

(No Model.)

A. P. BROOMELL.
GOVERNOR FOR ENGINES.

No. 338,822.

Patented Mar. 30, 1886.

Fig. 1.

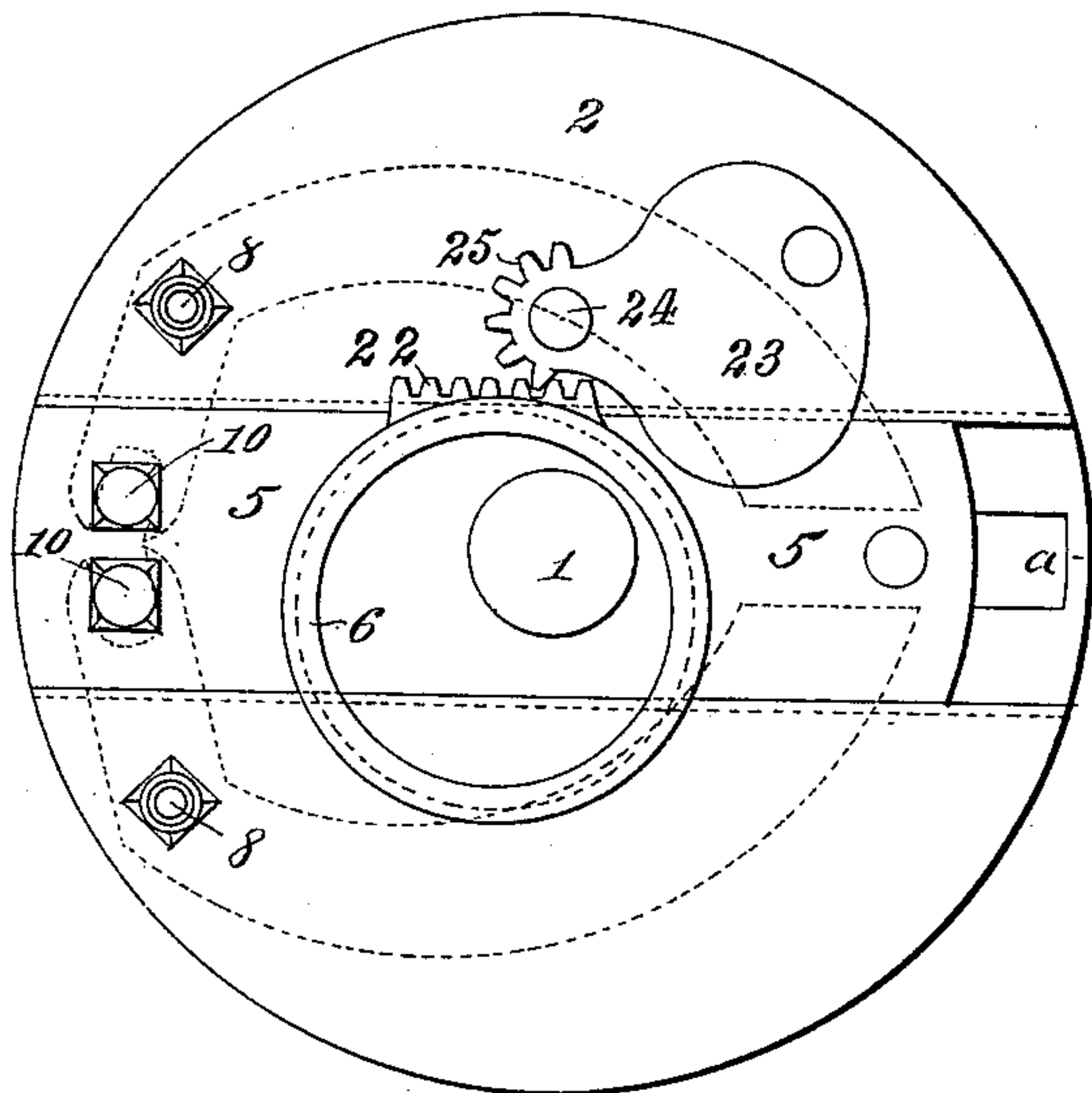


Fig. 2.

