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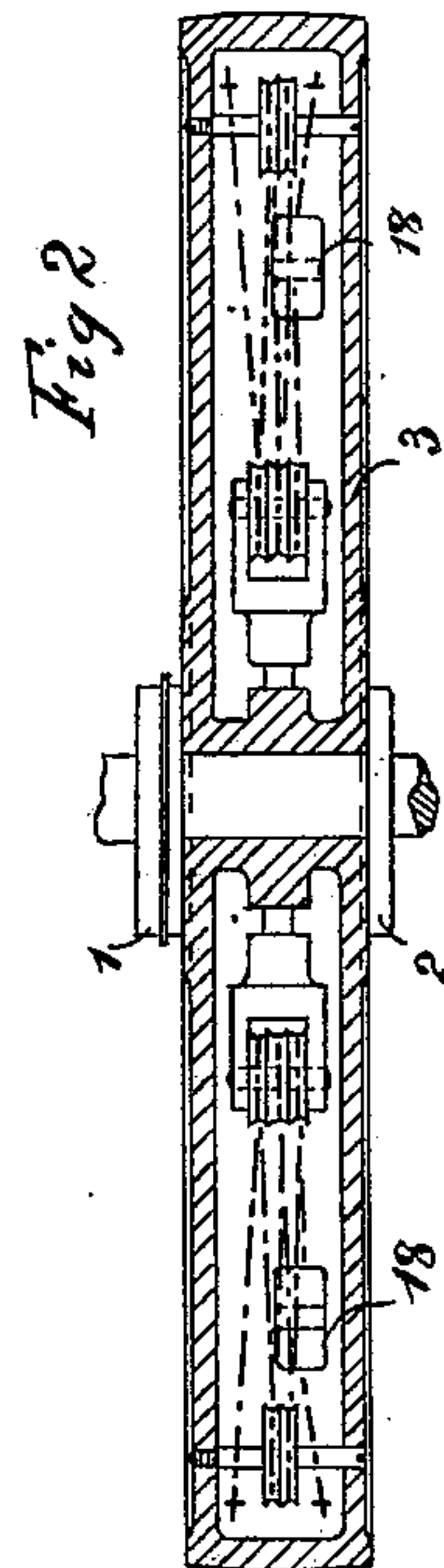
