(No Model.) 2 Sheets—Sheet 1.

W. JULIAN.

GOVERNOR FOR FLUID MOTORS.

No. 545,367. Patented Aug. 27, 1895.

Fig. 1.

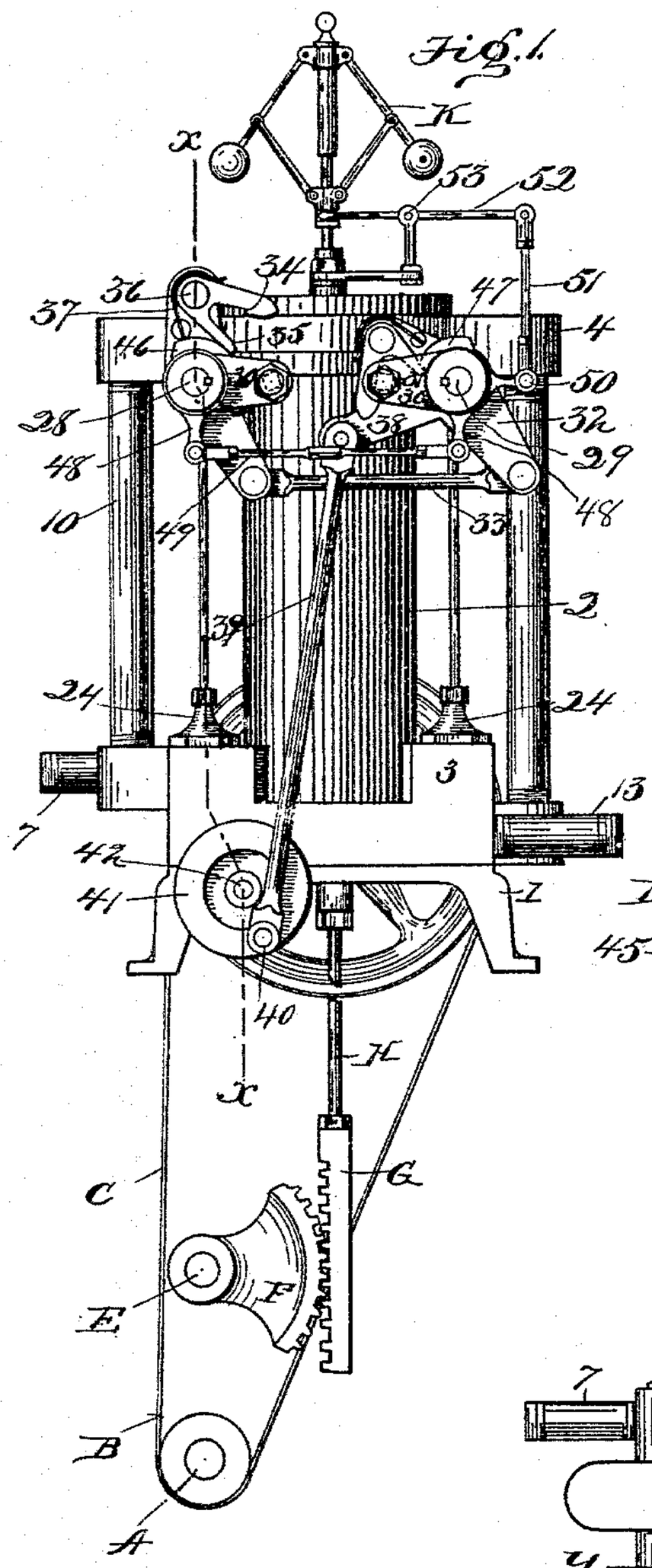

Fig. 2.

