

No Model.)

4 Sheets—Sheet 1.

J. D. WILLIAMSON, Jr.  
MECHANISM FOR OPERATING VALVES OF ENGINES.

No. 567,671.

Patented Sept. 15, 1896.

Fig. 1.

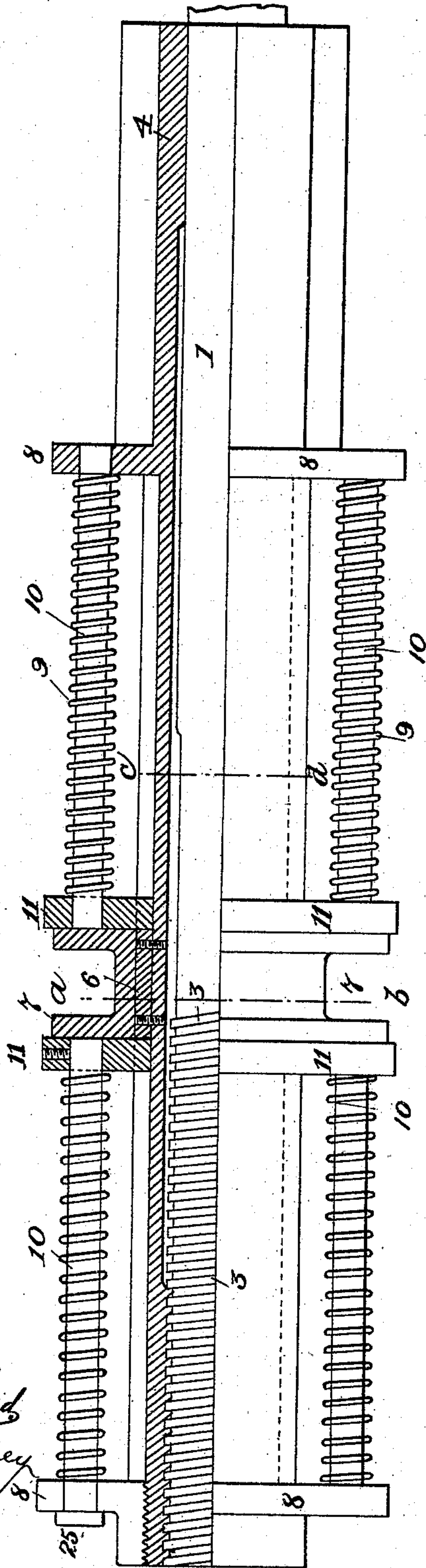


Fig. 3.

