

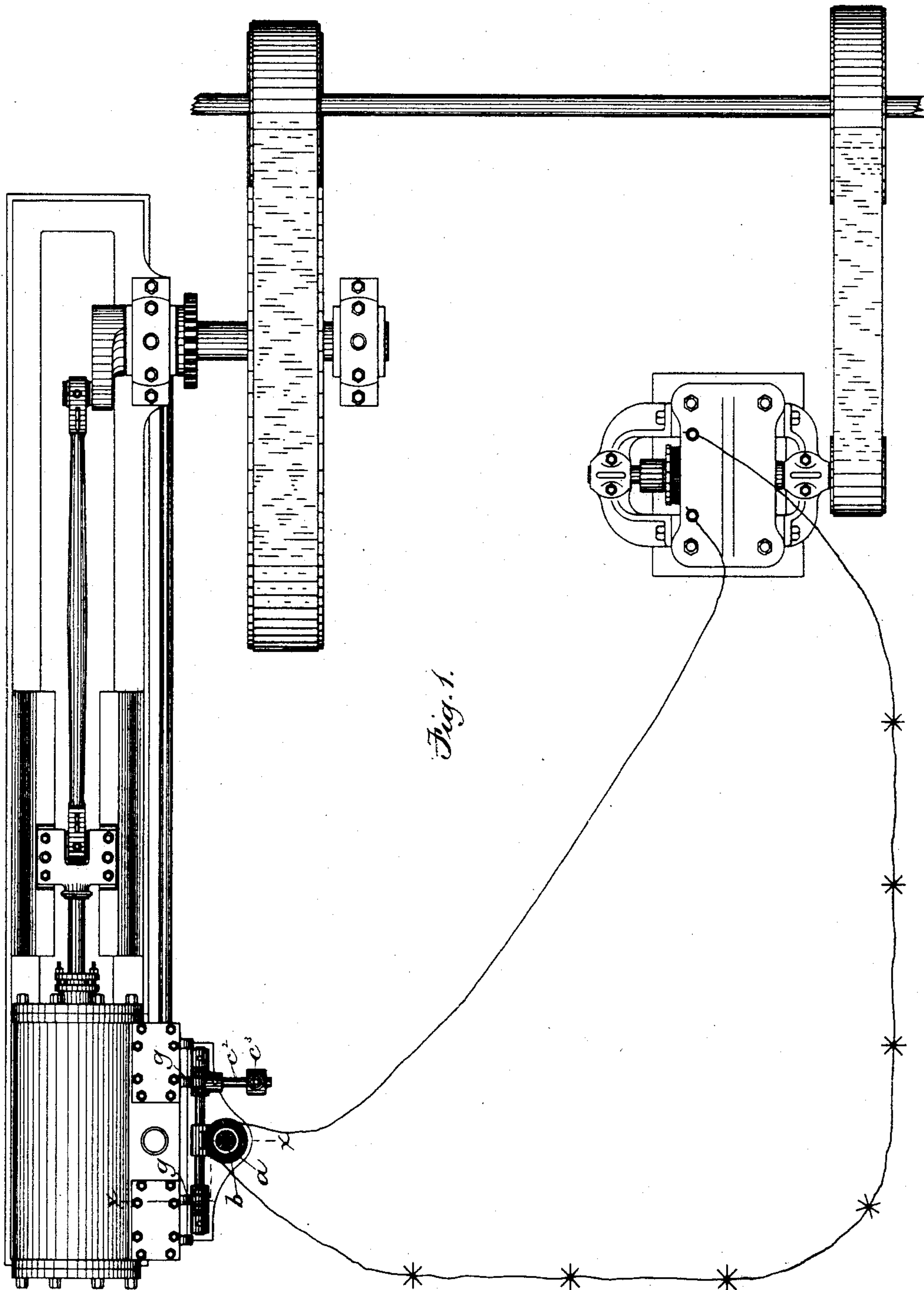
(No Model.)

E. B. PARKHURST.  
ELECTRIC GOVERNOR.

4 Sheets—Sheet 1.

No. 286,841.