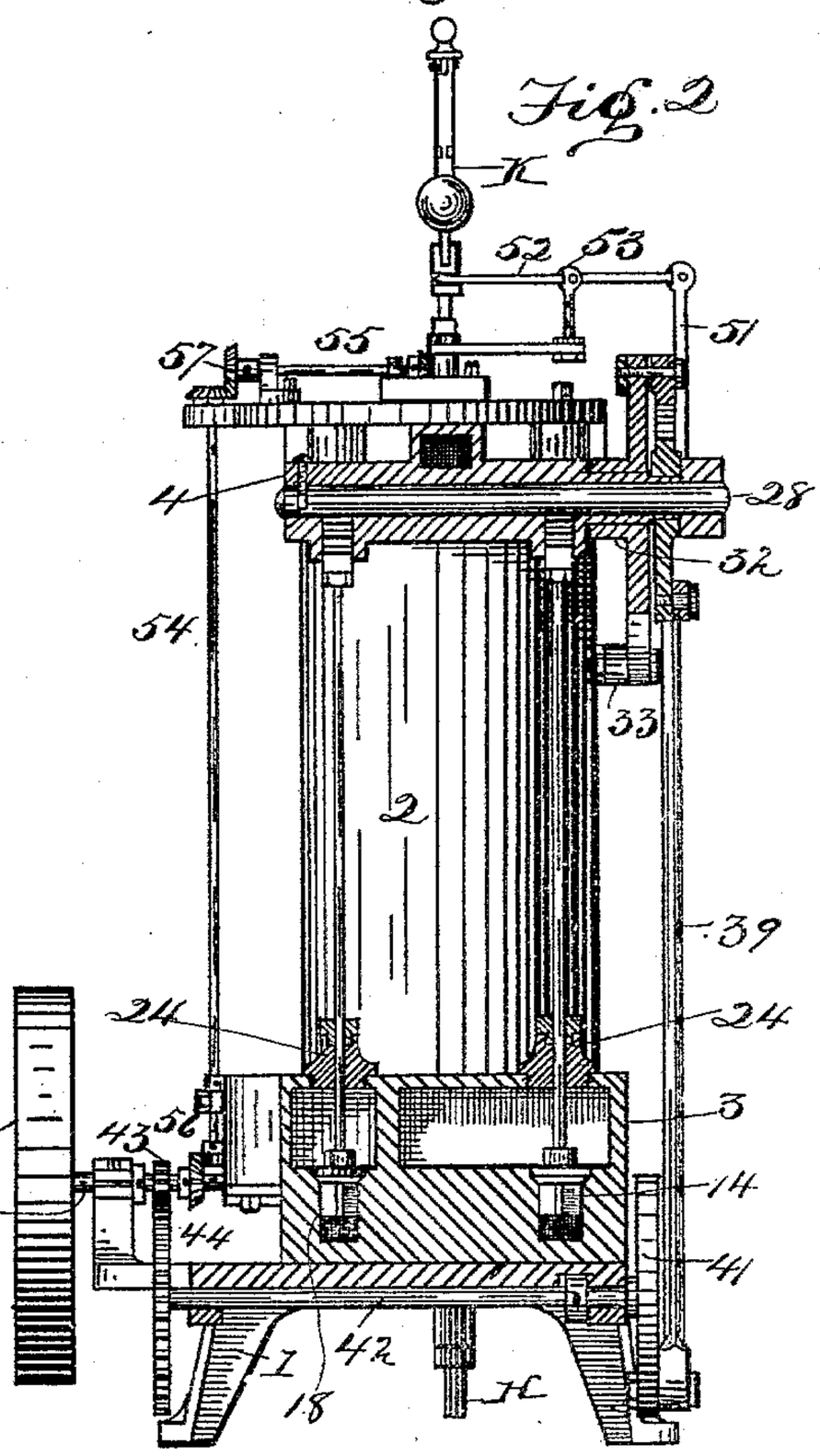

Fig. 3.