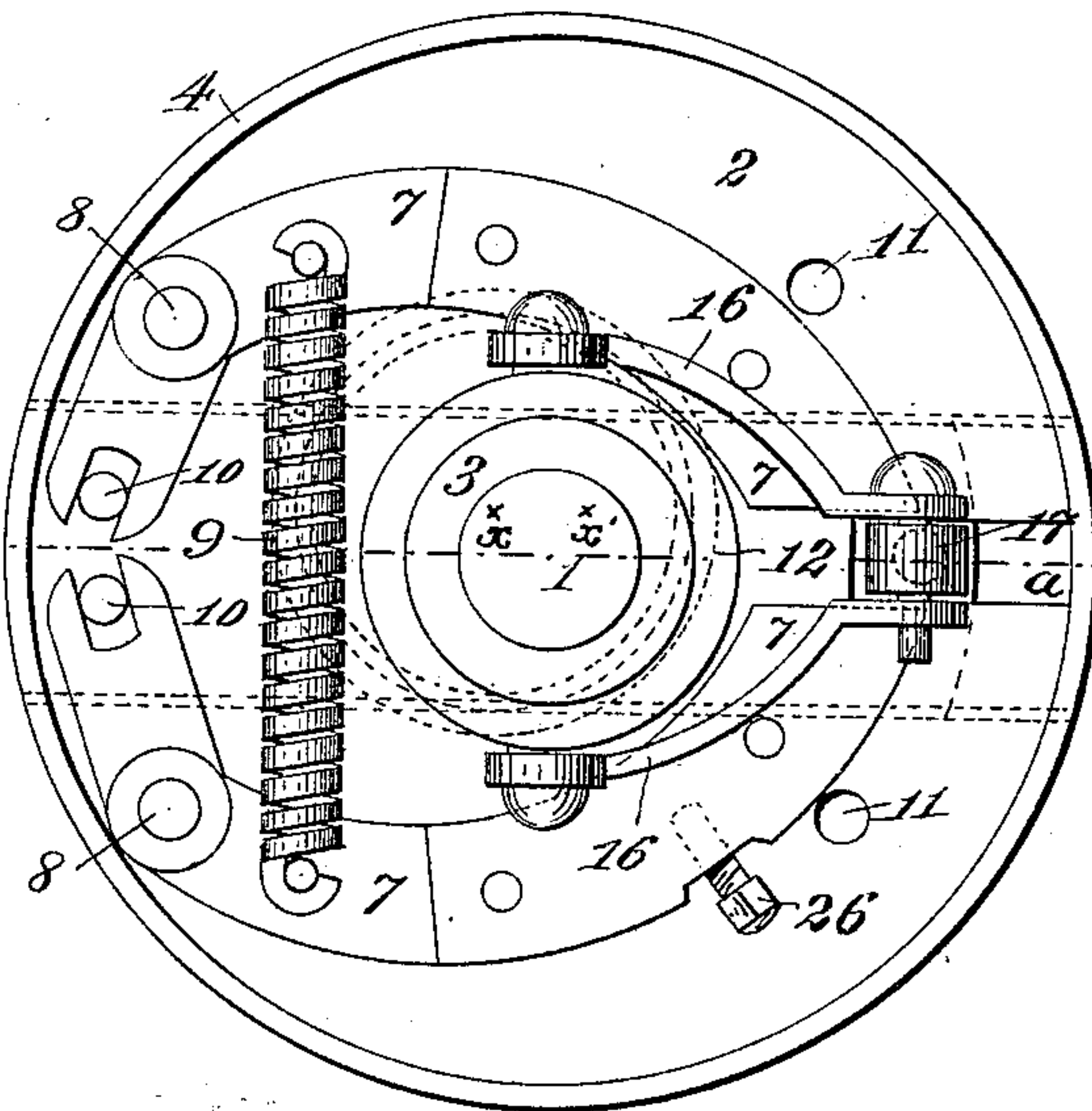


Fig. 3.