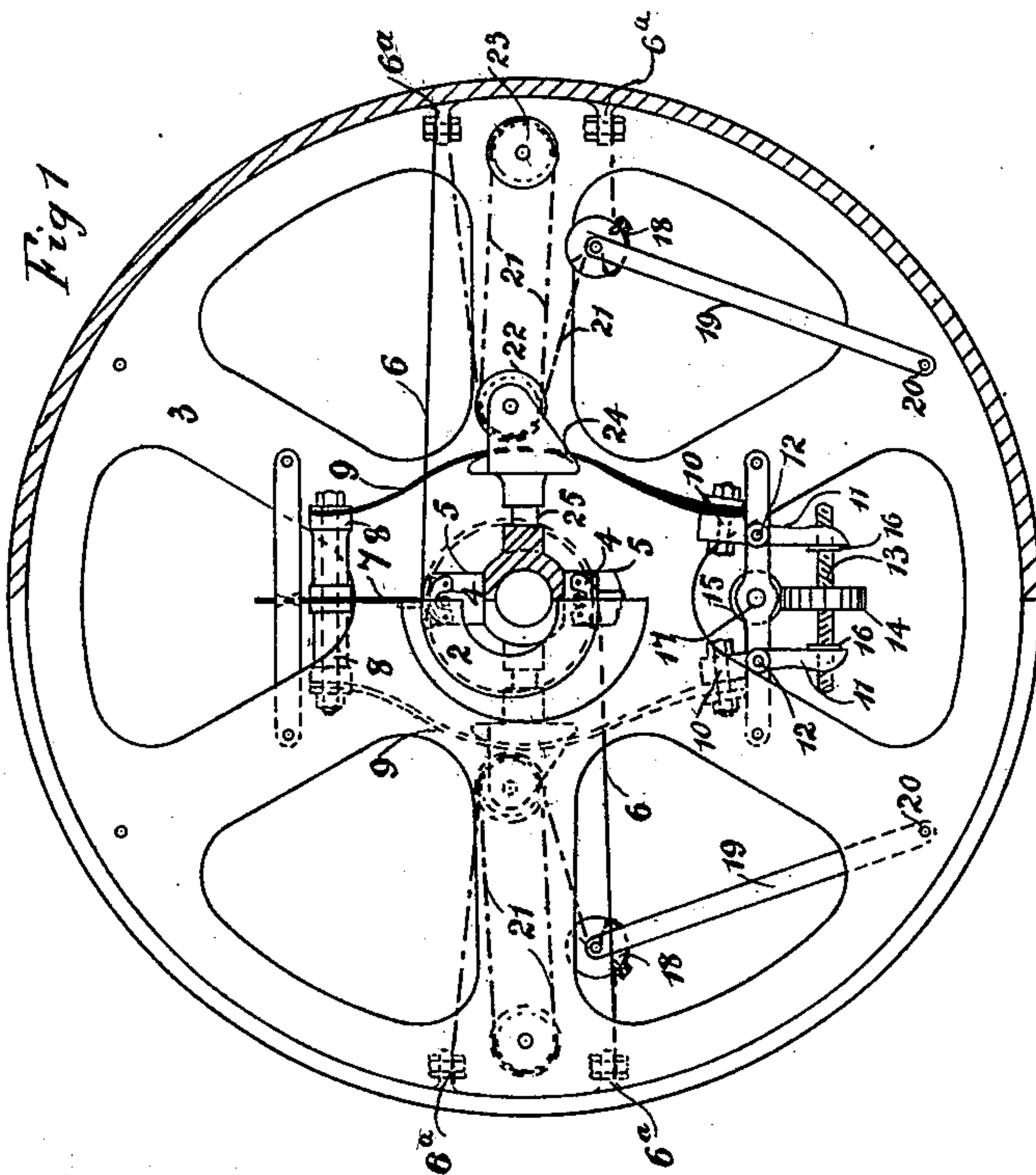
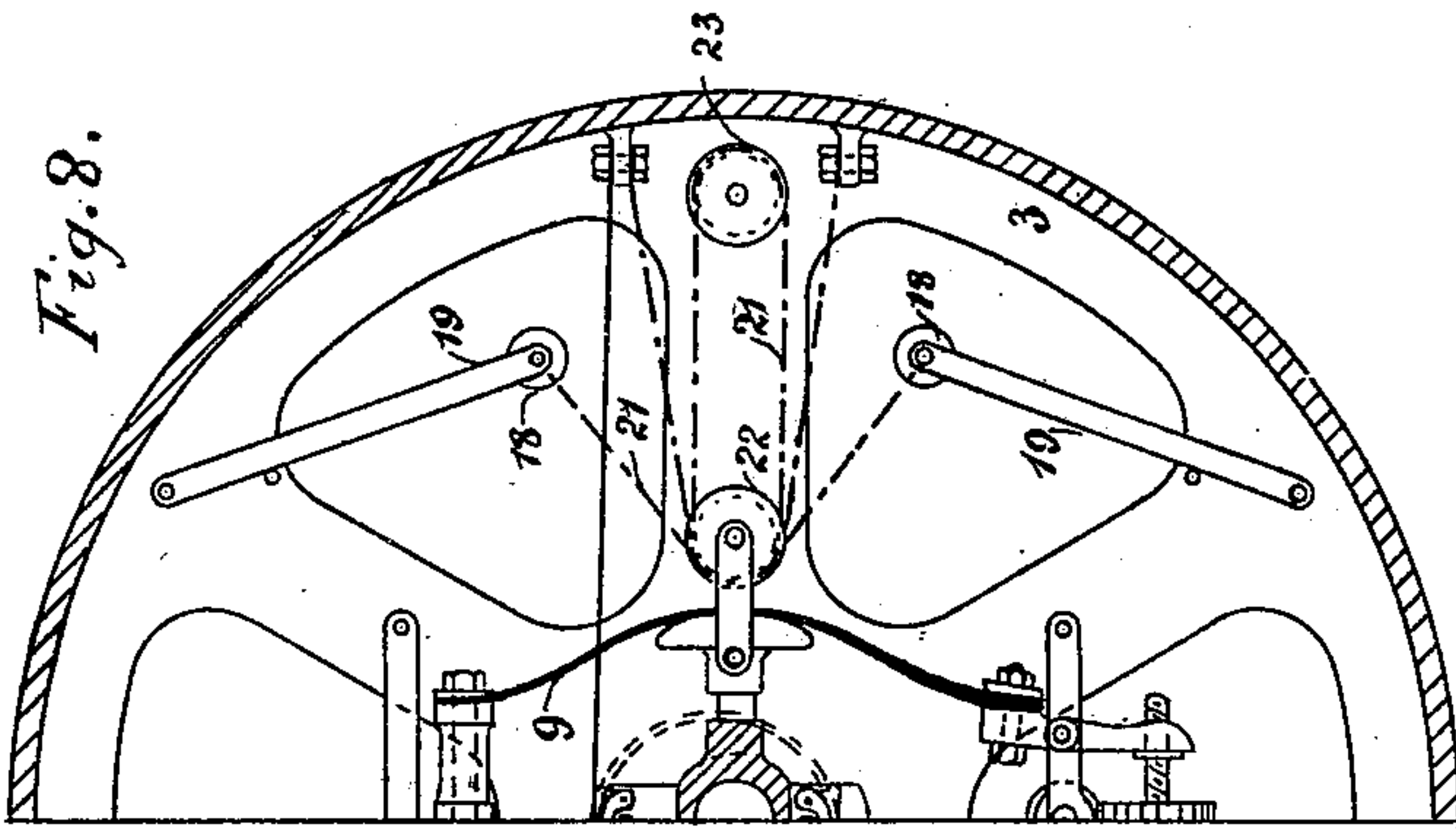
Patented June 20, 1899.