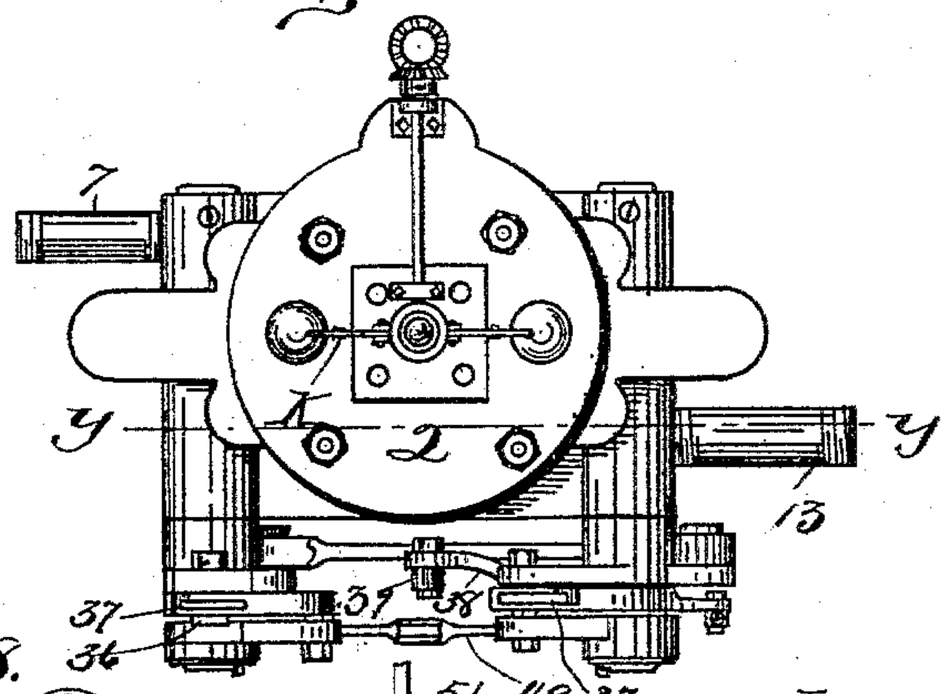

Fig. 8.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

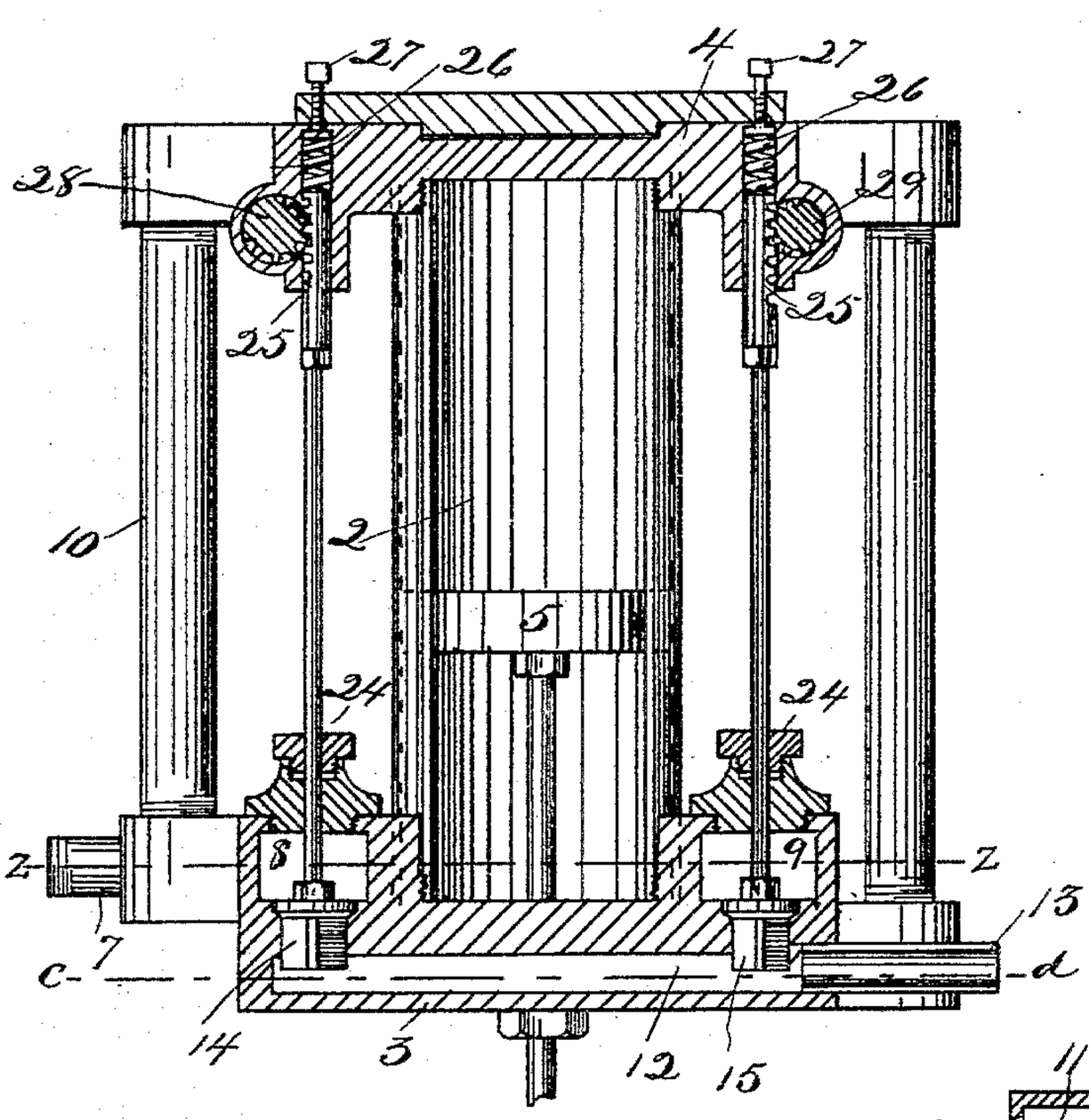


