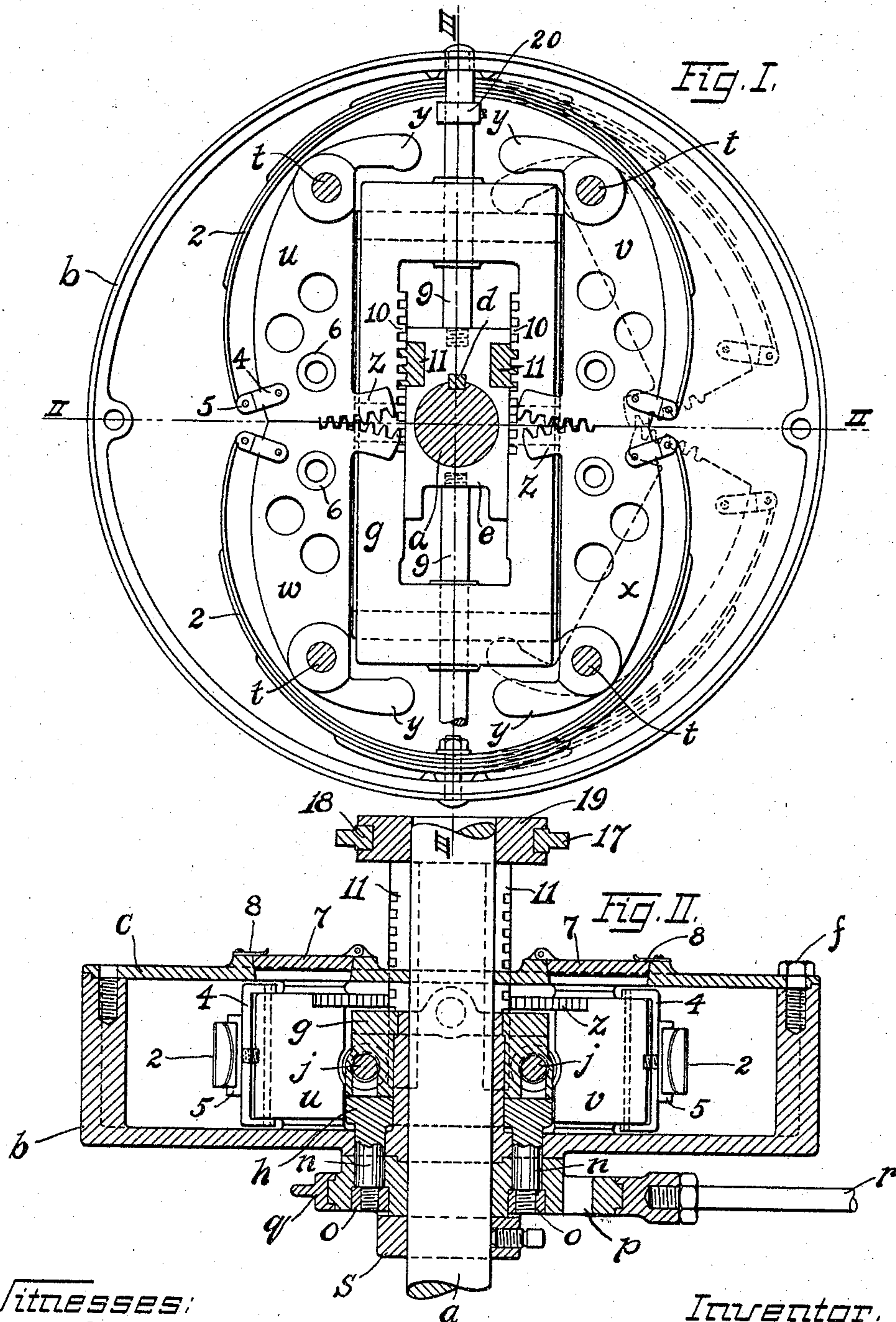


No. 782,458.

PATENTED FEB. 14, 1905.