Patented Oct. 16, 1883.



Witnesses.

A. L. White  
W. Rogers

Inventor:  
E. B. Parkhurst  
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Att'y.

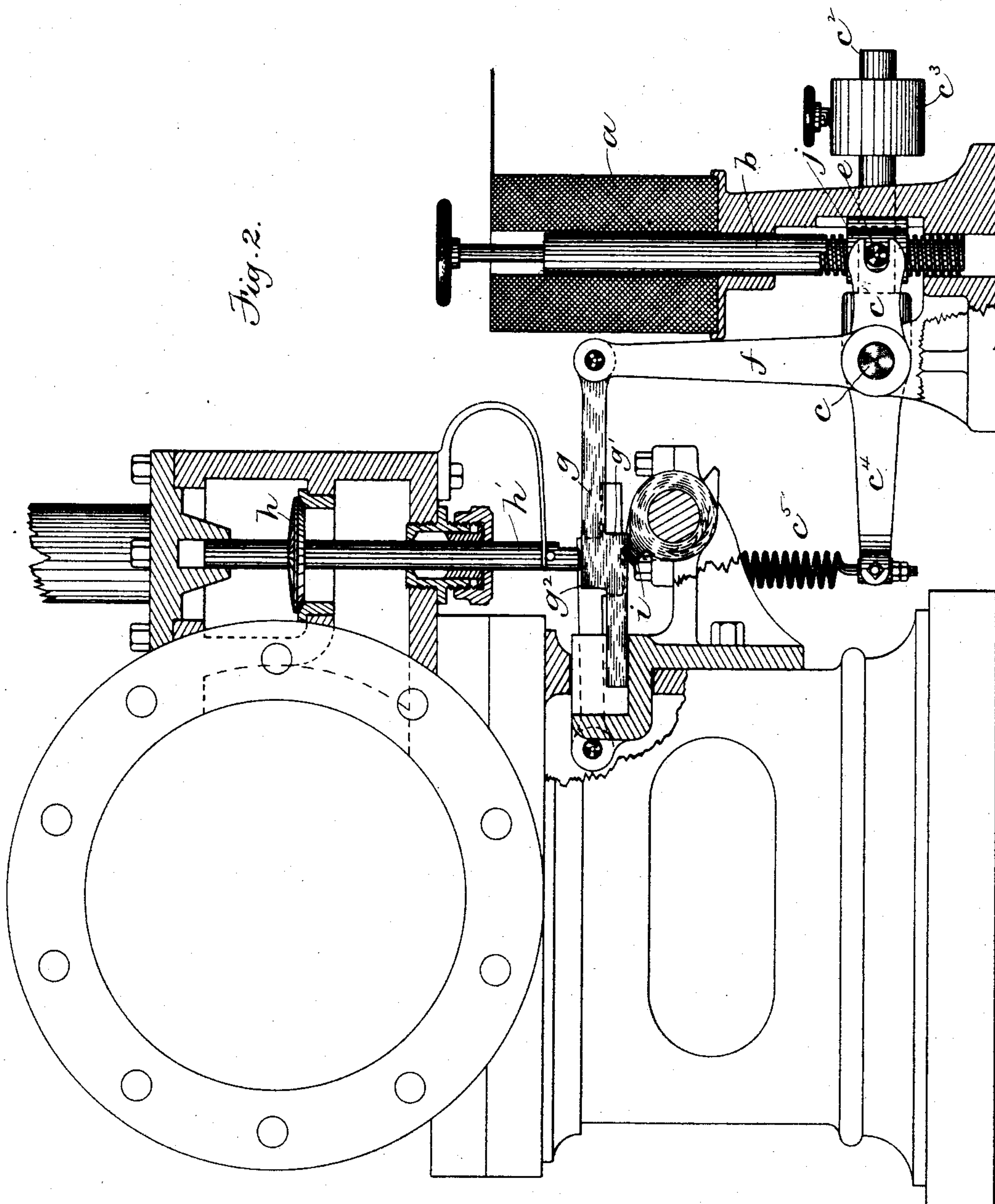
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E. B. PARKHURST.  
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(No Model.)

