

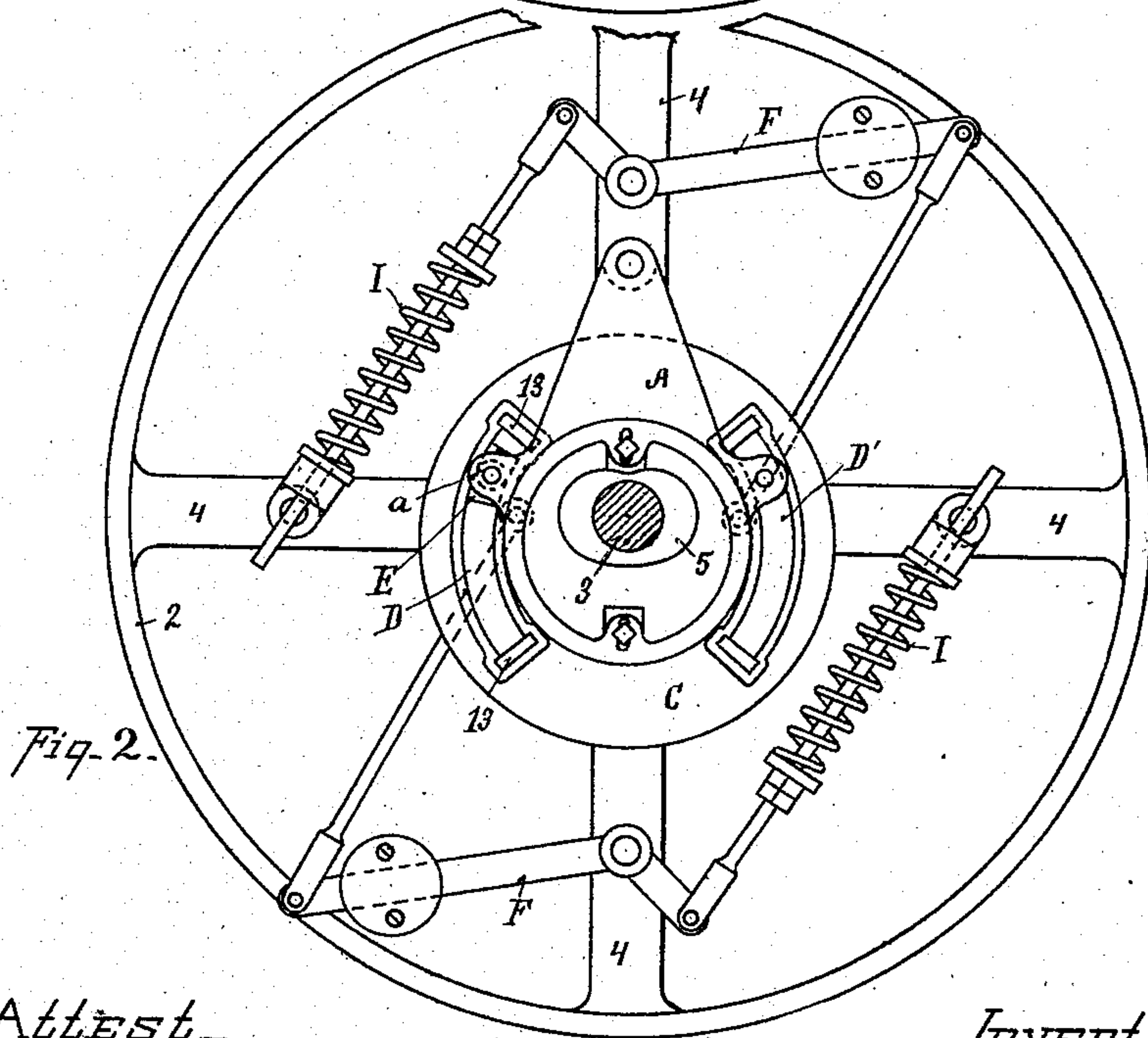
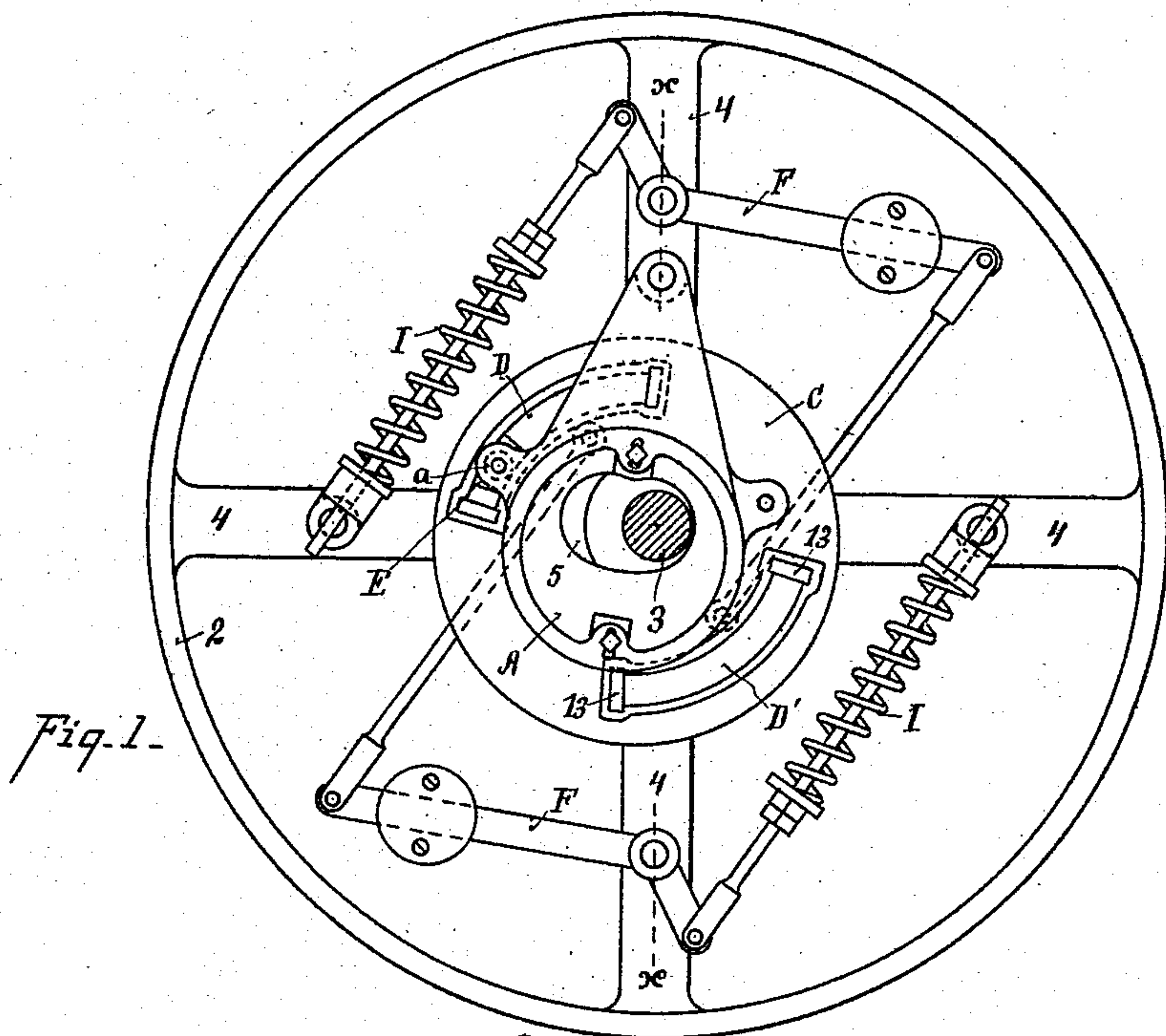
(No Model.)