C. R. MINOR.
SHAFT GOVERNOR.
APPLICATION FILED APR. 15, 1904.

2 SHEETS—SHEET 1.



Witnesses:

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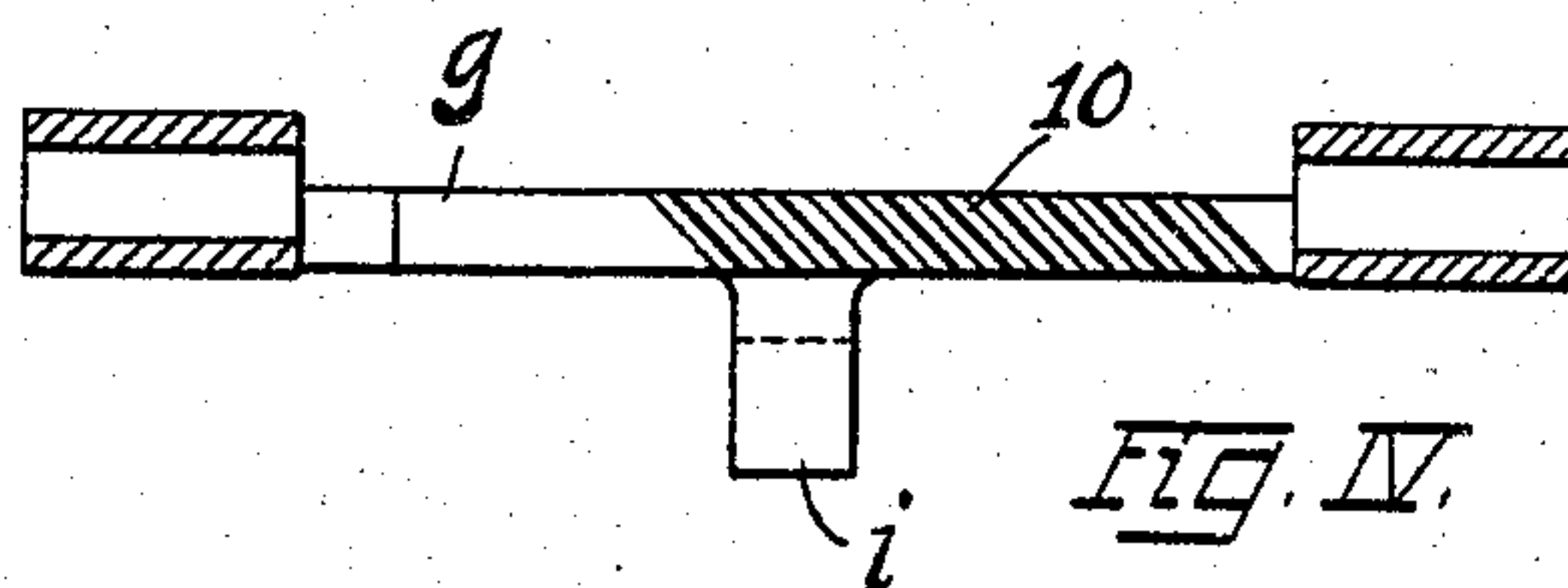


FIG. IV.

