D. F. Mosman.

Steam Engine Governor.

No. 88,406. Patented Mar. 30, 1869.

Fig. 1.

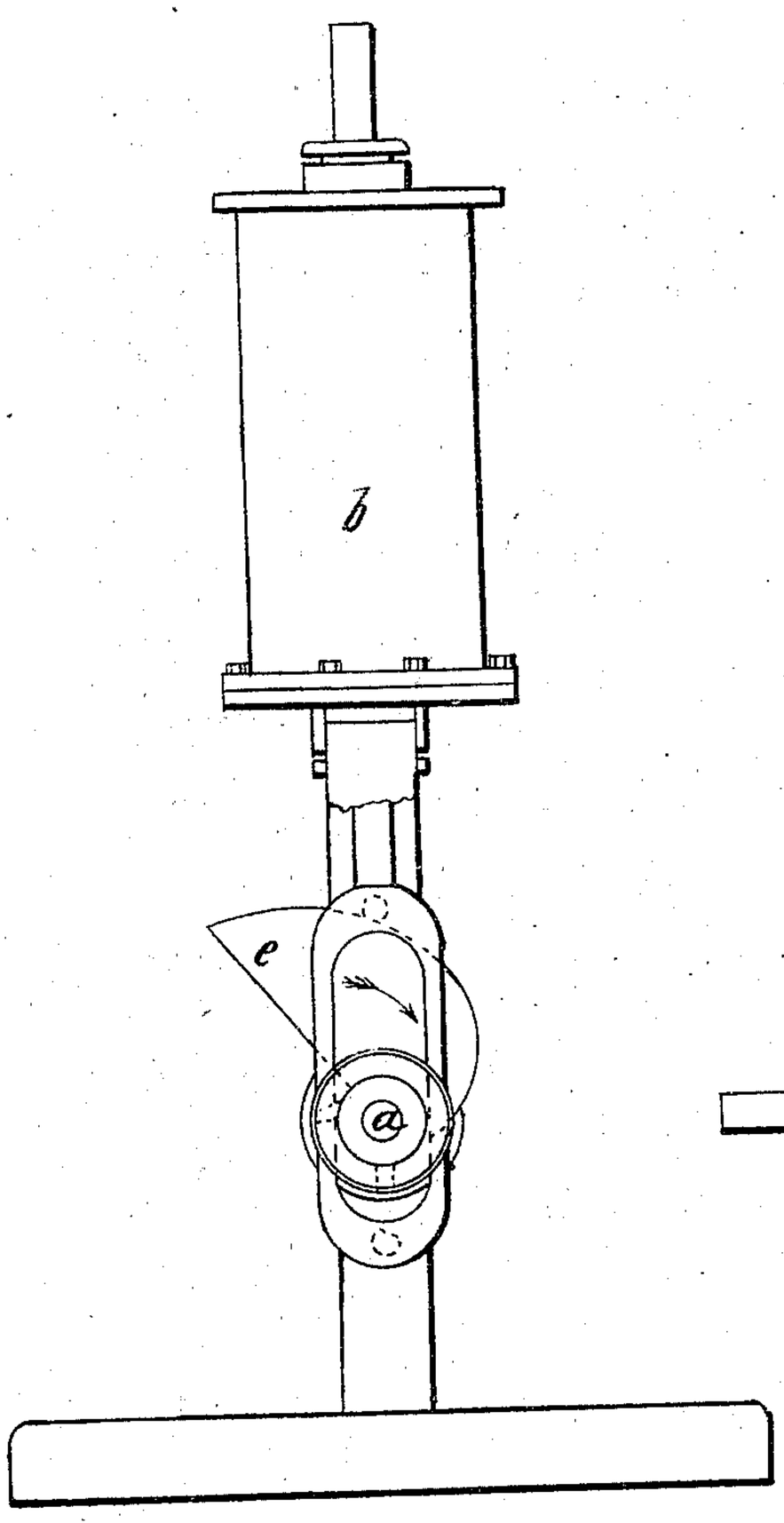
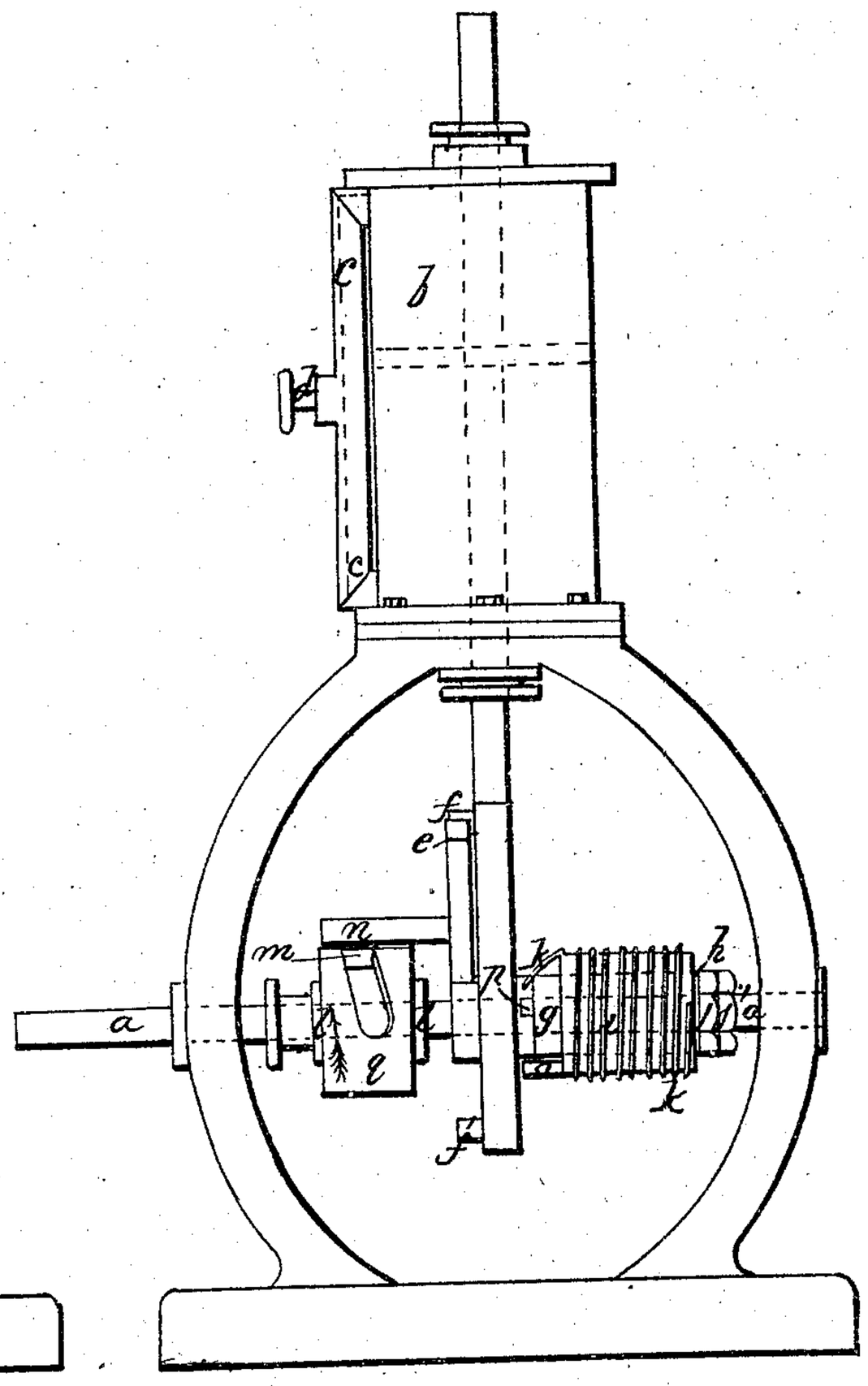