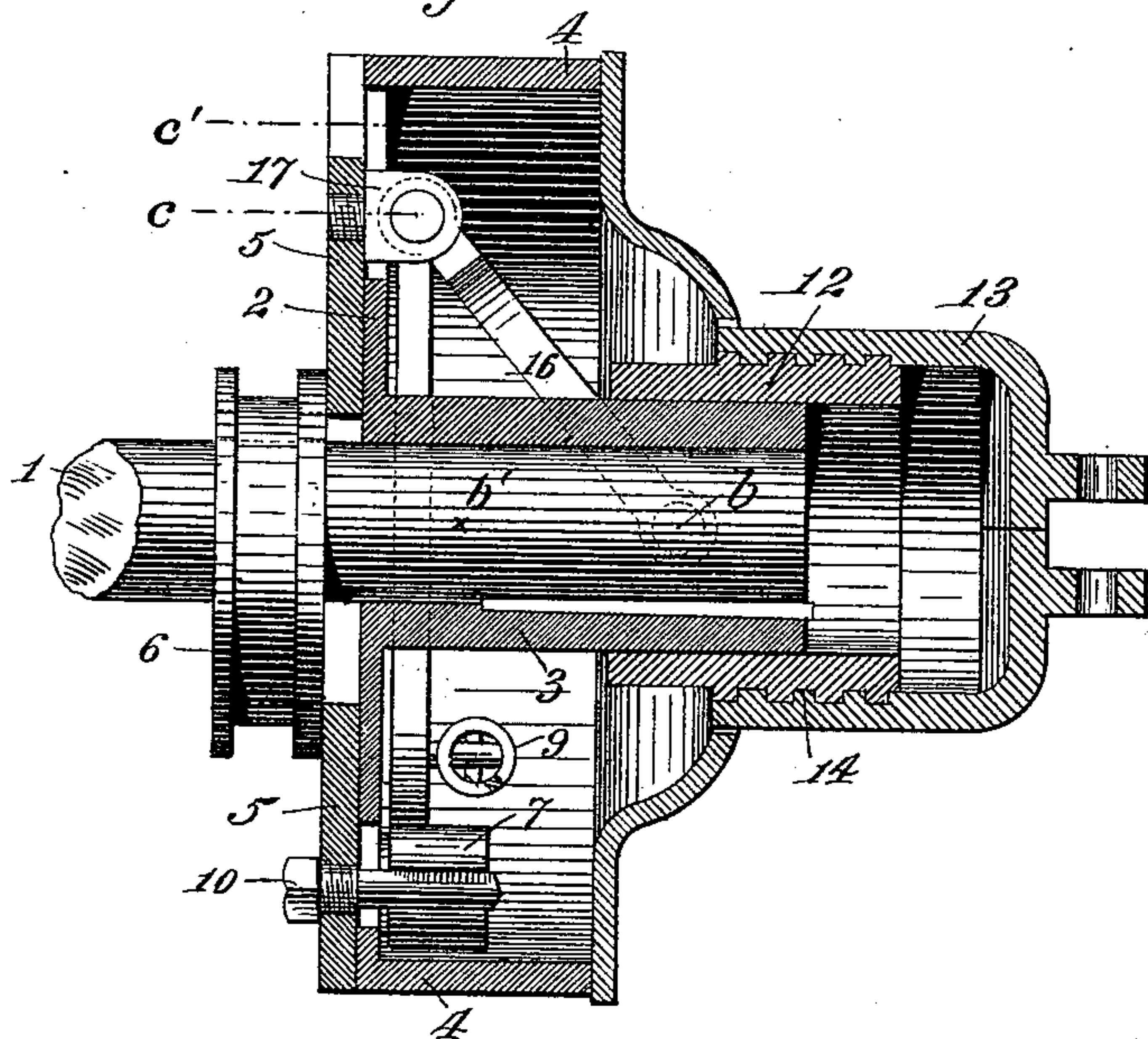
