

(No Model.)

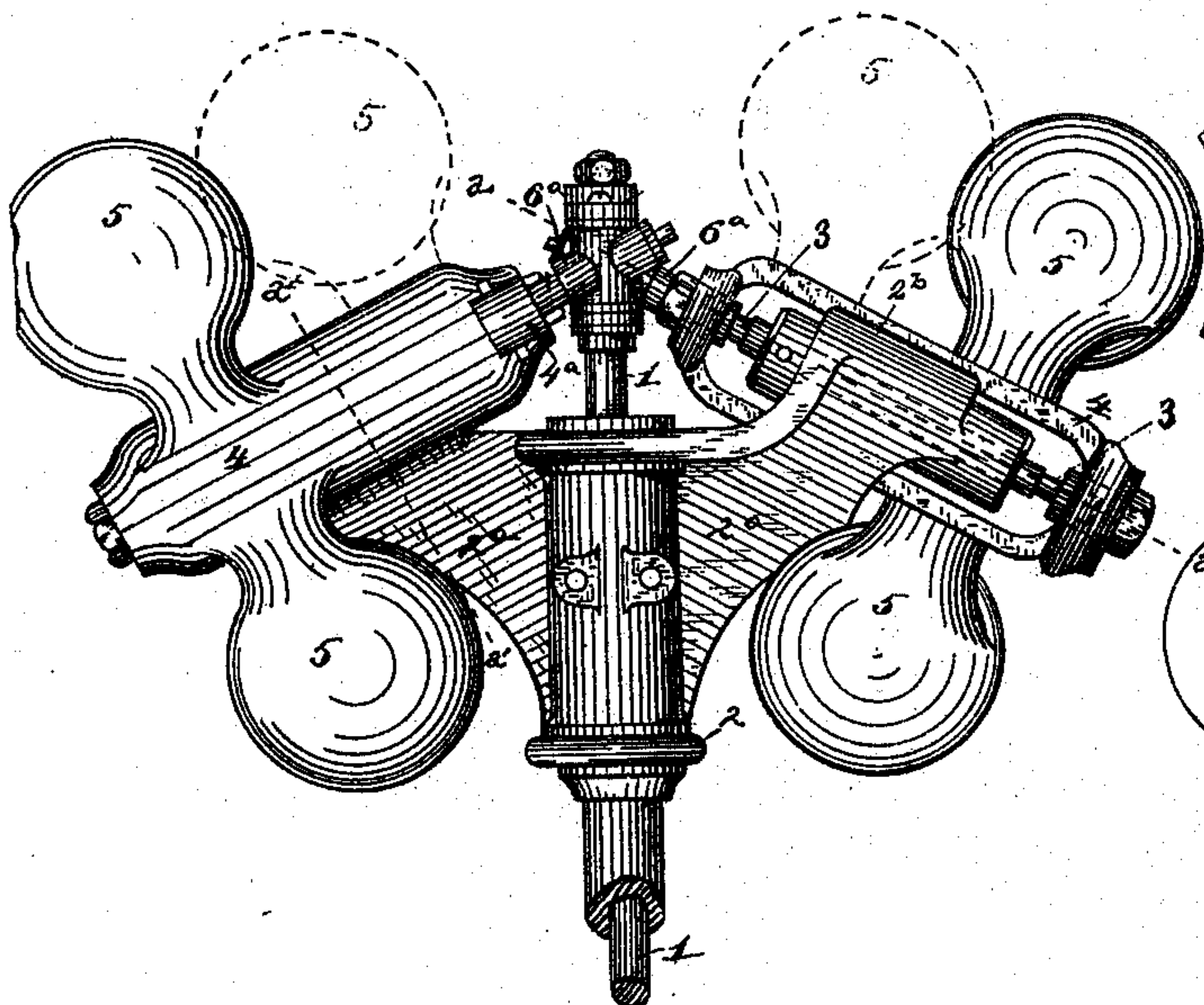
2 Sheets—Sheet 1.

J. SELWIG.  
CENTRIFUGAL GOVERNOR.

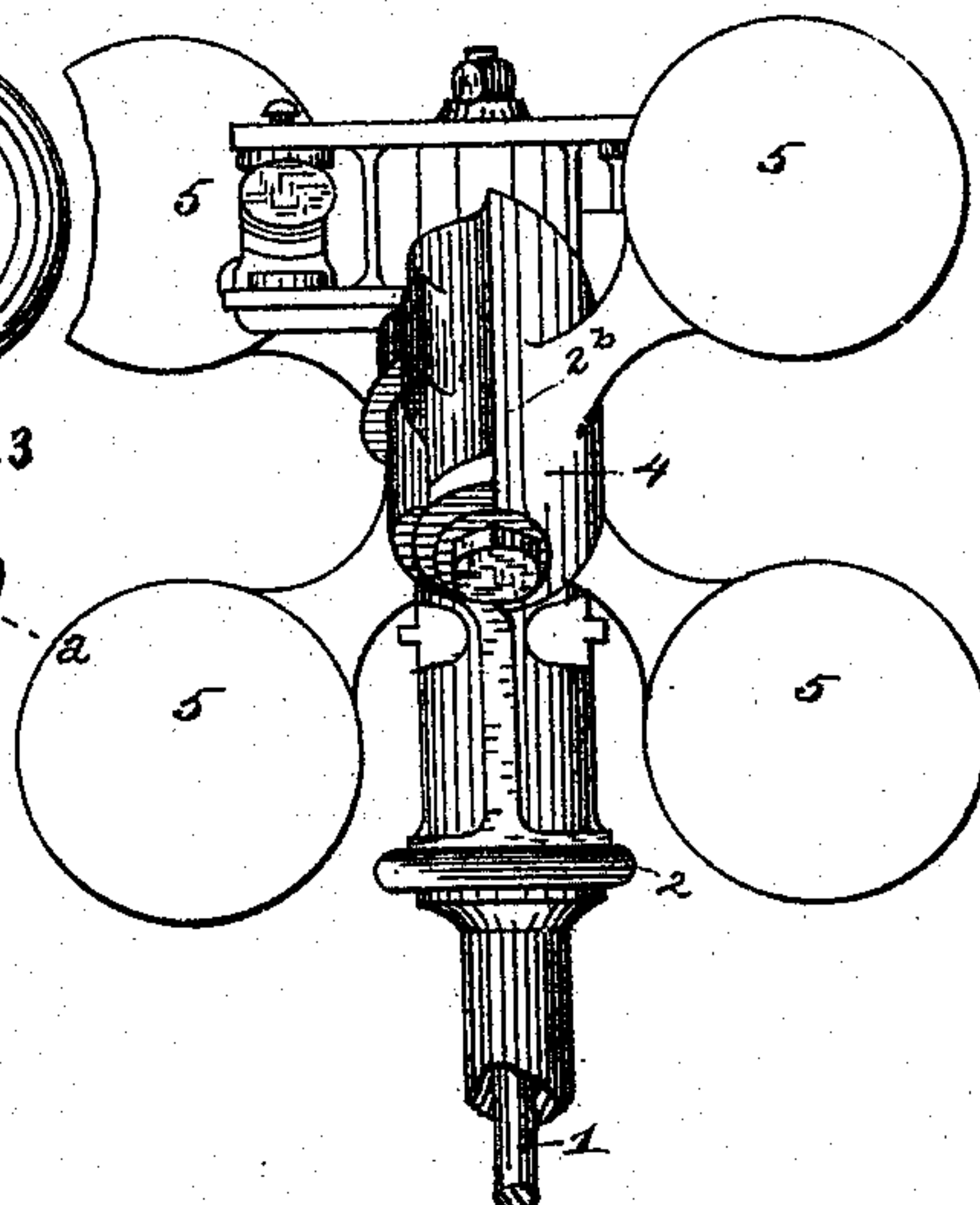
No. 292,512.