E. B. PARKHURST.

4 Sheets—Sheet 3.

ELECTRIC GOVERNOR.

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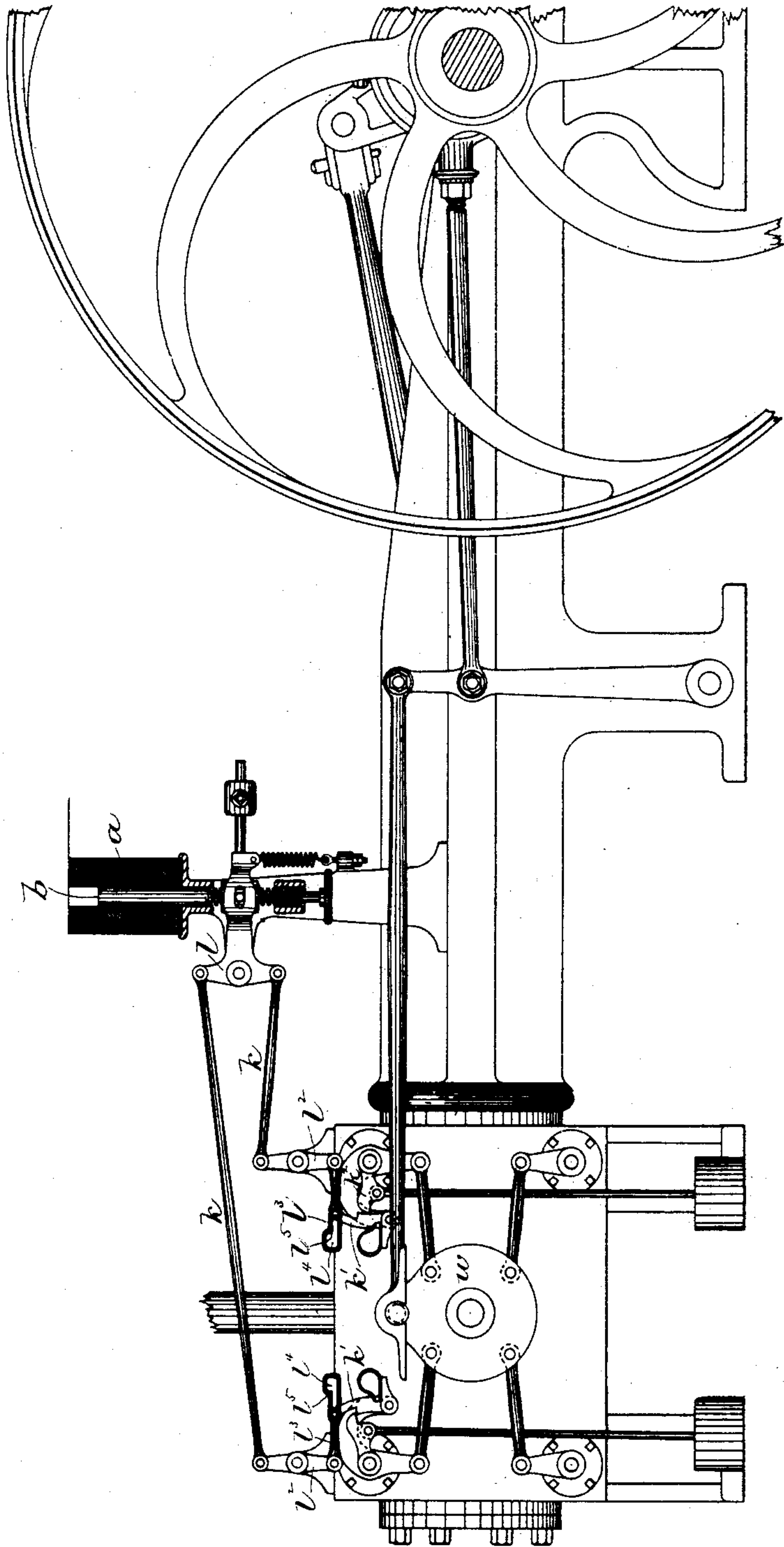


Fig. 3.