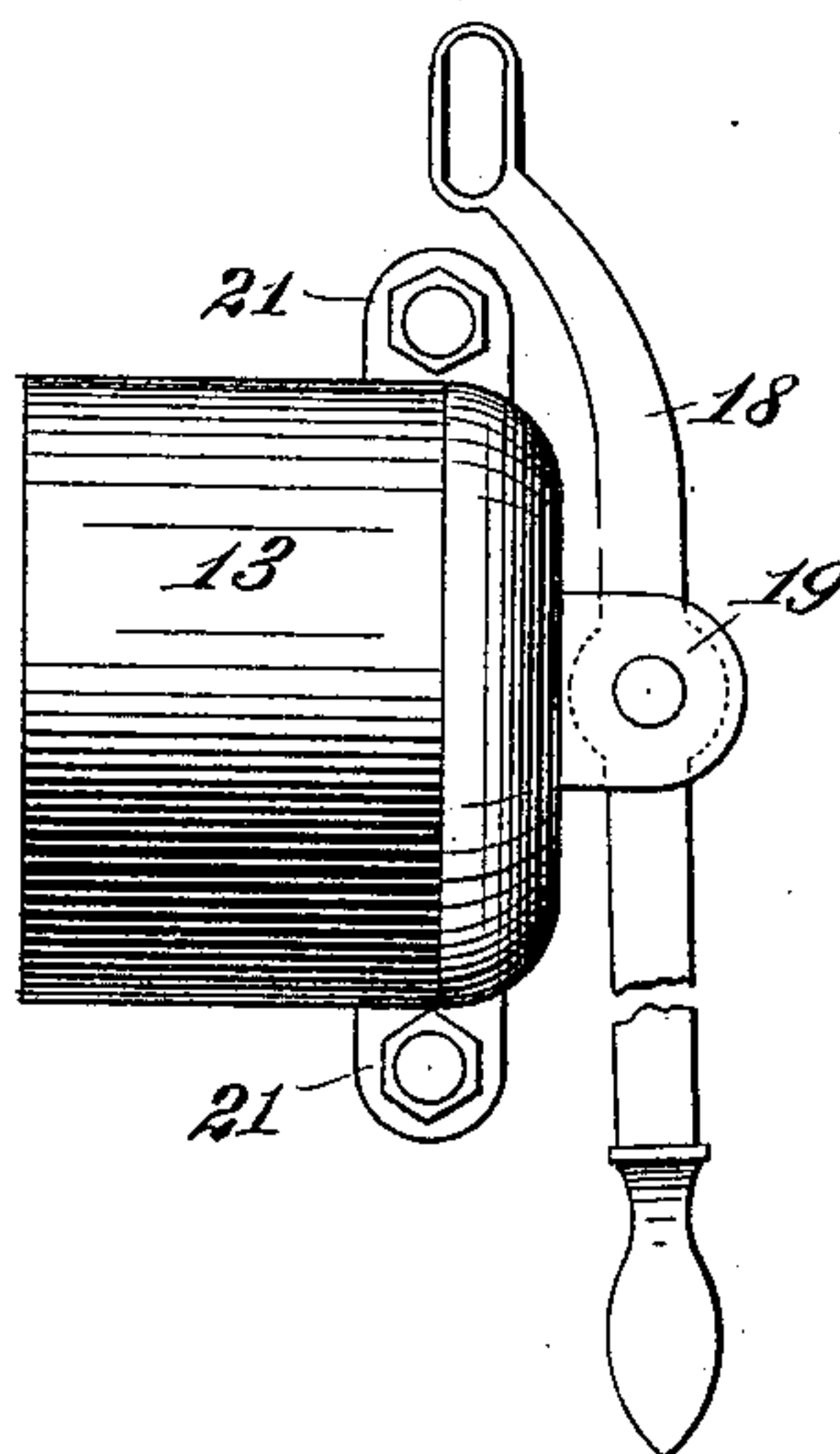


