(No Model.) 2 Sheets—Sheet 1.

J. MORTON.

SPEED GOVERNOR.

No. 326,235. Patented Sept. 15, 1885.

Fig. 1.

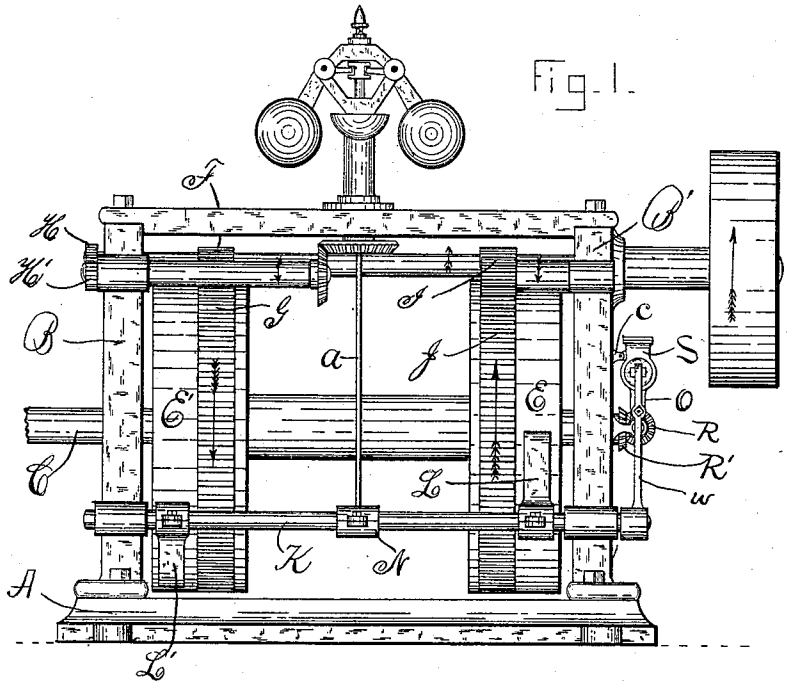


Fig. 3.

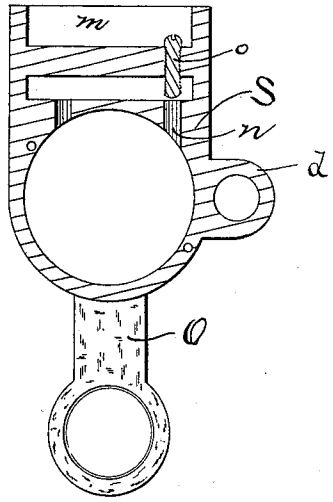
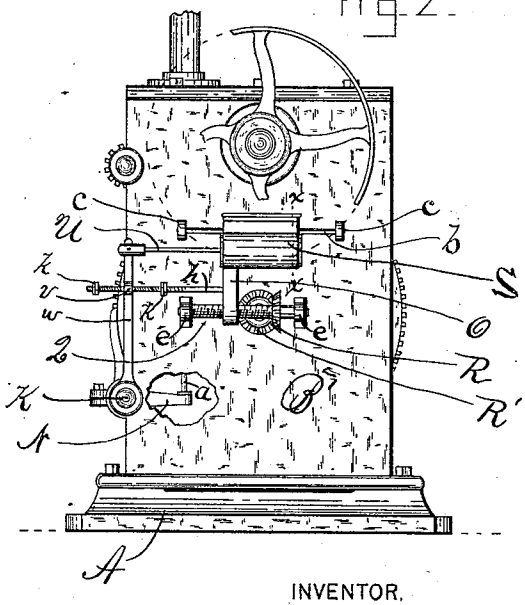


Fig. 2.



WITNESSES.

Arthur S. Howard

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James Morton,

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(No Model.) 2 Sheets—Sheet 2.

