

No. 825,530.

PATENTED JULY 10, 1906.

F. ELLICOTT.

DEVICE FOR SYNCHRONIZING PRIME MOTORS.

APPLICATION FILED NOV. 29, 1902. RENEWED DEC. 23, 1905.

2 SHEETS—SHEET 1.

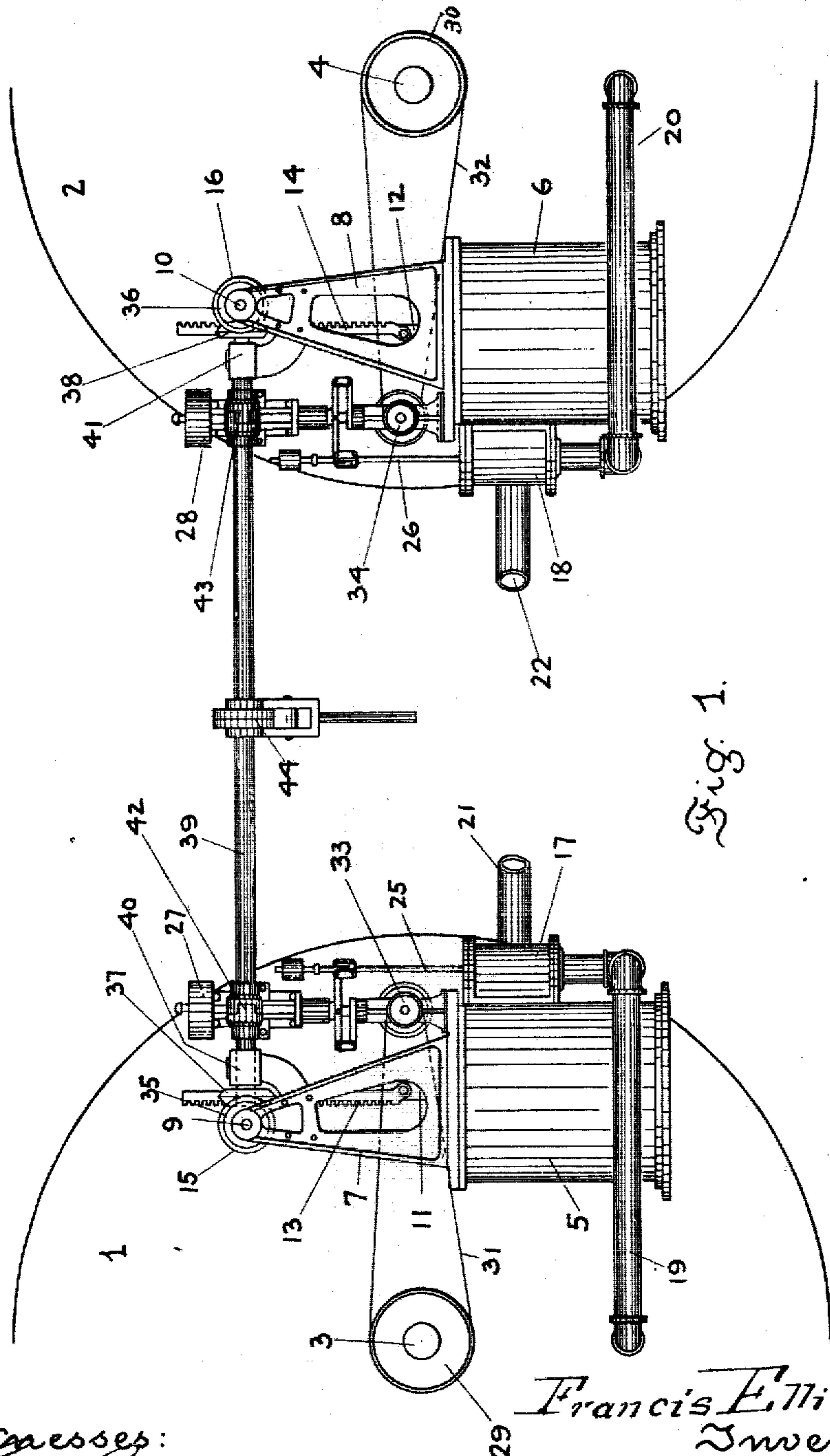


Fig. 1.

