

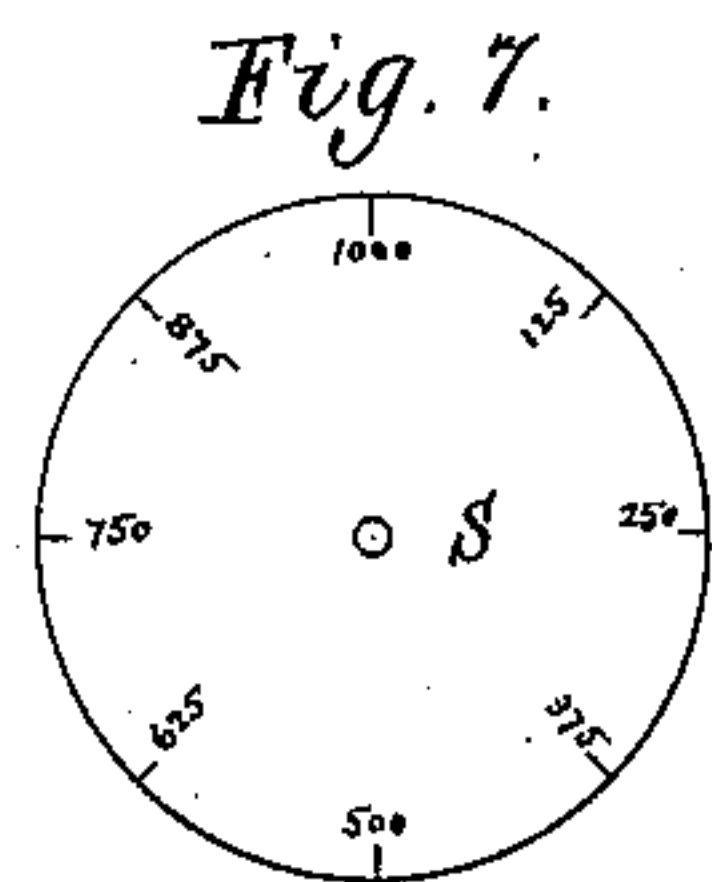
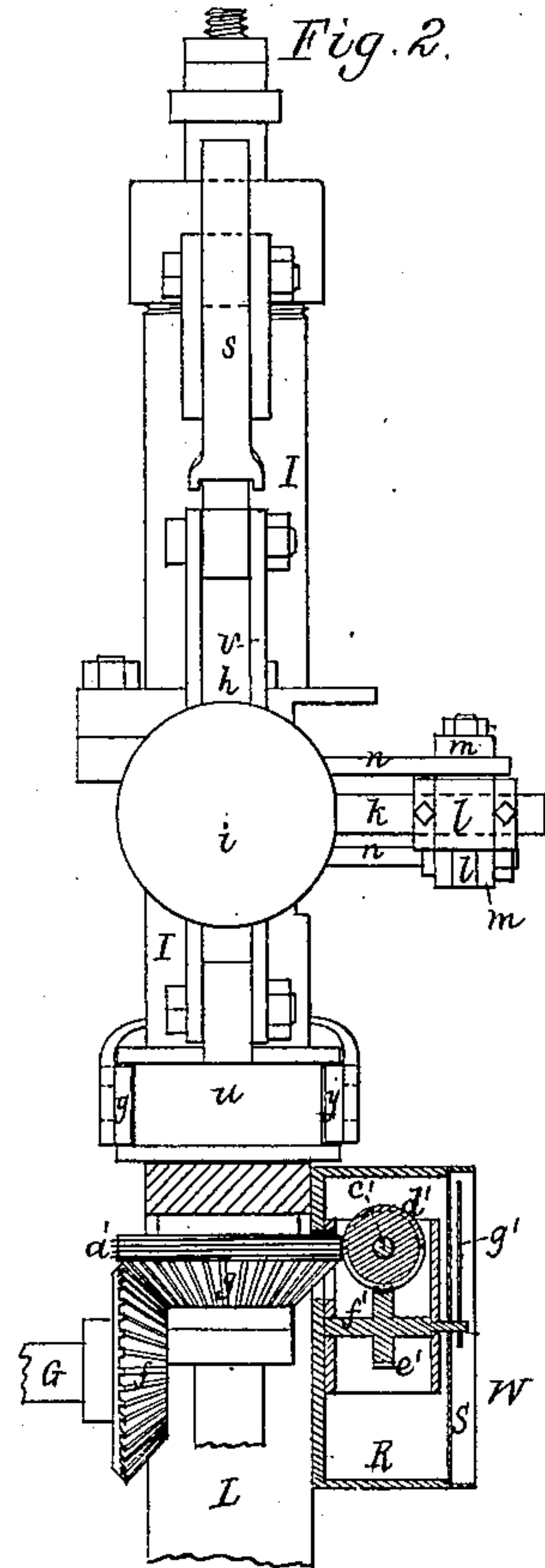