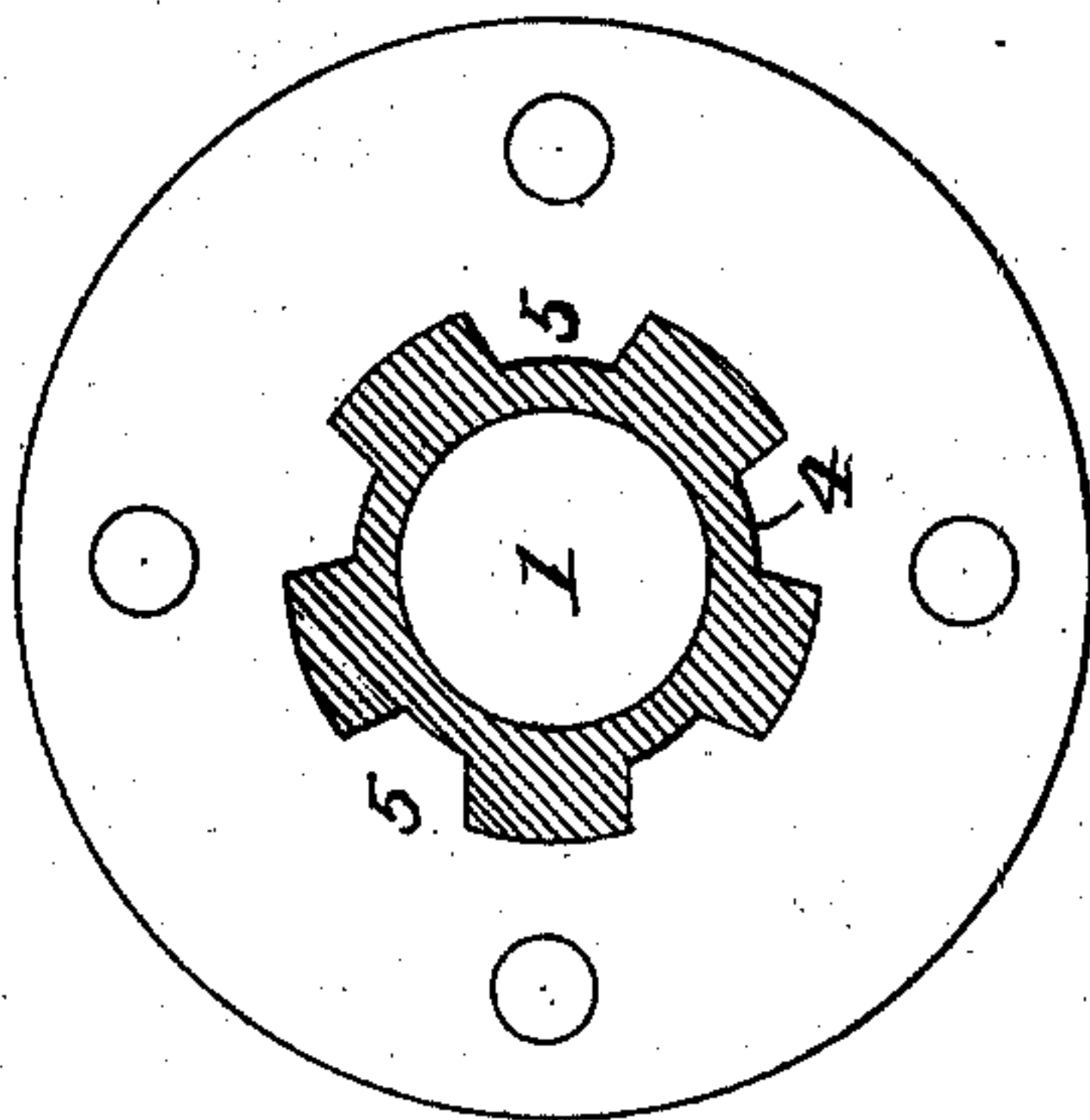
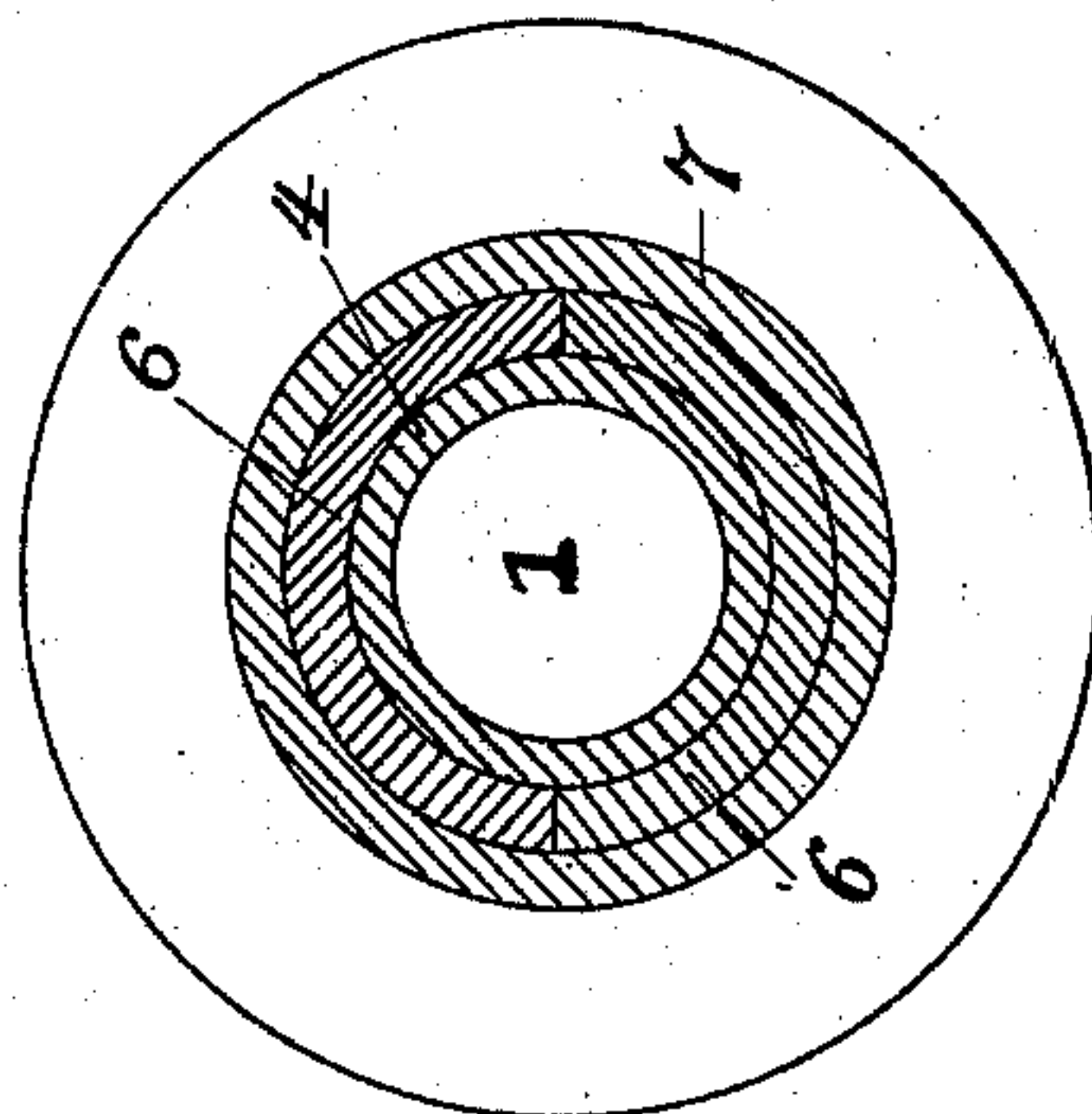


Fig. 2.



WITNESSES:

Edward C. Rowland  
Francis V. Reiley

INVENTOR

J. D. Williamson, Jr.

BY

R. M. Norcross

ATTORNEY

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Fig. 5.