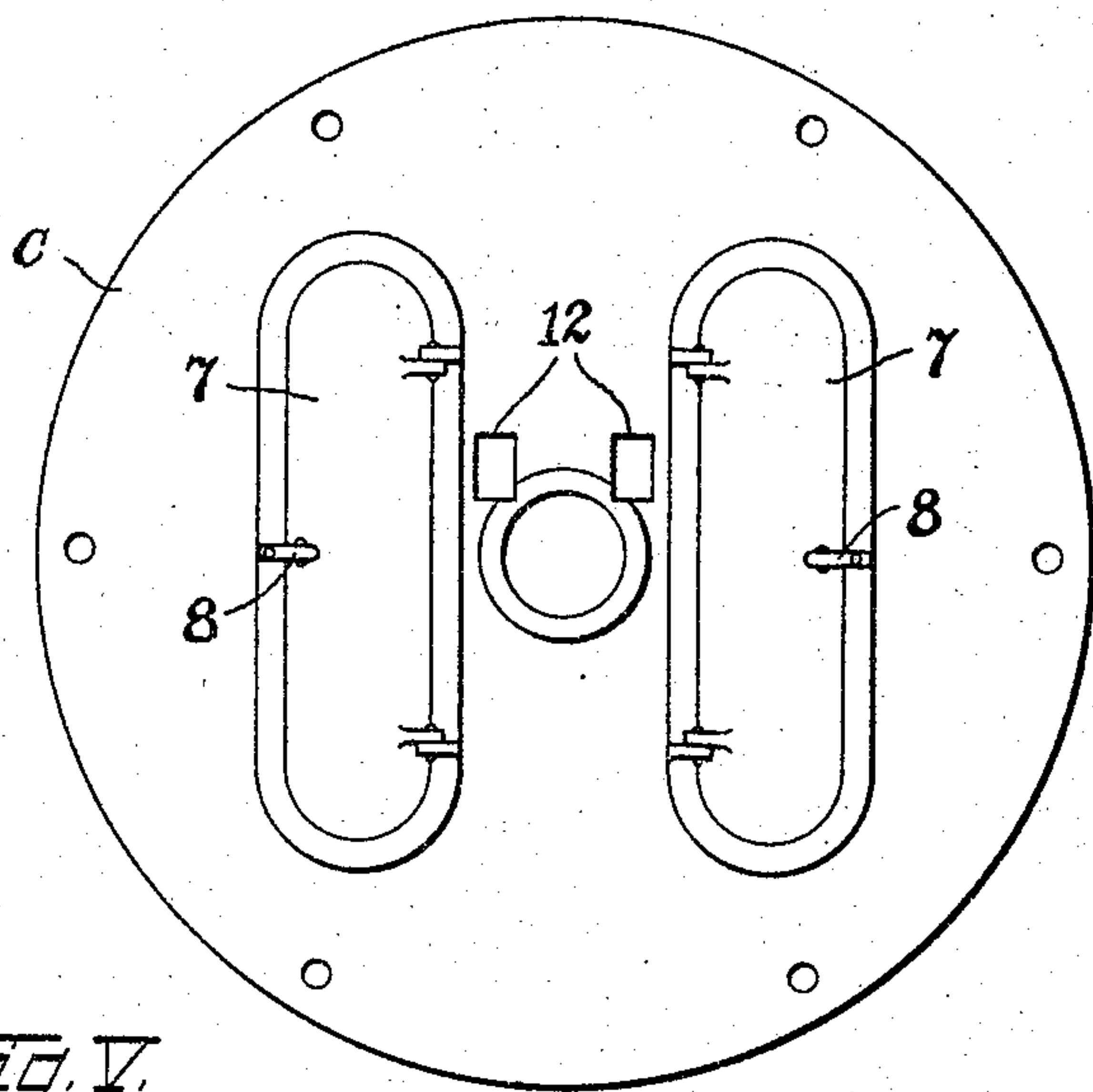


FIG. V.