3 Sheets—Sheet 1.

E. W. HARDEN.  
GOVERNOR.

No. 486,404.

Patented Nov. 15, 1892.



Attest—  
C. W. Miles—  
Secy. Ashton—

Inventor—  
Edward W. Harden—  
By Wood & Boyd, Attys. at

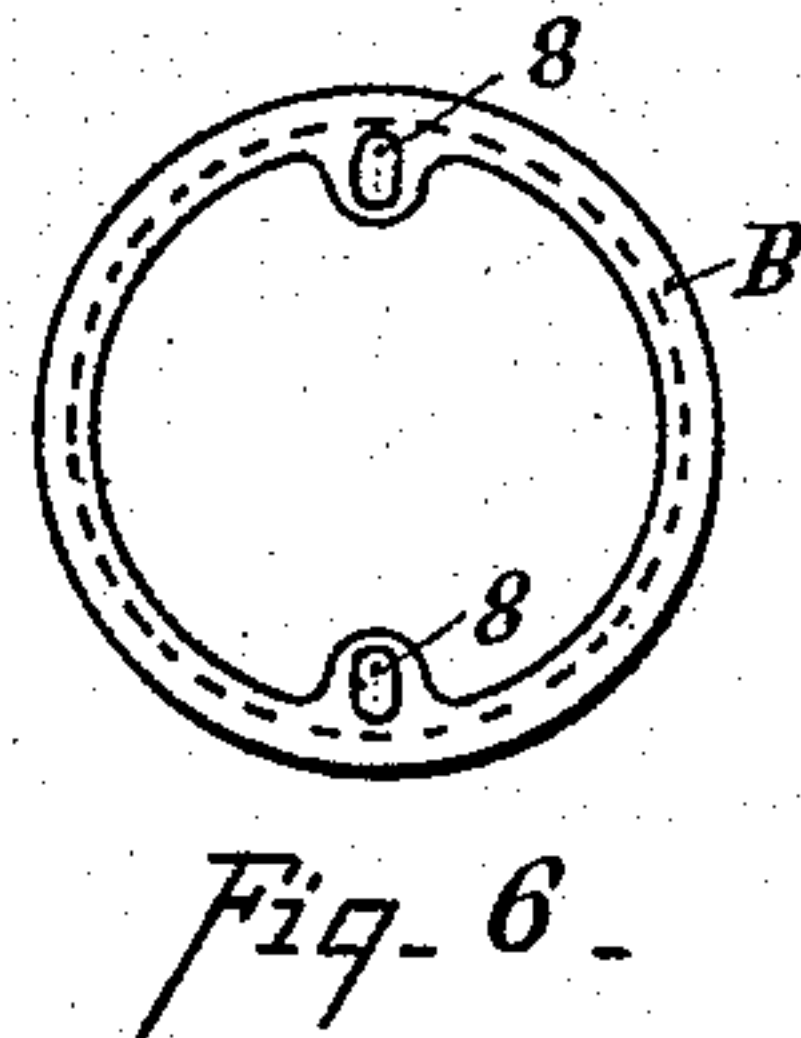
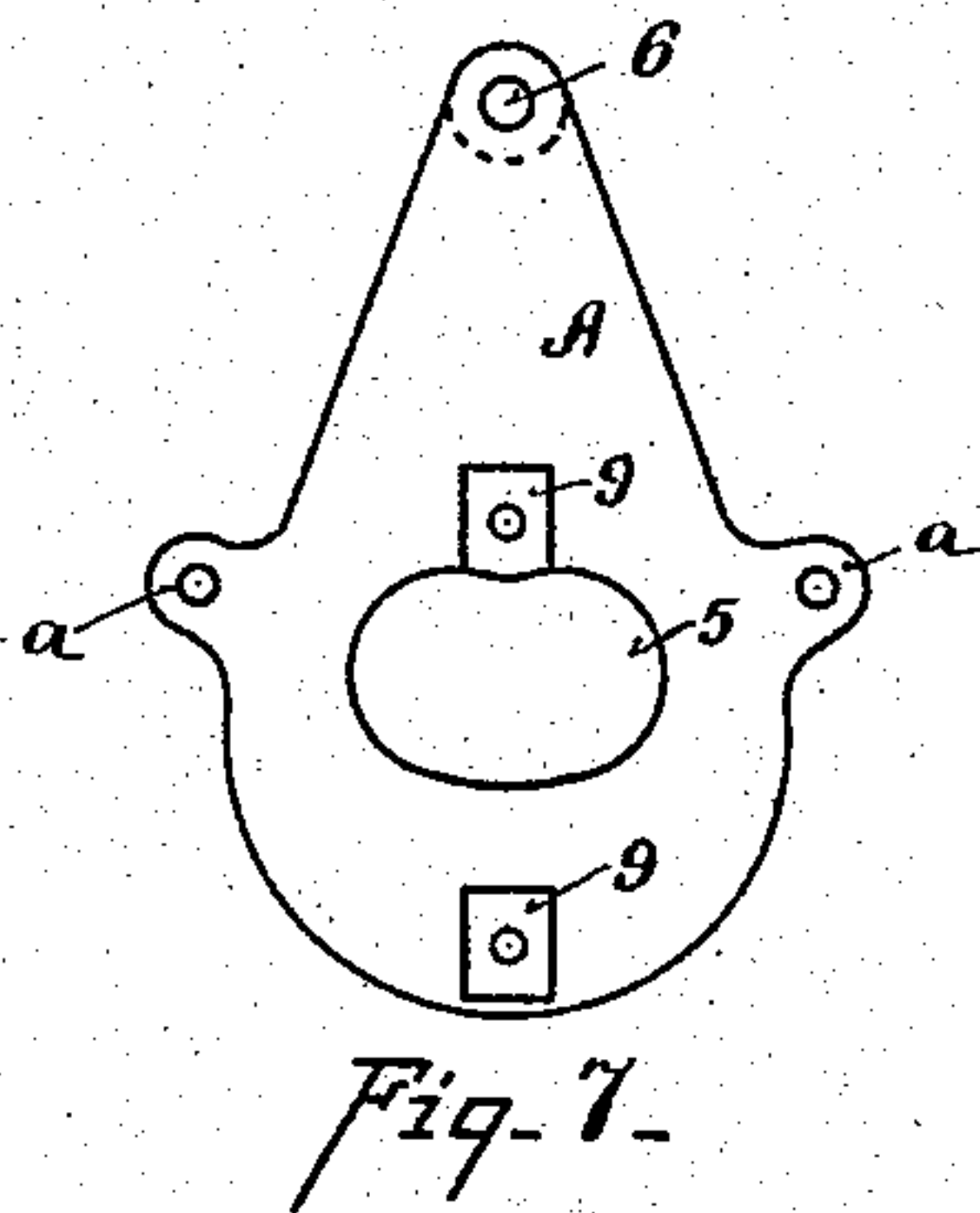
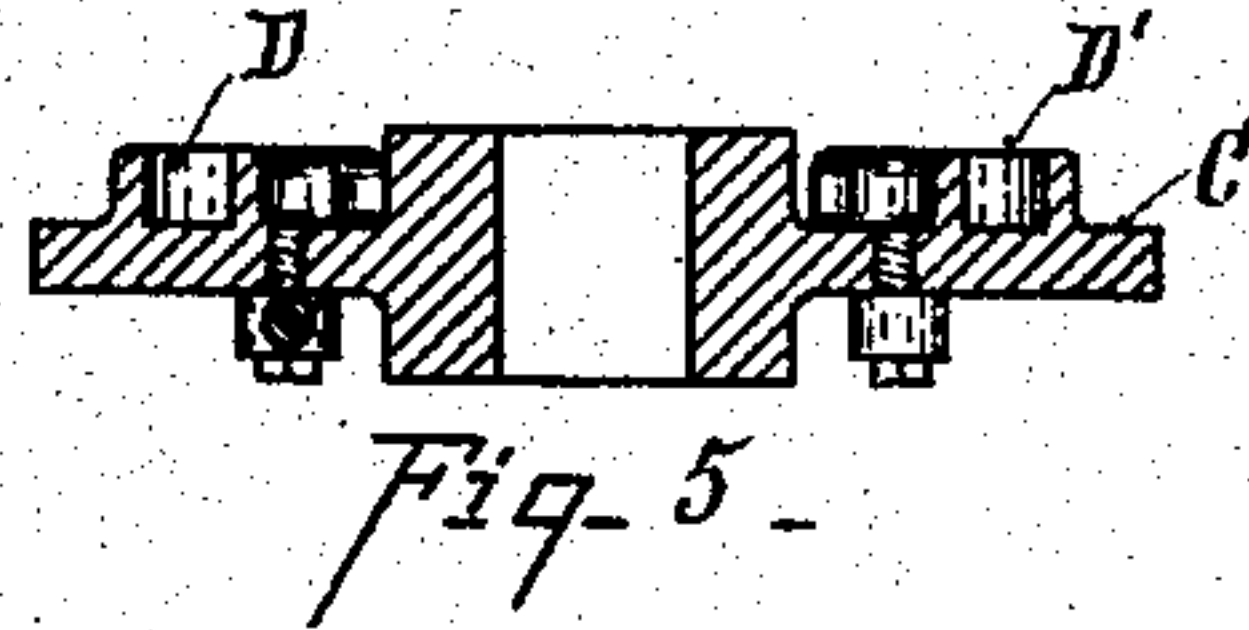