Patented Jan. 29, 1884.

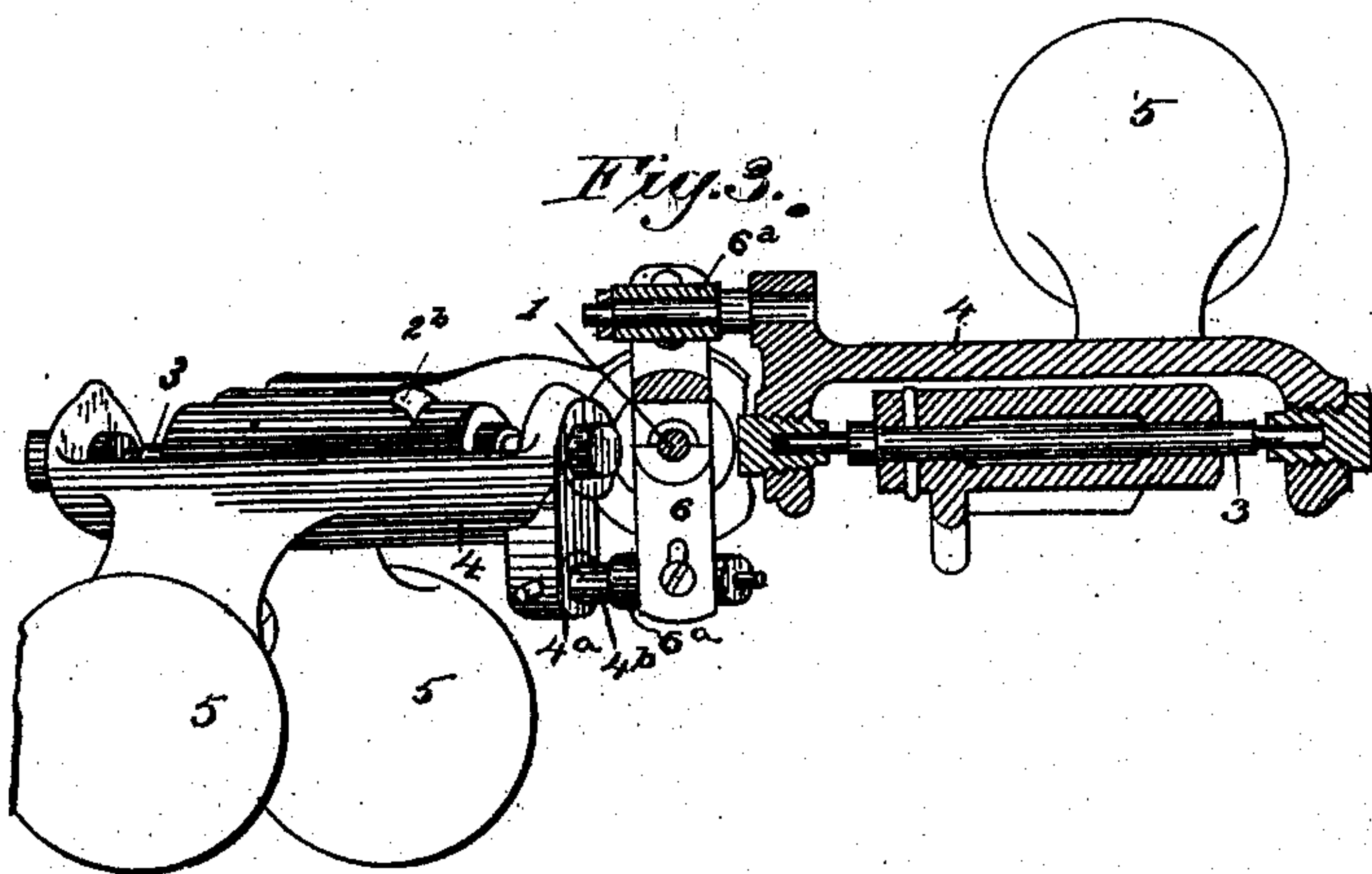
*Fig. 1.*



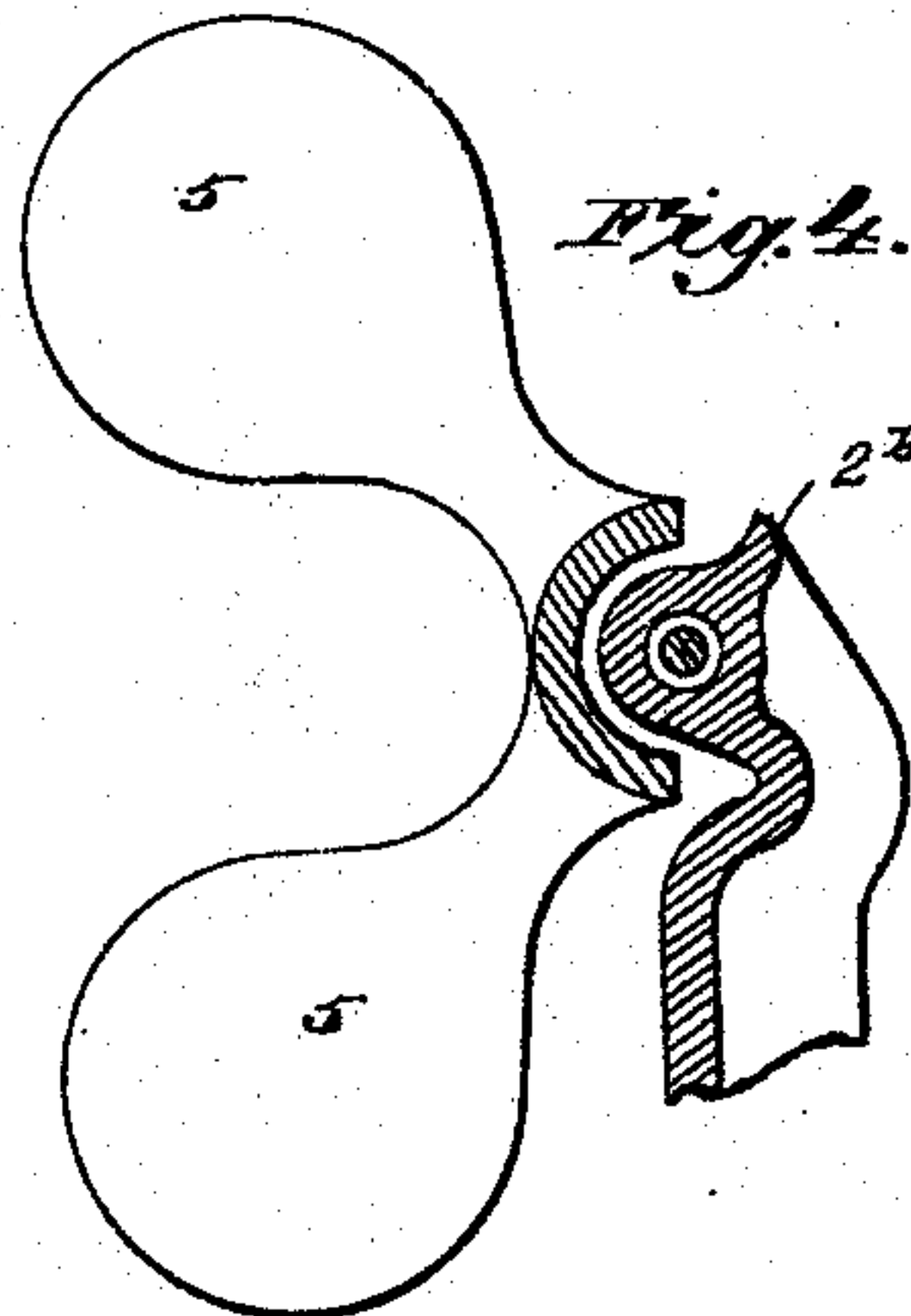
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