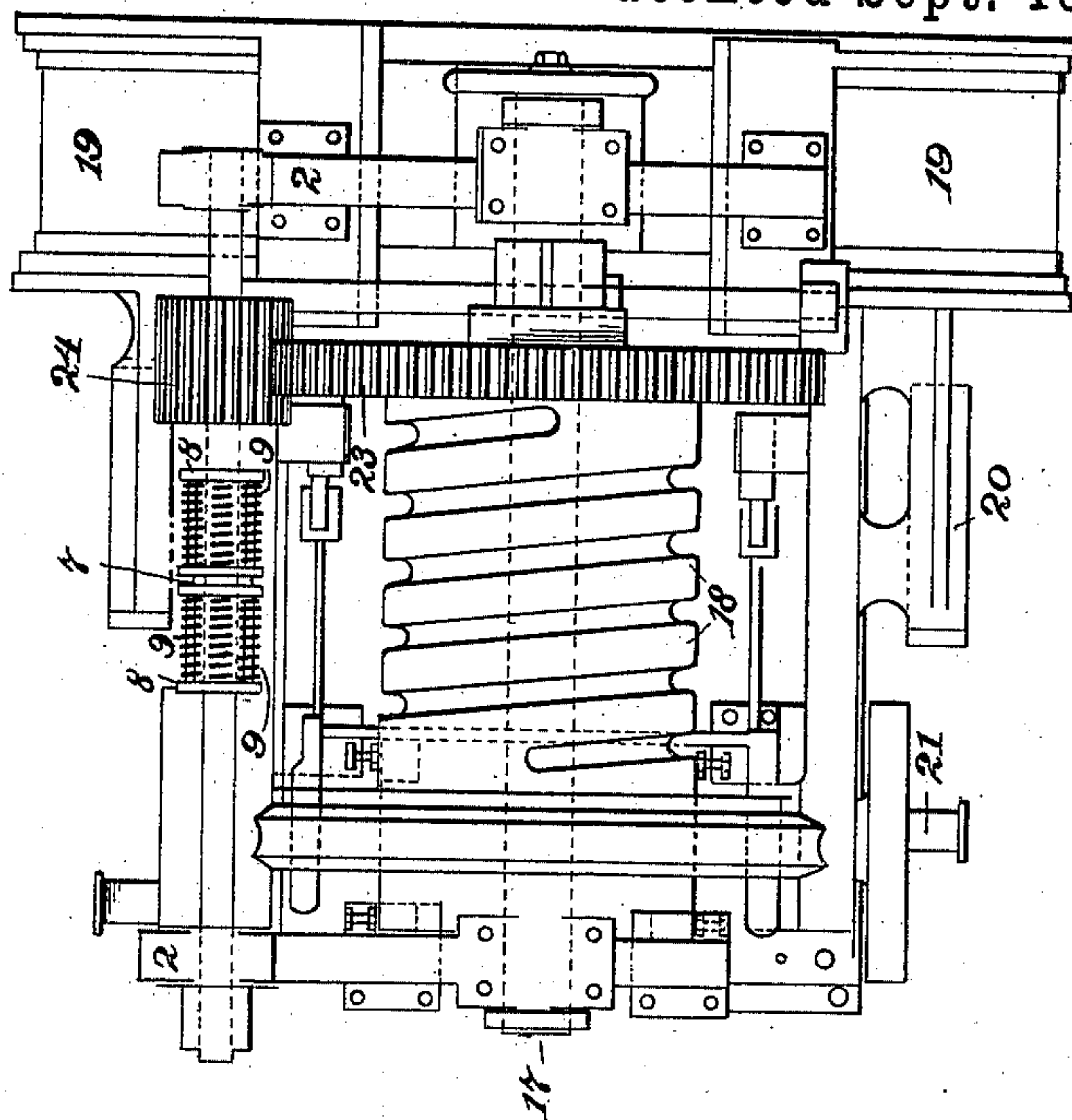
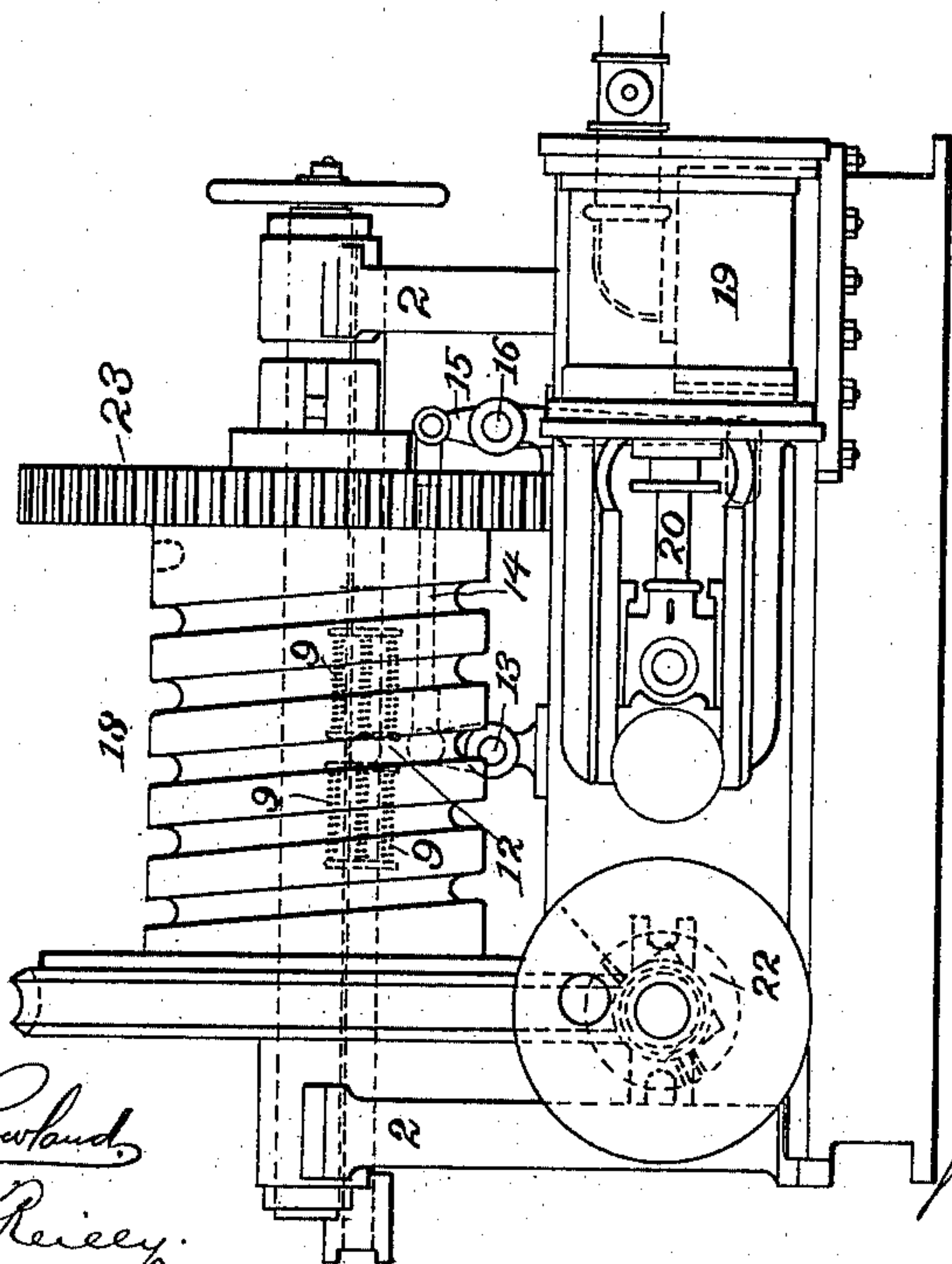