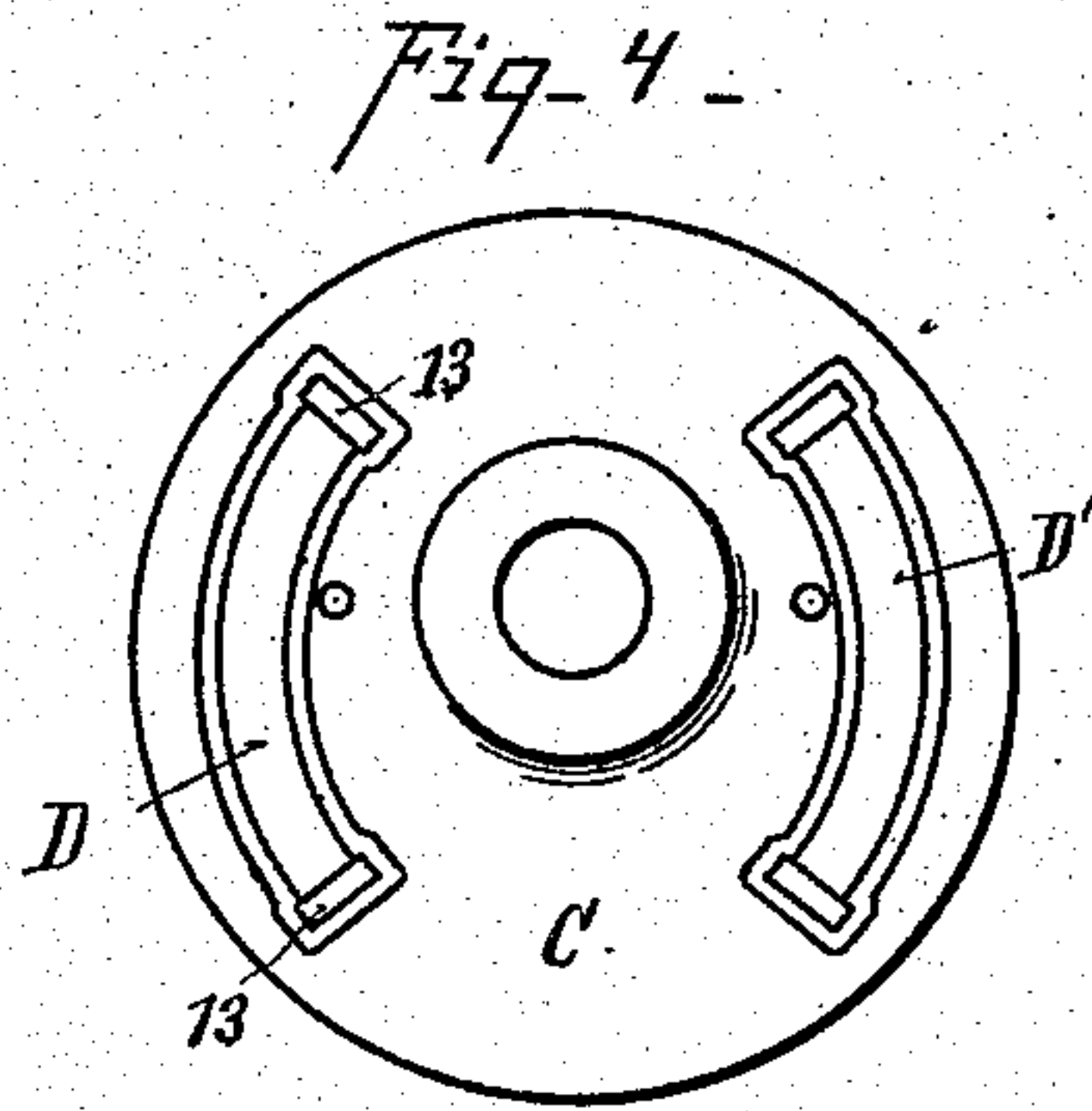
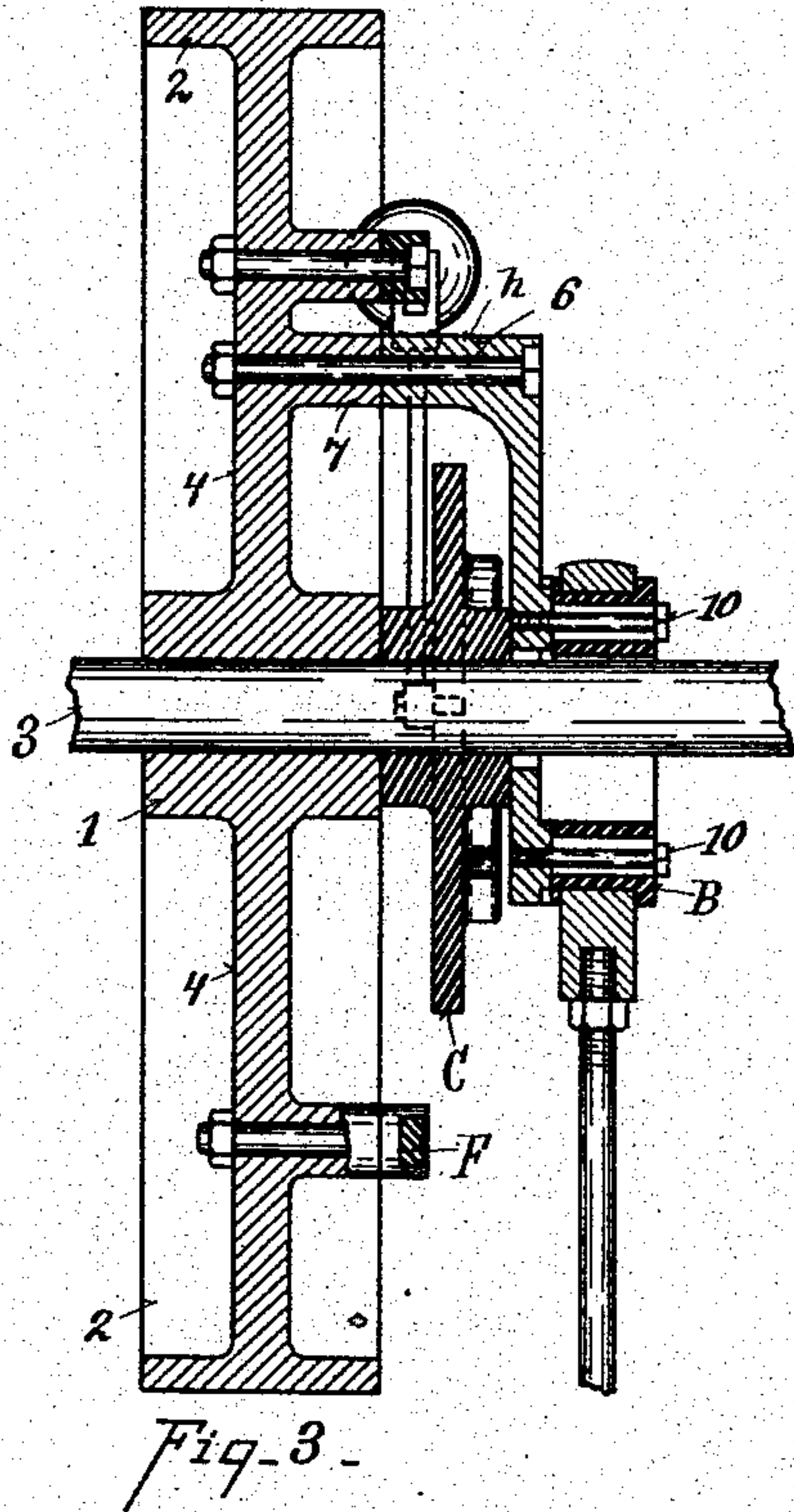
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3 Sheets—Sheet 2.

