7 is connected with the valve, as shown in Fig. 6, and on the outer end of this stem is fixed an arm 8. A lever 9, loosely sleeved on the rocker shaft *c*, is provided on the opposite side with jaws engaging a roller on the arm 8. To this lever is pivoted a rod 10, passing loosely through a sleeve 11 swiveled to one side of the motor cylinder *i*, as shown in Figs. 4 and 6, and between collars on said rod and opposite ends of the sleeve 11, are interposed springs 12.

13 is a quadrant bolted to the upper side of the guide *j* between the motor and cushion cylinders. It is provided with a notched arc 14, adjustable endwise thereon and secured at its ends to upturned ears on the quadrant by screws 15.

16 is a forked lever straddling the quadrant and fulcrumed below the rack *n*. It is connected on each side above its fulcrum by links 17, with the cushion cylinder *l*, and it is provided with a spring actuated detent 18 for locking it in different positions to the arc 14. A hand grip lever 19, connected with said detent, serves to withdraw it from engagement with the arc 14. The arc 14 is formed with a longitudinal groove in its toothed face and in this groove may be inserted a bridge piece 20, as shown in Figs. 3 and 7, to span any desired number of notches in any part of the arc. A sufficiently tight fit is made to hold the bridge piece in place in the groove.

My improved set-works operates as follows: The stop lever or arm 16 being set and locked to the graduated arc 14 of the quadrant in position to advance the knees the proper distance for sawing lumber of the desired dimension, and the parts of the set-works being in the positions in which they are illustrated in the drawing, the lever 9 is pulled by the setter backward or to the left, as seen in Figs. 1 and 3. This turns the valve *v* to the right, carrying its supply port *y* into register with the port or passage *w*. The cavity 2 opposite the port *y* being constantly supplied with steam or other motive fluid through its connection with the interior of the valve, balances the valve when it is closed maintaining a close fit between it and its seat next to the ports *w* and *x*. The above mentioned movement of the valve establishing communication between the ports *w* and *y* at the same time establishes communication between the cavity 2 and the cavity 3, opposite the port *w*, thereby preserving the balance of the valve and maintaining a close fit between its working face and seat. Steam or other motive fluid being thus admitted to the cylinder *i* in front of the piston *m*, moves said piston backward, turning the rocker shaft *c* to the left and swinging one pawl carrier *e* forward and the other backward a distance corresponding with the position of the stop lever 16 and of the cushion cylinder *l*. The ports in the valve and in the valve chamber and the faces of the valve and valve seat are so proportioned and disposed that steam or other motive fluid is admitted to one end of the cylinder a little in advance of its being exhausted from the opposite end of the cylinder. This causes the piston to start gradually without shock to the setting mechanism. As the cushion piston *o* approaches the adjustable head of the cushion cylinder and the corresponding port *q* passes into and is closed by said head, the free escape of air from that end of the cylinder is cut off and the air con-

fined therein is compressed more or less according to the speed of the piston, which is thus checked in its movement and brought to a gradual stop. The piston is permitted to come to a dead stop against the cylinder head by the flow of air through the restricted passage *r* from one side of the piston to the other. The setter then reverses the valve *v* by turning the lever 9 back to the right. This admits steam or other motive fluid to the back end of the cylinder *i* through the port *x*, while the other end of said cylinder is opened to exhaust through the port or passage *w*. The piston *m* is thereupon driven back to its initial position, in which it is shown in Fig. 3, turning the rocker shaft *c* back to the right and swinging the pawl carriers back to their original positions. As the cushion piston *o* approaches the fixed head *k* of the cushion cylinder its movement is checked by the air confined in that end of the cylinder when the corresponding port *q* passes into and is closed by the cylinder head. The confined air escaping through the restricted passage *r* into the other end of the cylinder, allows the piston to gradually come to a dead stop against the cylinder head *k* without shock.

Each of the pawl carriers makes a complete forward and backward movement to each backward and return movement of the motor piston *m* and turns the ratchet wheel *b* a distance corresponding with the position of the lever 16 and cushion cylinder *l*, which determines with accuracy and certainty the limit or extent of movement of the pawl carriers and hence the advance of the knees. The cushion produced by the confined air in the ends of the cushion cylinder causes the motor piston and hence the pawl carriers to come to a gradual stop in both directions, whatever the extent of movement of the motor piston may be, and the heads of the cushion cylinder exactly determine the limits of such movement, thereby preventing overthrow of the knees and inaccuracy in setting. The more rapid the movement of the motor piston and the greater the momentum of the moving parts of the setting mechanism, the greater will be the compression of air in the ends of the cushion cylinder, which operates with certainty under varying conditions of power, speed and load, independently of the motive fluid, which cannot be depended upon under varying pressure and conditions to properly cushion and check the movement of the motor piston. When the lever 9 has been turned in either direction sufficiently to slightly open the valve port *y* into either of the ports *w* and *x*, one of the springs 12 takes effect and opposes a gradually increasing resistance to its further movement. By this means the setter is enabled to determine according to the force he applies to said lever, the power applied to the operation of the set-works and thus to more certainly regulate and control the operation of the set works according to varying conditions.