Fig. 7.

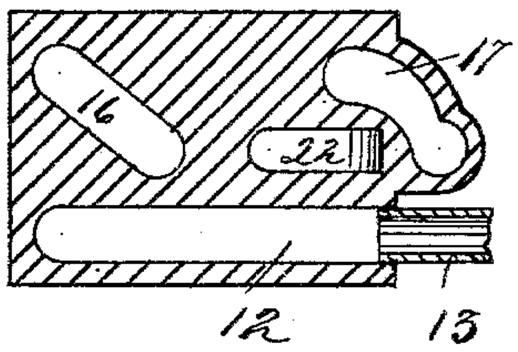


Fig. 6.

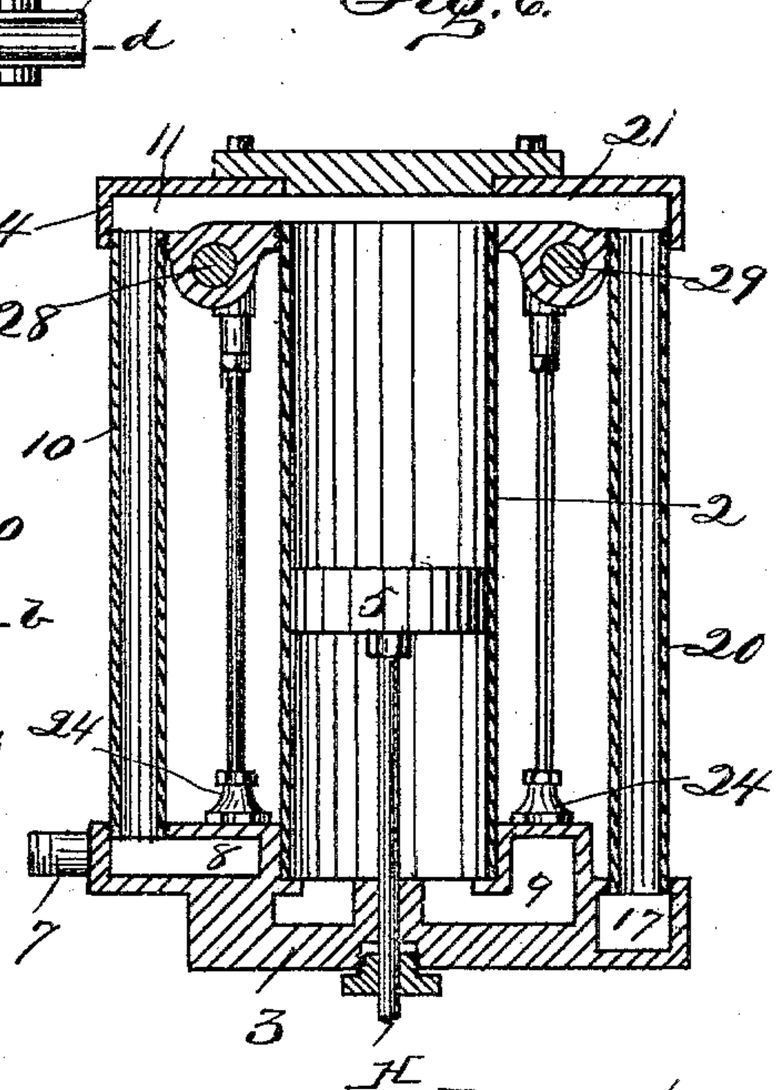
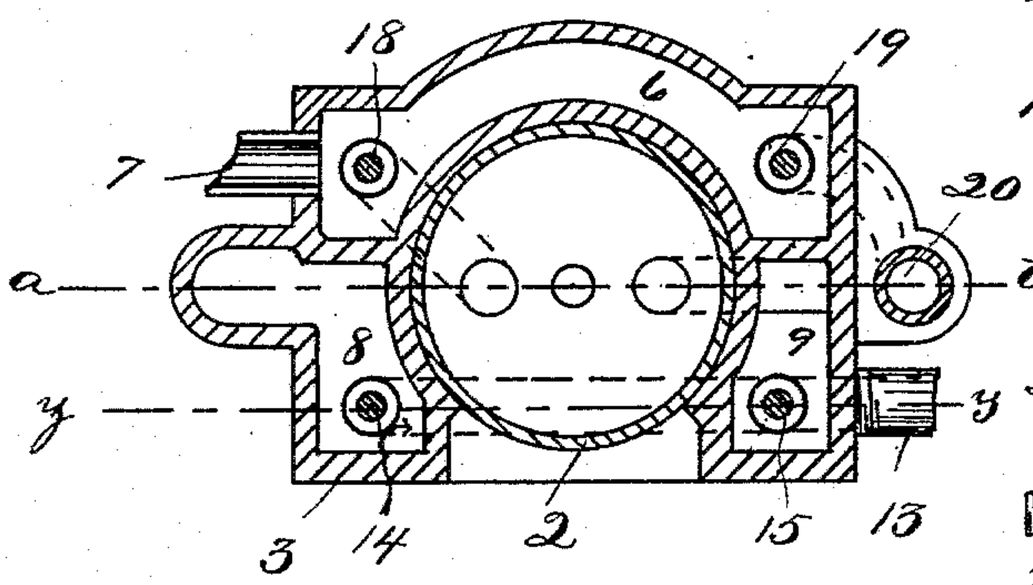