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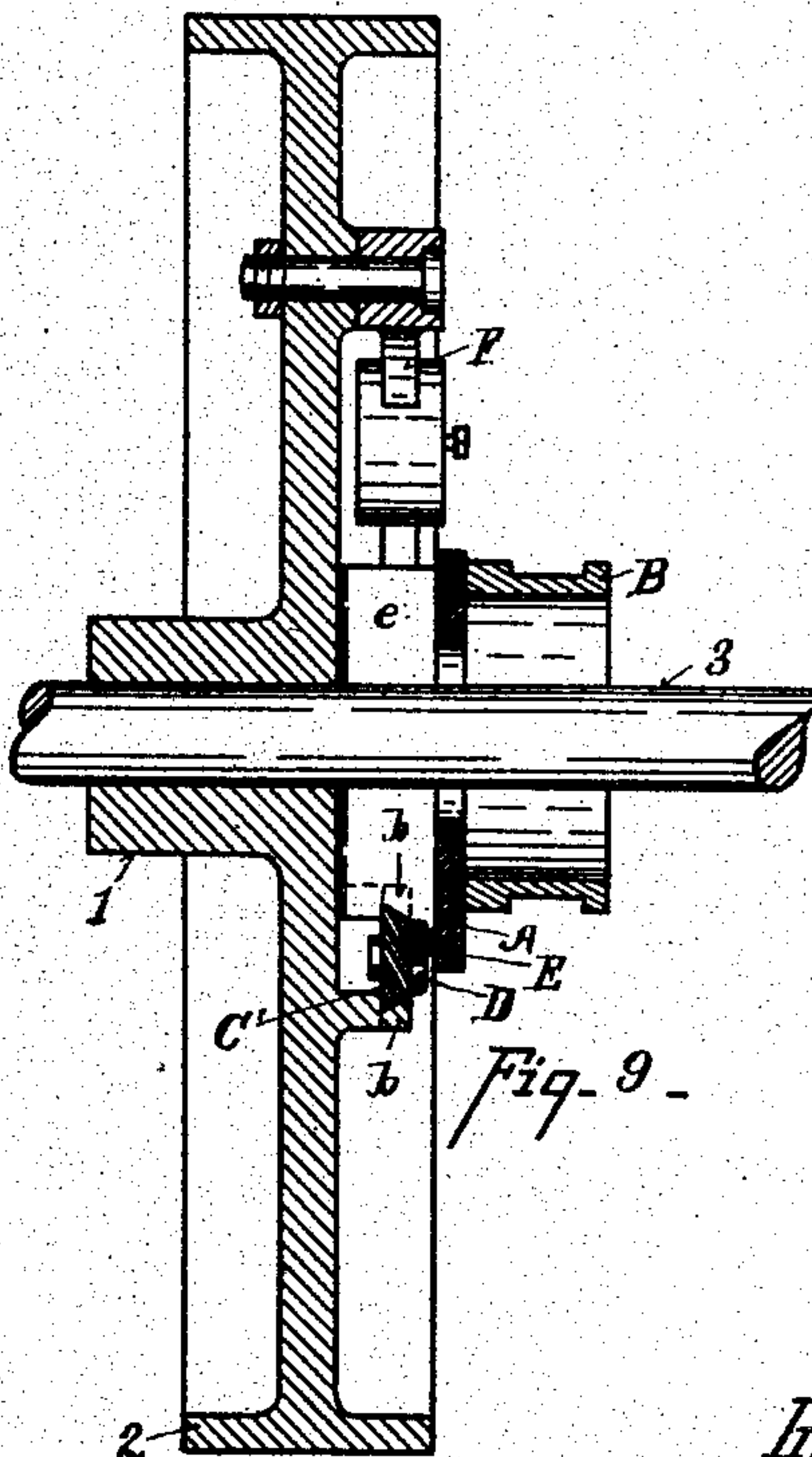