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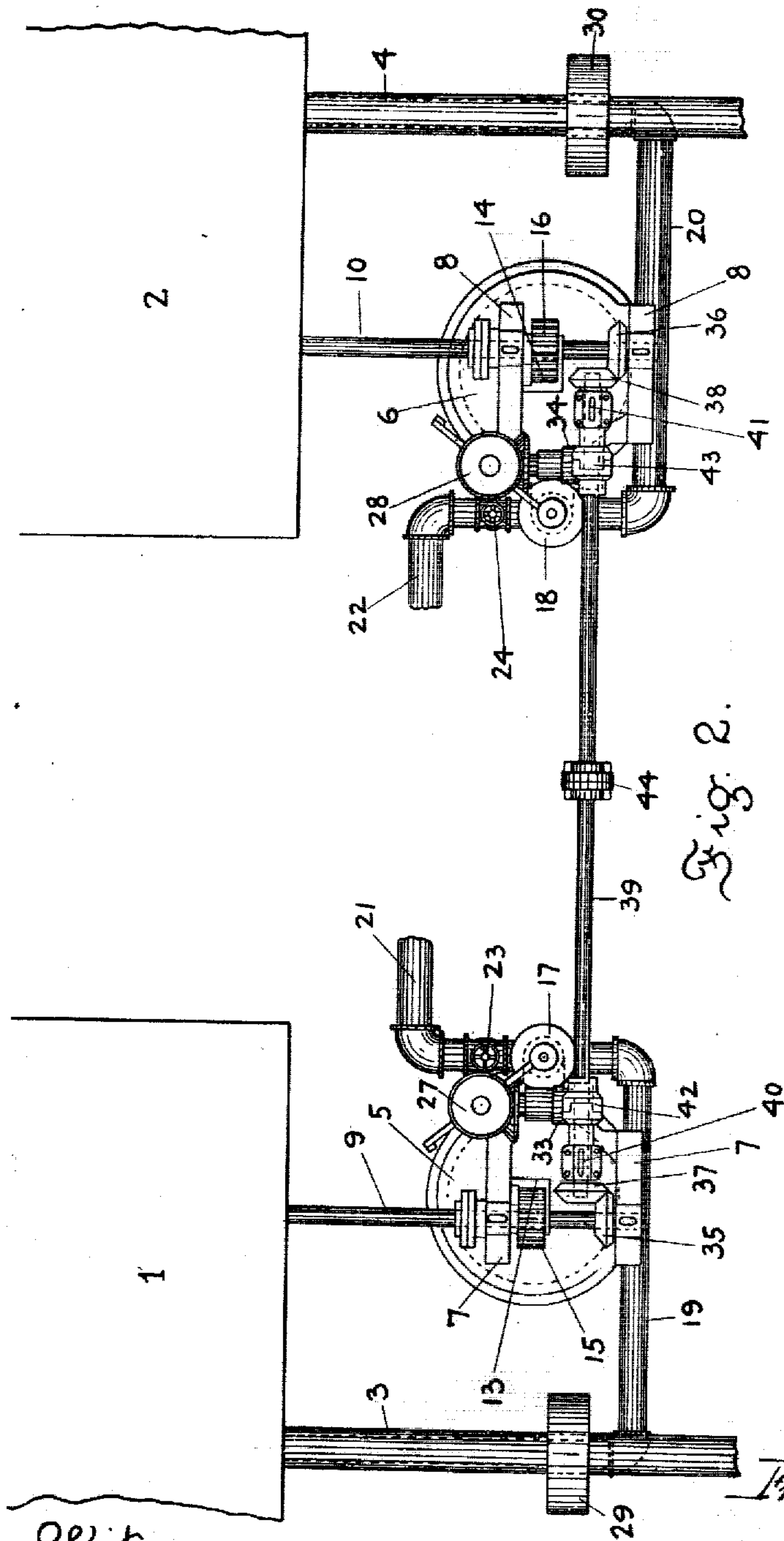


Fig. 2.

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UNITED STATES PATENT OFFICE.

FRANCIS ELLICOTT, OF BALTIMORE, MARYLAND.

DEVICE FOR SYNCHRONIZING PRIME MOTORS.

No. 825,530.

Specification of Letters Patent.

Patented July 10, 1906.

Application filed November 29, 1902. Renewed December 23, 1905. Serial No. 293,113.

To all whom it may concern:

Be it known that I, FRANCIS ELLICOTT, a citizen of the United States of America, and a resident of Baltimore, State of Maryland, have invented certain new and useful Improvements in Devices for Synchronizing Prime Motors, of which the following is a specification.

My invention relates to a device for synchronizing the movement of the gates of two water-wheels. It may be applied to other forms of prime motor; but it has been applied by me to water-wheels.

