2 Sheets—Sheet 1.

M. W. SHAPLEY.

GOVERNORS FOR STEAM-ENGINES.

No. 173,069. Patented Feb. 1, 1876.

Fig. 1.

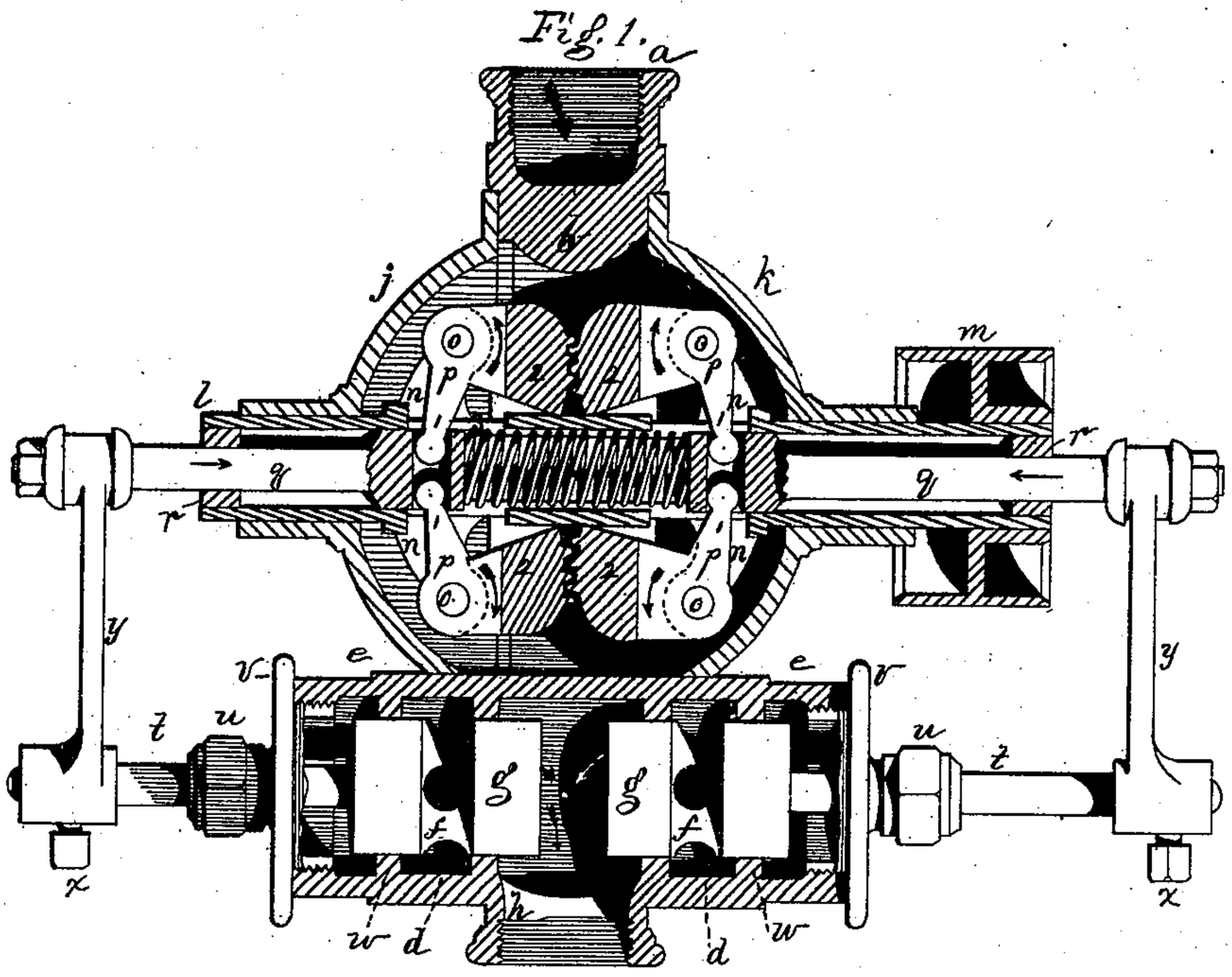
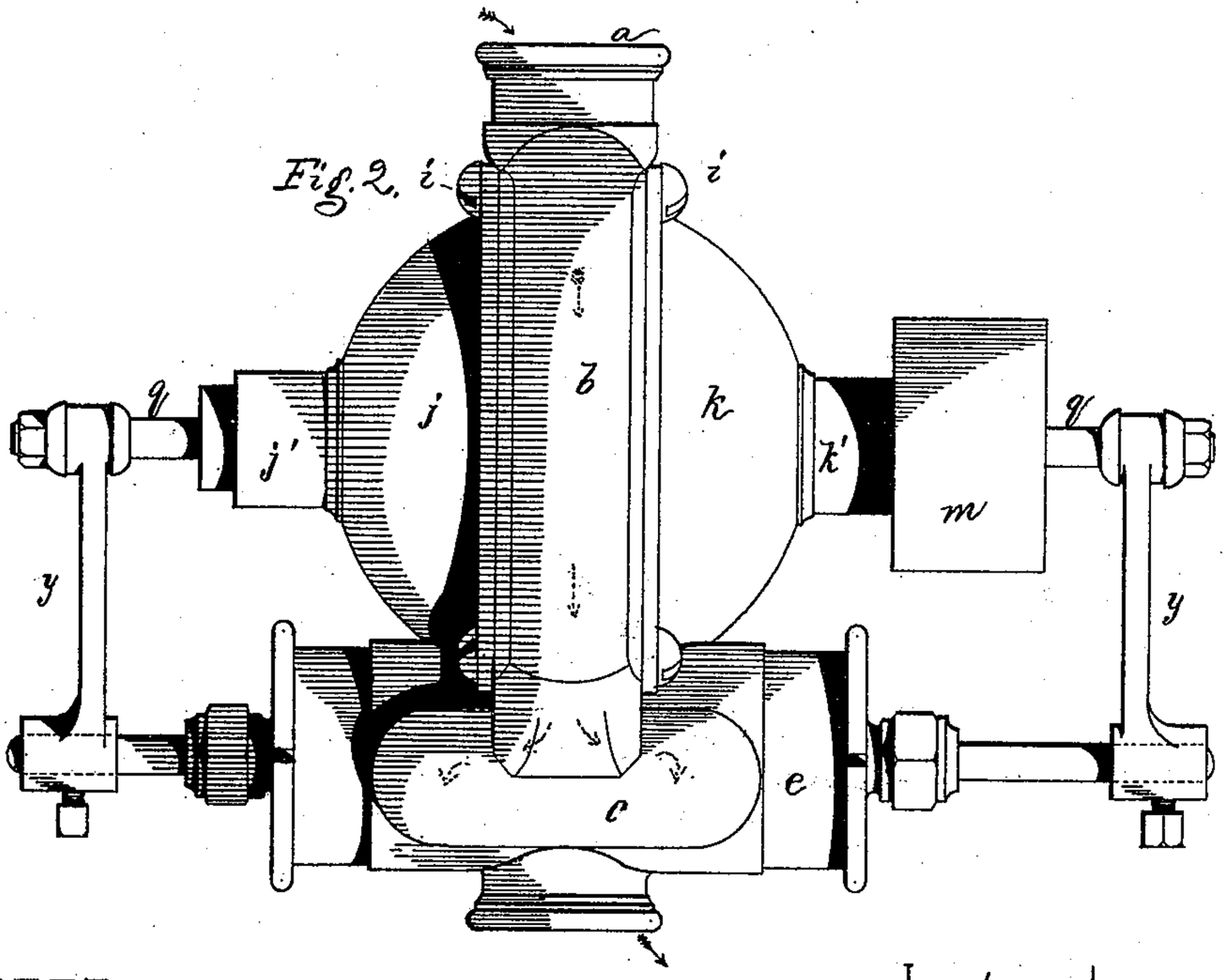