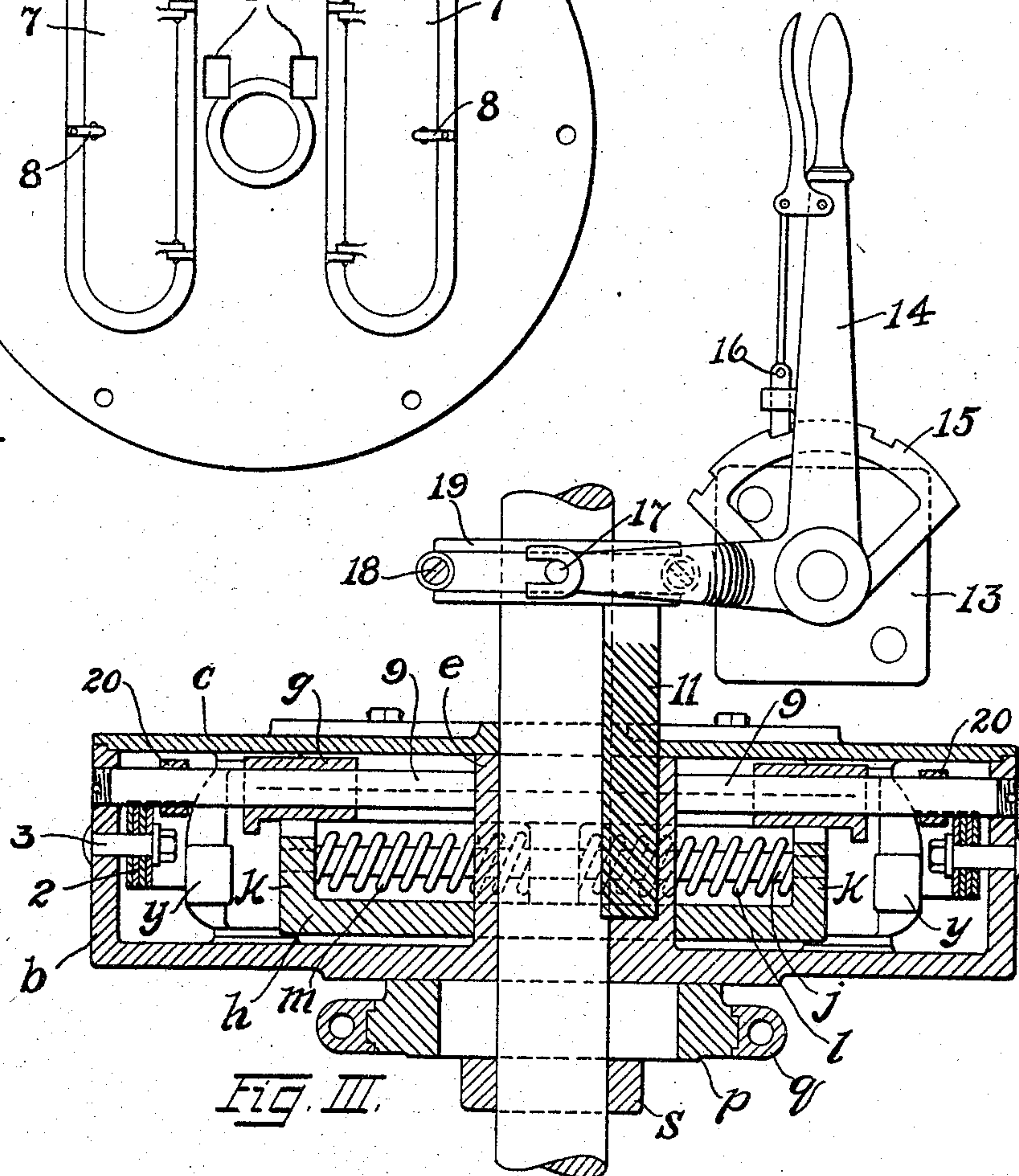


FIG. III.

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UNITED STATES PATENT OFFICE.

CLARENCE RAY MINOR, OF SANDUSKY, OHIO, ASSIGNOR OF ONE-HALF
TO JOHN RAY, OF SANDUSKY, OHIO.

SHAFT-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 782,458, dated February 14, 1905.

Application filed April 15, 1904. Serial No. 203,382.

To all whom it may concern:

Be it known that I, CLARENCE RAY MINOR, a citizen of the United States, residing at Sandusky, in the county of Erie and State of Ohio, have invented certain new and useful Improvements in Shaft-Governors and Reversing Mechanisms, of which the following is a specification.

This invention relates to shaft-governors for regulating the speed of engines and to means for reversing the direction of rotation of engine-shafts.

It has for its object the provision in this type of governor of more effective means for opposing the centrifugal action of the weights and also improved means for reversing the motion of the engine, together with the operation of the governor to correspond therewith.

To these ends my invention consists in the novel features and combinations hereinafter described and claimed, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure I is an elevation of the outer end of the governor with the cover-plate removed, the shaft and reversing-racks being shown in section. Fig. II is a section taken on line II II of Fig. I. Fig. III is a section of the governor, taken on line III III of Fig. I, showing the reversing mechanism, the shaft *a* and rack 11 being shown in outside elevation. Fig. IV is a detached sectional view of the reversing-plate similar to that shown in Fig. III. Fig. V is an outside elevation of the cover-plate.

The reference-letter *a* indicates the main shaft of the engine. A cylindrical casing *b*, provided with a tight-fitting cover-plate *c*, is mounted upon said shaft and secured thereto by a key *d* or other suitable means. The casing *b* has a hub *e* projecting inwardly, and the cover-plate is secured to said casing by screws *f*. The casing-hub *e* is elongated or flanged and provided with parallel side faces, as shown, to serve as guides for both the reversing-plate *g* and the eccentric-plate *h*. The reversing-plate *g* is normally held stationary in relation to the casing, but is arranged to be shifted across the shaft for the purpose of

reversing the motion of the engine. Midway of its length said reversing-plate is provided with a pair of lugs *i*, one upon each side, projecting inwardly and having grooves therein through which the spring-rods *j* may reciprocate. The eccentric-plate *h*, working against the inner face of the casing *b*, is provided at its ends with outwardly-projecting flanges *k*, having grooves therein fitted to receive the ends of the said spring-rods *j*. Surrounding the rods *j* and abutting against the respective flanges *k* and the lugs *i* are two pairs of spiral springs *l* and *m* of substantially equal size and strength and preferably somewhat in compression when the eccentric-plate is in its middle position. Projecting inwardly through elongated slots in the casing *b*, midway of the length of the eccentric-plate *h* and preferably integral therewith, is a pair of pins *n*. Secured upon said pins by suitable means, such as the nuts *o*, and bearing against the casing is an eccentric *p*, through an elongated slot in which the main shaft *a* extends. Said eccentric is provided with the usual encircling strap *q*, to which is attached a valve-rod *r*, connecting with the intake-valve of the engine, and a shaft-collar *s* is provided when necessary. It will thus be observed that the eccentric *p* and the plate *h* are rigidly connected together and arranged to move across the shaft as one piece.