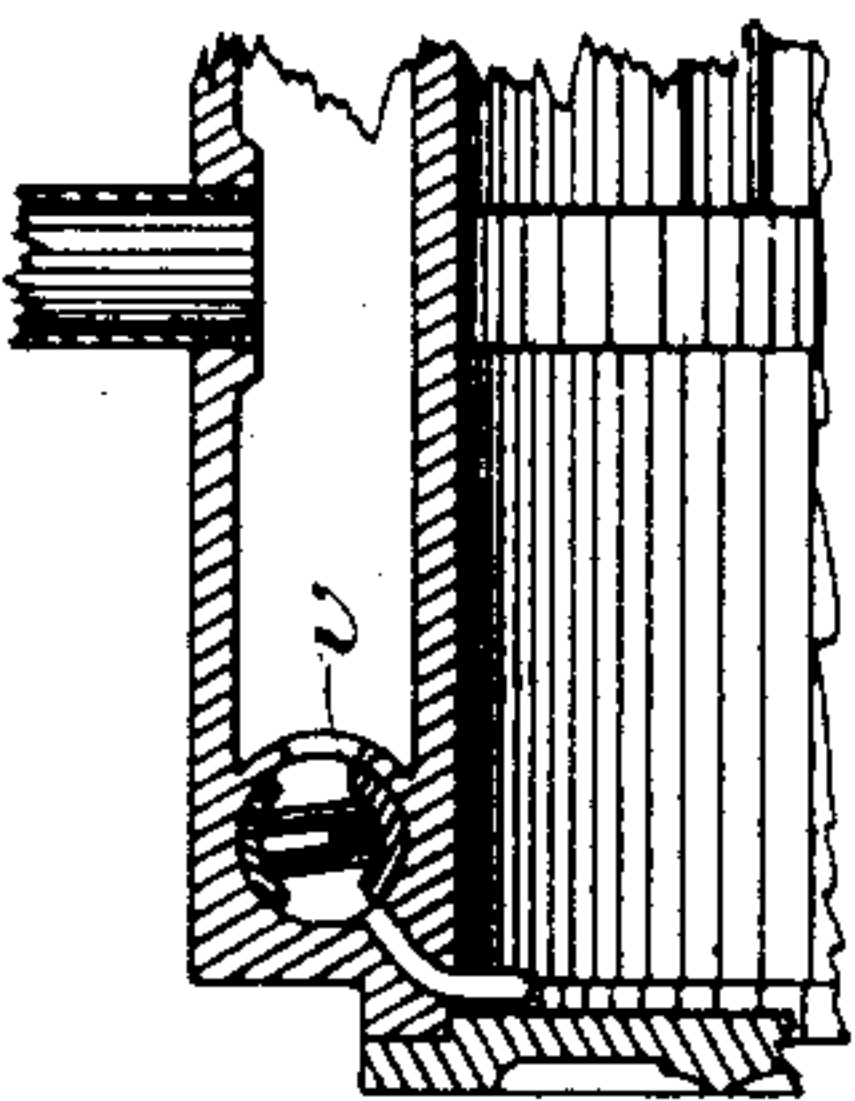


Fig. 4.

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(No Model.)