Fig. 4.



Witnesses:

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by Marcellus Bailey
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UNITED STATES PATENT OFFICE.

ALBERT P. BROOMELL, OF YORK, PENNSYLVANIA.

GOVERNOR FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 338,822, dated March 30, 1886.

Application filed December 21, 1885. Serial No. 186,349. (No model.)

To all whom it may concern:

Be it known that I, ALBERT P. BROOMELL, of York, in the State of Pennsylvania, have invented certain new and useful Improvements in Automatic Governors and Reversing-Gear for Steam-Engines, of which the following is a specification.

My invention relates to automatic governors for steam-engines, its object being to furnish a governor simple in construction and reliable in action, controlling automatically the speed of the engine by altering the throw of the valve, while its lead is always kept the same and "racing" or "plunging" avoided, and which is adapted for use as a reverser, when desired, by the addition thereto of devices permitting it to be manually operated. To accomplish these ends the eccentric operating the valve-slide is not attached to the shaft, but is attached to a base-plate arranged to slide endwise in a disk attached to and rotating with the shaft, so that the eccentric may be moved in a straight line at a right angle to the axis of the shaft. Upon the disk are pivoted two weights—one on either side of the shaft—the pivotal points of both, however, being near the edge of the disk on the same side of the shaft, a spring connecting the two weights, so as to normally draw them inward toward each other. From the pivotal points of these weights short arms connected to them take by slotted ends on pins secured in the sliding eccentric base-plate, so that as these weights are thrown outward by centrifugal force or brought inward by the resistance of the spring they will cause the base-plate to slide in its ways in the disk and change the relation of the center of the eccentric to the center of the shaft, and so vary or control the amount of movement of the slide-valve, and consequently the admission of steam to the cylinder or cylinders. If the weights be disconnected from the sliding eccentric base-plate, and such base-plate be connected to mechanism by which it may be manually moved when desired, it forms a simple and reliable reversing-gear.

The invention thus generally set forth may be better understood by reference to the drawings, wherein—

Figure 1 is a plan view of the back, and Fig. 2 a plan view of the front, of a governor embodying the invention. Fig. 3 is a section thereof on the line *a a*, Fig. 2, while Fig. 4 is an elevation of a detail of construction.

In these figures, the reference-numeral 1 indicates a shaft of the engine, from which, by means of an eccentric, 6, the proper motion is given to the valve mechanism of the engine.

2 is a disk having a flange, 4, so as to form a receptacle for certain of the parts, and a hub, 3, by which it is keyed or otherwise secured to the shaft, so as to rotate therewith. In a grooved way upon the back or exterior of this disk is a sliding plate, 5, the grooved way serving to attach it to the disk 2, and yet permit a reciprocating or sliding movement to the plate. Any other form of attachment permitting such movement may be used. The eccentric 6 is cast with or otherwise attached to this sliding plate, which may be termed the "sliding eccentric base-plate," and consequently the disk 2, plate 5, and eccentric 6 rotate with the shaft 1.

Within the case or box formed by the flange 4 are the weights 7 7, pivoted to the disk 2 at 8 8, one on either side of the shaft, the pivotal points 8 8, however, being near the edge of the disk and upon the same side of the shaft, permitting a spring, 9, to be attached at its ends to both these weights, the spring tending to normally draw them in toward each other and the shaft, while its force is expended equally on each and unequal tension or strain on the weights and their pivots avoided.

From the pivotal points 8 8 arms formed with or attached to the weights extend inwardly and over the sliding eccentric base-plate. These arms are slotted or yoked at their free ends, pins 10, seated in the sliding plate, passing through slots in the disk, taking therein, so that as the weights are moved motion is communicated therefrom through the medium of the arms and pins to the plate 5.

Adjusting-screws 26 may be seated in the outer edge of the weights, so that the amount of outward throw to be permitted the weights may be adjustably regulated, the impingement of 26 upon the flange 4 limiting the movement.

The devices thus far described form the automatic governor itself, operating as follows: The tension of the spring 9 is so adjusted that its force overcomes the centrifugal force imparted to the weights by rotation so long as the predetermined extreme rate of speed of rotation is not exceeded. When exceeded, however, the centrifugal force acting upon 7 exceeds the force of the spring, and the weights fly outward to a greater or less extent. In so flying outward they carry or move the sliding eccentric base-plate 5 in its guideways, causing a change in the relation of the eccentric to the shaft, so that the throw of the slide-valve is lessened, the area of valve-opening diminished, and consequently less steam admitted, a reduction of speed to within the predetermined limit following.

When it is desired to use the eccentric and the sliding eccentric base-plate and their connections to the shaft as a manually-operated reversing-gear, the following simple changes permit this to be done: The pins 8 are removed from their seats in the sliding eccentric base-plate and placed in seats 11 11 in disk 2, thereby locking and keeping out of action the weights 7 7. Upon the hub 3 of disk 2 is placed a sleeve, 12, adapted to move longitudinally thereon, to opposite sides of which are pivoted arms 16 16, leading thence and pivoted to a lug, 17, formed on or attached to the sliding eccentric base-plate, and passing inwardly through a slot in the disk 2 of sufficient size to permit quite a range of movement to 17 and 5. The outer end of the sleeve 12 is formed with one or more plane peripheral grooves or corrugations, 14, fitting in similar grooves or corrugations in the interior of a cap, 13. This cap is formed in two halves united by bolts or other fastening devices, passing through lugs or ears 21, formed on each half. The sleeve 12 is caused to rotate with the disk and eccentric by its connections 16, the grooves 14 permitting its rotation within the stationary cap 13, while they compel it to partake of any sliding or longitudinal movement given the cap.