J. MORTON.

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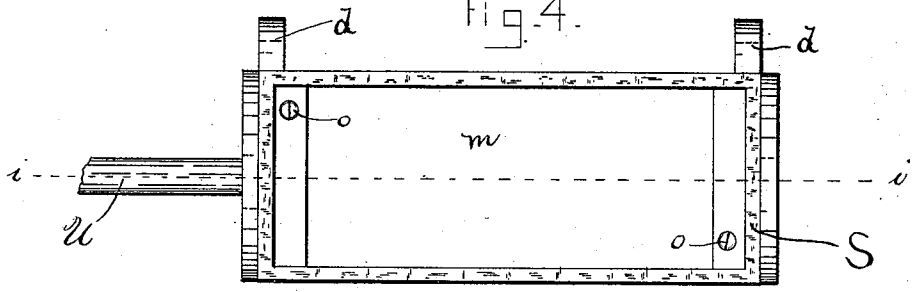
Fig. 4.



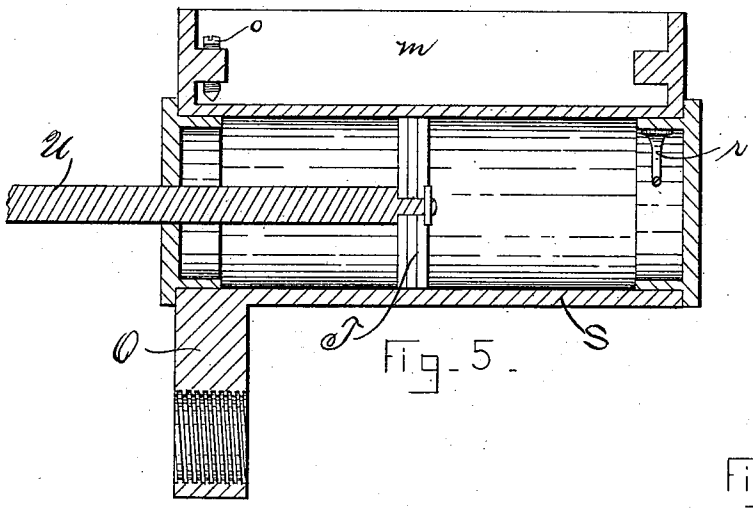


Fig. 5.

Fig. 6.

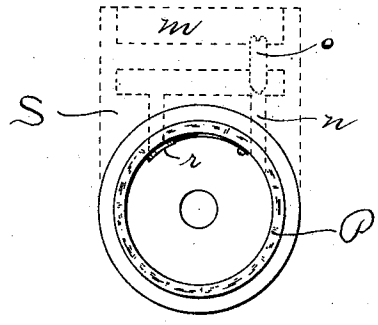
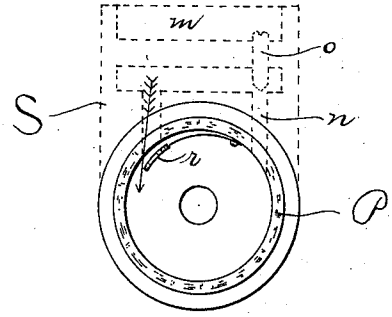


Fig. 7.



WITNESSES.

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UNITED STATES PATENT OFFICE.

JAMES MORTON, OF NORWICH, CONNECTICUT.

SPEED-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 326,235, dated September 15, 1885.

Application filed June 12, 1884. (No model.)

To all whom it may concern:

Be it known that I, JAMES MORTON, of the city of Norwich, county of New London, and State of Connecticut, have invented a certain new and useful Improvement in Regulators for Water-Wheels, which improvement is fully set forth and described in the following specification, reference being had to the accompanying drawings.

My improvement relates to an attachment which may readily be applied to most of the forms of regulators now in use, for the purpose of obtaining quicker action in and more perfect control of the mechanism which moves the gate-shaft. This I accomplish by the use of an oil-filled cylinder and reservoir and a piston so connected with the regulating mechanism to which they are attached that as the gate-shaft is moved to raise or lower the gate said oil-filled cylinder and piston act to check the momentum of the gate-shaft and prevent it from passing the desired stopping-point, as more fully described hereinafter.

My present improvement is shown as attached to a form of regulator known as the "Morton Regulator," patented January 29, 1884, No. 292,673. In constructing and operating said regulator I find a tendency on the part of the gate-shaft to travel past the desired stopping-point, (as above stated,) and in consequence more time is required for the wheel to settle down to its normal speed than would be necessary if the gate-shaft could be checked when it had adjusted the gate to admit the proper volume of water to the wheel.