Fulcrumed upon studs *t*, set into the casing *b* near its periphery, are four centrifugal weights *u, v, w*, and *x*, each provided with an arm *y*, projecting beyond its fulcrum and adapted to engage the respective end of the eccentric-plate *h*. The said weights are arranged to move in pairs, the weights *u* and *w* forming one pair and weights *v* and *x* another. This is accomplished, preferably, by means of toothed segments *z* upon the free ends of the respective weights, the segments of each pair meshing together. For the purpose of holding the weights normally at their inner positions semi-circular plate-springs 2 are provided, being secured midway of their lengths to the inside of the casing *b* in any suitable manner, as by bolts 3, and the ends of one spring being hinged, respectively, to the weights *u* and *v* and the

ends of the other being respectively hinged to the weights w and x . The hinge pieces or links are preferably made in two parts, the parts 4 being hinged to the weights and the parts 5 being hinged to the ends of the springs and provided with a shank-screw threaded into the part 4, as shown in Figs. I and II, so that some adjustment may be made to compensate the tension of the springs relatively to the centrifugal force of the weights. For adjusting the governor to operate at differing rates of speed I form circular apertures in the weights, some or all of which may be filled as required with plugs or hollow bushings 6, Fig. I. Apertures are made in the cover-plate c to give access to said weight-bushings and are tightly closed by suitable covers, which I prefer to form as hinged doors 7, provided, respectively, with spring-buttons 8 for keeping them closed.

The reversing-plate g is slidably mounted at its ends, respectively, upon rods 9, secured between the hub and flange of the casing b in any suitable way. Skew-rack-teeth 10 are formed upon the inner sides of said plate and adapted to mesh with the respective skew-racks 11, which are slidably mounted in suitable channels in the hub e of the casing and project therein through apertures 12 in the cover-plate c . The racks 11 may travel through the back of the casing b and into the elongated opening in the eccentric p if necessary but in ordinary cases this excessive travel will not be required.

Fulcrumed upon a suitable extraneous support, as 13, Fig. III, is a hand-lever 14, which should be provided with means for locking it in its central and outermost positions—such, for example, as the well-known notched quadrant 15 and latch 16, engaging therewith. The lever 14 is provided with a bifurcated end each branch of which is forked or slotted to engage the oppositely-projecting pins 17 of a two-part collar 18. The collar 18 is loosely fitted between the flanges of a sliding collar 19, mounted upon the main shaft and carrying the skew-racks 11. Stops 20 may be provided to prevent excessive travel of the reversing-plate g .

In the operation of the mechanism when the lever 14 is thrown over to one of its extreme positions it will readily be seen that the skew-racks meshing with the reversing-plate g will shift the latter and with it the eccentric-plate h and eccentric p to their outer positions upon one side of the main shaft, and since said eccentric is operatively connected with the slide-valve of the engine the position of said valve will be such in relation to the crank-shaft that steam will enter the cylinder to drive the engine in one direction, and by throwing the lever 14 to its other extreme position the said parts, including the eccentric, will be shifted to the opposite side of the main shaft, effecting a change in the initial position of the slide-

valve, whereby steam will enter the cylinder at such times that the engine will be driven in the opposite direction. It will also be observed that when the hand-lever 14 is thrown over to one of its outer positions one end of the eccentric-plate h will bear against the arms y of two of the weights. When the engine is at rest, the weights assume the inner positions, as shown in Fig. I, with their ends abutting, respectively, against the ends of the opposite weights. When the engine is running and tends to exceed its normal rate of speed, the weights are swung outward by the centrifugal force of revolution, as shown by dotted lines in Fig. I, overcoming the resistance of the plate-springs 2 and the pair of spiral springs l or m , according as the engine is running in one direction or the other, and shifting the plate h and eccentric p toward their central position, thereby decreasing the travel of the engine slide-valve and cutting off the flow of pressure fluid to the engine-cylinder earlier in the stroke of the piston, and conversely as the speed tends to decrease the weights swing inward and the springs l or m force the eccentric toward its outer position, where it makes the valve travel farther, thus admitting more pressure fluid to the cylinder.

