J. Finlay,

Water-Mill Governor,

No. 6,868. Patented Nov. 13, 1849.

Fig: 1.

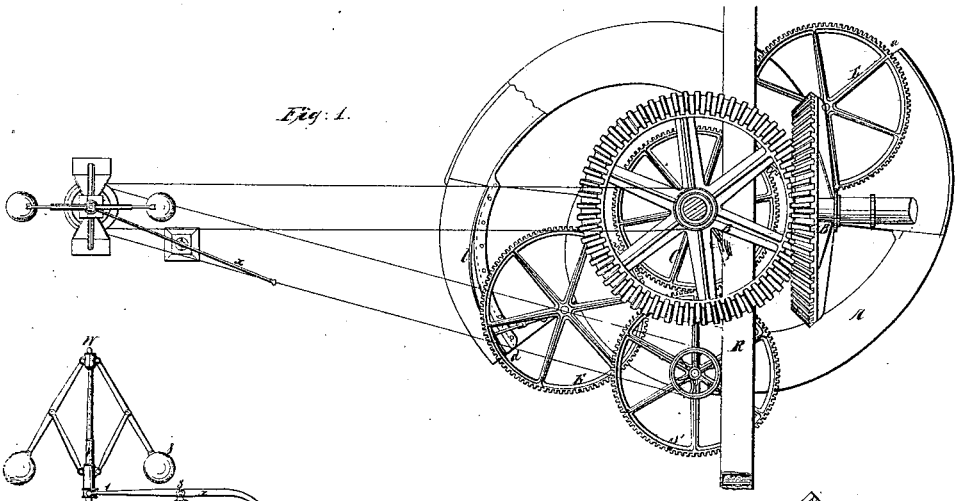

Fig: 2.

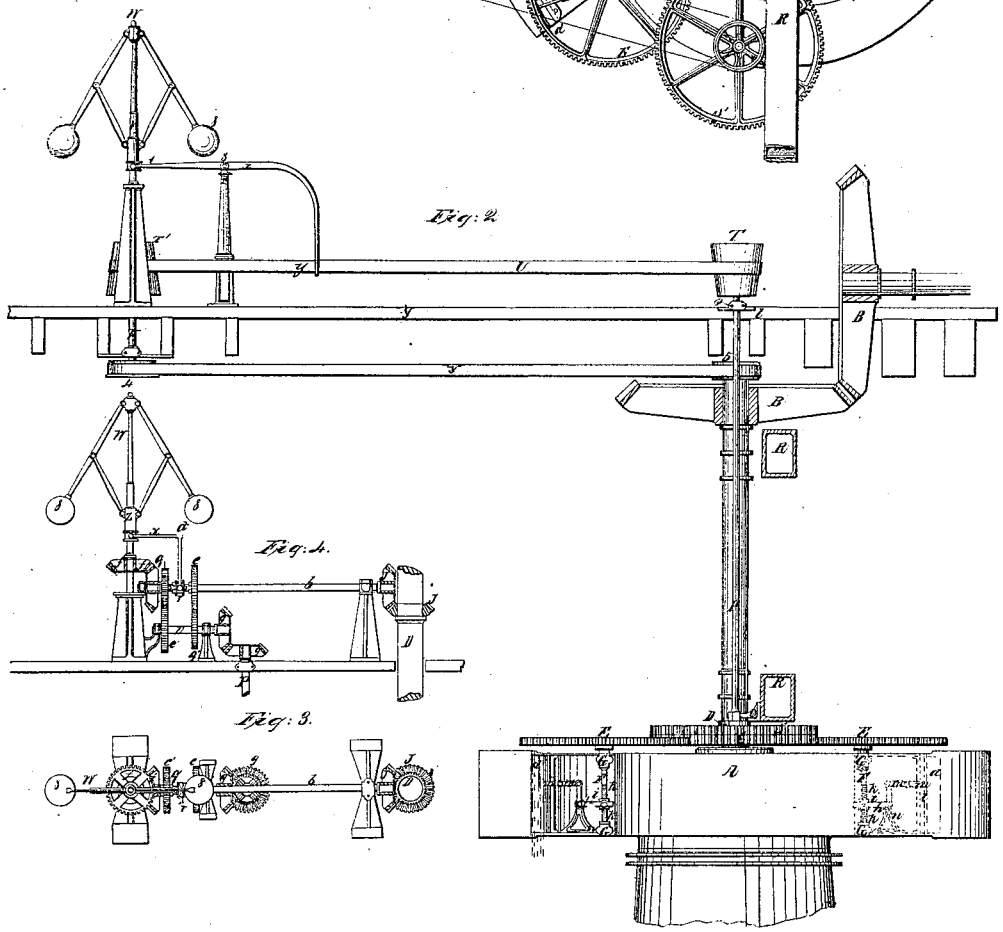

Fig: 4.