Fig. 5.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM JULIAN, OF ROCHESTER, NEW YORK.

GOVERNOR FOR FLUID-MOTORS.

SPECIFICATION forming part of Letters Patent No. 545,367, dated August 27, 1895.

Application filed April 3, 1895. Serial No. 544,314. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM JULIAN, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Governors for Fluid-Motors; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference letters and numerals marked thereon.

My present invention has for its object to provide an improved governor for securing for water-wheels or other motors operated by fluid under pressure a uniform speed by the adjustment of the gate or valve admitting water or other fluid to said motor, the direction of movement of said gate being dependent upon the speed of the motor, and to this end the invention embodies a motor or engine operated by fluid under pressure connected to said gate and in certain improvements in construction and combinations of parts, all as will be hereinafter fully described, and the novel features pointed out in the claims at the end of this specification.

In the drawings, Figure 1 is a front elevation of a governor device constructed in accordance with my invention; Fig. 2, a vertical sectional view taken on the line *x x* of Fig. 1; Fig. 3, a plan view of the device; Fig. 4, a vertical section on the line *y y* of Fig. 3 and the corresponding line of Fig. 5; Fig. 5, a horizontal section on the line *z z* of Fig. 4; Fig. 6, a sectional view on the line *a b* of Fig. 5; Fig. 7, a horizontal section on the line *c d* of Fig. 4; Fig. 8, a detail view showing the operation of one of the valve-operating devices.

Similar reference numerals and letters in the several figures indicate similar parts.

I have not deemed it necessary to show herein the water-wheel or motor to be controlled, as it may be of any construction desired; but it is sufficient that the valve or gate controlling the supply of fluid to, it is connected to the main actuating-piston of the governor and that said governor shall be driven from the motor, so that in Fig. 1, A indicates a suitable shaft operated from the motor, having a pulley B thereon, connected by a belt C with the driving-pulley D, forming part of the governor mechanism. E indicates a shaft connected to and controlling the position of the gate regulating the supply to the motor, and on this shaft is shown a sector F, with which meshes a rack G, connected to the piston-rod H of the governor mechanism.