Fig. 4.



WITNESSES:

*Edward C. Rowland,*  
*Francis P. Reiley.*

INVENTOR

*J. D. Williamson, Jr.*

BY

*R. M. Voorhees*  
ATTORNEY

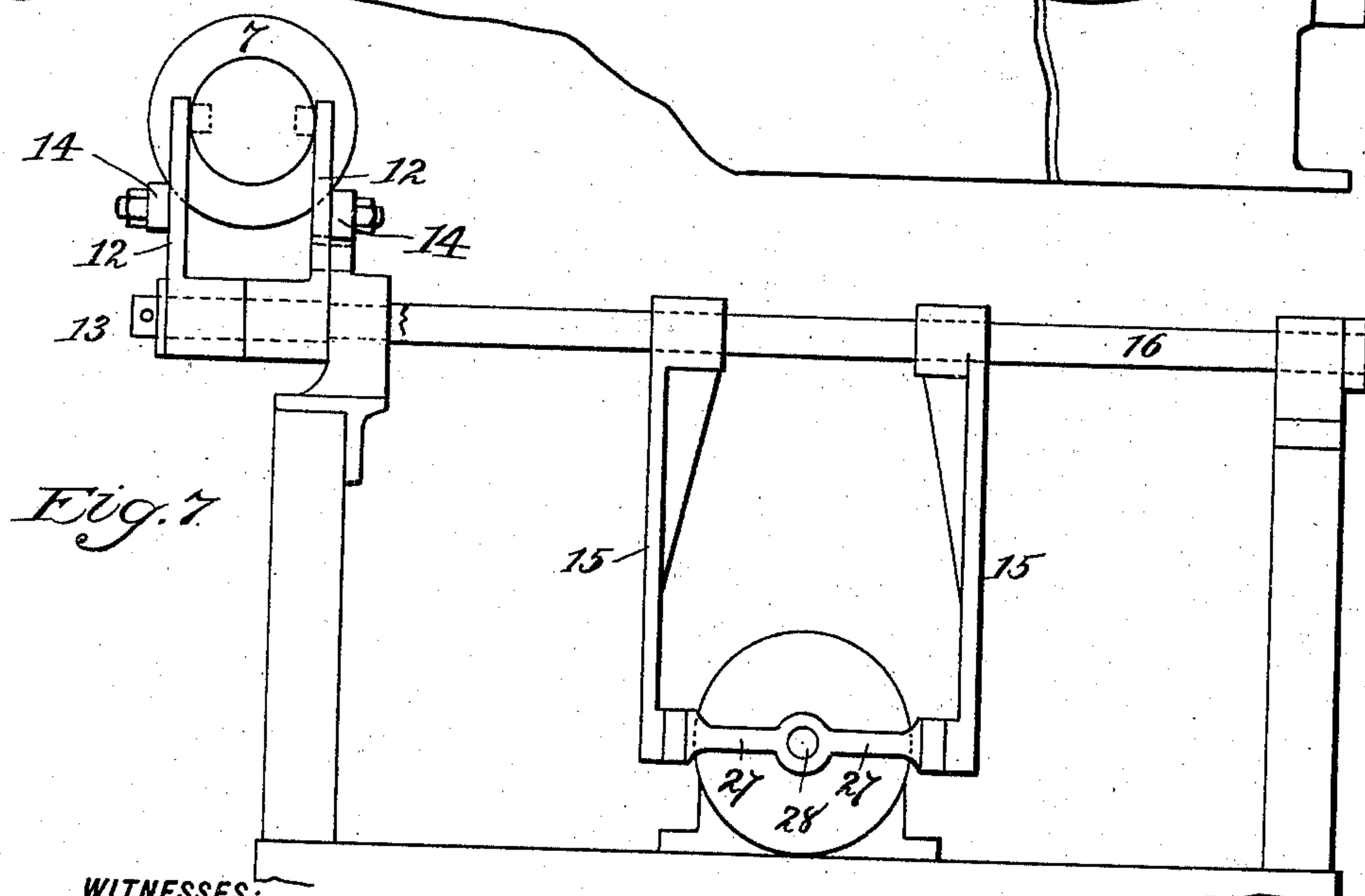
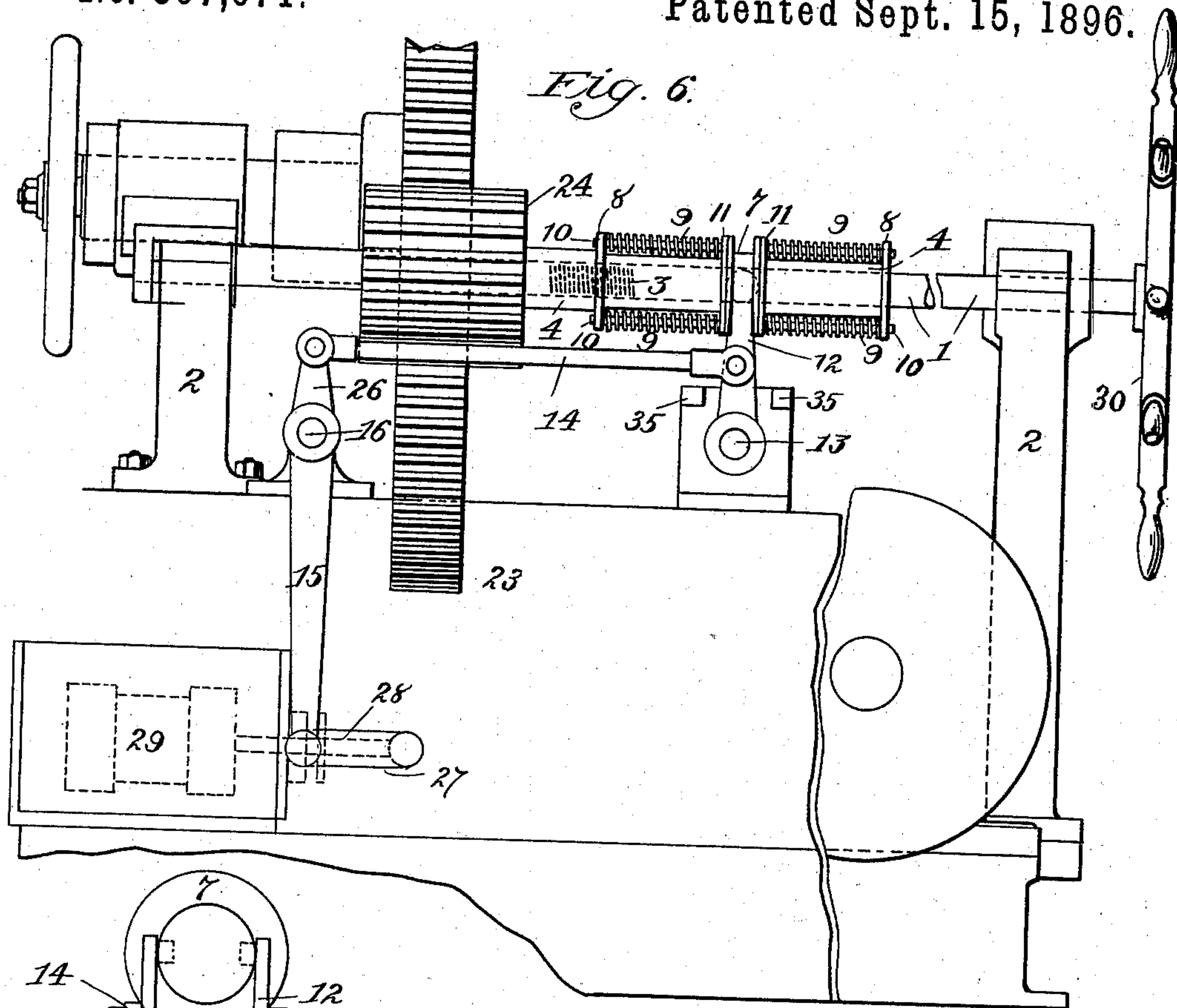
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J. D. WILLIAMSON, Jr.  
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No. 567,671.

Patented Sept. 15, 1896.



WITNESSES:

Edward L. Bowditch  
James F. Court

INVENTOR

John D. Williamson, Jr.  
BY  
Francis P. Riley,  
ATTORNEY



(No Model.)