It has been found in practice that when two or more wheels are running together supplying power jointly for the generation of electricity the fluctuations of load will be taken up by one of the wheels more readily than by the other, due to the difference of the frictional resistance of the two wheels, with the result that one wheel will be doing, say, seventy-five per cent. of the work and the other wheel twenty-five per cent. of the work. This unequal distribution of the load upon wheels which are running together is a very undesirable condition and one which leads to an unequal wear of the apparatus and an undesirable condition in the generation of power. In the patents which were granted to me on December 25, 1900, Nos. 664,393, 664,392, and 664,394 I have described a form of automatic governor which I have used successfully for the government of a single water-wheel. This governor is capable to a great extent of governing two or more independent wheels running on the same load; but it is not capable of insuring constant synchronism in the movement of the gates of the two wheels without some additional means to accomplish this result. I have devised an additional means, which is described in this application.

Figure 1 represents a pair of governing mechanisms similar to that shown in Patents Nos. 664,392 and 664,394, above referred to, and which are each capable of governing its own wheel. They are shown in connection with two independent flumes and two independent driving-shafts. The governors in the case shown are independent of the driving-shafts, but are belted to them, so as to follow their motion. Fig. 2 is a plan view of the same.

Referring to Fig. 1, 1 and 2 are two identical flumes in which are located two water-wheels. 3 and 4 are two runner-shafts pro-

truding from the center of the flumes and connected within the flumes to the runners of the wheels. 5 and 6 are two governor-cylinders suitably mounted upon a suitable base. (Not shown in this figure.) 7 and 8 are brackets mounted on the tops of the cylinders 5 and 6 and in the upper ends of which are journaled the shafts 9 and 10, by which the gates of the wheels are moved. 11 and 12 are the piston-rods, which protrude from the tops of the cylinders 5 and 6 and to which are connected racks 13 and 14, which mesh with gear-wheels 15 and 16 (shown in Fig. 2) of the shafts 9 and 10 and by which these shafts are turned. 17 and 18 are valve-cylinders located upon the sides of the cylinders 5 and 6 and connected at each end with the flumes 1 and 2 by means of the pipes 19 and 20. Through the pipes 19 and 20 water-pressure is supplied to the valve-cylinders 17 and 18 and the cylinders 5 and 6. 21 and 22 are exhausts from the valve-cylinders 17 and 18, controlled by exhaust-valves 23 and 24. 25 and 26 are the valve-rods by which the valves contained in the valve-cylinders 17 and 18 are moved. 27 and 28 are centrifugal governors identical in construction to those shown and described in Letters Patent No. 664,392, dated December 25, 1900. 29 and 30 are pulleys on the main driving-shafts of the wheels, and to them the centrifugal governors are belted by means of the belts 31 and 32 and the pulleys 33 and 34. 35 and 36 are beveled gears on the shafts 9 and 10, respectively, and 37 and 38 are beveled gears meshing with the beveled gears 35 and 36 and secured to the opposite ends of a shaft 39. The shaft 39 is journaled in brackets 40 and 41 and is provided with couplings 42 and 43, which are capable of being thrown into or out of engagement so as to connect or disconnect the two governors. 44 is a ratchet-and-pawl lever by means of which the shaft 39 may be turned and the gates of the two wheels moved simultaneously while the rest of the apparatus is stationary, if desired.

The operation of the device is as follows: When the wheels are in operation and a fluctuation of load occurs either increasing or decreasing the speed, the runner-shafts will correspondingly move the governors, and they will move the valves contained in the cylinders 17 and 18, admitting pressure to the cylinders 5 and 6, by which the pistons in the said cylinders and the racks 13 and 14 will be moved, the shafts 9 and 10 rotated, and the

gates of the wheels opened or closed. If there were no rigid connection between the two mechanisms, the one which moved more easily would move farthest until a sufficient amount of power was committed to the wheels to take up the additional load or a sufficient quantity was cut off to correspond to the reduction of load, and the gates might be at quite different positions, although the speed of one runner was maintained the same as the speed of the other runner, each controlled by its own governor. In the mechanism shown, however, in this case the connecting-shaft 39 compels a uniform motion of the shafts 9 and 10, and as one or the other moves the other must move simultaneously and uniformly. It will thus be seen that where two wheels are running together upon the same load they can be made by this simple mechanical connection to equally divide the load between them and to run in complete

synchronism with one another, the gates of each wheel being always open to exactly the same extent.

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

In a water-wheel governor the combination of a series of water-wheels each provided with a device for admitting water to or cutting water off from the wheels, means for actuating all of said devices uniformly and simultaneously, and an automatic speed-governor connected to and controlling said devices so as to admit power to or cut power off from all of said wheels simultaneously.

Signed by me at Washington, District of Columbia, this 25th day of November, 1902.

FRANCIS ELLICOTT.

Witnesses:

A. B. WILLIAMS,
WM. J. JACOBI.