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2 Sheets—Sheet 2.

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Fig. 5.

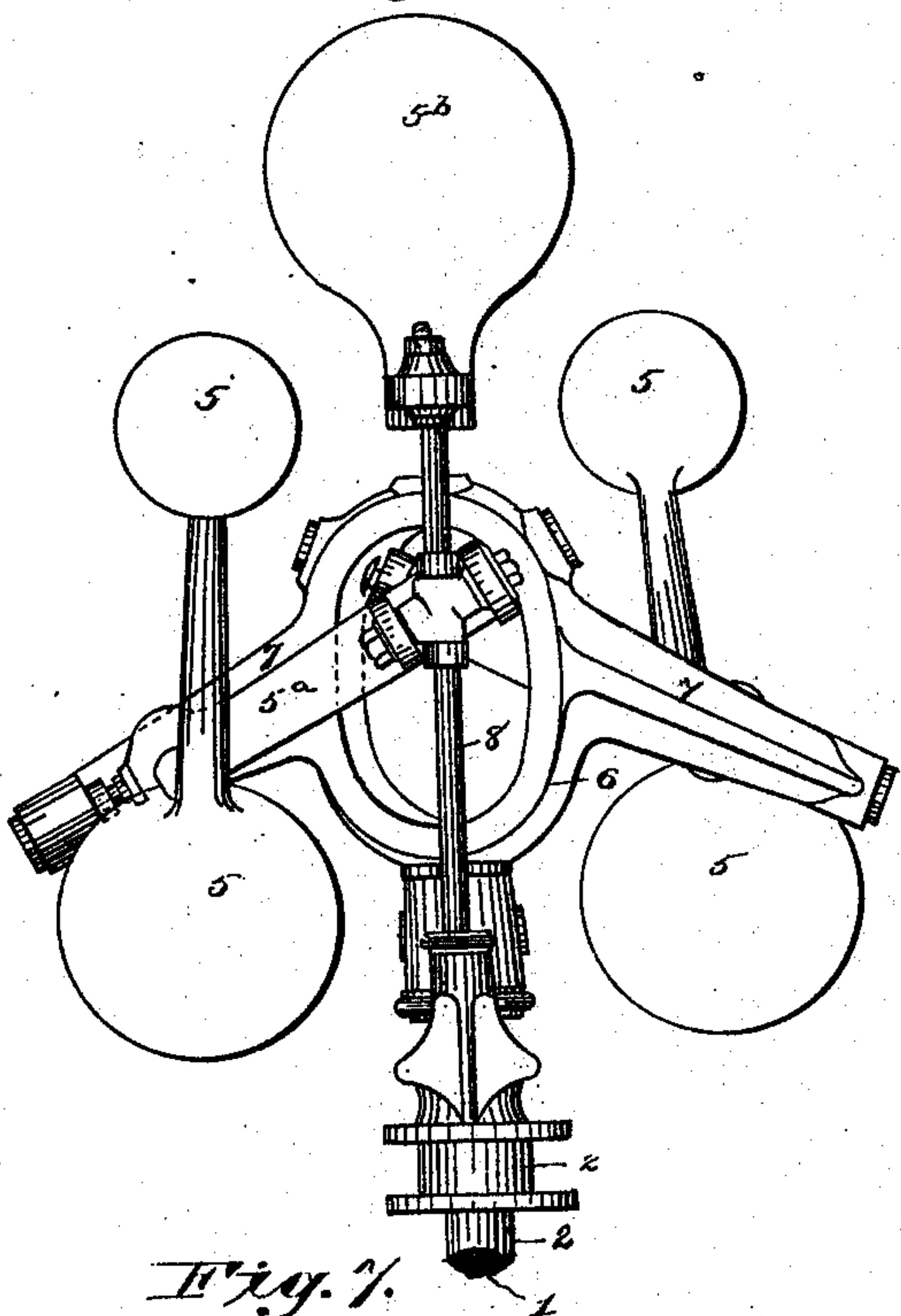


Fig. 7.