The frame of the governor mechanism embodies a suitable supporting-base 1 and a main cylinder 2, the lower end of the latter being connected to a casting 3, having suitable fluid channels, (to be described,) while the upper end is connected to a frame or casting 4, also having suitable passages or channels in it. Operating in the cylinder is a piston-head 5, connected to the rod H, previously described, and which by its movement controls the supply valve or gate of the motor. The lower casting 3 is provided with a chamber 6, into which fluid under pressure is introduced through the supply-pipe 7, and said casting is also provided with fluid-exhaust chambers 8 and 9, these chambers being preferably in the same plane and the chamber 8 communicating by a pipe 10 with a recess or channel 11 in the upper casting 4, which channel communicates with the upper end of the cylinder 2. Also, in the casting 3, and preferably in a lower plane than the chambers 6, 8, and 9, is provided an exhaust chamber or passage 12, with which the exhaust-pipe 13 connects, and suitable ports are arranged between chambers 8 and 9 and the chamber 12, controlled by exhaust-valves 14 and 15, respectively, the valve 14 operating, when lifted from its seat, to allow fluid in the chamber 8 to exhaust into the chamber 12, and the valve 15, when lifted from its seat, to allow fluid in chamber 9 to exhaust into said chamber 12.

16 indicates a passage communicating with the lower end of the cylinder 2 and extending beneath the chamber 6, a suitable opening being formed between the two, closed by the valve 18, and 17 indicates a passage communicating with the pipe 20 at its lower end, which pipe at its upper end connects with a channel 21 in the upper casting 4, communicating with the upper end of the cylinder.

19 indicates a valve normally closing a port or aperture between the chambers 6 and 17 and operating, when raised, to admit pressure from the former to the latter. The valves are preferably arranged in pairs embodying

exhaust-valve 14 and supply-valve 18 and exhaust-valve 15 and a supply-valve 19, and both valves of a pair are adapted to be simultaneously lifted from their seats, as, for instance, if the valves 14 and 18 are lifted fluid under pressure will be admitted from the chamber 6 through passage 16 to the lower end of the cylinder, thereby operating to raise the piston 5 and opening the gate to the motor, and simultaneously the valve 14 will be lifted, permitting the fluid in the cylinder above the piston to pass through passages 11, 10, 8, and 12 to the exhaust, and so, also, when the valves 15 and 19 are lifted from their seats, fluid under pressure will pass through passages 17, 20, and 21 to the upper end of the cylinder above the piston, while the fluid below the piston will be exhausted through passages 22, 9, and 12 to the exhaust 13.

In order to operate these valves in pairs and at the proper time, I connect them to rods 14′, 18′, 15′, and 19′, operating through stuffing-boxes 24, the upper end of said rods being provided with racks 25 and operating in suitable recesses formed in the upper casting 4, and I preferably arrange above said rods springs 26, abutting against adjusting-screws 27, said springs serving to hold the valves normally down upon their seats and closing the ports controlled by them, though, the pressure of fluid being above them, their tendency will be to close.