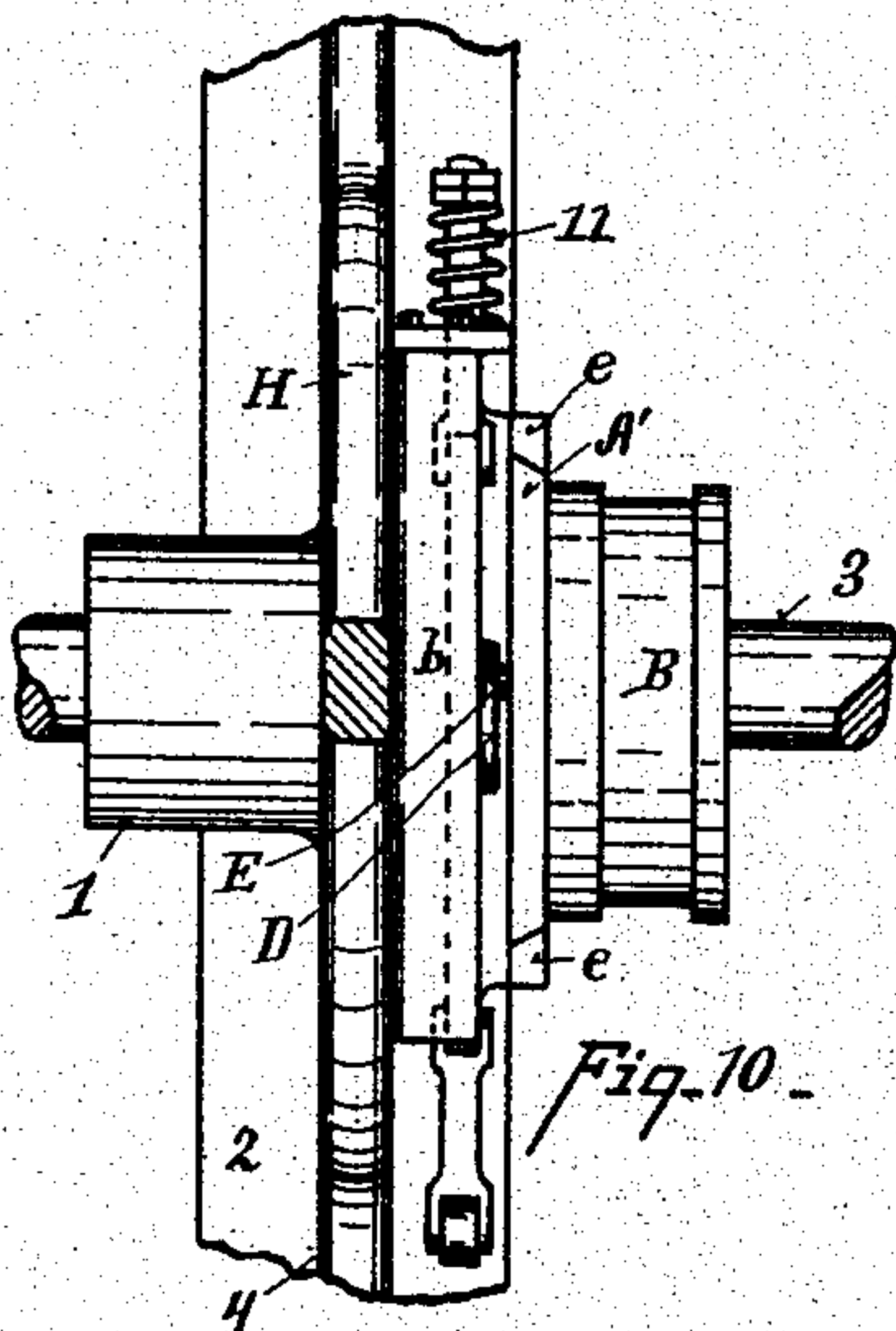
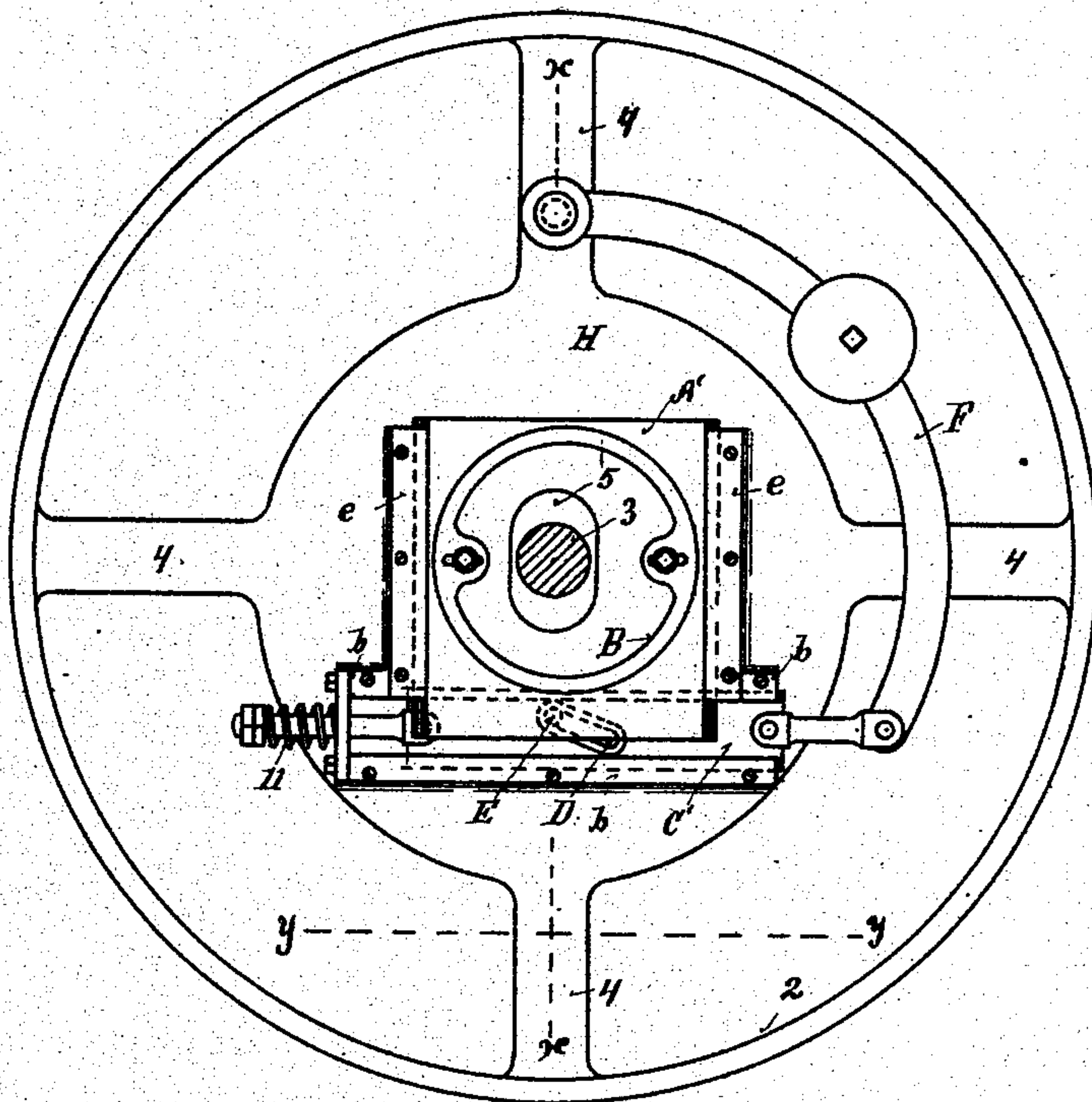
3 Sheets—Sheet 3.