Having now so fully described my invention that those skilled in the art to which it appertains can make and use it, either in the form shown herein or under some modification thereof, what I claim as new, and desire to secure by Letters Patent, is—

1. In a governor for engines, the combination with a rotatable shaft, of a slidable plate suitably mounted upon the shaft, an eccentric attached to said plate and operatively connected to the pressure-fluid-admission valve of the engine, spring-cushioned means for holding said plate and sliding it across the shaft, centrifugal weights arranged to revolve with the shaft and to engage directly with said slidable plate and shift its position according as the speed of revolution varies, approximately semicircular plate-springs adapted to oppose the outward movement of said weights, and adjustable hinged links connecting said weights respectively to the extremities of said plate-springs, substantially as set forth.

2. In a governor for engines, the combination with a rotatable shaft, of a slidable plate suitably mounted upon the shaft, an eccentric attached to said plate and operatively connected to the pressure-fluid-admission valve of the engine, a reversing-plate operatively connected through suitable springs with said slidable plate, means for holding said reversing-plate and shifting it across the shaft, centrifugal weights arranged to revolve with the shaft and to engage directly with said slidable plate and shift its position in relation to said reversing-plate according as the speed of revolution varies, and approximately semicircular plate-springs adapted to oppose the outward

movement of said weights, substantially as set forth.

3. In a governor for engines, the combination with a rotatable shaft, of a slidable plate
5 suitably mounted upon the shaft, an eccentric attached to said plate and operatively connected to the pressure-fluid-admission valve of the engine, a reversing-plate connected through
10 suitable springs with said slidable plate and provided with diagonal gear-teeth, centrifugal weights and opposing springs adapted to engage directly with said slidable plate, racks
15 mounted to reciprocate parallel with the shaft having skew-teeth fitted to mesh with the teeth on said reversing-plate, and means for holding and reciprocating said racks, substantially as set forth.

4. In a governor for engines, the combination with a rotatable shaft, of a slidable plate
20 suitably mounted upon the shaft, an eccentric attached to said plate and operatively connected to the pressure-fluid-admission valve of the engine, a reversing-plate connected through suitable springs with said slidable plate and
25 provided with diagonal gear-teeth, centrifugal weights and opposing springs adapted to engage directly with said slidable plate, a collar slidingly mounted upon the shaft, racks carried by said collar having skew-teeth fitted
30 to mesh with the teeth on said reversing-plate to shift the latter across the shaft, and suitable means for sliding said collar along the shaft and locking it in requisite positions, substantially as set forth.

35 5. In a governor for engines, the combination with a rotatable shaft, of a slidable plate suitably mounted upon the shaft, an eccentric attached to said plate and operatively connected to the pressure-fluid-admission valve of the

engine, a reversing-plate connected through 40
suitable springs with said slidable plate and provided with diagonal gear-teeth, centrifugal weights and opposing springs adapted to engage directly with said slidable plate, a collar slidingly mounted upon the shaft, racks 45
carried by said collar having skew-teeth fitted to mesh with the teeth on said reversing-plate to shift the latter across the shaft, a reversing-lever mounted upon an extraneous support provided with means for sliding said collar along 50
the shaft, and means for locking the reversing mechanism, substantially as set forth.

6. In a governor for engines, the combination with a rotatable shaft, of a governor-casing rigidly mounted thereon, a slidable plate 55
suitably mounted in said casing, an eccentric attached to said plate and operatively connected to the pressure-fluid-admission valve of the engine, a reversing-plate connected through suitable springs with said slidable plate and 60
provided with diagonal gear-teeth, centrifugal weights and opposing springs adapted to engage directly with said slidable plate, racks mounted in suitable bearings in said casing to reciprocate parallel with the shaft having 65
skew-teeth fitted to mesh with the teeth on said reversing-plate, and means for holding and reciprocating said racks, substantially as set forth.

In testimony whereof I affix my signature, 70
in the presence of two subscribing witnesses, at Sandusky, Ohio, this 12th day of April, 1904.

CLARENCE RAY MINOR.

Witnesses:

C. H. CRAMER,
JOHN RAY.