A. S. F. ROBINSON.  
ENGINE GOVERNOR.

(Application filed Nov. 9, 1897.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses.  
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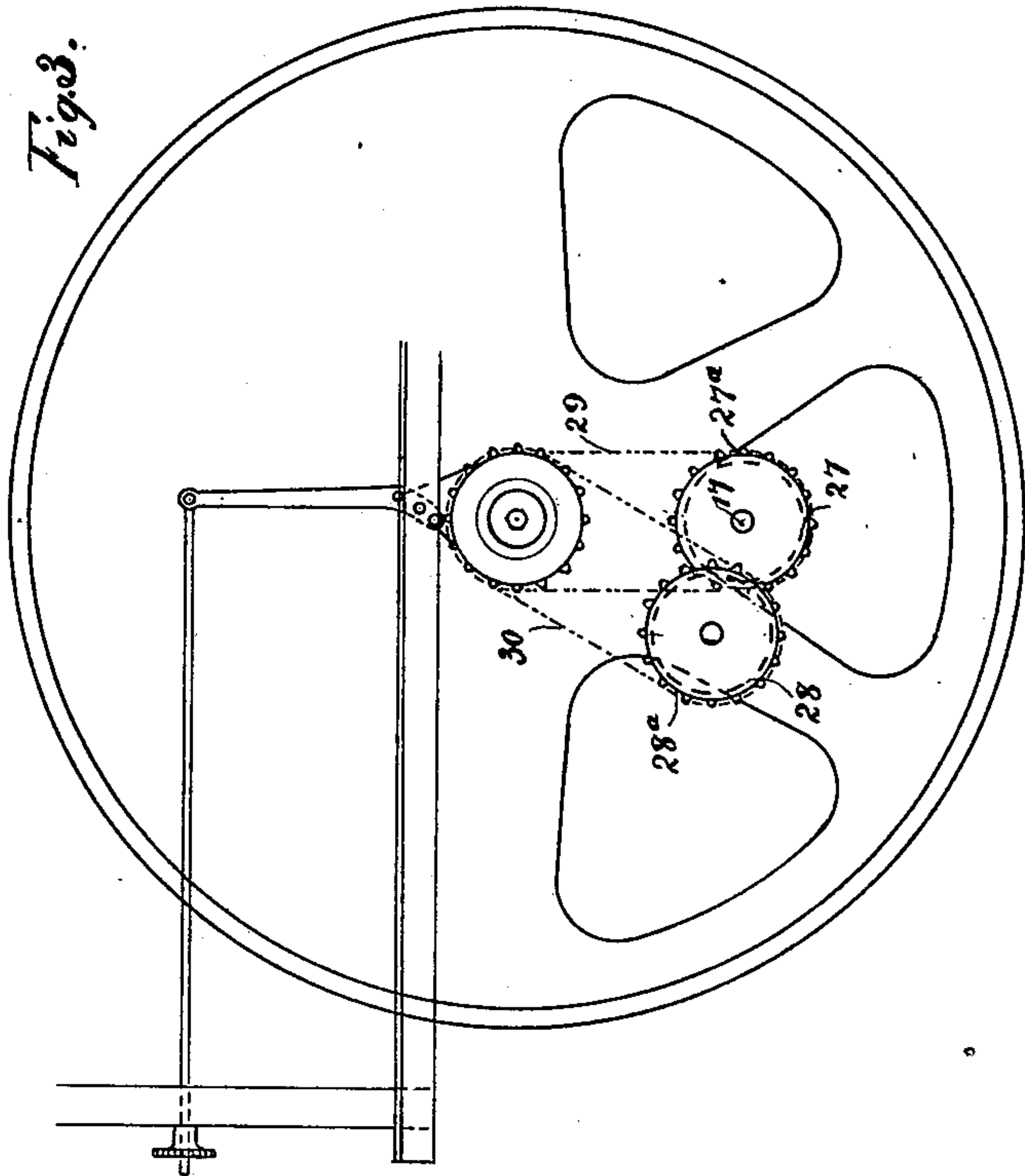
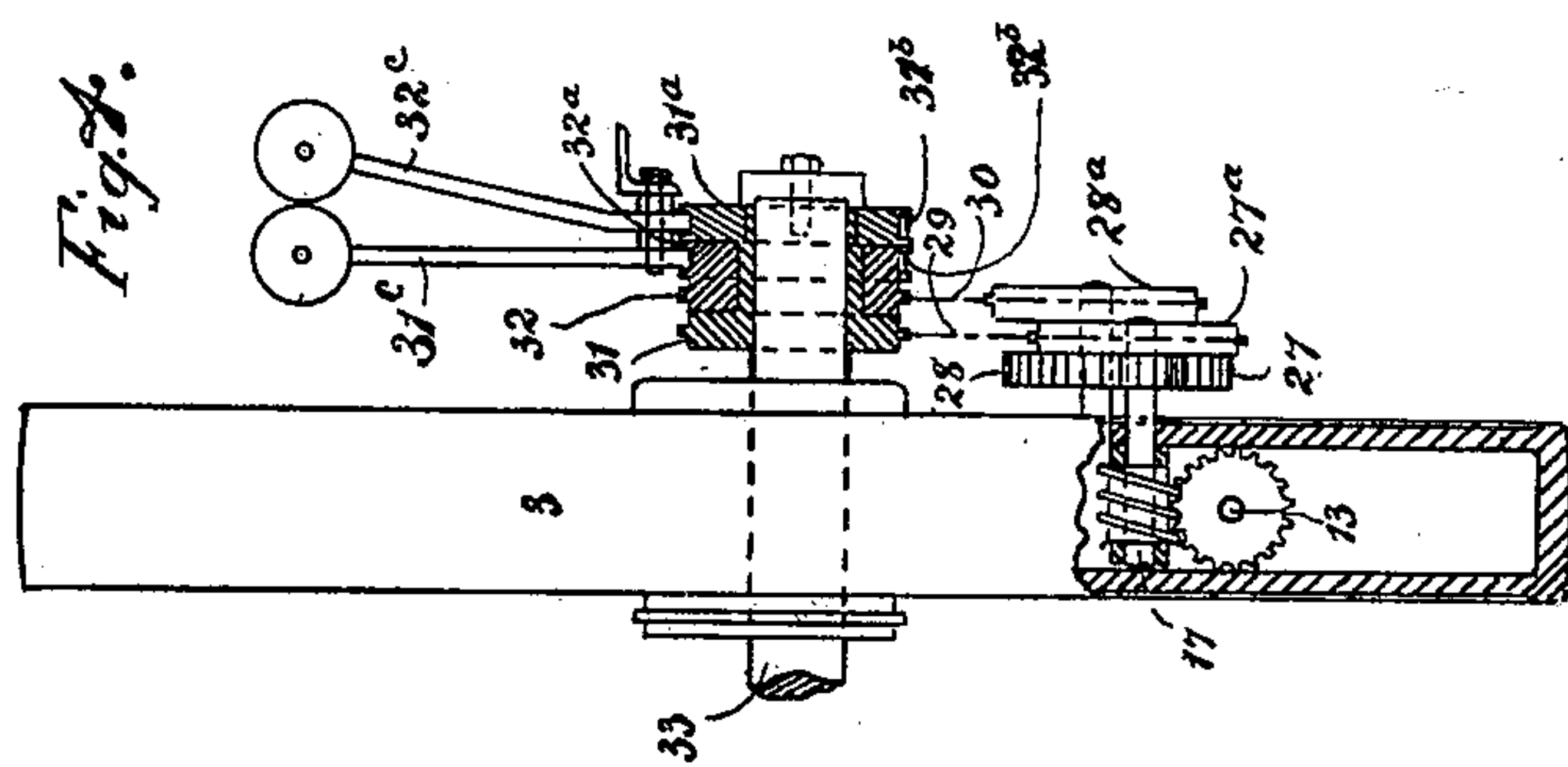
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3 Sheets—Sheet 2.