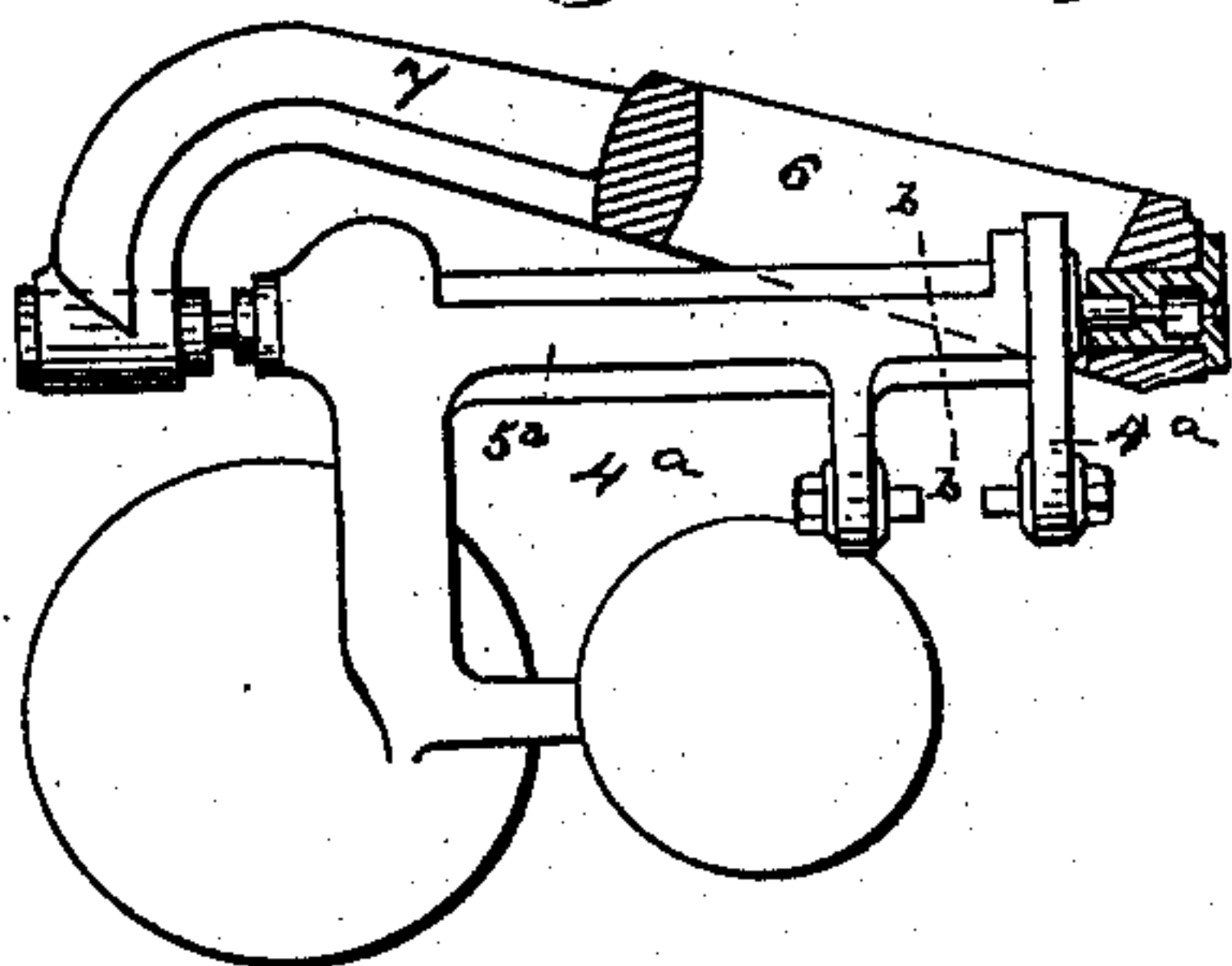


Fig. 6.

