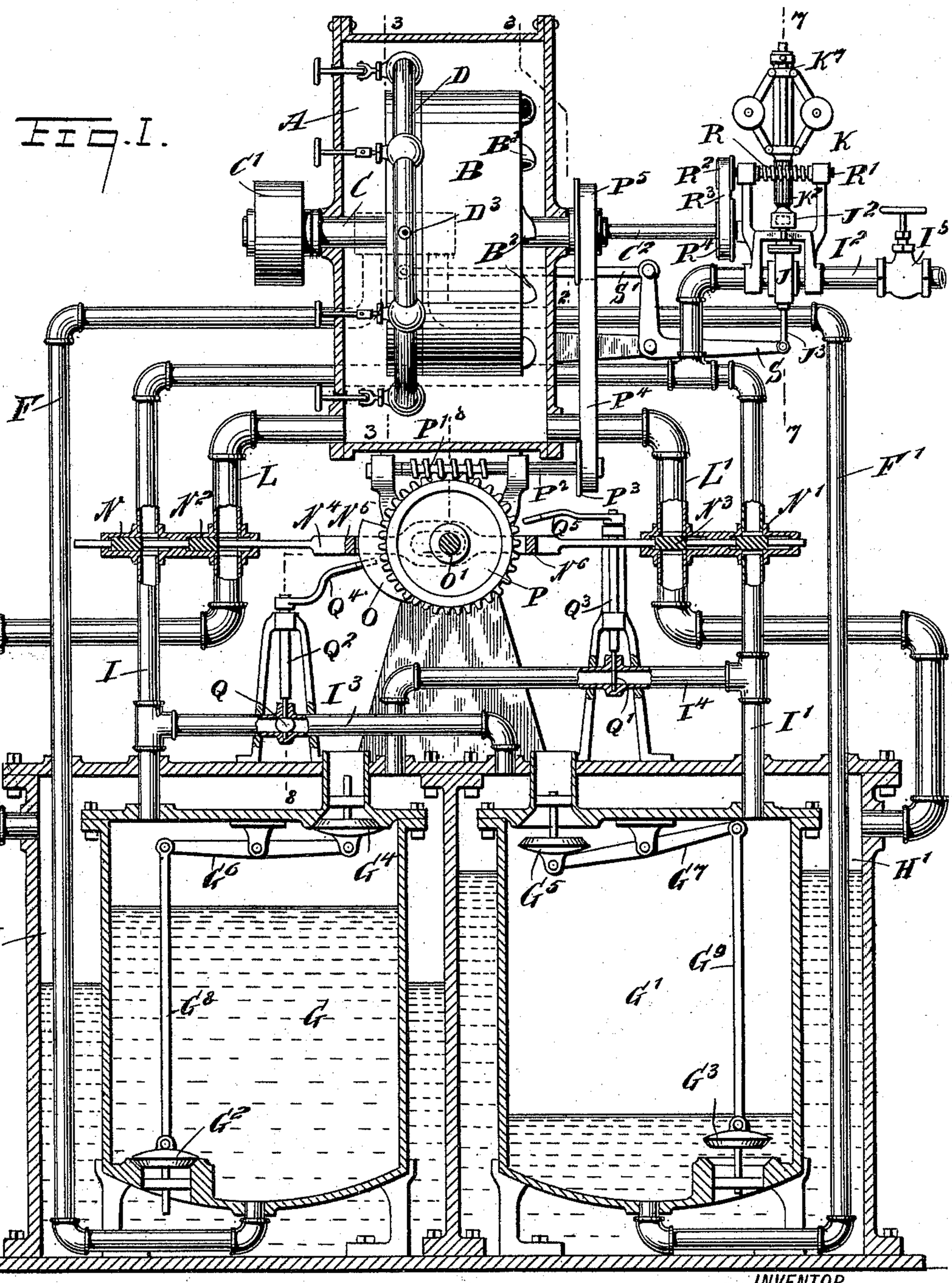
(No Model.) 3 Sheets—Sheet 1.

S. B. BATTEY.

FLUID PRESSURE AND HYDRAULIC MOTOR.

No. 584,620. Patented June 15, 1897.

Fig. 1.



INVENTOR

S. B. Battey

BY

Munn & Co

ATTORNEYS.

WITNESSES:

H. H. Walker

Henry J. Hoolbrook

(No Model.) 3 Sheets—Sheet 2.

S. B. BATTEY.

FLUID PRESSURE AND HYDRAULIC MOTOR.

No. 584,620. Patented June 15, 1897.

Fig. 2.