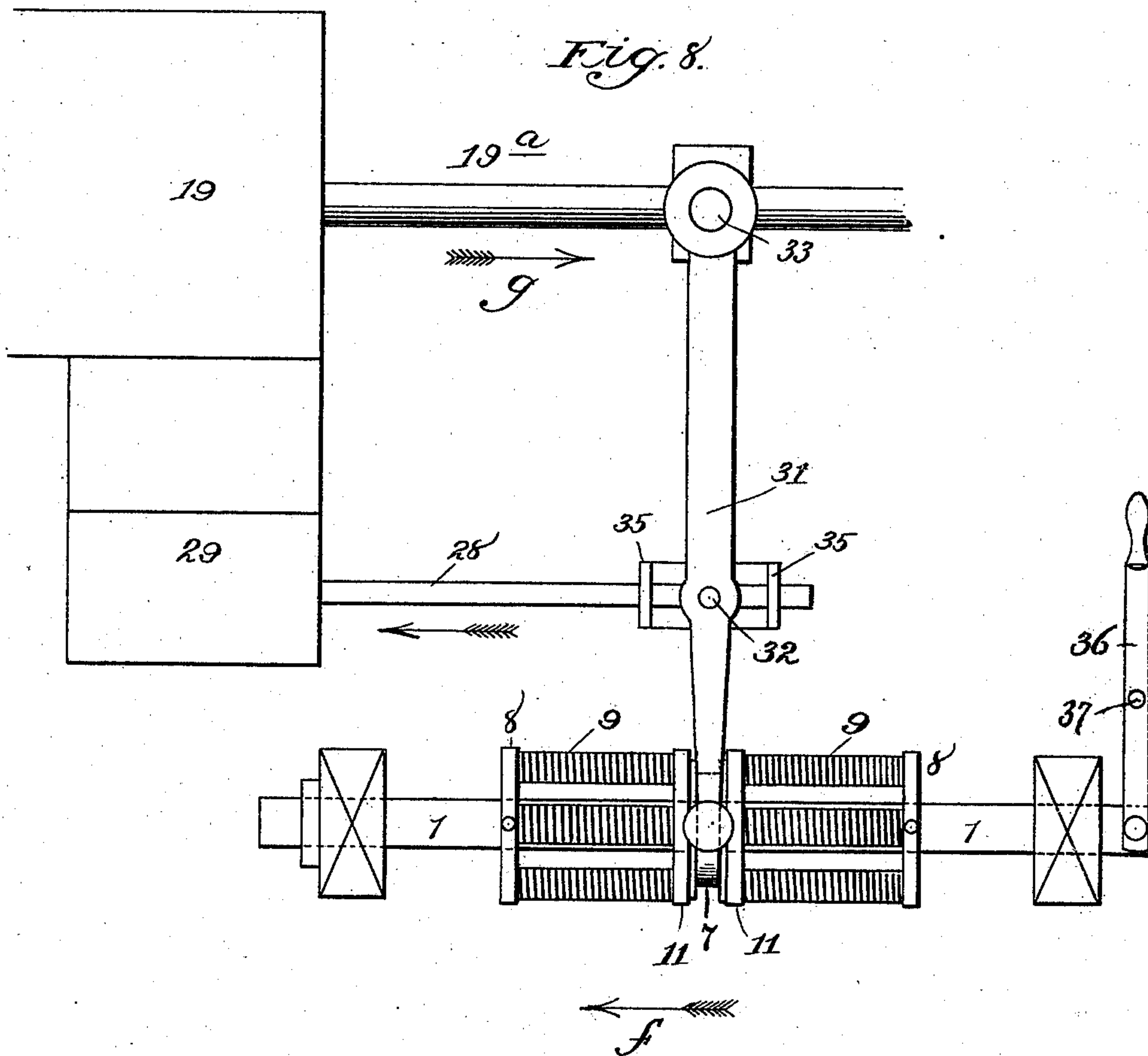
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J. D. WILLIAMSON, Jr.

MECHANISM FOR OPERATING VALVES OF ENGINES.

No. 567,671.

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WITNESSES:

*Edward C. Rootland*  
*James F. Court*

INVENTOR

*John D. Williamson, Jr.*  
BY  
*Francis P. Reilly*  
ATTORNEY

# UNITED STATES PATENT OFFICE.

JOHN D. WILLIAMSON, JR., OF PHILADELPHIA, PENNSYLVANIA.

## MECHANISM FOR OPERATING VALVES OF ENGINES.

SPECIFICATION forming part of Letters Patent No. 567,671, dated September 15, 1896.

Application filed May 15, 1894. Serial No. 511,344. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN D. WILLIAMSON, Jr., of the city and county of Philadelphia, in the State of Pennsylvania, have invented  
5 a new and useful Improvement in Mechanism for Operating Valves of Steam and other Engines, which invention is fully set forth and illustrated in the following specification and accompanying drawings.

10 The object of this invention is sufficiently indicated by its title above given.

The invention will first be described in detail, and then set forth in the claims.

15 In the accompanying drawings, Figure 1 is a sectional view of a valve-operating mechanism embodying my invention. Fig. 2 is a vertical cross-section taken through Fig. 1 at the line *a b*. Fig. 3 is a vertical cross-section taken through Fig. 1 at the line *c d*. Fig. 4  
20 is a side elevation showing my invention as applied to a steam steering-engine. Fig. 5 is a view in plan of Fig. 4. Figs. 6 and 7 show in side and end elevation, respectively, enlarged views of the valve-operating mechanism shown in Figs. 4 and 5, certain parts of  
25 the steering-engine being omitted. Fig. 8 shows a modified form of valve-operating mechanism hereinafter described.

30 In said figures the several parts are respectively indicated by numbers, as follows:

The number 1 indicates a shaft carried in bearings in standards 2, Figs. 4 and 5, and provided for a portion of its length with screw-threads 3. Fitted to and surrounding  
35 this screw-threaded shaft is a long sleeve or hollow rod 4, preferably provided with a grooved surface 5. At or near the central part of said sleeve or nut the projections forming the grooves are cut away and two  
40 half-rings 6 are fitted in, as clearly shown in Figs. 1 and 3. An annular casting or flanged ring 7, which derives movement from the sleeve 4, is held in position between two fixed collars 8, secured to the sleeve 4, by  
45 springs 9, supported and sliding upon rods 10, secured to movable collars 11. The collars 11 are grooved so as to fit into the grooves in the sleeves 4. The ring 7 can move laterally over the entire grooved surface of the sleeve 4

until the springs 9 on one side of said ring 50 are fully compressed. The collars 11 are held by said springs against the two half-rings 6, and said collars can move no further inwardly than their central positions of original adjustment.