When the set-works is used for sawing certain dimensions of lumber it is often desirable to close some of the notches in the graduated arc 14, to prevent the detent 18 of the stop lever 16 from engaging with such notches, and to enable the setter to adjust the stop lever for such dimensions with greater facility and certainty. For this purpose a bridge piece 20 of the desired length is inserted in the groove of said arc to span the notches which are not used adjacent to that with which the detent is to be most frequently engaged.



To take up play and wear in the setting mechanism and to compensate for any inaccuracy in fitting, and at the same time to cause the pawls of the back carrier to properly engage with the teeth of the ratchet wheel without too much or too little play, the adjustable connection between the rocker shaft *c* and the pinion *s* is provided.

By means of the screws *u* the pawls of the back carrier may be slightly advanced or withdrawn to properly engage the teeth of the ratchet wheel when the motor and cushion pistons are at rest in their initial or home positions. On the other hand, to adjust the pawls of the other pawl carrier to properly engage in like manner with the teeth of the ratchet wheel when the cushion piston *o* is against its back stop, the position of which is determined by the notched arc 14 and the stop lever 16, said arc is adjusted endwise on the quadrant by means of the screws 15.

One or more ports may be provided in the tubular rod of the cushion piston on each side thereof, and these ports may be made of any desired area and disposed in different ways, and the passage through said piston may be varied in form and position according to the requirements of the case. In short, various changes in the details of construction and arrangement of parts of the set-works may be made without departing from the principle and intended scope of my invention.

I claim:

1. In saw-mill set-works the combination with the set shaft and a motor cylinder and piston for actuating said shaft, of a cushion cylinder, a cushion piston attached to the motor piston rod, and means for varying the distance between the cushion piston and one of the cushion cylinder heads, substantially as described.
2. In saw-mill set-works the combination with the set shaft and a motor cylinder and piston for actuating said shaft, of a cushion cylinder having an axially adjustable head and a cushion piston fitted in the cushion cylinder and attached to the motor piston, substantially as described.
3. In saw-mill set-works the combination with the set shaft and a motor cylinder and piston for actuating said shaft, of a cushion cylinder adjustable in length and a cushion piston having a tubular rod attached to the motor piston and provided with ports arranged on opposite sides of the cushion piston in position to be closed by their passage into the cushion cylinder heads, substantially as described.
4. In saw-mill set-works the combination with the set shaft and a motor cylinder and piston for actuating said shaft, of a cushion piston attached to the motor piston, and a cushion cylinder having a stationary head on which it is adjustable endwise to vary the stroke of said pistons, substantially as described.
5. In saw-mill set-works the combination with the set

shaft and a motor cylinder and piston for actuating said shaft, of a cushion cylinder arranged coaxial with the motor cylinder and having one of its heads stationary and the other adjustable to vary the length of the cylinder chamber, and a cushion piston attached to the motor piston rod and having a tubular rod passing through the cushion piston heads and open to the atmosphere, lateral ports being provided in said tubular rod, one or more on each side of the cushion piston, substantially as described.

6. In saw-mill set-works the combination with the set shaft and a motor cylinder and piston for actuating said shaft, of a cushion cylinder having one head adjustable towards and from the other, a graduated quadrant and a lever connected with the adjustable head of the cushion cylinder and adapted to be secured in different positions to said quadrant, and a cushion piston attached to the motor piston, substantially as described.

7. In saw-mill set-works the combination with the set shaft and a motor cylinder and piston for actuating said shaft, of a cushion cylinder having a fixed head upon which it with its other head is adjustable lengthwise, a cushion piston attached to the motor piston, a forked lever connected with opposite sides of said cushion cylinder, and a graduated quadrant to which said lever is adapted to be secured in different positions, substantially as described.

8. In saw-mill set-works the combination with the set shaft and a motor cylinder and piston for actuating said shaft, of a cushion cylinder having openings through its heads, one of which is movable towards and from the other, a cushion piston having a restricted passage through it, and a tubular rod fitted in said openings and provided with ports arranged on opposite sides of and at a distance from the piston in positions to be closed by their passage into the cylinder heads, and means for adjusting the movable cylinder head, substantially as described.

9. In saw-mill set-works the combination with the set shaft provided with a ratchet wheel, a pawl carrier provided with a pawl arranged to engage the teeth of the ratchet wheel, a rocker shaft, and a motor connected with the rocker shaft, of a jointed link connecting an arm of the rocker shaft with the pawl carrier and serving to transmit motion from the motor to the set shaft and affording means for manually turning the set shaft when the motor is at rest, substantially as described.

10. In saw-mill set-works the combination with the set shaft provided with a ratchet wheel, a pawl carrier provided with a pawl adapted to engage the teeth of the ratchet wheel, a rocker shaft and a motor connected with and arranged to oscillate the rocker shaft, of a link composed of two pivotally connected members connecting an arm on the rocker shaft with the pawl carrier, one of said members being extended beyond its pivot connection with the other and constituting a handle for manually turning the set shaft, and means for locking said members together, substantially as described.

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

ALBERT CUNNINGHAM.

Witnesses:

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