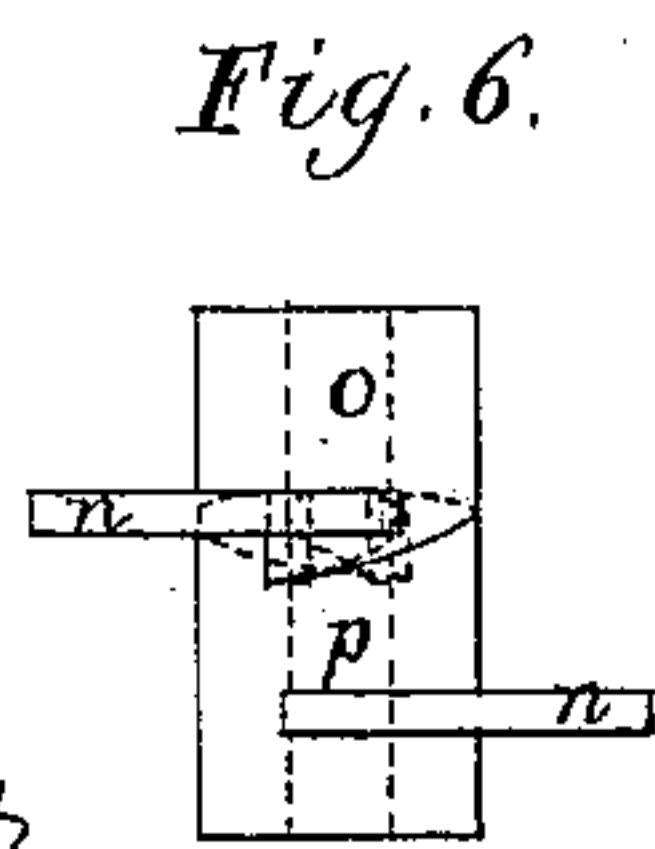
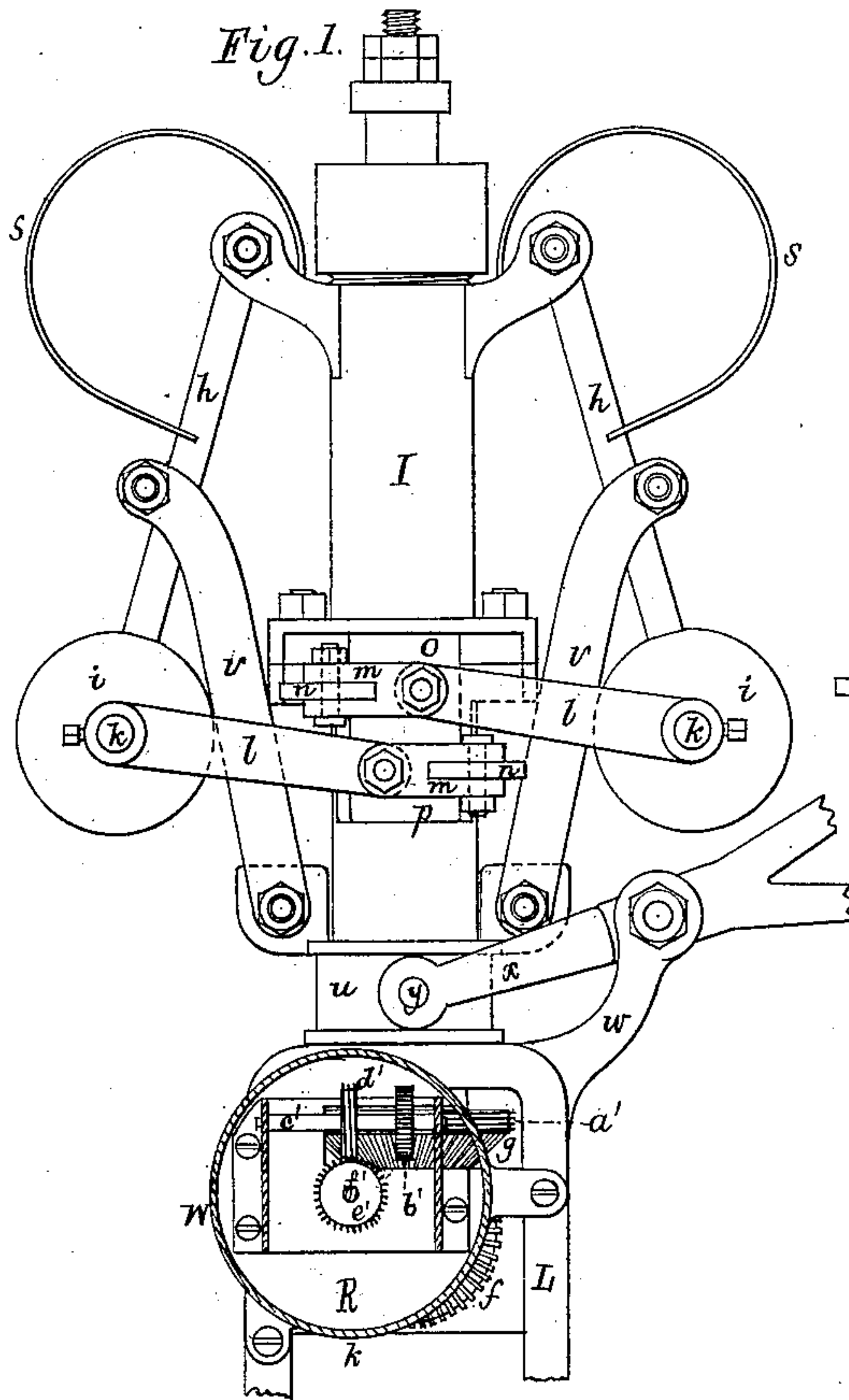
(No Model.)