55 Any desired number of the springs 9 may be used, distributed circumferentially.

In Figs. 4 to 7 the device above described is shown applied to a steam steering-engine for operating the controlling-valve of the  
60 same. Connected to the ring 7 is a forked lever or pair of arms 12, Figs. 4, 6, and 7, mounted upon a short shaft 13, two stops 35 being provided for limiting the movement of this lever. Connected to the lever 12 are two  
65 connecting-rods 14, the other ends of which are connected to a forked lever 26, which corresponds to the lever 12 and is mounted upon a long shaft 16. Secured to the shaft 16 are the upper ends of two arms 15, the lower  
70 ends of which are connected, by means of links 27, to the valve-rod 28 of the valve 29 of the steering-engine, as shown in Figs. 6 and 7. Said engine is provided with a drum-shaft 17, carrying the usual chain-drum 18,  
75 and operated from the cylinders 19 by connecting-rods 20, crank-shaft 21, and worm-gearing 22. Said drum-shaft 17 has secured to it a gear-wheel 23, which meshes with a spur-pinion 24, secured to the sleeve or nut  
80 4 surrounding the shaft 1.

The shaft 1 may be provided with a hand-wheel, Fig. 6, for operating the same, or said shaft may be operated by any shafting or gear-  
85 ing, or by any telemotor mechanism, whether mechanical, electric, hydraulic, or pneumatic.

The operation of the mechanism above described is as follows: If the shaft 1 be rotated by the hand-wheel 30, or any other suitable means connected thereto, the screw-threads 3  
90 thereon will cause the sleeve or nut 4 to slide laterally, carrying with it the ring 7. This movement of the ring 7 will, through the instrumentality of the lever 12, connected thereto, and the shaft 13, rods 14, arms 26, shafts 16,  
95 arms 15, links 27, and valve-rod 28, open the controlling-valve 29 of the steering-engine, and thus cause said engine to move the rudder



into the desired position. The valve is held open until the movement of the steering-engine causes the gear-wheel 23 on the drum-shaft 17 to revolve the pinion 24. This revolution of the pinion 24 will cause the sleeve 4, to which it is secured, to rotate on the screw-threaded shaft 1 and move backward, thus returning the flanged ring 7 and lever 12 to their original positions and closing the valve of the engine. The springs 9 are made strong enough to effect the movement of the ring 7 in either direction.

It is obvious that if the shaft 1 be rotated in the opposite direction to that above described the valve of the engine and also the rudder will be moved in the opposite direction.

The mechanism herein described presents the important advantage of preventing breakage of any of the valve connections should the lever 12 bring up against either of the stops 35, or should the valve of the engine stick on its seat or reach the end of its stroke while the shaft 1 is revolving, as in such case the ring 7 will cease its lateral movement, the sleeve or nut 4, however, continuing to slide laterally until the springs 9 on one side or the other of said ring, as the case may be, are compressed. Said springs will thus prevent breakage of any of the valve connections. This construction also provides for the steering-wheel being put hard over to either side when the rudder has been put hard over by the engine, should the engine in thus acting have moved the rudder in advance of the hand steering-wheel; or should the action of the hand-wheel hold the valve open after the rudder gets hard over and before the hand-wheel has turned its full number of turns to either side the hand-wheel can still be revolved until it completes its full number of turns by compressing the springs. In this case the hand-wheel can be reversed from "hard-over," in unison with a hard-over helm, to "amidships" or any other reverse point desired.

In Fig. 8 a modification of my invention is shown in which the screw-threads on the shaft 1 and also the hollow sleeve or nut 4 are dispensed with. The shaft 1 is shown in said figure as a plain rod, to which are keyed the fixed collars 8. Connected to said shaft or rod is one end of a lever 36, Fig. 8, fulcrumed at the point 37. This lever may be operated by hand, or it may be connected to a rod leading from a telemotor or other actuating device, so as to impart reciprocating motion to the shaft 1. A floating lever 31 has one end connected to the ring 7, its other end being connected to the piston-rod 19<sup>a</sup> of the cylinder 19. The valve-rod 28 is connected to the lever 31 at the point 32, two stops 35 being provided to limit the movement of said lever. If the operating-lever 36 be moved so as to impart reciprocating motion to the shaft 1 in the direction of the arrow *f*, the lever 31 will effect the movement

of the valve-stem in the same direction and open the valve to admit steam into the cylinder 19<sup>a</sup>. The piston-rod 19 will thus be forced in the direction of the arrow *g*, carrying with it the lever 31 and valve-stem 28, and thereby closing the valve. If in opening the valve the lever 31 should bring up against one of the stops 35 and the shaft 1 be still kept in motion by the lever 36, one set of springs 9 will compress and hold the valve open until the engine has moved the required distance to close the valve. For example, with the parts moving in the direction of the arrows, Fig. 8, the continued movement of the lever 36 after the lever 31 has impinged against the stop 35 will result in compressing the springs 9 at the right-hand side, thus preventing breakage of any of the parts.