Fig: 3.

UNITED STATES PATENT OFFICE.

JAMES FINLAY, OF COLD SPRING, NEW YORK.

REGULATOR FOR WATER-WHEELS, &c.

Specification of Letters Patent No. 6,868, dated November 13, 1849.

To all whom it may concern:

Be it known that I, JAMES FINLAY, of Cold Spring, in the county of Putnam and State of New York, have invented a new and useful governor or regulator suitable in its application to Whitilow and Stirratt's patent water-mill (usually called "the Scotch motor") and to all other mills when the aperture, sail, or part to be acted upon is carried around by the rotary motion of such mill; and I do hereby declare that the following is a clear and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making part of this specification.

Figure 1 is a plan, showing the application of this governor to Messrs. Whitilow and Stirratt's patent water mill, and Fig. 2 an elevation, in both of which figures the same letters and numbers point out the same parts.

A is the water mill of which the jet apertures *a*, *a*, are to be acted on by the governor.

B, B, are cog wheels for transmitting the power of the water mill to any required distance.

R, R, are the main beams which support the water mill.

C, is a cog wheel accurately bored and fitted to the turned part of the water mill shaft D, on which it acts. It is not keyed, but left loose, so as to revolve freely around on its seat; either in the same direction as that in which the water mill revolves, or in the direction contrary to it; accordingly as it is acted upon.

E, E, are cog-wheels which gear into C. They are something less than one half the breadth of C.

F, F, are spindles on which these cog-wheels are keyed. These spindles are secured in bearings G, G, to the top and bottom plates of the water mill; having screws *k*, *k*, cut in the lower ends which pass through the nuts *i*, *i*. These nuts have two projecting cylindrical ears, opposite each other, which are held in the forked ends of the horizontal arms of the bell-cranks *h*, *h*. The other, or vertical arms *o*, *o*, are connected to the movable plates *l*, *l*, (which form the inner sides of the jet apertures *a*, *a*,) by the links *m*, *m*. *n*, *n*, are standards having a center pin, on which the bell cranks *o*, *h*, *o*, *h*, turns.

It will now be obvious that if the cog wheel *c*, be made to revolve in either direction, the cog wheels E, E, and spindles F, F will also revolve; and by the action of the screws, the nuts *i*, *i*, will either ascend, or descend in accordance with the direction of the motion given to C; and will act on the movable plates *l*, *l*, through the bell cranks *o*, *h*, *o*, *h*, and links *m*, *m*, so as either to push those plates outward and diminish the width of the apertures, or draw them inward and increase that width.

P, is a shaft secured in bearing Q, Q, to the fixed beam R, and floor *t*.

S is a cog-wheel of the same breadth as E, E, which also gears into C, above E, E, so as to allow these cog-wheels, when carried around by the revolution of the water mill to pass clear under it. This cog-wheel is keyed on the lower end of the shaft P, and consequently revolves with it. On the upper end of this shaft is fixed a conical drum T with the smaller end downward which is connected by means of a belt U, with a similar conical drum T′, having the smaller end upward. The last conical drum is fixed on the spindle V, of an ordinary governor W, (such as are usually applied to steam engines). The belt U passes through an eye formed in the end of the bent lever *x*, shown at *y*. The other end of this lever embraces a groove in the sliding collar *z*, by means of a fork 1, formed on the end of it in the usual manner. Q is a standard having a pin 3 through the top, on which *x* turns as a fulcrum. A pulley 4, fixed on the governor spindle is by means of a belt Y connected with another pulley 5 shown here as fixed on the water mill shaft; but which may be fixed on any shaft driven by the water mill.

Such is the general arrangement here shown which will serve to explain the principle of the invention. But it will be obvious that this construction may be varied to suit existing circumstances. For instance, the conical drums T, T′, may be mounted on separate horizontal shafts, in place of the vertical shafts as drawn. One of which shall be connected by the means of a pair of bevel wheels with the shaft P, and the other shall communicate with any convenient shaft driven by the water mill. In this case the governor W, must also be driven separately, either from the water mill shaft, or from any shaft connected therewith.

I will now proceed to explain the operations of this governor. The proper speed of the water mill is here supposed to be 37 revolutions per minute, and the governor W, being calculated to revolve at the same speed; it follows, that the pulleys 4 and 5, must necessarily be of the same diameter.