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**No. 627,353.**

**Patented June 20, 1899.**

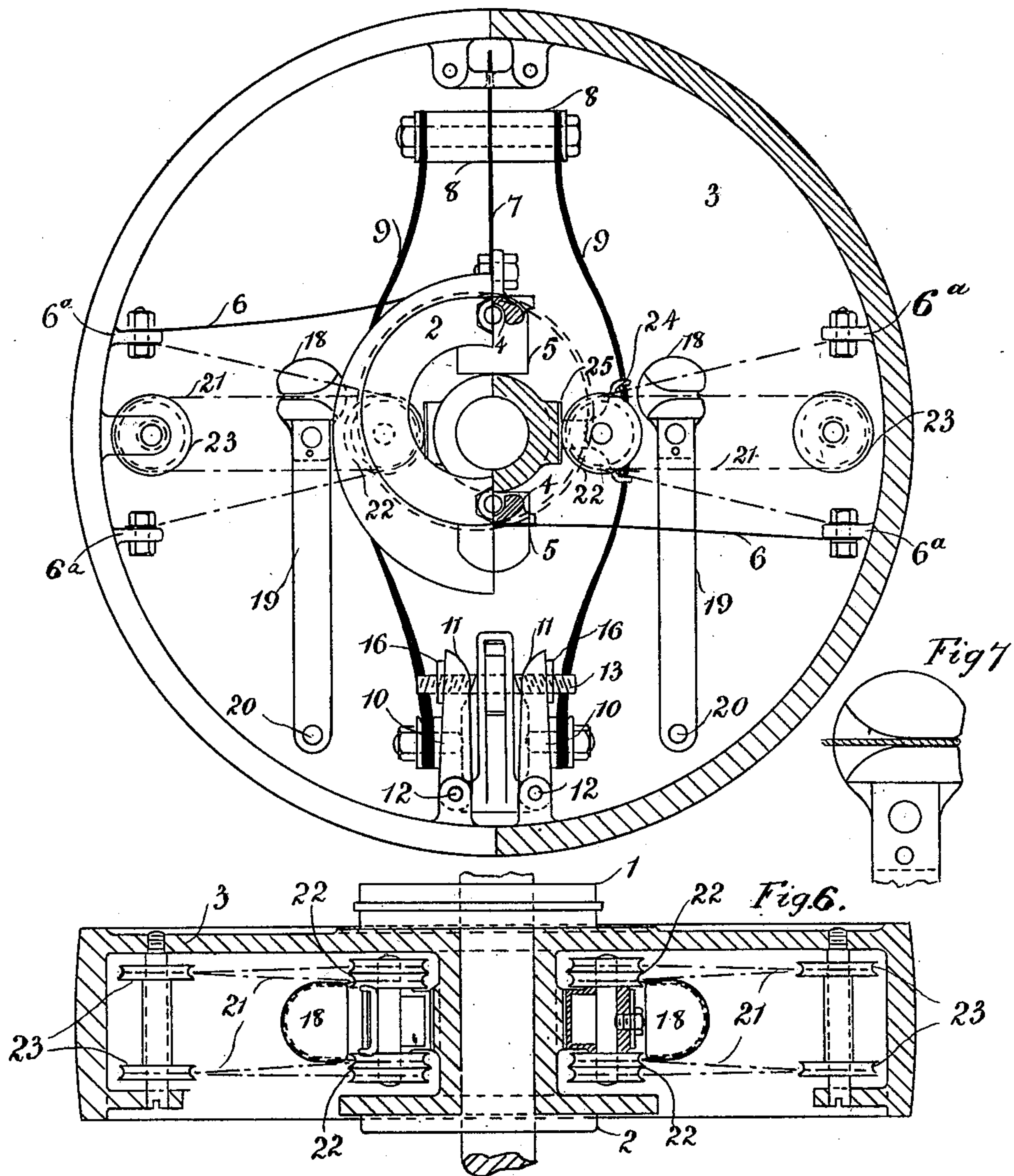
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**3 Sheets—Sheet 3.**

*Fig. 5.*



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# UNITED STATES PATENT OFFICE.