It is obvious that the lever 36 may be substituted for the wheel 30, (shown in Fig. 6,) in which case the movement of said lever will impart reciprocating motion to both the shaft 1 and the sleeve 4, and thus effect the opening of the valve, the closing of the valve being effected by the revolution of the pinion 24, which will, as hereinbefore described, cause the sleeve 4 to rotate on the screw-threaded shaft 1 and move backward, thus closing the valve of the engine.

The groove shown on the sleeve 4 and collars 11 may be omitted, in which event the spring-rods 10 may be provided with collars 25, Fig. 1, to prevent twisting of the springs 9.

I do not confine myself to the use of the valve-operating mechanism herein described, in conjunction with a steering-engine, as said mechanism may be used on engines employed for other purposes, and in particular where the motion for the work required is of an intermittent character. If it be used in conjunction with a steering-engine, such engine may be of any desired construction, operated by any motive power.

Having thus fully described my invention, I claim—

1. In a valve-operating mechanism, the combination of a reciprocating rod; a ring or annular casting loosely mounted on said rod so as to slide thereon, and connected with the valve; and a spring or springs on both sides of said ring.

2. In a valve-operating mechanism, the combination of a reciprocating rod; a ring loosely mounted on said rod so as to slide thereon and connected with the valve; fixed and movable collars; and a spring or springs between said collars on both sides of said ring.

3. In a valve-operating mechanism, the combination of a reciprocating rod; a ring adapted to slide thereon, and to be connected with the valve; a spring or springs on both sides of said ring; a pinion secured to said rod; and a gear-wheel secured to a shaft and meshing with said pinion.

4. In a valve-operating mechanism, the



combination of a reciprocating rod; a ring adapted to slide thereon and to be connected with the valve; fixed and movable collars; a spring or springs on both sides of said ring; a pinion secured to said rod; and a gear-wheel secured to a shaft and meshing with said pinion.

5. In a valve-operating mechanism, the combination of a reciprocating rod; a ring adapted to slide thereon and to be connected with the valve; a spring or springs on both sides of said ring; a lever connected to said ring; a rod connected to said lever; and a double-armed lever having one arm connected to said rod and its other end to a valve or valve-rod.

6. In a valve-operating mechanism, the combination of a reciprocating rod; a ring adapted to slide thereon and to be connected with the valve; a spring or springs on both sides of said ring; a pinion secured to said rod; a gear-wheel secured to a shaft and meshing with said pinion; a lever connected to said ring; a rod connected to said lever; and a double-armed lever having one end connected to said rod and its other end to a valve or valve-rod.

7. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft; and a ring or annular casting adapted to slide on said sleeve and to be connected with the valve.

8. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft and provided with a grooved surface; and a ring adapted to slide on said sleeve and to be connected with the valve.

9. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft; a ring adapted to slide on said sleeve and to be connected with the valve; and springs on both sides of said ring.

10. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft; a ring adapted to slide on said sleeve and to be connected with the valve; fixed and movable collars; and springs between said collars on both sides of said ring.

11. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft and provided with a grooved surface; a ring adapted to slide on said sleeve and to be connected with the valve; and two half-rings between said ring and said sleeve.

12. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft and provided with a grooved surface; a ring adapted to slide on said sleeve and to be connected with the valve; a spring or springs on both

sides of said ring; and two half-rings between said ring and said sleeve.

13. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft and provided with a grooved surface; a ring adapted to slide on said sleeve and to be connected with the valve; fixed collars secured to said sleeve; movable collars provided with grooved surfaces; and springs between said collars on both sides of said ring.

14. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft; a ring adapted to slide on said sleeve and to be connected with the valve; a pinion secured to said sleeve; and a gear-wheel secured to a shaft and meshing with said pinion.

15. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft and provided with a grooved surface; a ring adapted to slide on said sleeve and to be connected with the valve; a pinion secured to said sleeve; and a gear-wheel secured to a shaft and meshing with said pinion.

16. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft; a ring or annular casting adapted to slide on said sleeve and to be connected with the valve; springs on both sides of said annular casting; a pinion secured to said sleeve; and a gear-wheel secured to a shaft and meshing with said pinion.

17. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft; a ring adapted to slide on said sleeve and to be connected with the valve; fixed and movable collars; springs between said collars on both sides of said rings; a pinion secured to said sleeve; and a gear-wheel secured to a shaft and meshing with said pinion.

18. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft and provided with a grooved surface; a ring adapted to slide on said sleeve and to be connected with the valve; fixed collars secured to said sleeve; movable collars provided with grooved surfaces; springs between said collars on both sides of said ring; a pinion secured to said sleeve; and a gear-wheel secured to a shaft and meshing with said pinion.

19. In a valve-operating mechanism, the combination of a rotary screw-threaded shaft; a sleeve or nut surrounding said shaft; a ring adapted to slide on said sleeve and to be connected with the valve; springs on both sides of said ring; a lever connected to said ring; a rod connected to said lever; and a double-armed lever having one arm connected to said rod and its other arm to a valve or valve-rod.

20. In a valve-operating mechanism, the

combination of a rotary screw-threaded shaft;  
a sleeve or nut surrounding said shaft; a ring  
adapted to slide on said sleeve and to be con-  
nected with the valve; springs on both sides  
5 of said ring; a pinion secured to said sleeve;  
a gear-wheel secured to a shaft and meshing  
with said pinion; a lever connected to said  
ring; a rod connected to said lever; and a

double-armed lever having one arm connected  
to said rod and its other arm to a valve or 10  
valve-rod.

JOHN D. WILLIAMSON, JR.

Witnesses:

C. WESLEY RUFFELL,  
WILLIAM D. CLOUDS.