Fig. 2.



Witnesses.

L. H. Latimer.

W. J. Pratt.

Inventor.

Martin W Shapley

per Coosby & Gregory

Attys.

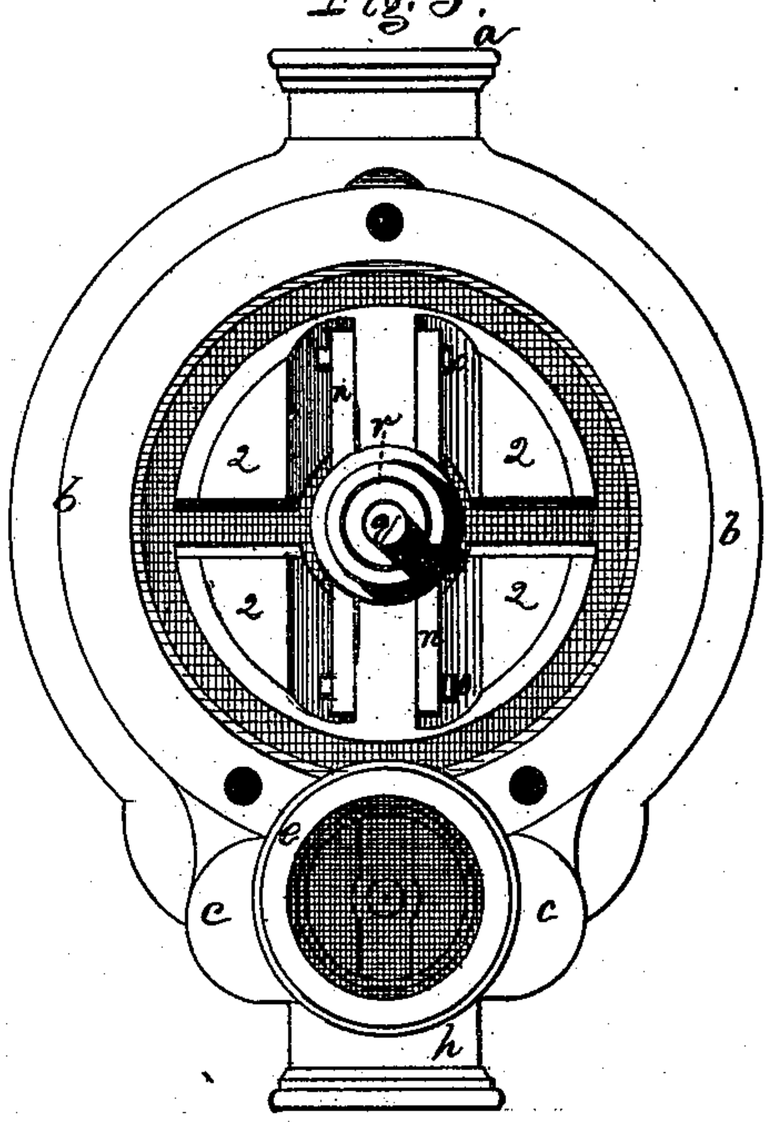
2 Sheets—Sheet 2.

M. W. SHAPLEY.

GOVERNORS FOR STEAM-ENGINES.

No. 173,069. Patented Feb. 1, 1876.

Fig. 3.



Witnesses.

L. H. Latimer

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Inventor.

Martin W. Shapley

per Crosby Gregory Att'ys.

UNITED STATES PATENT OFFICE.

MARTIN W. SHAPLEY, OF BINGHAMTON, NEW YORK.

IMPROVEMENT IN GOVERNORS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **173,069**, dated February 1, 1876; application filed October 12, 1875.

To all whom it may concern:

Be it known that I, MARTIN W. SHAPLEY, of Binghamton, in the county of Broome and State of New York, have invented an Improved Governor for Steam-Engines, of which the following is a specification:

This invention relates to a governor for steam-engines to regulate the admission of steam to the cylinder, to maintain speed of the engine at a uniform velocity.

My invention consists in a governor provided with a horizontally-rotating shaft to which are connected weighted levers or arms geared together, so that the movement of the arms, caused by centrifugal action will be in harmony. Also, in the combination with such weighted arms and their carrying-shaft of two sliding shafts and a spring acting to throw the sliding shafts in a direction opposite to that in which the weighted arms will move such shafts, when, by centrifugal action, the arms move away from their carrying-shaft. Also, in the combination of the horizontally-rotating shaft and its arms and the sliding shafts, with sliding valves to open and close the steam-passage to the steam-cylinder, substantially as described.

Figure 1 shows this improved governor in side view, and Fig. 2 in section; and Fig. 3 shows an end view with the disk removed.

The governor is placed in any well-known or desired position between the steam-supplying source and the cylinder of the engine. The steam, entering at the opening *a*, passes through passages or ways in a circular or loop-like frame, *b*, shown in edge view, Fig. 1, and in section, Fig. 2, into passages in the enlargements *c*, one on each side of the frame, (see dotted arrows, Fig. 2,) passing from the ends of these passages *c* into spaces *d* in the valve-chest *e*, from which it passes through openings *f* in the cylindrical valves *g*, and out through the open free ends of the cylindrical valves into the space *h*, from which it passes through suitable pipes or connections to the usual steam-chest and valve mechanism of the steam-engine cylinder. Attached to the loop-like frame, which is of cast metal in the form of a circular pipe and provided with an open interior or space (see Fig. 3) to receive the governor-arms are secured, by means of screws *i*, cup-like or spherical disks *j k*. The screws pass through flanges of the disks, and projecting from the central portions of the disks are bearings *j' k'* that sustain a hollow shaft, *l*, having attached at one end a pulley, *m*, which receives the belt for imparting motion to the governor-shaft in the usual way. This hollow shaft is provided with projecting ears *n* at each side of its center to sustain the pivots *o*, on which are hung the weighted arms *p*, made as elbow-levers. The ends 1 of the weighted arms extend through longitudinal slots in the shaft *l*, and into openings in sliding shafts *q*, and their ends 2, which are heavy and segmental, are provided with teeth or gear on their faces, (see Fig. 2,) and the gear on one segmental part meets the gear on the opposite segmental part. In the shaft *l* are placed bearings *r* to sustain the shafts *q*, the interior ends of the shafts having, in this instance, enlarged heads to fit the interior of the shaft *l*, and having, also, slots to receive the ends 1 of arms *p;* and between the ends of shafts *q*, and within the shaft *l*, is placed a spiral or other spring, *s*. The valves *g* are shown as cylindrical shells attached to valve-stems *t* fitted to move in stuffing-boxes *u* in heads *v*, fitted, in this instance, by screw-threads, into the ends of the valve-chest *e*.