ARTHUR SAMUEL FRANCIS ROBINSON, OF WANTAGE, ENGLAND.

## ENGINE-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 627,353, dated June 20, 1899.

Application filed November 9, 1897. Serial No. 657,940. (No model.)

*To all whom it may concern:*

Be it known that I, ARTHUR SAMUEL FRANCIS ROBINSON, a subject of the Queen of Great Britain and Ireland, residing at Wantage, in the county of Berks, England, have invented Improvements in Engine-Governors, (for which patents have been granted in other countries as follows: United Kingdom, No. 17,411, dated July 23, 1897; France, No. 274,824, dated February 8, 1898; Switzerland, No. 16,390, dated February 11, 1898; Belgium, No. 133,779, dated February 14, 1898; Italy, Reg. Att., Vol. XCIII, No. 188, dated March 31, 1898; Austria, No. 48/3,870, dated July 19, 1898; Norway, No. 6,749, dated February 14, 1898; Hungary, No. 12,614, dated February 24, 1898, and Canada, No. 59,262, dated March 12, 1898,) of which the following is a specification.

This invention has reference to engine-governors of the shaft type in which the position of the shifting eccentric is controlled by the centrifugal action of a weight or weights; and it has for its objects to increase the sensitivity and stability of such governors and to obviate the use therein of a heavy weight or weights. For this purpose the governor weight or weights is or are caused by centrifugal force to act upon and adjust the position of the shifting eccentric in one direction, through a cord-and-pulley arrangement, against the action of a spring or springs which effect the adjustment of the eccentric in the opposite direction. By this means the weight or weights can be reduced in size and its or their traverse increased so as to enhance the sensitiveness of the governor, when the cord-and-pulley arrangement also acts in some cases as a locking arrangement to hold the eccentric in such a manner that it cannot influence the weight or weights in the way it can and does in governors in which the eccentric and weight or weights are connected together through direct and rigid connections. Consequently my invention enables the dash-pots or equivalent braking or controlling devices usually employed in shaft-governors to be dispensed with. The invention also has for its object to provide improved means for enabling the speed-regulating mechanism of a shaft-governor to be readily adjusted while

the engine to which the governor is applied is running.

Governor weights, cords, and pulleys designed to act on the eccentric in the manner hereinbefore set forth can be variously arranged. Conveniently the weight or each weight may be mounted upon a rod or spring-bar pivoted or fixed to the governor-drum, so as to be capable of oscillating thereon, and the pulleys may be mounted on the governor mechanism or on the governor or drum, or both.

The invention can be applied in connection with shaft-governors of various kinds. In the following description I shall describe its application to shaft-governors of the type described in the specification of my United States Patent No. 549,020, in which the position of the eccentric is controlled by the centrifugal action of weights through bent flexible or spring arms or blades (hereinafter called the "spring-blades") that are connected at one end to the fly-wheel drum or disk, (hereinafter called the "drum,") in or on which the governor is mounted, and at the other end to the shifting eccentric.

In the accompanying drawings, Figure 1 shows, partly in end elevation and partly in transverse section, and Fig. 2 in horizontal section, a shaft-governor of the kind referred to embodying my present invention. Fig. 3 is an elevation of the same end of the governor to that represented in Fig. 1, and Fig. 4 is a side elevation, partly in longitudinal section, showing my improved means for adjusting the speed-regulating mechanism of the governor. Figs. 5 and 6 are similar views to Figs. 1 and 2, respectively, showing an engine-governor with a modified arrangement of the governor-weights and cord-and-pulley arrangement especially suited for high speeds. Fig. 7 is a detail view of a weight drawn to a larger scale than Figs. 5 and 6. Fig. 8 is a half transverse section of a governor with a further modified arrangement of weights, cords, and pulleys.