3 Sheets—Sheet 1.

F. McMAHON.
STEAM ENGINE GOVERNOR.

No. 377,168.

Patented Jan. 31, 1888.



Witnesses.

H. Grayson.
Thos. Houghton.

Inventor.

Francis McMahon.
by Singleton Piper atty's

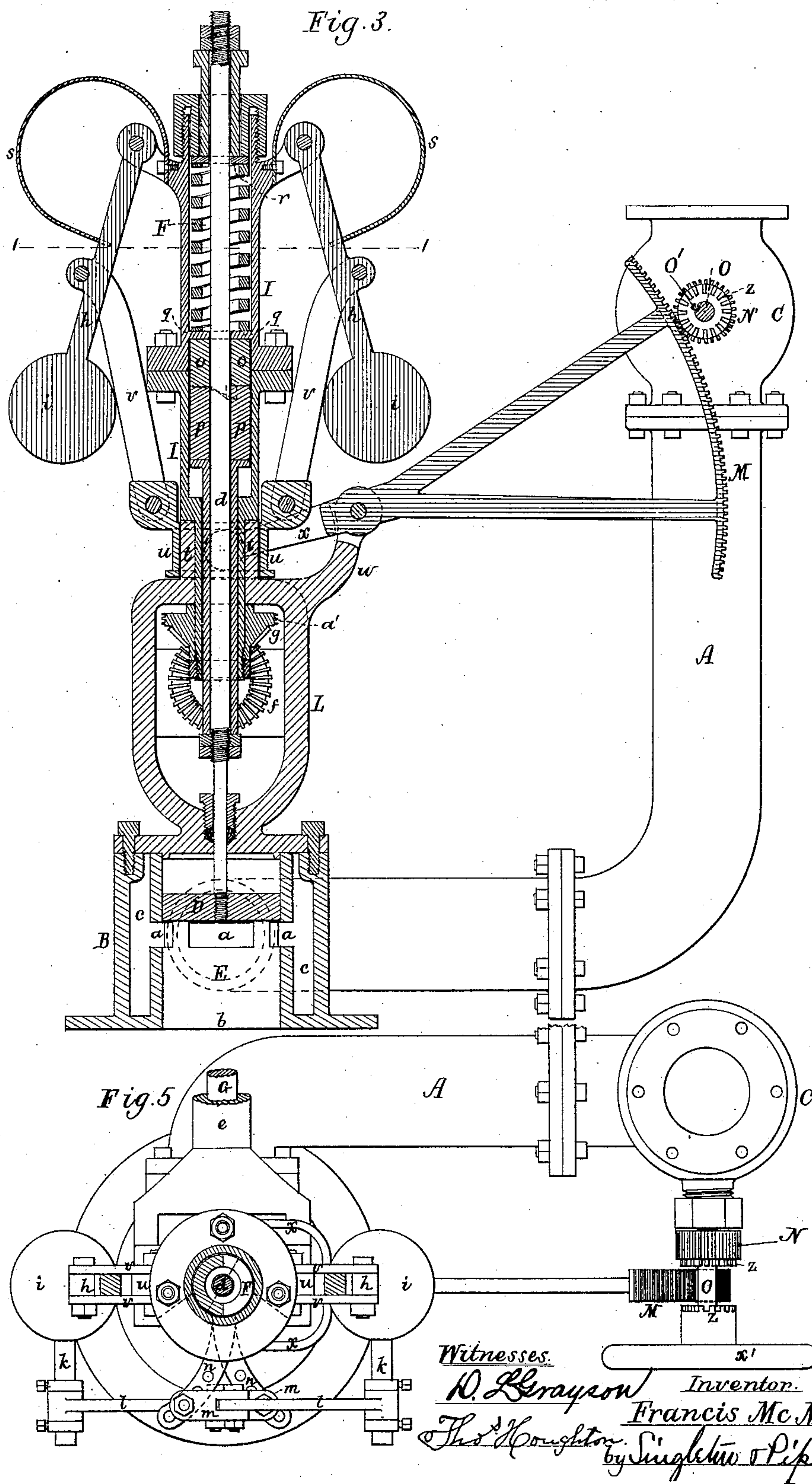
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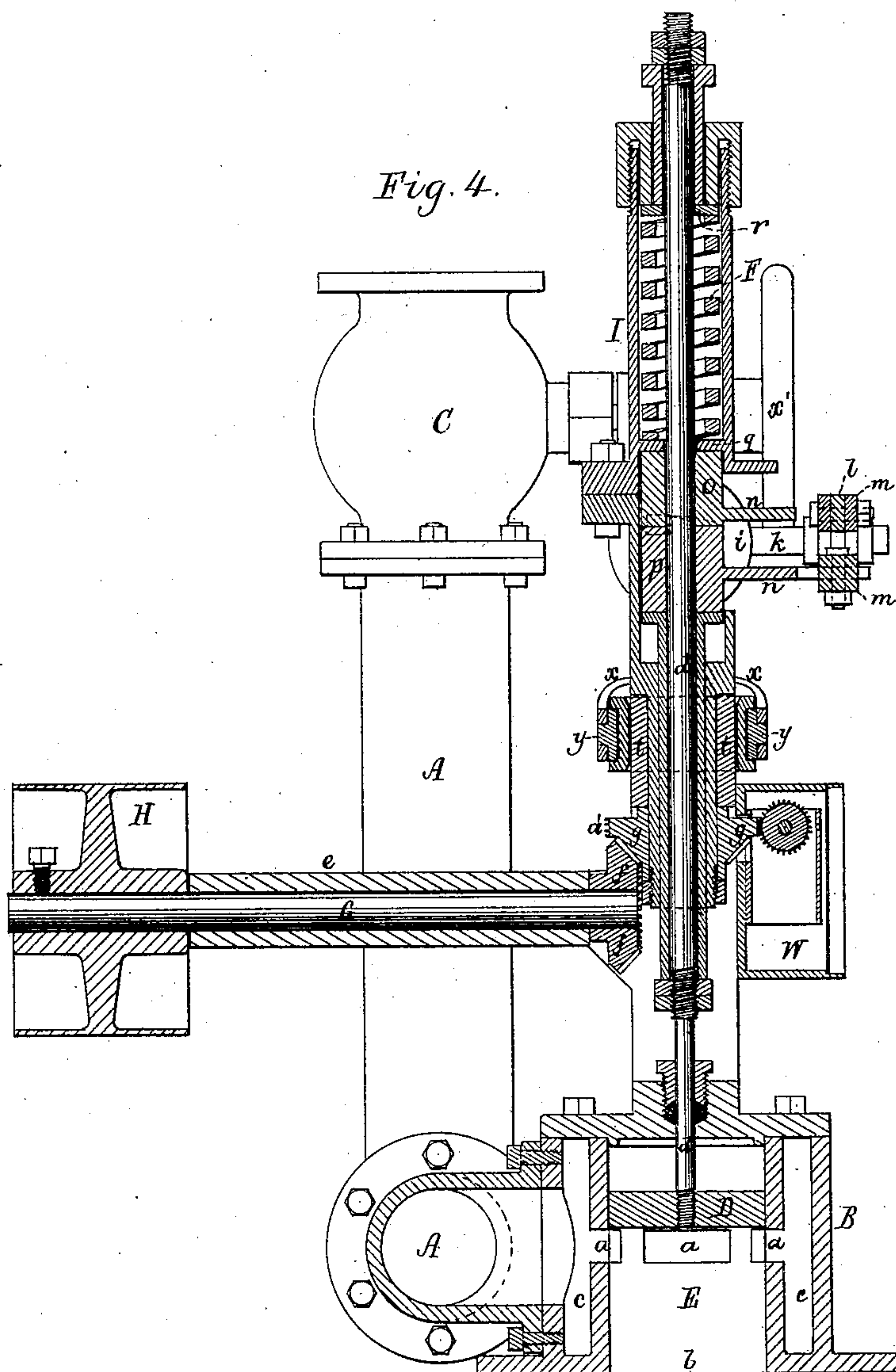
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UNITED STATES PATENT OFFICE.