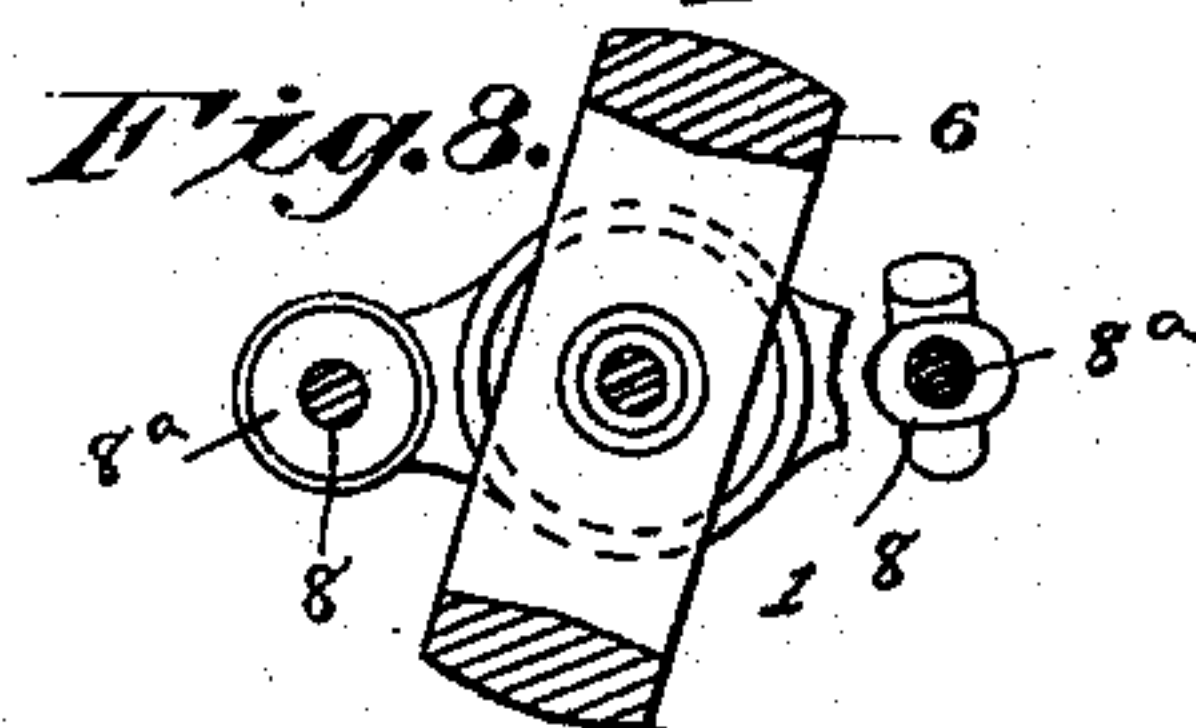
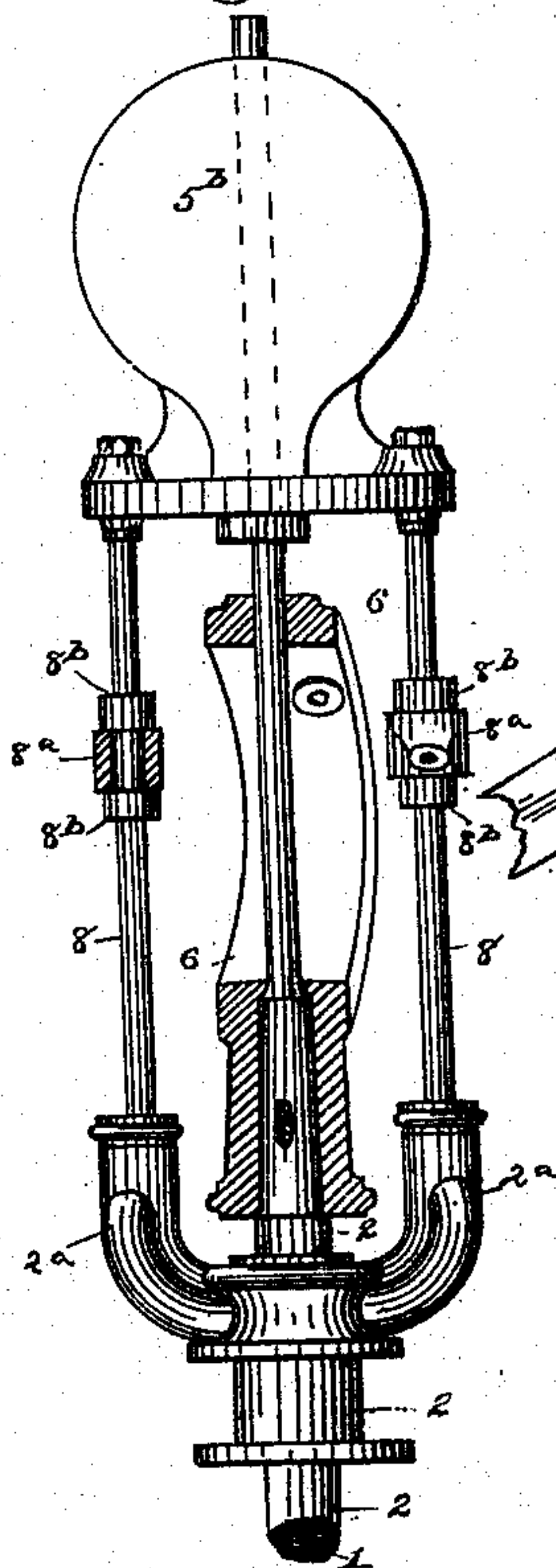


Fig. 11.

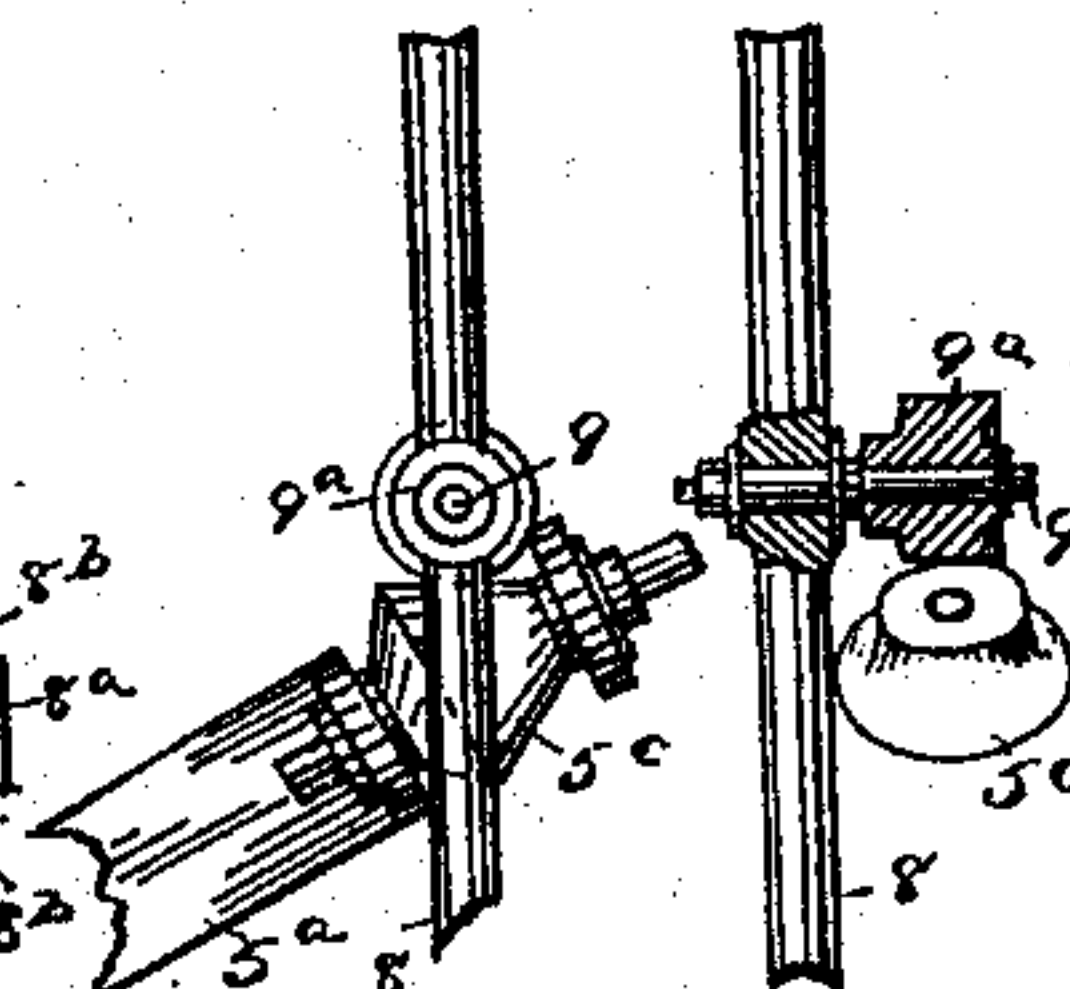


Fig. 10.