1 is the shifting eccentric, and 2 a guide-plate arranged to slide at opposite sides of the governor-drum 3. They are connected together by transverse distance-pieces 4, that work in slots 5 in the sides of the drum and



are connected by spring radius-bars 6, forming a parallel motion, to lugs 6<sup>a</sup> on the drum. To one of the distance-pieces 4 are secured the connecting-strips 7, by which the eccentric and attached parts are connected through the distance-pieces 8 to the free ends of two spring-blades 9, the other ends of which are connected at 10 to levers 11, pivoted at 12, so that they can be moved toward and from each other by speed-regulating mechanism comprising a right and left handed screw 13, driven by a worm-wheel 14 and worm 15 and acting upon nuts 16, carried by the ends of the levers 11.

17 is the worm-spindle, that extends through one side of the drum and is operated as hereinafter described.

The foregoing parts are constructed and arranged and operate substantially in the manner described in my said former specification.

In the arrangement shown in Figs. 1 and 2 there are two governor-weights 18, which instead of being carried by the spring-blades or equivalent parts, as in former arrangements of shaft-governors, are according to this invention each secured to one end of a rod or spring-arm 19 or pair of rods or spring-arms, the other end or ends of which is or are pivoted at 20 to the governor-drum 3. Each weight is connected to one end portion of a cord 21, which is passed one or more times around two sets of grooved pulleys 22 and 23 and is fixed at its other end to the drum at 6<sup>a</sup>. The pulley 22 is pivoted between the jaws of a holder 24, fixed to the central portion of the corresponding spring-blade 9 and provided with a buffer 25, and the pulley 23 is pivoted to the drum, the cord in the example now being described passing three times around the pulleys 22 and twice around the pulleys 23, the whole forming a compound cord-and-pulley arrangement. The end portion of each cord to which the weight 18 is connected may conveniently be fixed to the adjacent lug 6<sup>a</sup> on the drum to limit the inward movement of the weight; but other means may obviously be used for the purpose.

In Figs. 1 and 2 the parts are shown in the positions they occupy when the governor is at rest. When the governor is set in motion, the weights 18 move outward under the action of centrifugal force and pull upon the cord 21, so as to shorten the distance between the pulleys 22 and 23 of each pair against the action of the spring-blades 9, which are consequently bent outward to a greater extent and cause the eccentric 1 to move in a direction transverse to the governor-shaft, the elasticity of the spring-blades serving to move the weights and eccentric in the reverse direction when the speed of the governor falls below the normal. The resistance to motion caused by the cord-and-pulley arrangement serves to effectually lock the eccentric in all positions into which it is moved, and consequently imparts great stability to the governor. Also by reason of the weights

being placed near the periphery of the drum they can be made light and are rendered very sensitive to variations in changes of velocity of the drum, so that the governor will act very promptly to correct variations in speed.

In the modification shown in Figs. 5, 6, and 7 each cord 21 is secured at its two ends to the corresponding pairs of lugs 6<sup>a</sup> on the drum and passes around sets of pulleys 22 and 23 and also around the corresponding weight 18, which is suitably grooved for the purpose and acts directly upon the upper horizontal portions of the cord. In the governor, part of which is shown in Fig. 8, there are four weights 18, each carried by a pivoted bar 19 or pair of bars and each connected to one end of a separate cord 21, that passes around the pulleys 22 and 23 and is connected at the opposite end to the drum. Thus in this case each spring-blade 9 is acted upon by two weights through a compound cord-and-pulley arrangement comprising two independent cords.

To enable the speed-regulating mechanism to be adjusted while the engine is running, there is fixed upon the worm-spindle 17 a toothed wheel 27, Figs. 3 and 4, that is in gear with another toothed wheel 28, pivoted to the drum 3. On the two toothed wheels 27 and 28 are fixed two chain-wheels 27<sup>a</sup> and 28<sup>a</sup>, respectively, which are respectively connected by chains 29 and 30 to two chain-wheels 31 and 32, provided, respectively, with brake-band pulleys 31<sup>a</sup> and 32<sup>a</sup>. The chain-wheel 31 is mounted on the governor-shaft 33 and is formed with a sleeve 31<sup>b</sup>, to which the brake-pulley 31<sup>a</sup> is fixed and on which, between the chain-wheel 31 and brake-pulley 31<sup>a</sup>, is mounted to rotate the combined chain-wheel 32 and brake-band pulley 32<sup>a</sup>.