FRANCIS McMAHON, OF SOMERVILLE, MASSACHUSETTS.

STEAM-ENGINE GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 377,168, dated January 31, 1888.

Application filed July 25, 1887. Serial No. 245,208. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS McMAHON, of Somerville, in the county of Middlesex, of the Commonwealth of Massachusetts, have invented a new and useful Improvement in Steam-Engine Governors; and I do hereby declare the same to be described in the following specification and represented in the accompanying drawings, of which—

Figure 1 is a front elevation, partly in section; Fig. 2, a side view; Fig. 3, a vertical, median, and longitudinal section, and Fig. 4 a vertical, median, and transverse section, of a "governor" of my invention, the nature of which is defined in the claims hereinafter presented. Fig. 5 is a horizontal section of it, taken on the line 1 1 of Fig. 3. Fig. 6 is a side view of the two spiral cams for depressing the steam-valve. Fig. 7 is a view of the dial of the speed-indicator.

In Figs. 3, 4, and 5 of such drawings the pipe for leading steam to the valve chest B is shown at A, it being supposed to be provided, as usual, with a throttle-valve, whose case is represented at C. In the chest B is the valve D, which is circular and moves vertically within a cylindrical chamber, E, having lateral inducts or ports *a* and an educt, *b*, there being around the cylinder a clear space, *c*, for reception of the steam from the pipe A. The educt is to lead steam to the valve-chest of the steam-engine. The stem of the valve D is shown at *d*, it being provided with a spiral spring, F, for elevating it and the valve, the mechanism for depressing it being hereinafter explained. The shaft for driving the governor is shown at G as supported in a stationary sleeve or bearing, *e*, and provided with a pulley, H, to which an endless band from a wheel or drum on some shaft of the steam-engine is to work in order to revolve the shaft G. On the inner end of such shaft G is fastened a bevel-gear, *f*, which engages with another such gear, *g*, secured upon the lower part of the tubular or hollow revoluble spindle I of the governor. To this spindle two arms, *h h*, carrying at their lower ends balls *i i*, are pivoted. A cylindrical stud, *k*, extends forward from each of the balls *i i*. Two arms, *l l*, fixed on the studs *k k*, project inwardly therefrom, and by links *m m* are connected with two curved arms, *n n*, extend-