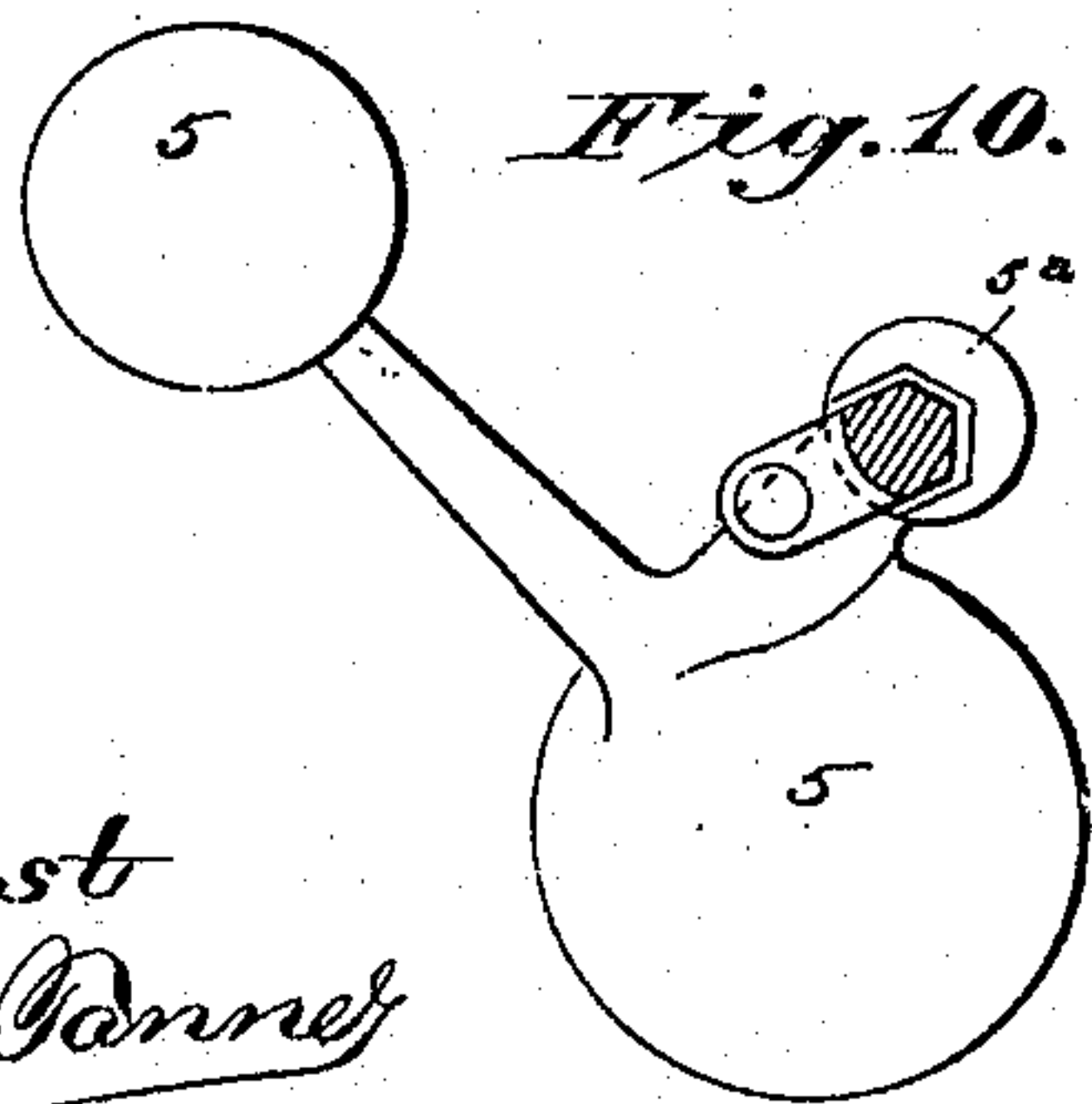
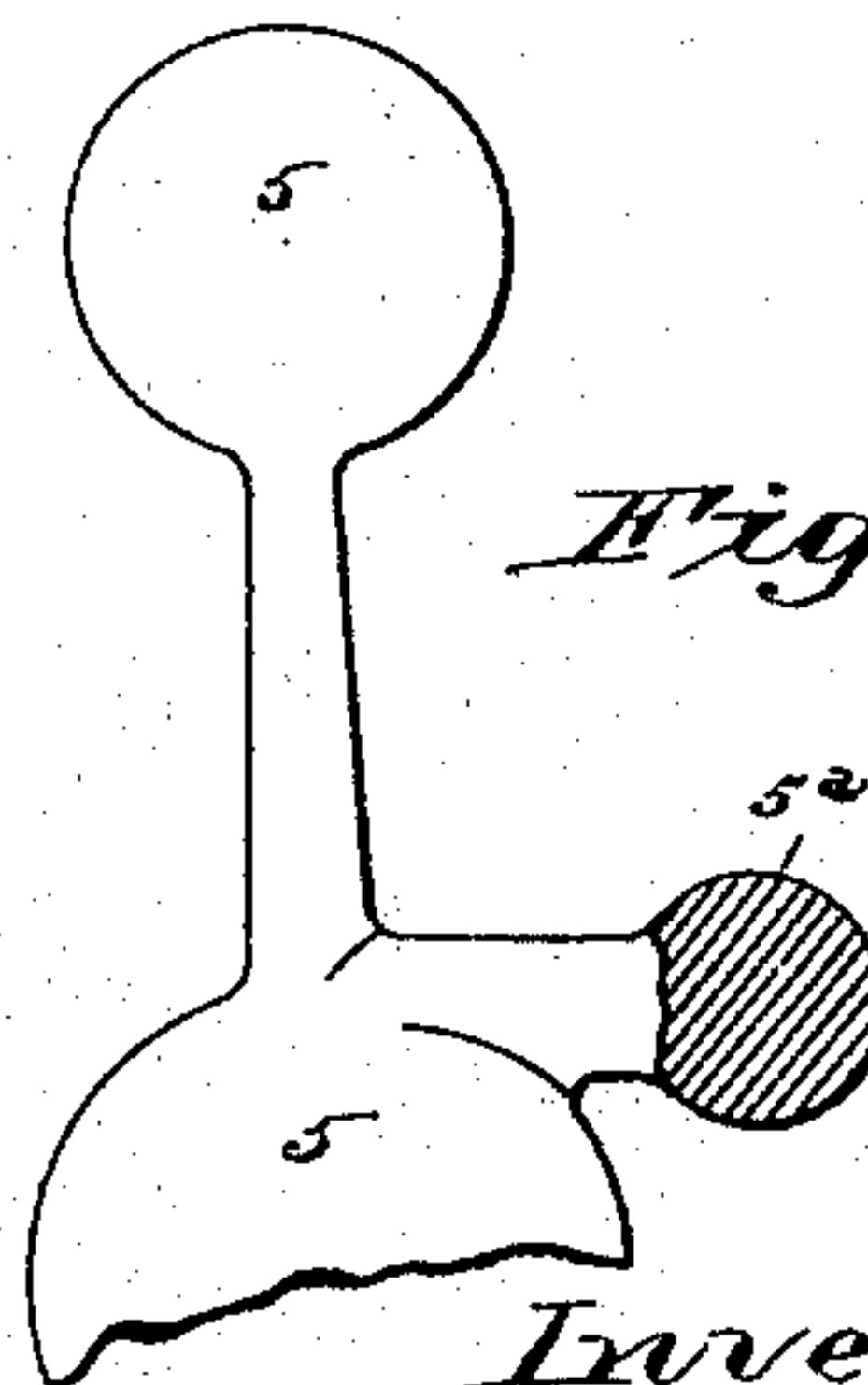