In ears or other supports, 19, on the top of the cap is pivoted a lever, 18, whose outer end, 20, is to be pivoted in or to any suitable standard, (not shown,) so as to form a fulcrum for the lever. The parts being thus arranged and in the relative position shown in Fig. 3, if it be desired to reverse the engine, force is applied to the lever 18, causing the cap 13 and sleeve 12 to move from right to left in Fig. 3, carrying the points of attachment *b* of 16 16 to 12 from *b* to *b'*. This moves the sliding eccentric base-plate 5, say point *c* to *c'*. The plate carrying the eccentric 6 with it changes its center of the eccentric relatively to the axis of the shaft from *x* to *x'*—that is, from one side to the other of the central line of the shaft—thus reversing the engine.

It has been found that the centrifugal force due to the weight of the eccentric and its con-

nections, when revolving at a high rate of speed, (especially if the eccentric be much out of the center, either upon one side or the other,) is such as to make it somewhat difficult to instantaneously and readily operate the reverser to shift the center of the eccentric. To obviate this a rack, 22, is formed on one edge of the sliding eccentric base-plate, in which takes the cogged gearing 25, formed on the hub of a weight, 23, which is pivoted at 24 to the disk 2. This weight 23 is of such size that its centrifugal force during rotation of the disk shall approximate that of the eccentric and its connections. The tendency given the eccentric by centrifugal force is to fly outward and carry the plate 5 from right to left in Fig. 1. The tendency given weight 23 is also to fly outward, giving its racked or geared hub 25 beyond the pivot 24 a tendency to move from left to right, the reverse of the tendency to move given 5 by the eccentric. The centrifugal forces acting on the eccentric and weight thus balance each other, one counteracting the other, and leaving only the mere weight of the metal and friction to be overcome in operating the reverser. This auxiliary weight 23 is not necessary for the successful operation of the device, which is complete without it. It is, however, an aid, and of advantage in counteracting any effects of centrifugal force on the eccentric, and its use in no manner interferes with or lessens the usefulness and effect of the weights when the devices are used as an automatic governor. This construction insures a reliable, simple, and easily-operated automatic governor, a leading feature of which—to wit, the movement of the eccentric in a straight line at right angles to the axial line of the shaft—may be availed of to form a reversing-gear for manual operation.

Having thus described my improvements, what I claim to be new and of my own invention is—

1. The combination of a disk for attachment to the shaft of an engine, a base-plate carrying the eccentric and adapted to move longitudinally in or upon such disk, an eccentric, weighted arms operating upon the sliding base-plate, and a spring extending between and attached at opposite ends directly to said arms, substantially as described.

2. The combination of the disk 2, sliding base-plate 5, and eccentric 6, carried thereby, and the weighted lever-arms 7, pivoted to the disk 2, engaging with their shorter arms the sliding base-plate, and having their longer arms connected by a spring, 9, extending between and attached at opposite ends directly to said arms, these parts being constructed and arranged for joint operation in the manner hereinbefore set forth.

3. A combined automatic governor and reversing-gear for steam-engines, consisting of the disk 2, the sliding base-plate 5, and eccentric 6, carried thereby, weighted arms 7, de-

tachably connected to said base-plate, means
for locking the said arms against movement,
the sliding reversing-sleeve 12, and the arms
or links 16, whereby said sleeve may be de-
5 tachably connected with the base-plate 5,
these parts being arranged and adapted for
use substantially in the manner and for the
purposes hereinbefore set forth.

In testimony whereof I have hereunto set
my hand this 8th day of December, 1885.

ALBERT P. BROOMELL.

Witnesses:

B. H. FARQUHAR,
F. J. EVANS, Jr.