The water mill being put in operation, and making 37 revolutions per minute, will transmit the same number of revolutions, in the same direction to the governor spindle V. And the balls 8, 8, having by their centrifugal action receded from the center of motion to a distance corresponding to this number of revolutions will necessarily, have drawn up the sliding collar Z, and with it the forked end of the bent lever *x* to the exact position at which it will stand, when the water mill is revolving at 37 revolutions per minute, (its proper speed.) But the other end of the bent lever having an eye through which the belt passes, will, by the same action, have shifted the belt down upon the conical drum. Let us now suppose that at this position the belt is held so as to pass over each of the conical drums, at the middle of the length. In this case (the cones being similar,) the same number or 37 revolutions per minute will be transmitted to the shaft P, and cog-wheel S. But the cog-wheel S being in gear with the loose cog-wheel C, and being of the same diameter, will necessarily transmit to it, the same number of revolutions; and this being also the speed of the water mill the cog-wheel C, will consequently preserve the same relative position, as regards the water mill and shaft, that is, it will not move in either direction round the shaft; but it will stand in the same relation to it, as though it were keyed fast; and can therefore have no action on the cog-wheels E, E, and through them, on the movable plates *l*, *l*.

Let us now suppose that a part of the resistance has been thrown off the water mill. The speed of the water mill will begin to increase; but the moment that this takes place, the balls 8, 8, will, by the increased centrifugal action consequent thereon, recede farther from the center of motion, and raise the sliding collar *z;* which acting on the bent lever *x*, will tend to push the belt *v*, farther down, on a larger part of the conical drum T′, and on a smaller part of the conical drum T. The consequence will be, a greater number of revolutions transmitted to the shaft P, and cog-wheels S, and C, but this last being free to move in its seat, on the water mill shaft, will have a relative motion as regards the water mill, in the same direction, equal to the difference in the number of their absolute revolutions in a given time. For instance should the difference be one revolution per minute, the cog-wheels E, E, and screw spindles F, F, will each make one revolution per minute, which acting through the nuts *i*, *i*, bell cranks *o*, *h*, and links *m*, *m*, a motion outward will be transmitted to the movable plates *l*, *l*, tending to diminish the width of the jet orifices to the extent of the distance between two contiguous threads of the screw on the spindles for every such revolution; providing the arms of the bell cranks *o*, and *h*, be of the same length or to such proportion of that distance, as corresponds to the proportional length of those arms should they differ in length.

Let us now suppose that the resistance taken off the water mill is again thrown on it. It is obvious that an action precisely similar to what has been described will take place, but in a contrary direction. The cog-wheel C, will then have a relative motion, in a direction contrary to that of the water mill, and the action will be transmitted to the movable plates, so as to draw them inward, and thus increase the width of the jet orifices.

It will thus be seen from the foregoing specification that the distinguishing characteristic of my invention is a peculiar mode of employing well known mechanical devices for the transmitting of such a motion to a loose cog wheel on the shaft of the water mill, or such other first mover, whose motion it is intended to regulate, as will cause it to make the same number of revolutions in a given time, as such water mill, or first mover is required to make, when working at its proper speed. Such motion being derived, either from the main shaft of said water mill, or first mover, or from any shaft connected therewith, but modified and transmitted under the influence of an ordinary governor (such as is usually applied to steam engines) so as to cause the number of revolutions of said cog-wheel, in a given time to differ from the number of revolutions made by such water mill or first mover in the same time, whenever the speed of said water mill or first mover, shall vary from its proper speed or that speed at which it is required to move.

I do not claim the conical drums, endless belt and governor, this having been long known as a means of changing speed; but—

I claim as my invention—

The employment of these, or analogous arrangements in connection with the loose cog wheel C, herein described, as the means of causing the revolutions of said cog wheel to exceed or fall short of the revolutions of said water mill, or first mover, whenever such water mill or first mover shall exceed, or fall short of its proper speed, the consequences of this variation, through the agency of the screw K, bell crank *o*, *h*, and movable plate (which parts I also claim in combination with those above mentioned) being

either to enlarge or contract the jet apertures, and thereby to increase or diminish the speed of such water mill, or first mover, in accordance with the necessities of the case; and this I claim under an arrangement substantially the same with that herein fully set forth—not intending however to limit myself to the particular form and construction of the individual parts, but to vary these as I may find expedient while I attain the same end by analogous means.

JAMES FINLAY.

Witnesses:
WM. J. DONOHOO,
THOS. P. JONES.