Fig. 9.



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# UNITED STATES PATENT OFFICE.

JOHANNES SELWIG, OF BRUNSWICK, GERMANY.

## CENTRIFUGAL GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 292,512, dated January 29, 1884.

Application filed June 29, 1882. (No model) Patented in Belgium May 12, 1882, No. 57,888, and in France May 12, 1882, No. 148,913.

*To all whom it may concern:*

Be it known that I, JOHANNES SELWIG, a subject of the Emperor of Germany, residing at Brunswick, in the Empire of Germany, have invented an Improved Centrifugal Regulator, of which the following is a specification.

My invention relates to governors for steam-engines and other motors, and it is designed, also, for use in connection with machines for indicating the speed of revolving shafts.

The object of my invention is the production of an astatic governor—that is to say, one in which there shall be no preponderating inertia due either to gravity or friction, or to other causes.

To the above end my invention consists in the provision of a governor or regulator having rotating pendulums oscillating in circular paths, and in the combination therewith of a series of mechanical devices, as hereinafter explained.

In order that my invention may be fully understood, I will describe it with reference to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved regulator, transverse to the planes of the pendulum-arms. Fig. 2 is a similar view in line with the pendulum-arms. Fig. 3 is a top view of my improved regulator, one half being in elevation and the other half being in section on the line *a a* of Fig. 1. Fig. 4 is a transverse section on the line *a' a'* of Fig. 1. Fig. 5 is a side elevation of a modified form of my improved regulator, looking across the planes of the two pendulum-arms. Fig. 6 is a similar view, the loop being in vertical section and the pendulum-arms being removed. Fig. 7 is a horizontal section of the loop, the pendulum and its support being shown in elevation. Fig. 8 is a horizontal section of the loop and connecting-rods. Fig. 9 is a plan view of one of the pendulums, its axis being shown in section. Fig. 10 is a cross-section of the pendulum-axis on the line *b b* of Fig. 7, and looking toward the regulator-shaft. Fig. 11 is a detached view (in two positions) of a modified form of bearing for the pendulum-axis.

I will first describe my invention as embodied in the construction shown in Figs. 1 to 4, inclusive. In these figures, 1 designates the regulator-shaft, which, at its lower ex-

tremity, may be connected to the throttle-valve of a steam-engine, or to the ingress-valve of any other motor, or to the detent mechanism of devices for indicating the speed of rotating shafts, &c., the said shaft 1 being arranged to rise and fall, and these movements serving to operate the devices connected to the lower extremity of said shaft.

Surrounding the shaft 1 and turning with it is a collar, 2, which is formed with two bracket-arms, 2<sup>a</sup>, on its two opposite sides, and extend upward above the top of the sleeve or collar 2, as shown. Each of these bracket-arms 2<sup>a</sup> constitutes the support for a cylindrical bar, which constitutes the axle of the pendulum. Each pendulum consists of a hollow semi-cylindrical casting, 4, formed upon the periphery of which are two balls, 5, extending outward radially from the casting 4, so as to form an angle of ninety degrees between them. The castings 4 are placed with their convex surfaces in opposite directions, so that the pendulum-balls on the one side of the regulator-shaft 1 are oppositely situated to those upon the other side, whereby, through the medium of the devices (presently to be described) for connecting the pendulums to the shaft 1, the two pendulums balance each other. The upper extremities of the arms 2<sup>a</sup> are cylindrical in form, and bored centrally for the reception of the axle-bars 3, which are firmly keyed therein, and have bearings at their ends in screw-threaded plugs 3<sup>a</sup>, which are adjustable in the ends of the castings 4.

Upon the periphery of each of the castings 4, and at a point thereof near to the shaft 1, is formed a projection, 4<sup>a</sup>, in which is keyed or otherwise firmly fastened a short arm, 4<sup>b</sup>, whose other end is loosely journaled in a socket, 6<sup>a</sup>, supported by cross-head 6 of the shaft 1. The socket 6<sup>a</sup> is bored at an angle, so as to be in line or concentric with the axis of the casting 4.

The operation of this device is as follows: Motion being imparted to the motor, the shaft 1 will cause the whole of the device, as above described, to revolve. As the velocity of the revolution is increased, the centrifugal governor's force will tend to throw the lower ball, 5, out until both balls are equidistant from the centre of revolution. This necessa-



rily raises the one and lowers the other, which revolves the casting 4 on its axis, thereby raising the arm 4<sup>a</sup>, which carries with it the connection 4<sup>b</sup> 6<sup>a</sup> 6, and consequently the shaft 1.