31<sup>b</sup> and 32<sup>b</sup> are the brake-bands, with separate brake-operating levers 31<sup>c</sup> 32<sup>c</sup> for the pulleys 31 and 32, respectively. As will be seen, the arrangement constitutes an epicyclic gear such that by braking the one or other set of wheels by means of one or other brake-band while the governor-drum is rotating the worm-spindle 17, and consequently the right and left handed screw 13, will be rotated in one direction or the other, so that the resistance of the spring-blades will be increased or decreased and the speed of the engine controlled by the governor consequently raised or lowered. Means may be provided for giving an indication when the limit of speeding is arrived at in one direction or the other.

What I claim is—

1. In an engine-governor the combination of a rotary carrier, means adapted to adjust the position of a shifting eccentric carried thereby in a direction transverse to the governor-shaft, a weight acting by rotation of said carrier to operate said adjusting means, and cord-and-pulley tackle connecting said weight and adjusting means, substantially as described.

2. In an engine-governor, the combination of a rotary carrier, a spring-loaded eccentric-



supporting device mounted thereon and having a constant tendency to move in one direction transversely to the governor-shaft, a weight mounted on said rotary carrier and tending when the same is rotated to move said loaded eccentric-supporting device in the opposite direction, and cord-and-pulley tackle connecting said eccentric-supporting device to said weight, substantially as described.

3. In an engine-governor, the combination of a rotary carrier, a supporting device carried thereby, an eccentric carried by said supporting device, a spring device acting to move said supporting device and eccentric in one direction transversely to the governor-shaft and cord-and-pulley tackle and centrifugal weight acting, upon rotation of said carrier, to adjust the position of said supporting device and eccentric in the opposite direction.

4. In an engine-governor, the combination of a rotary carrier, means for adjusting the position of a shifting eccentric to be carried thereby, a weight acting by rotation of the carrier to operate said adjusting means, and a locking device consisting of a compound cord-and-pulley tackle connected with said adjusting means.

5. An engine-governor comprising a rotary carrier, one or more spring-blades connected at one end to said carrier and at the other end to an eccentric-supporting device movably mounted on said carrier and adapted by bending to move said eccentric-supporting device in a direction transverse to the governor-shaft, cord-and-pulley tackle adapted to pull on said spring-blade, or each of them, and one or more centrifugal weights mounted on said carrier and adapted to act on said spring blade or blades through said cord-and-pulley tackle, substantially as described.

6. In an engine-governor, the combination with eccentric-adjusting mechanism operating under the action of one or more weights, of a locking device comprising one or more cords connecting the weight or weights to the remaining portion of the adjusting mechanism, and pulleys two or more of which are carried by the adjusting mechanism and one or more by the governor-drum and around which said cord or cords passes or pass, substantially as described.

7. In an engine-governor, the combination with a rotating carrier, eccentric-adjusting mechanism, and speed-regulating mechanism

having an operating-spindle extending through one side of the governor-drum, of speed-adjusting mechanism comprising two toothed wheels geared together and one of which is fixed to the projecting end of said spindle and the other is pivoted to said drum, two chain-wheels fixed to the respective toothed wheels, two toothed wheels mounted to independently rotate upon the governor-shaft, and each provided with a brake-pulley, endless chains connecting the separate pairs of chain-wheels, and brake devices for separately controlling each brake-pulley, substantially as described.

8. An engine-governor comprising a rotary carrier, a shifting eccentric, loaded spring-blades connected at one end to said eccentric, adjustable supports mounted on said carrier and to which the other ends of said spring-blades are connected, means for moving said supports to and from each other, a worm and spindle for operating said means, and speed-adjusting mechanism comprising two toothed wheels geared together and one of which is fixed to the projecting end of said spindle and the other is pivoted to said drum, two chain-wheels fixed to the respective toothed wheels, two toothed wheels mounted to independently rotate upon the governor-shaft, and each provided with a brake-pulley, endless chains connecting the separate pairs of chain-wheels, and brake devices for separately controlling each brake-pulley, substantially as described.

9. An engine-governor comprising a rotary carrier, a shifting eccentric, a pair of spring-blades connected together at one end and to said eccentric and arranged to extend past and on opposite sides of the axis of said carrier and connected at their opposite ends to said carrier, pulleys mounted on said spring-blades and on said carrier, one or more cords passing around said pulleys, and centrifugal weights carried by rods or bars mounted on said carrier so that they can oscillate thereon and arranged to act on said cords, substantially as herein described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR SAMUEL FRANCIS ROBINSON.

Witnesses:

EDMUND S. SNEWIN,  
PERCY E. MATTOCKS.