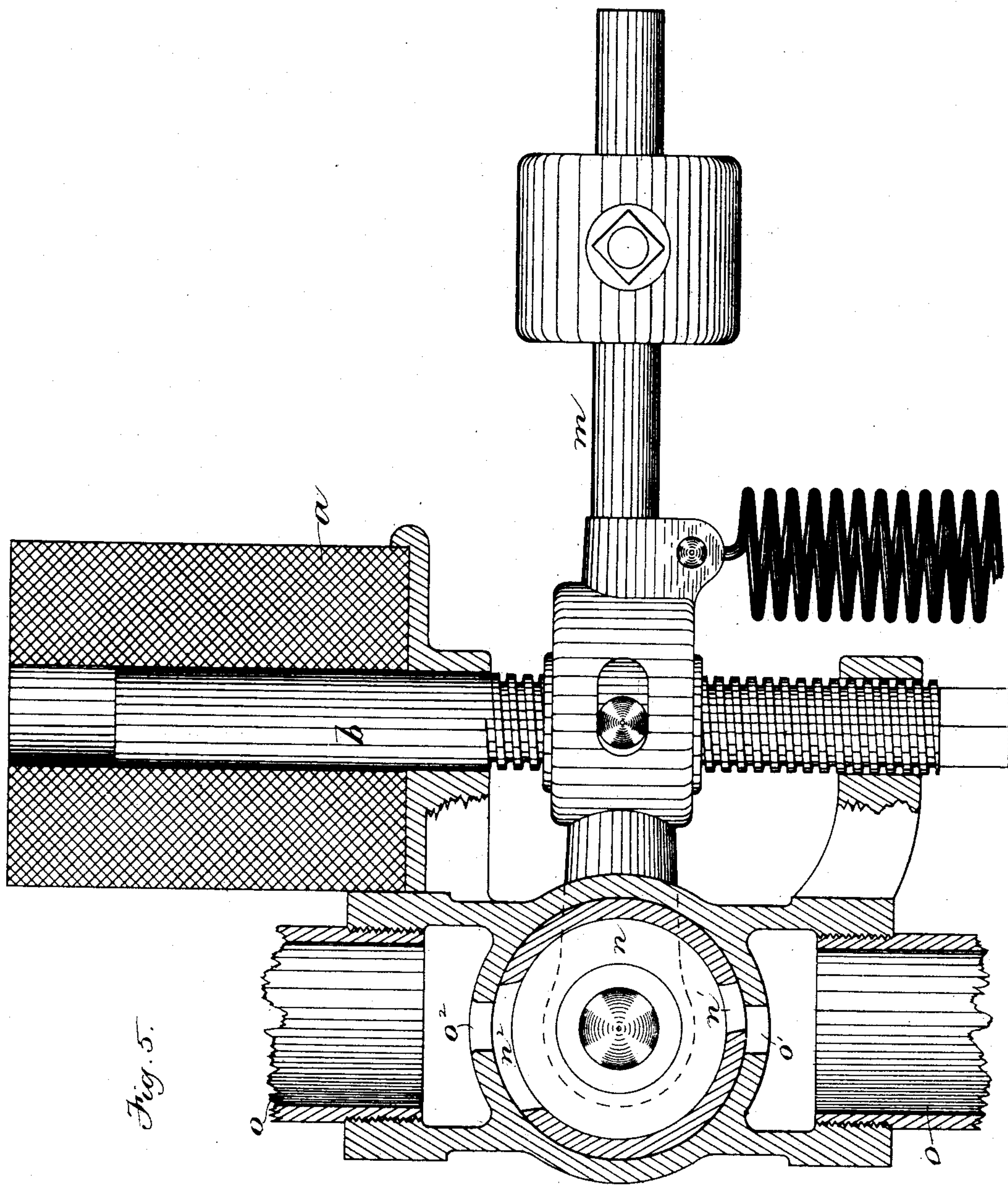
E. B. PARKHURST.

4 Sheets—Sheet 4.

ELECTRIC GOVERNOR.

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# UNITED STATES PATENT OFFICE.

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L. PARCELLE, OF BOSTON, MASSACHUSETTS.

## ELECTRIC GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 286,841, dated October 16, 1888.

Application filed May 29, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD B. PARKHURST, of Woburn, in the county of Middlesex and State of Massachusetts, have invented certain  
5 Improvements in Electric Governors, of which the following is a specification.

This invention has for its object to provide an improved governor adapted to be operated by the variations of the strength of an electric  
10 current generated by a dynamo-electric machine, and to regulate the admission of steam to the engine which impels said electric machine or generator.