ing from two spiral cams, *o p*, arranged one over the other and within and revoluble in the spindle I. The upper cam bears at top against a partition, *q*, going across and stationary within and relatively to the spindle. The spiral spring F rests at its foot on such partition *q*, and at top bears against a washer, *r*, fixed on the valve-stem *d*, which in the drawings is shown as raised to its highest position by the said spiral spring F. The arms *h h* have curved or bow springs *s* applied to them and to the spindle for forcing such arms inwardly after outward movements of them by centrifugal force. While the spindle is revolving the balls will be thrown outwardly, and in so moving will cause, by the mechanism connecting them with the two spiral cams *o p*, such cams to simultaneously turn horizontally, and thereby cause the valve-stem *d* and valve D to be moved down, so as to more or less close the ports or inducts *a* of the part E. The ends of the cams that are in contact are spirally shaped, to cause them, when the cams are turned opposite ways, to move both cams vertically—one downward and the other upward.

The spindle I is supported by a frame, L, projecting, as shown, from the valve chest B. On the neck *t* of such frame is a sleeve or ring, *u*, grooved circumferentially. Two arms, *v v*, pivoted at their lower ends to such sleeve, extend upward, as shown, and are slotted or open lengthwise downwardly from near their upper parts to receive the two arms *h h*, which go through the said arms *v v*. (See Figs. 1 and 3.)

A furcated toothed sector, M, fulcrumed to a bracket, *w*, extending upward from the frame L, has each of its prongs *x x* provided with an anti-friction wheel, *y*, that enters the peripheral groove of the sleeve *u*. The teeth of the sector M are to engage with a pinion, N, on the spindle O of the throttle-valve. (See Fig. 5.) This pinion is movable by hand or otherwise on the said spindle O, lengthwise thereof, into or out of engagement with the sector, such pinion, when in engagement with the sector, being clutched to the hub of the hand-wheel *x'* of the spindle O by clutch-teeth *z*, extending from both hub and gear.

On the balls of the governor, when revolving, being thrown outwardly by centrifugal

force, the sleeve *u* will be raised, so as to cause the toothed sector to be moved out of engagement with the pinion N, the sector being moved below the said pinion; but should a rupture of the driving-belt of the pulley H take place the balls will fall, and as a consequence the toothed sector will be moved into engagement with the pinion and cause it to turn the spindle O to close the throttle-valve, and thereby cut off the passage of steam to the engine. By moving on the spindle O the pinion out of engagement with the toothed sector, the throttle-valve may be worked by manual power applied to the hand-wheel *x'*.

15 A speed-indicator, W, is shown as applied to the governor. To this end the upper part of the gear *g* is formed as a worm or screw, *a'*, which engages with a worm-gear, *b'*, fixed on a shaft, *c'*, in a cylindrical case, R, provided with a dial, S, suitably divided. On the shaft *c'* is fixed a worm, *d'*, that engages with a worm-gear, *e'*, fixed on an arbor, *f'*, carrying a hand, *g'*, to turn around the dial.

I claim—

25 1. The combination, with the revoluble spindle I, its arms *h*, and balls *i*, and with the stem

d, of the valve D, of the spring F, for elevating the valve-stem, and the mechanism connected with the said balls and stem for depressing the valve, such mechanism consisting of the studs *k*, arms *l*, links *m*, curved arms *n*, and the spiral cams *o p*, all being arranged and to operate substantially as set forth.

2. The combination, with the ball-governor and the throttle-valve stem, of the mechanism for effecting the closing of the throttle-valve in case of breakage of the driving-belt of the governor, such consisting of the open or slot-
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toothed arms *v*, applied, as described, to the arms *h* of the balls *i*, the grooved sleeve *u*, forked toothed sector M, and the pinion N, the latter being applied to the throttle-valve spindle O and movable lengthwise thereon, and having means of clutching it to the hand-wheel *x'* of such spindle, as specified.

3. The combination of the speed-indicator, as described, with the steam-engine governor, substantially as set forth.

FRANCIS McMAHON.

Witnesses:

R. H. EDDY,
R. B. TORREY.