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Fig-8.



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# UNITED STATES PATENT OFFICE.

EDWARD W. HARDEN, OF CINCINNATI, OHIO, ASSIGNOR TO FREDERIC C. WEIR, OF SAME PLACE.

## GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 486,404, dated November 15, 1892.

Application filed March 7, 1892. Serial No. 424,048. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD W. HARDEN, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Shaft-Governors, of which the following is a specification.

My invention relates to that class known as "shaft-governors."

The object of my invention is to provide a positive means for regulating the throw of the valve and consequently the speed of the engine, which will readily move under slight variations of load and yet positively stop at the desired speed, avoiding oscillations or tremor movement common to ordinary shaft-governors in changing under varying speed. This is accomplished by means of the traveling plate carrying a pin or slide engaging with the cam or eccentric guide for shifting the eccentric, which travels normally in right lines to the movement of the shifting-plate, thereby locking the rapidly-moving eccentric against the strain of the valve-rod.

The various features of my invention are fully set forth in the description of the accompanying drawings, making a part of this specification, in which—

Figure 1 is a plan view of the governor, showing the position of the parts on approximately-full stroke. Fig. 2 is a similar view showing the position of the parts at the short or reduced stroke. Fig. 3 is a section on line *x x*, Fig. 1. Fig. 4 is a plan view of the oscillating disk. Fig. 5 is a cross-section of the same. Fig. 6 is a plan view of the eccentric-ring; Fig. 7, a plan view of the pendulum. Fig. 8 is a modification of Fig. 1. Fig. 9 is a vertical section on line *x x*, Fig. 8; Fig. 10, a sectional elevation on line *y y*, Fig. 8.

1 represents the hub of the governor-wheel; 2, the rim thereof; 3, the main shaft of the engine.

4 represents arms connecting the hub and rim together.

A represents the eccentric-ring support, preferably a pendulous lever, provided with an oblong opening 5, through which passes the main shaft 3.

6 represents the center on which said pendulum is hung, and it is secured to the boss 7

of one of the arms by the axial bolt passing through lug *h* and boss 7.

B represents the eccentric-ring. It is grooved around its periphery, in which groove the eccentric-strap is journaled. It is provided with slotted openings 8.

9 represents bosses on the pendulum A, upon which the eccentric rests, and is secured by means of bolts 10, passing through the oblong opening of the eccentric and tapping into the bosses 9. This eccentric can therefore be adjusted radially upon the lever A by loosening the said bolts 10 and moving it on the bosses 9 to lengthen and shorten the valve travel by increasing or decreasing the throw of the eccentric.