Fig. 2.



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Letters Patent No. 88,406, *dated March* 30, 1869.

IMPROVEMENT IN GOVERNORS FOR STEAM AND OTHER ENGINERY.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, D. F. MOSMAN, of Chelsea, in the county of Suffolk, and State of Massachusetts, have invented an Improved Governor; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practise it.

This governor is designed for operation upon the gate of a water-wheel, to control the volume of water flowing thereto, so as to regulate the velocity of the wheel, to keep it revolving at a fixed normal speed under increase and diminution of the head of water and varying amounts of resistance or work applied to the wheel.

It is also designed to control the speed of steam-engines under the varying conditions of work or resistance, and varying pressures of steam, and may be connected with throttle and cut-off valves by many different means.

In my invention, I make use of a closed hollow cylinder, and piston working therein, the cylinder being filled with fluid, which being allowed to pass from one side to the other of the piston, through an aperture, or apertures, which may be made adjustable, determines the number of reciprocations which the piston can make in the cylinder, in a given time, under a given pressure.

I combine with the rod of the piston, a cam, which is arranged to reciprocate it, forcing the fluid from one to the other side of the piston, the cam being located on a shaft driven by a water-wheel or a steam-engine, and being so fitted thereon that it is held from endwise movement, though allowed to turn on the shaft, it being rotated with the shaft through the medium of a spring, the tension of which determines the amount of pressure which can be exerted on the fluid in the cylinder through the medium of the piston.

To prevent breakage of the spring, one end of which is fixed to the cam, the other end is fixed to a sleeve on the shaft, which is driven by the shaft solely by frictional contact, the degree of which is determined by screw-threads, or other suitable means of adjustment.

In the drawings, which illustrate an embodiment of my invention—

Figure 1 is a side elevation, and

Figure 2 is a front elevation of my improved governor.

The shaft driven from the engine or water-wheel, is marked *a*, and the cylinder, which is suitably supported with relation to the shaft, is marked *b*, the piston therein being denoted by dotted lines.

c represents a pipe connecting both ends of the cylinder, *d* representing a valve or screw-plug, by which the area of the fluid-passage in *d* is increased or diminished, so as to regulate the number of beats, or reciprocations of the piston in a given time.