Journaled in suitable bearings formed in the upper casting 4 are two oscillatory arbors 28 and 29, each having gear-teeth thereon meshing with the racks on the valve-rod and operating when turned to lift the valves from their seats. Secured to the outer ends of the arbors 28 and 29 are crank-arms 30, each having an angular pin 31 secured to the inner side thereof and mounted upon the sleeves formed upon the casting 4, and around said arbors are levers 32, connected with each other on one side of the pivot by a connecting-rod 33, while the other ends of said levers have mounted upon them latches, each provided with a shoulder 34, adapted to engage with the pin 31 on the crank 30, and with tails 35, projecting in proximity to the center of oscillation of the levers 32, said latches being pivoted at 36 and being pressed by springs 37, carried on the levers 32, in a direction to cause the shoulders 34 to engage the pins 31 when moving upward, the beveled ends of said latches causing their engagement when moving down. The lever 32, surrounding the arbor 29, is provided with a third arm 38, connected by a pitman 39 with a wrist-pin 40 on a wheel 41, connected to the end of a shaft 42, which is driven by gears 43 and 44 from a shaft 45, on which the driving-pulley D is mounted. From this it will be seen that, as the shaft 42 is rotated, the levers 32 (which are connected and form a continuously-operated valve-actuator) will be oscillated or rocked on their pivots, and as the latches are moved around their shoulders 34 will tend to engage the pins 31 and alternately oscillate the arbors 28 and 29, lifting the valves from their seats; but in order that these valves shall be lifted at the proper time and only when necessary I provide the oscillating releasing-cams 46 47, controlling the engagement of the latches, the former journaled on the sleeve surrounding the arbor 28 and the latter on the sleeve surrounding the arbor 29, said cams being provided with arms 48, connected by a rod or link 49, and the cam 47 being also provided with an additional arm 50, connected by a link 51 with the end of a lever 52, pivoted at 53, the other end of said lever being adapted to be operated by a ball-governor K. This governor, which may be of any suitable construction, is adapted to be driven from the shaft 45 by any suitable mechanism—such, for instance, as the shafts 54 55 and beveled gears 56 and 57. It will now be understood that when the motor is running at normal speed the levers 32 will be oscillated by the movement of the shaft 42, which is driven mediately from the main water-wheel or motor, and the latches thereon would normally tend to engage the pins 31 and, oscillating the arbors 28 and 29, lift the pairs of valves alternately from their seats; but the governor K, which is also driven by the motor, and the cams 46 and 47 operated thereby, are so adjusted that at the normal speed of the motor they will maintain such relation to the pins 31, connected to the arbors, that the tails 35 of the latches will be engaged by said cams and the shoulders 34 prevented from engaging and lifting the pins, as shown in full lines in Fig. 8. When, however, the speed falls below normal, the governor-balls will drop, pulling up the link 51 and turning the cams so that the tail 35 of the latch on the lever for actuating the arbor 28 will be allowed to move toward the center of said arbor and the shoulder 34 may engage and lift the valves 14 and 18 from their seats, thereby admitting fluid through the passages described to the under side of the piston 5, at the same time connecting the upper end of the cylinder with the exhaust-chamber 12, thereby causing the engine-piston 5 to be raised and the gate or valve governing the supply to the motor to be opened, and as soon as the motor attains normal speed again the cam 46 will be moved by the governor so that the latch will not engage the pin 31 during the oscillation of the lever 32, thereby allowing the valves to close again by the pressure of fluid, which is always above them, or they may be assisted in this downward movement by the springs 26. In the same manner when the motor exceeds the normal or predetermined speed the cam 47 will be actuated to allow the latch controlled by it to actuate the arbor 29, as in dotted lines, Fig. 8, opening the valves 15 and 19 and causing the downward movement of the engine-piston 5, operating to close the main gate or valve. It will of course be understood that unless there is a very rapid change in the speed of the gov-

ernor the cams 46 and 47 will only be moved a sufficient distance to allow the latches to engage and rotate arbors 28 or 29 a short distance, so that the valves will only be lifted a short distance from their seats at each oscillation of the levers 32, and by this means I am enabled by the frequent and comparatively-slight movement to regulate to a nicety the adjustment of the supply valve or gate, and therefore the speed of the motor.

It will be noted that there is always a solid column of water or fluid on both sides of the piston 5 and both valves operate against pressure and that as the exhaust and the supply of pressure to the piston are simultaneously and positively controlled the operation of the motor-controlling gate or valve will be smooth and not liable to be affected by the weight of the valve or gate if vertically moving, nor will there be an opportunity for air to accumulate above or below the piston and interfere with its operation, and, furthermore, as the valves for controlling the operation of the piston 5 are moved positively by the direct operation of the motor, and are not positively actuated by the governor, but simply thrown into engagement by it, the speed of the motor is less liable to fluctuate or to fail to operate properly.

The particular construction of the device shown is simple, and it may be constructed cheaply, and I find in practice that it is admirably adapted for the purpose; but I do not desire to confine my invention to this particular embodiment, though I prefer it, and it is readily adapted for connection to any style of motor or water-wheel.