C represents the eccentric-moving lever-plate. As shown in the preferred form, its movement is rotary and journaled upon the shaft 3. It is provided with a cam or eccentric guide D. When the device is to be used, say, for a right-hand governor, only one such guide is employed. If it is desired to be used either right or left, a secondary cam or guide D' is provided.

E represents a slide. It may be either of the pin or other suitable form to be held in the guide D, in which it journals. As shown in Figs. 1 and 2, its preferred form of construction is oblong, or it may be an ordinary crank-pin, as shown in Fig. 8.

*a* represents an ear to which the pendulous lever A is bolted. The opposite ear on said lever is only employed when the governor is required to run in the reverse direction.

F represents centrifugal or weighted arms counterpoised by spring I. In the preferred form of construction, two of such arms are used on opposite sides of the governor-wheel, as shown in Fig. 1; but only one arm may be employed, as shown in Fig. 8. These arms are each journaled upon a center, and one end of the arms is hinged to the eccentric-moving plate, and the other arm is connected to the spring which opposes the action of the weighted arms. When the speed of the governor-wheel is increased, the weighted arms move outwardly and compress the spring and oscillate or move the plate C, which moves the slide E forward in the slot-guide D, swinging the pendulum across the shaft and chang-



ing the position of the parts—say from that shown in Fig. 1 to that shown in Fig. 2. When the speed decreases, the spring will cause the opposite movement of said parts.

5 In the modification shown in Fig. 8 I have shown only one weighted arm F, and the moving lever-plate C' is mounted in a guideway supported upon the enlarged hub or plate H.

10 *b b* represent the guide in which the lever-plate C' moves. The eccentric-supporting plate A', instead of a pendulous lever, is supported and moves in slides *e e*. The spring 11, which counterpoises the weighted arm in this instance, is attached to the opposite ends  
15 of the lever-plate C'. These parts A' and C' are the equivalents of the parts A and C, (shown in Figs. 1 and 2,) except that they move in straight lines instead of curved. The weighted arm F and spring 11 are the equivalent  
20 of the weighted arm and springs shown in Figs. 1 and 2, but placed in a different relation to act in substantially the same manner.

It will be observed that the slide E moves a considerable distance in the guideway D to  
25 a comparatively-short movement of the lever A or plate A', owing to the slight eccentricity of the guideway. Consequently the slide and guideway form a lock or a resistance sufficient to prevent the friction of the valve  
30 movement from effecting the operation of the governor. Another advantage is obtained because of the increased leverage of the slide E, owing to the slight eccentricity of the guide, causing a positive and ready movement  
35 of all the parts by the movements of the weighted arms alone. Another advantage is due to this particular form of construction, namely: The centrifugal force of the weights  
40 is normally held in equilibrium by the resistance of the spring and any disturbance of these forces is apt to cause a vibratory movement; but by the construction of the guideway and slide moving in a slightly-eccentric plane furnishes a sufficient resistance to overcome the  
45 vibratory action due to the disturbance of these forces. I am enabled by this means to remove almost entirely the vibratory effect produced in ordinary shaft-governors by the action of the spring opposing the movement  
50 of weighted arms.

It will be observed that the movement of the lever A or plate A' is nearly at right lines to the path of the eccentric-guideway D and the slide E traveling therein. Consequently  
55 it makes it impossible for the movement of the valve to effect the governor, and yet the latter operates positively to move the plate A or A' and lengthen or shorten the valve-travel.

It will be observed that the plate C, when it is moved forward to arrest the increase of  
60 speed, travels in the same direction as the governor-wheel and ahead of its speed, which is a material advantage. In order to prevent the bumping of the slide E in case of the extreme throw, I provide elastic cushions 13 in  
65 the said guideways, against which the said slide E will strike. Under ordinary circumstances these will not be required. When the governor is to be changed, say, from the right  
70 to the left, and the slide E is detached from the guideway D and placed in the guideway D', the levers and springs are reversed and occupy opposite quadrants of the wheel.

Having described my invention, what I claim is—

1. In a shaft-governor, the combination, with a wheel and an eccentric-support having an elongated opening receiving the shaft, of a plate C, having an eccentric-guide D, a slide E, hinged to the eccentric-support and work-  
80 ing in the eccentric-guide D, an eccentric-ring B, secured to said eccentric-support, and a weighted arm connected to said eccentric-ring B and to the wheel, substantially as described. 85

2. In a shaft-governor, the combination, with a wheel and an eccentric-support having an elongated opening receiving the shaft, of a plate C, having an eccentric-guide D, a slide E, hinged to the eccentric-support and work-  
90 ing in the eccentric-guide D, an eccentric-ring B, adjustably secured to said eccentric-support, and a weighted arm connected to said eccentric-ring B and to the wheel, substantially as described. 95

3. In a shaft-governor, the combination, with a wheel and an eccentric-support having an elongated opening receiving the shaft, of a plate having an eccentric-guide D, a slide hinged to the eccentric-support and working  
100 in the guide D, and a weighted arm for operating said parts, substantially as described.

4. In a shaft-governor, the combination, with a wheel, of a laterally-moving eccentric-support mounted thereon and having an elong-  
105 gated opening receiving the shaft, an eccentric-ring radially adjustable on such support, and a weighted arm connected to said eccentric-ring and to the wheel, substantially as described. 110

In testimony whereof I have hereunto set my hand.

EDWARD W. HARDEN.

Witnesses:

T. SIMMONS,  
C. W. MILES.