In the accompanying drawings, Figure 1 is a side elevation of a regulator having my present invention properly attached. Fig. 2 is an elevation from the end where my new device is located, a part of the driving-pulley being cut away to show more clearly the relative arrangement and location of the new parts. Fig. 3 is an enlarged sectional view taken on line *x x*, Fig. 2, of my oil cylinder and reservoir, showing the openings through which the oil flows from the reservoir to the cylinder, or from the cylinder to the reservoir, as the case may be. It also shows the screw by means of which said flow of oil can be regulated to cause it to act slower or quicker, as desired. Fig. 4 is a top or plan view of the oil-cylinder with piston in place and with cover removed. Fig. 5 is a vertical section of Fig. 4 taken on line *i i*. Fig. 6 is a view of the inner side of cylinder-head P, showing also a valve which admits the supply of oil, but prevents said oil from escaping through the same orifice. The valve in Fig. 6 is shown as closed. Fig. 7 shows said valve as opened to admit a supply of oil. The dotted lines in Figs. 6 and 7 show the relative location of the oil-reservoir and the openings through which the oil enters and leaves the cylinder.

The operation of the regulator proper may be described, in general terms, as follows:

A represents a base having secured to it uprights B B′, said base and uprights being of size and strength sufficient to support the various other parts.

C represents a horizontal central shaft having bearings in B B′, said shaft being connected, when in use, with a vertical shaft which operates the wheel-gate.

Between uprights B B′ on said central shaft are disks or pulleys E E′, which, when the speed is at its normal rate and the gate-shaft at rest, revolve loosely on said shaft. These disks carry within them a peculiar clutch mechanism so finely adjusted that a slight pressure on the periphery of the disks causes said mechanism to clutch the central shaft, C, causing it to rotate until the friction is removed.

By the system of gears F G H I J H′ the disks E E′ are kept in constant motion and forced to rotate in opposite directions.

To provide a convenient means for producing the requisite degree of friction to cause the clutches to act at the proper instant, I have arranged a rock-shaft, K, which also finds bearings in B B′, and has secured to it arms L L′, one above the other below the plane of said rock-shaft.

At a point immediately below the fly-ball governor is a lever-arm, N, whose free end is secured to the lower end of the governor-rod *a*, the other end being secured rigidly to rock-shaft K. Thus it will be seen that an increase of speed in the fly-ball governor will immediately depress rod *a* and lever-arm N. This movement brings the friction-arm L in engagement with the periphery of disk E. The clutch

is then thrown into action, rotating shaft C, which motion slightly closes the wheel-gate. This reduces the volume of water entering the wheel and brings the speed down to its normal rate.

Should the speed of the fly-ball governor be decreased the rod *a* is raised, the arm L′ brought into engagement with E′, and shaft C acts to raise the wheel-gate, admitting a greater supply of water and bringing the speed up again.

Having thus described in general terms the action of the regulator as heretofore constructed, I will proceed to describe my new auxiliary device.

On the outer side of the upright B′ are projecting lugs *c c*, forming bearings for a rigid shaft, *b*, on which my oil-filled cylinder S travels when in use, said cylinder being constructed with lugs *d d*, drilled to fit loosely on shaft *b*.

Projecting downward from and forming a solid part of the oil-cylinder S is an arm, O, tapped to fit a short horizontal shaft Q, said shaft being held by and adapted to rotate in bearings *e e*.

Fixed rigidly on the screw-shaft Q is a beveled gear, R, which engages a corresponding gear, R′, on the end of shaft C. It will now be evident that as shaft C rotates motion will be imparted to the screw-shaft Q and the cylinder will travel on said screw-shaft.

Within the cylinder is a piston, T, having a piston-rod, U, whose outer end is pivoted to the free end of an arm, W, the lower end of said arm being fixed rigidly to the end of rock-shaft K.

At a convenient point below the piston-rod is a second rod, *h*, fixed rigidly at one end to the cylinder, its outer end being threaded to receive nuts *k k*, and passing through a hole, *v*, made for its reception in arm W.

The general appearance of the cylinder when complete is similar to that of a steam-cylinder and steam-chest, the part *m*, which forms my oil-reservoir, corresponding to said steam-chest. The space *m* is filled with oil and the cap or lid screwed tightly down.