I claim as my invention—

1. The combination with a gate or valve of a fluid motor, of an engine for controlling it embodying a movable piston, and having fluid supply passages leading to opposite sides of the piston, and fluid exhaust passages leading from opposite sides of said piston, valves in each of said passages, and connections between each exhaust valve and its corresponding supply valve on the opposite side of the piston, actuating devices substantially as described for operating said valves in pairs, and a governor for controlling the operation of said actuating devices, substantially as described.

2. The combination with the gate or valve of a motor, of an engine for controlling it embodying a movable piston, valves for controlling the supply to and valves for controlling the exhaust from said piston, said valves being connected in pairs consisting of a supply and an exhaust valve, a continuously operating valve actuating device, detachable connections between it and each of the pairs of valves, and a governor for connecting either pair of valves with the actuating device, substantially as described.

3. The combination with the gate or valve of a motor, of an engine for controlling it embodying a movable piston, valves for controlling the supply of fluid to opposite sides of the piston, valves for controlling the exhaust from opposite sides of the piston, connections between each supply valve and its corresponding exhaust valve for causing their simultaneous operation, both said supply valves opening toward the fluid supply and each of said exhaust valves opening toward the side of the piston controlled by it, actuating devices substantially as described for operating the valves in pairs, and a governor controlling the operation of the actuating devices, substantially as described.

4. The combination with the gate or valve of a motor, of an engine for controlling it embodying a movable piston, valves for controlling the supply of fluid to opposite sides of the piston, valves for controlling the exhaust from opposite sides of the piston, connections between each supply valve and its corresponding exhaust valve for causing their simultaneous operation, both said supply valves opening toward the fluid supply, and each of said exhaust valves opening toward the side of the piston controlled by it, a continuously operating valve actuating device, detachable connections between it and each of the pairs of valves, and a governor for causing the connection of either pair of valves with the valve-actuating device, substantially as described.

5. The combination with the gate or valve of a motor, of an engine for controlling it embodying a movable piston and having valves controlling the supply of fluid to opposite sides of said piston, valves for controlling the exhaust from opposite sides of said piston, connections between each supply and its corresponding exhaust valve, movable supports, and latch connections between them and the pairs of valves, and a governor actuated by the motor controlling the engagement of the latches, substantially as described.

6. The combination with the gate or valve of a motor, of an engine controlling it embodying a movable piston and having valves controlling the supply of fluid to opposite sides of said piston, valves for controlling the exhaust of fluid from opposite sides of the piston, connections between each supply and its corresponding exhaust valve, the oscillatory arbors, one for each pair of valves, and arms thereon, oscillatory levers and latches between said levers and arms, cams for engaging the latches and controlling their operation, and a governor operated by the motor and controlling the movement of the cams, substantially as described.

7. The combination with the cylinder, the piston operating therein, valves controlling the supply of fluid to opposite sides of the piston, valves controlling the exhaust from opposite sides of the piston, connections between each supply and its corresponding exhaust valve, movable supports having latches

thereon arranged to operate the valves in pairs, and a governor device controlling the engagement of said latches with the valve-operating devices, substantially as described.

8. The combination with the gate or valve of a motor, of an engine for controlling it embodying a movable piston, valves for controlling the supply and valves for controlling the exhaust from said piston, the oscillatory shafts, each operating one exhaust and one supply valve, the arms on said shafts, having the pins, the continuously operating valve-actuating device having the latches for engaging said pins, the cams for controlling said latches, and a governor device operating the cams to cause the engagement of one or the other of the valve shafts with the actuating device, substantially as described.

9. The combination with the main frame embodying the cylinder and having inlet exhaust passages, and the piston operating in said cylinder, of the two pairs of valves, each having a stem with a rack thereon, the two oscillatory shafts having gears engaging the racks, and the catch-pins the oscillatory levers, the latches thereon, the cams cooperating with the latches, and the governor connected to the cams for oscillating them, substantially as described.

10. The combination with the cylinder, the piston operating therein, the casting having the chambers 6, 8 and 9, and passages 12, 16, 17 and 22, the casting having the passages 11 and 21 and the tubes 10 and 20, of the valves 14, 15, 18 and 19 connected for operation in pairs, substantially as described.

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Witnesses:
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G. A. RODA.