5 The casting is prevented from revolving too far by a lug, 2<sup>b</sup>, formed on the upper extremity of the arm 2<sup>a</sup>.

The device illustrated in Figs. 5 to 11, inclusive, constitutes a somewhat more perfect embodiment, practically considered, than that just described. In this device the regulator-shaft 1 is to connected, as before, at its lower end, with the ingress-valve, or detent mechanism, or other device, as the case may be, such devices being operated, as before, by the ascending and descending motions of the said shaft. The collar 2 surrounds and turns with the shaft 1, as before. In this form of my invention, however, the bracket-arms 2<sup>a</sup> are replaced by a ring or loop, 6, keyed to the shaft 1, and the semi-cylindrical castings 4 are replaced by arms 7, which are attached at their inner ends to (or are formed integrally with) the said loop 6 on the opposite sides thereof. 25 The pendulum-balls in this case are also somewhat modified in form, though constructed upon the same principle as that of the pendulums first described. In the present illustration (said Figs. 5 to 11) the balls are in what may be designated as "dumb-bell" form, the lower ball of each pendulum being heavier than the upper ball. These pendulums are secured to, or are formed directly upon, their axes 5<sup>a</sup>, which are journaled at their ends in the 30 outer extremities of the arms 7 and in the opposite side of the loop 6, as shown. The projections 4<sup>a</sup> are here employed as before, but each projection is arranged to work in connection with a second projection, making a pair of projections for each pendulum-arm, and the two, instead of being connected by a journal-connection directly to the regulator-shaft 1, as before, are journaled upon one of two rods, 8, each of which is provided with a 45 socket-ring, 8<sup>a</sup>, working between two stop-rings, 8<sup>b</sup>. These rods 8 are supported below by the bracket-arms 2<sup>a</sup>, and carry a weight, 5<sup>b</sup>, which is provided with a central vertical bore, through which the shaft 1 passes, as shown. 50

In Fig. 11 I have shown a modified form of bearing for the pendulum-arms 5<sup>a</sup> in the rods 8. In this arrangement the rods 8 are placed a little farther apart than would be the case ordinarily, and in place of the socket-rings 8<sup>a</sup> inwardly-projecting pivots 9 are secured to the rods 8, and upon each of these pivots turns a roller, 9<sup>a</sup>. The inner end of each axis, 5<sup>a</sup>, is a conical roller, 5<sup>c</sup>, the upper face of which will be horizontal, and which rests beneath the roller 9<sup>a</sup>. These rollers 5<sup>c</sup> are to be substituted for the projections 4<sup>a</sup>. In this construction a mutual rolling takes place in the parts 9<sup>a</sup> and 5<sup>c</sup> as the pendulums move upward and downward. 60

65 In the form of my invention shown in Figs. 1 to 4, inclusive, the balls 5 may be arranged either as shown in strong lines in Fig. 1 or

as shown in dotted lines in said figure. In the latter case one of the balls is placed at one end of the periphery of the casting 4 and the other ball at the opposite end. In this arrangement, however, the two balls form the same angle of ninety degrees as in the first-mentioned arrangement. 70

The operation of the latter form of my invention is as follows, the principal remaining the same in both instances, viz: The motor being set in operation, the regulator is caused to revolve horizontally around an axial line drawn vertically through the center of the shaft 1. This revolution is looking 80 down upon the regulator from above, in a direction from right to left, or the same as the hands of a watch. As the velocity of revolution increases, the heavier ball lags behind the lighter one. This tends to elevate the lower one and depress the upper one, as in the other form, thereby revolving the casting 5<sup>a</sup> on its axis. The ring or loop being secured to the shaft 1, the lugs 4<sup>a</sup> tend to elevate the rods 8, which carry with them the collar 2, weight 5<sup>b</sup>, and consequently depress the regulator-shaft 1, which action serves to open and close the egress-valve of the motor, or to actuate other devices according to the purpose for 95 which the regulator is used.

In the device shown in Figs. 5 to 11 the movement of the pendulums is made to act upon the weight 5<sup>b</sup>, such weight acting as a sort of counter-balance. 100

The relative positions of the weights and their actions are determined by calculation, so that the regulator shall be as nearly astatic as possible. Any novel subject-matter described but not claimed in this application I 105 have reserved to be claimed in future original applications.

Having thus described my invention, the following is what I claim as new therein, and desire to secure by Letters Patent: 110

1. An astatic centrifugal governor consisting of two or more oscillatory pendulums revolving with the regulator-shaft, said pendulums consisting of a pair of balls mounted in different horizontal planes on an oscillatory 115 axis, having suitable connections with the said regulator-shaft, whereby said shaft will be operated upon by the oscillation of the pendulums, substantially as set forth.

2. In an astatic centrifugal governor, a pendulum consisting of a pair of balls mounted in different horizontal planes on an oscillatory axis, whereby their centrifugal force will cause said axis to oscillate, substantially as and for the purposes set forth. 125

3. The combination, with the regulator-shaft 1 and the sleeve 2, carrying brackets 2<sup>a</sup>, of the pendulums mounted upon axes secured in adjustable bearings in the said brackets, and having bearings in the said regulator-shaft, substantially as described. 130

4. The combination, with the regulator-shaft 1, having a cap, 6, provided with bearings 6<sup>a</sup>, and the sleeve 2, carrying supporting-



brackets 2<sup>a</sup>, of the pendulum 5, secured later-  
ally upon hollow semi-cylindrical castings 4,  
said semi-cylindrical castings having shafts 3,  
journaled in suitable bearings in semi-cylin-  
5 drical bracket-arms and loose connection with  
the cap 6, substantially as and for the purpose  
set forth.

5. In a centrifugal governor, the combi-  
nation of an oscillatory pendulum mounted  
10 on suitable axis, substantially as herein de-  
scribed, and a supporting-bracket having ad-  
justable bearings for said axis, as set forth.

6. In an astatic centrifugal governor, the  
combination, with an oscillatory pendulum  
substantially as herein described, of a lug or 15  
stop to arrest its oscillation, as and for the  
purpose set forth.

In testimony whereof I have signed this  
specification in the presence of two subscrib-  
ing witnesses.

JOHANNES SELWIG.

Witnesses:

HERMANN TIETZ,  
JOHS. KRACKE.