These cylindrical valves rest in bearings *w*, in the chest, have passages *f* through which steam in the passages *d* passes, issuing from the open free ends of these cylindrical valves (as shown by the arrows) near such ends, Fig. 2, and the position of these valve ends with relation to each other controls the quantity of steam issuing therefrom into the valve-chest of the steam-engine. If these ends are widely separated the steam passes in full volume, and if the ends of the valves are brought close together the flow of steam will be entirely cut off and the engine stopped. In practice, the ends of the valves will not be brought closely together, but a small space will be left, so as to keep the engine in motion.

In their normal position, the weighted arms rest with their heavy ends in contact, or substantially so, with the shaft *l*, they being, in a measure, held in this position by the pressure of the spiral spring *s* on the ends of shafts *q*, which, acting on the ends *t* of the arms, hold

them in toward the shaft, and, when in this position, the shaft *l* being stationary, the ends of valves *g* are placed at such a distance apart as will permit the passage of the amount of steam necessary to allow the engine to work at the desired speed, and this quantity of steam can be regulated by adjusting the position of the valves.

To adjust the valves, loosen the set-screws *x* in the connectors *y*, and when in proper position tighten the same on the valve-stems *t*. These connectors *y* extend from the valve-stems *t*, and fit between collars on the sliding-shafts *q*. Now, as long as the engine moves at the proper speed, the shafts *l* and *q*, as they are rotated through the pulley *m*, will throw out the ends 2 of the weighted arms by centrifugal action only so far as to maintain the ends of valves *g* at the proper distance apart; but should the speed of the engine become too great, or in excess of that required, then the more rapid rotation of the shaft *l* will cause the weighted ends of the arms *p* to fly so far away from the center of their motion, or from shaft *l*, that their ends 1 will draw the inner ends of shafts *q* toward each other and compress the spring *s*, and, through the connections *y* with the valve-stems, will move the ends of the valves *g* each toward the other, and close the size of the steam-passage, thereby reducing the speed to the proper point. The shafts *q* are always moved equal distances by the action of the weighted arms, for each arm must move the same distance as the other, owing to their being connected, as described, and being geared together, as shown, it is possible to use the weighted arms on a governor having a horizontal shaft. If the arms had not gear-teeth they would act each set in opposition to the other.

This governor will run either side or end up.

I do not intend to limit this invention to the exact devices shown, as the form of the parts might be modified or changed without departing from the invention described. The weighted arms are contained within the spherical shells and within the annular ring *b*, and are out of sight and reach, so they cannot be clogged.

Other connections than the particular gear-teeth shown might be employed to cause the weighted arms to move in unison.

Instead of the disks, I might use arms projecting from the loop-like frame to sustain bearings for the shaft *l*.

I claim—

1. The rotating shaft *l*, in combination with weighted levers geared together at their weighted ends, substantially as described.

2. The rotating shaft *l* and weighted and geared arms, in combination with sliding shafts and a spring adapted to rotate with the shaft *l*, and to operate substantially as described.

3. The rotating shaft, the weighted arms carried by the shaft, and the sliding shafts and spring adapted to be operated by the arms, in combination with the valves, valve-rods, valve-chest, and connections between the valve-rods and sliding shafts, substantially as described.

4. The combination of the sliding and rotating shafts *q* with the connectors, the valves, valve-rods, and adjusting devices, to confine the valve-rods in adjusted position with relation to the shafts *q*, substantially as described.

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

MARTIN W. SHAPLEY.

Witnesses:

PERRY P. ROGERS,

JOHN P. WORTHING.