The invention is intended, principally, for  
15 use in connection with engines which operate dynamo-electric machines for electric lighting; and it consists, as a whole, in the combination of a steam-engine, a dynamo-electric machine or generator operated by said engine, a solenoid  
20 or equivalent device in an electric circuit which includes the generator, and a movable part the position of which varies with the strength of the current, and intermediate mechanism connecting said movable part with the valve  
25 or valves governing the supply of steam to the cylinder of the engine, whereby the admission of steam is governed by the strength of the current.

The invention consists, also, in certain details  
30 of construction and combination of parts, all of which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a plan view of one form of a steam-engine hav-  
35 ing my improved governor. Fig. 2 represents an enlarged section on line *x x*, Fig. 1. Fig. 3 represents a side elevation of another form of engine to which my improved governor is applicable. Fig. 4 represents a longitudinal  
40 section of a portion of the steam chest and cylinder shown in Fig. 3. Fig. 5 represents a sectional view of the governor applied to a governor-valve.

The same letters of reference indicate the  
45 same parts in all the figures.

My improved governor is composed of a solenoid or other equivalent electrical device having a fixed helix, *a*, connected in an elec-  
50 trical circuit with a dynamo-electric machine or generator, and a movable core or plunger, *b*, adapted to be raised in the coil *a* by an in-

crease in the strength of the current, and depressed as the current weakens. An electro-magnet and its armature may be adapted for use in connection with devices, substantially  
55 as hereinafter described, as an equivalent for the solenoid, the armature of the magnet taking the place of the plunger *b*.

To enable the variations in the vertical position of the core *b* to act on the valves of the  
60 engine, I provide suitable intermediate mechanism positively connecting said core or plunger with the valves. The details of said mechanism will of course vary in different engines. In the form shown in Figs. 1 and 2, in which  
65 the governor is shown in connection with an engine having puppet-valves, I employ as the connecting mechanism a rock-shaft, *c*, journaled in fixed bearings, and provided with an arm, *c'*, engaged with lugs *e* on a collar, *j*, secured to  
70 the core *b*, and two upwardly-projecting arms, *f*, to which are pivoted shouldered slides *g*, one for each of the induction-valves *h*. These slides are interposed between the stems *h'* of said valves and the rotating cams *i*, which intermit-  
75 tently raise said stems, and are provided with shoulders *g'*, which offset the lower edges of said slides, making said edges lower between the shoulders *g'* and the outer ends of the slides  
80 than between said shoulders and the pivoted ends. The cams *i*, in rotating in the direction indicated by the arrow in Fig. 2, bear against the slides *g* and tilt said slides upwardly against the valve-stems *h'*, thereby lifting the valves *h*  
85 and holding them until the cams *i* pass off from the offset portions of the slides *g* at the shoulders *g'*, when the slides are released and fall with the valves to the position shown in Fig. 2.

It will be observed that the longitudinal position of the slides *g* varies with the vertical  
90 position of the core *b*. When said core rises, the slides *g* are moved so as to bring the shoulders *g'* nearer the point where the cams first act on said slides, and thus reduce the length of the offset portions of the slides on which the  
95 cams act. The period during which the cams raise the slides and valves is thus decreased, and the quantity of steam admitted to the cylinder is diminished. On the other hand, when the core *b* is depressed, the slides are moved in  
100 the opposite direction, more of the offset portions of the slides are presented to the cams,



and the valves remain open longer. The slides *g* have their upper edges cut away at their outer ends to form shoulders *g*<sup>2</sup>. When the core *b* of the solenoid drops to the lowest position it can assume in consequence of the breakage of the current, the shoulders *g*<sup>2</sup> pass from under the valve-stems, leaving the narrower portions of the slides between the cams *i* and valve-stems *h*'. These narrow portions are not wide enough to impart movement from the cams *i* to the valve-stems; hence the slides are vibrated by the cams without operating the valves *h*, and the engine is deprived of steam.