When the regulator is at rest, the piston remains near the middle of the cylinder, as in Fig. 5, and the supply of oil gradually finds its way down through the openings *n*, filling the cylinder on either side of the piston.

When the rock-shaft K is actuated by the fly-ball governor and shaft C begins to rotate, the gears R R′ cause the cylinder to move slowly on screw-shaft Q, and as the arm W prevents the piston from moving the cylinder must in consequence slide on said piston. This movement of the cylinder compresses the oil in one end before it can escape through the small orifice *n*, and as the cylinder continues to move it exerts an increased power against the rocker-arm W and, finally, overcoming the power of the fly-ball governor, releases the friction-arm from the disk and the gate-shaft stops. Thus the cushion of compressed oil in the cylinder checks the movement of the gate-shaft before the gate is carried past the proper stopping-point, and the speed is brought back to its normal rate much quicker than if operated only by the ordinary form of governor. The quick action thus obtained also prevents an unnecessary waste of water.

The flow of oil through *n* is timed and regulated by adjusting-screws *o* so located immediately over *n* that when they are screwed down their conical points enter the orifice and partly close it.

In cases where a quicker movement of the oil is desired, I provide at either end of the cylinder a valve, *r*, which allows the supply of oil to pass freely into the cylinder; but the instant the oil is compressed said valve closes and the oil is forced to find an exit through hole *n*.

It will be evident that liquids other than oil could be used in the cylinder and reservoir; but I prefer a good quality of sperm-oil, as it shows but little tendency to become gummy.

Having thus described my invention, I claim as new and wish to secure by Letters Patent—

1. In combination with the gate-operating shaft of a water-wheel and clutch-disks revolving in opposite directions on said shaft, a suitable governing device, by means of which said clutches are caused to act at the proper time, and an oil-filled receptacle and a piston, said oil-filled receptacle and piston being so connected with the gate-shaft and to the clutch-operating mechanism that it forms, when in motion, a cushion of compressed oil and exerts a force against the governor proper for the purpose of releasing the clutch mechanism, as described.

2. In combination with the gate-operating shaft, the clutch-disks constantly rotating in opposite directions on said shaft, the rock-shaft carrying friction-arms adapted (when operated by a fly-ball or other suitable governor) to engage the clutch-disks, and a cylinder and oil-filled reservoir and piston, substantially as hereinbefore described, said cylinder being connected with the gate-operating shaft by beveled gears, and a screw-shaft, as at Q, and arranged to travel on said screw-shaft, and having screws *o* so located relative to the openings *n* which connect the cylinder and reservoir that as said screws are advanced they partially close said openings for the purpose of regulating and controlling the flow of oil, as described.

3. The combination, with the gate-operating shaft, and mechanism for automatically moving said shaft to open or close the wheel-gate, of an oil-filled reservoir and cylinder and a piston, all so connected with the gate-operating shaft and its moving mechanism that when in action a cushion of compressed oil is formed, which acts against the force of the governor proper for the purpose of checking the movement of the gate-operating shaft at a desired point, substantially as described.

4. In combination with the shaft C, the screw-shaft Q, actuated by gears R R′, and an oil-filled reservoir and cylinder arranged to travel on said screw-shaft, said cylinder being pro-

vided with a suitable piston or plunger so connected with the mechanism which controls and moves the shaft C that the compressed oil in the traveling cylinder acts against the power of the fly-ball governor for the purpose of checking the movement of the gate-shaft, as described.

5. In combination with the shaft C, the screw-shaft Q, actuated by gears R R′, and a liquid-filled reservoir and cylinder arranged to travel on said screw-shaft, said cylinder being provided with a suitable piston or plunger, and with one or more openings, *n*, at each end, through which the liquid may freely pass from the reservoir to the cylinder, or from the cylinder to the reservoir, and having also at each end a secondary opening, *s*, with a valve, *r*, so arranged that the liquid may pass freely into the cylinder, said valve being then automatically closed by the compressed liquid as the cylinder moves on the screw-shaft, preventing the escape of the liquid, substantially as hereinbefore described.

JAMES MORTON.

Witnesses:
FRANK H. ALLEN,
WILLIAM T. CHAMBERLAIN.