The end of the piston-rod, which protrudes from the cylinder, is made to fit over and encompass the hub of the cam *e*, which cam is to be so fitted on shaft *a*, that it may turn, but not move longitudinally thereon.

In the yoke, or encompassing part of the piston, are fixed two pins, *f f'*, or friction-rolls, and the cam is so shaped that it will act on one pin, *f*, to raise the piston, and on the other pin, *f'*, to draw the piston down, the cam commencing to operate on one pin the instant it ceases to act on the other.

On the shaft *a*, between the fixed collar *g* and a loose friction-washer, *h*, is located a sleeve, *i*, which is made to turn with the shaft *a* by being pinched between collar *g* and washer *i*, by the nut *j*, which is kept in position by the check-nut *j'*.

The cam *e* and the sleeve *i* are connected by a helical spring, *k*, which is coiled about the sleeve *i*, one end of the spring being fast in the sleeve, and the other end in the hub of the cam *e*.

It will readily appear that as the shaft *a* rotates in the direction of the arrows seen in the drawing, the sleeve will turn with the shaft by reason of the friction exerted upon its ends, and that the spring *k* will be the medium through which the cam *e* is made to turn with the shaft.

Now, if the stress on the cam *e*, in reciprocating the piston, is sufficient to deflect the spring *k*, or to turn its coils, it is obvious that the movement of the cam *e* will not be synchronous with that of the shaft *a*.

The strength and tension of the spring and the area of the passage for the fluid from one to the other end of the cylinder, may be so adjusted that the cam will reciprocate the piston a given number of movements in a given time; and if shaft *a* is turned faster than will give such a number of reciprocations to the piston, then the spring *k* will yield, and the cam will turn on the shaft.

This differential motion between the cam and the shaft is converted into a reciprocating movement for the purpose of acting on a steam-valve or a water-gate, as follows:

On the shaft is located a sleeve, *l*, which is prevented from turning on the shaft, but allowed to slide thereon, by the common device of a feather and spline.

The sleeve has thereupon a cam, *q*, located between collars on the sleeve, which are to be made adjustable, so that any desired degree of end pressure can be exerted on cam *q*, which has cut in its periphery, an inclined groove, into which projects a roll, *m*, secured to an arm, *n*, which is fixed in the cam *e*, so that it will be seen that when there is any differential motion between the cam and the shaft, the inclined slot in the cam *q* will traverse the pin *m*, the effect of which will be to move the sleeve *l* endwise upon the shaft *a*; and as on one end of the sleeve *l* there is a neck fitted to receive one end of a lever, which connects directly or

indirectly with the steam-valve or water-gate to be controlled, it will be obvious how the apparatus described operates as a governor.

The sleeve *i* and the hub of the cam *e* are each provided with projections, marked, respectively, *o* and *p*, which, by coming into contact, prevent an excess of movement of the cam with relation to the shaft, such as would set or break the spring.

The illustration thus far has been made upon the supposition that the shaft *a* revolves faster than at the desired normal speed. Suppose, then, that the shaft *a* slackens its normal number of revolutions, then the spring *k*, by its resilient action, moves the cam *e* on shaft *a*, such movement operating, through arm *n* and pin *m*, to draw the sleeve *l* toward the cam *e*, and working the lever, or the connections, with a steam-valve or water-gate, so as to open either and increase the flow of the motive-medium, and thus cause an increase of the revolutions of shaft *a* up to the normal rate.

By manipulation of the valve, or screw-plug *d*, to increase or diminish the area of the fluid-passage between the ends of the cylinder, the number of reciprocations of the piston in a given time, under a given pressure, may be increased or diminished, and thus the normal speed at which the governor will keep the motor may be varied at will.

Instead of having the fluid-passage between the ends of the cylinder, as described, the piston itself may be perforated, or it may be made of less diameter than the bore of the cylinder, or the internal surface of the cylinder may be grooved, but I prefer the arrangement shown.

The normal rate of speed may also be determined by adjustments of the spring, and, if desired, the endwise movement of the sleeve *l* may be made to work the valve, or screw-plug *d*, so that as the speed of shaft *a* is increased, the area of the fluid-passage between the ends of the cylinder is diminished. and *vice versa*.

In the fluid-reciprocator, I pass the piston-rod through both heads of the cylinder, as shown in the drawing, so that the areas on both sides of the piston will be equal.

The action of the spring *k* may be aided by the employment of a rubber sleeve, located under the coils of the spring *k*, so that the rubber can aid the spring in its action.

While I have described the spring as a means for receiving the force developed by any undue increase in the speed of the shaft *a*, and for operating to move the cam *e*, as the rotations of shaft *a* fall below their normal number, it will be seen by competent mechanics how a balance-wheel or frictional gearing may be applied to serve the same purpose and as equivalents for the spring.

I claim the combination of the reciprocator with the shaft of the prime mover, provided with the cam, for causing the movements of the reciprocator, substantially as herein specified.

Witnesses: D. F. MOSMAN.

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