The rock-shaft *c* may be provided with an arm, *c*<sup>2</sup>, having an adjustable weight, *c*<sup>3</sup>, to adjust the resistance of said lever to the core of the solenoid. The rock-shaft may also have an arm, *c*<sup>4</sup>, connected by a spring, *c*<sup>5</sup>, with a fixed object, for the same purpose as the weight *c*<sup>3</sup>. The collar *j* is preferably a nut screwed upon a threaded portion of the core *b*, said core being thus rendered vertically adjustable to adapt the core to the strength of the current.

Fig. 3 shows a portion of a Corliss engine having four steam-valves oscillated by a connection with a wrist-plate journaled on a shaft at the side of the cylinder, and vibrated by a lever and connecting-rods operated by the movement of the fly-wheel eccentric. The valves are arranged so as to be cut off at any required part of the stroke by rods *k k*, which cause the connection between the wrist-plate and the valve-stems to be completed and released when the rods are brought into action by or freed from the action of the governor, which merely performs the function of connecting and disconnecting the levers which work the valves without exerting any force in opening and closing them. In this case the core *b* of the solenoid is engaged with one arm of a three-armed lever, *l*, and the rods *k k* are pivoted to the other two arms of said lever. The lever is oscillated by the upward and downward movements of the core *b*, and its oscillating movements are imparted to the valves, which are operated in the same manner as by the ball-governor ordinarily used with this form of engine. The rods *k k* are connected to pivoted levers *l*<sup>2</sup>, to which are pivoted rods *l*<sup>3</sup>, having slots *l*<sup>4</sup>, receiving studs on the usual oscillating dogs, *k' k'*, which engage with the dogs *k*<sup>2</sup>, attached to the valve-stems, and operate the valves in the usual manner. These parts have the usual form, with the exception of the slots *l*<sup>4</sup>, which are widened at the outer ends of the rods in which they are made, so as to form shoulders *l*<sup>5</sup>, which are intended for use only as a means for stopping the engine in case of accident, such as the breakage of the electric circuit. In such case the core *b* falls so far that the shoulders *l*<sup>5</sup> engage with the studs on the dogs *k*, and displace and hold said dogs so that they will not engage with and operate the dogs *k*<sup>2</sup> and the valves *v*. Each

valve therefore is closed by the usual spring or dash-pot connection, and the engine is stopped.

Fig. 5 shows the core *b* engaged with a lever, *m*, which is attached directly to an oscillating governor-valve, *n*, in a steam-pipe, *o o*, said valve having ports *n' n*<sup>2</sup> registering with ports *o' o*<sup>2</sup> in the valve-casing. This form of valve and governor is applicable to a slide-valve engine.

It will be seen that in any of the forms shown the core or movable part *b* is connected with the steam-valves, so as to operate them positively and certainly.

The invention is, as before stated, particularly adapted for use in connection with engines for electric lighting. It is obvious, however, that the invention is not limited to the use described, but may be applied to engines for other purposes, a small dynamo-machine or other electric generator being employed to furnish a sufficient current to actuate the core *b*.

I claim—

1. In combination, an engine, a dynamo, or other electrical generator operated by said engine, a solenoid in the electrical circuit which includes the generator, a core which varies in position with the strength of the current, and adjustable mechanism, substantially as described, which connects said core to a lever which controls the valve of the engine, all substantially as described.

2. The combination, with an engine having a series of puppet-valves and rotating cams operating said valves, of shouldered slides interposed between said cams and the stems of the valves, a dynamo-electric machine or generator operated by said engine, a solenoid connected in the circuit with said generator, and a connection between the core of the solenoid and the said shouldered slides, whereby the latter are adjusted by the movements of the former and caused to regulate the admission of steam, as set forth.

3. In an electric governor, a solenoid having on its core or movable portion a screw-threaded surface, combined with a nut engaged with said threaded surface, and a pivoted lever engaged with said nut and connected with the cut-off mechanism of an engine, as set forth.

4. In an electric governor, the combination of a solenoid, a nut on the core thereof, an arm connected with said nut and with the valve of the engine, substantially as described, and an adjustable counter-balance, all substantially as stated.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses, this 24th day of May, 1883.

EDWARD B. PARKHURST.

Witnesses:

A. L. PARCELLE,  
C. F. BROWN.