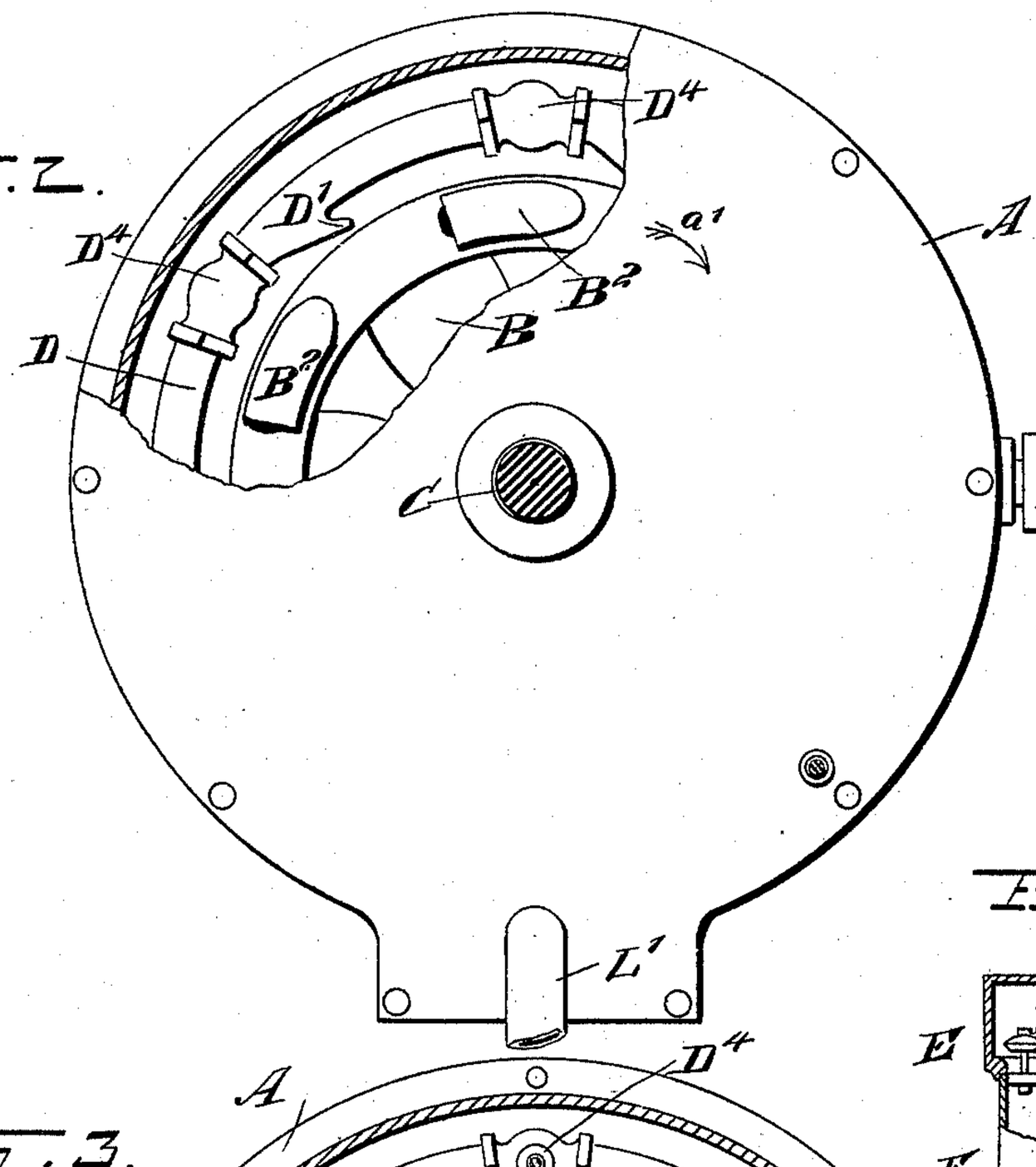


Fig. 4.

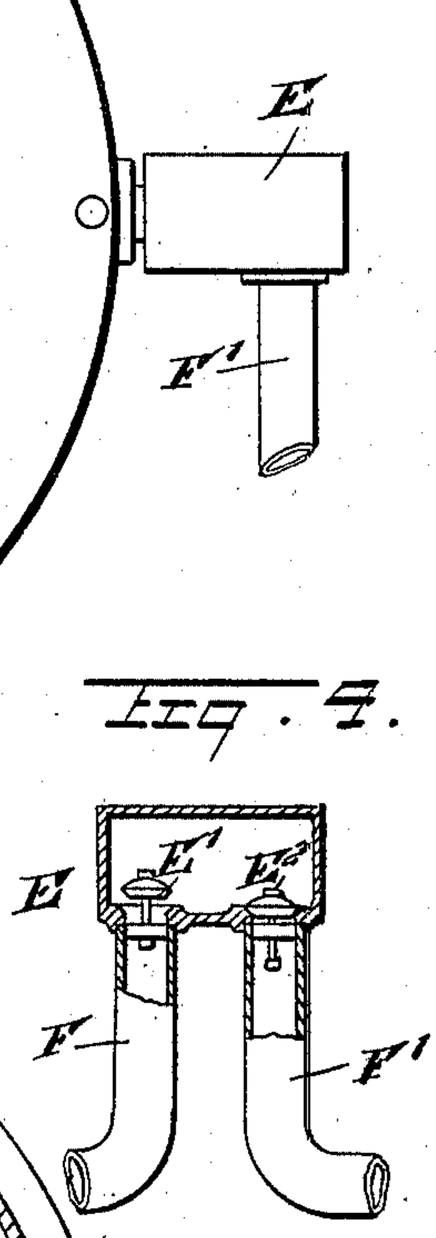
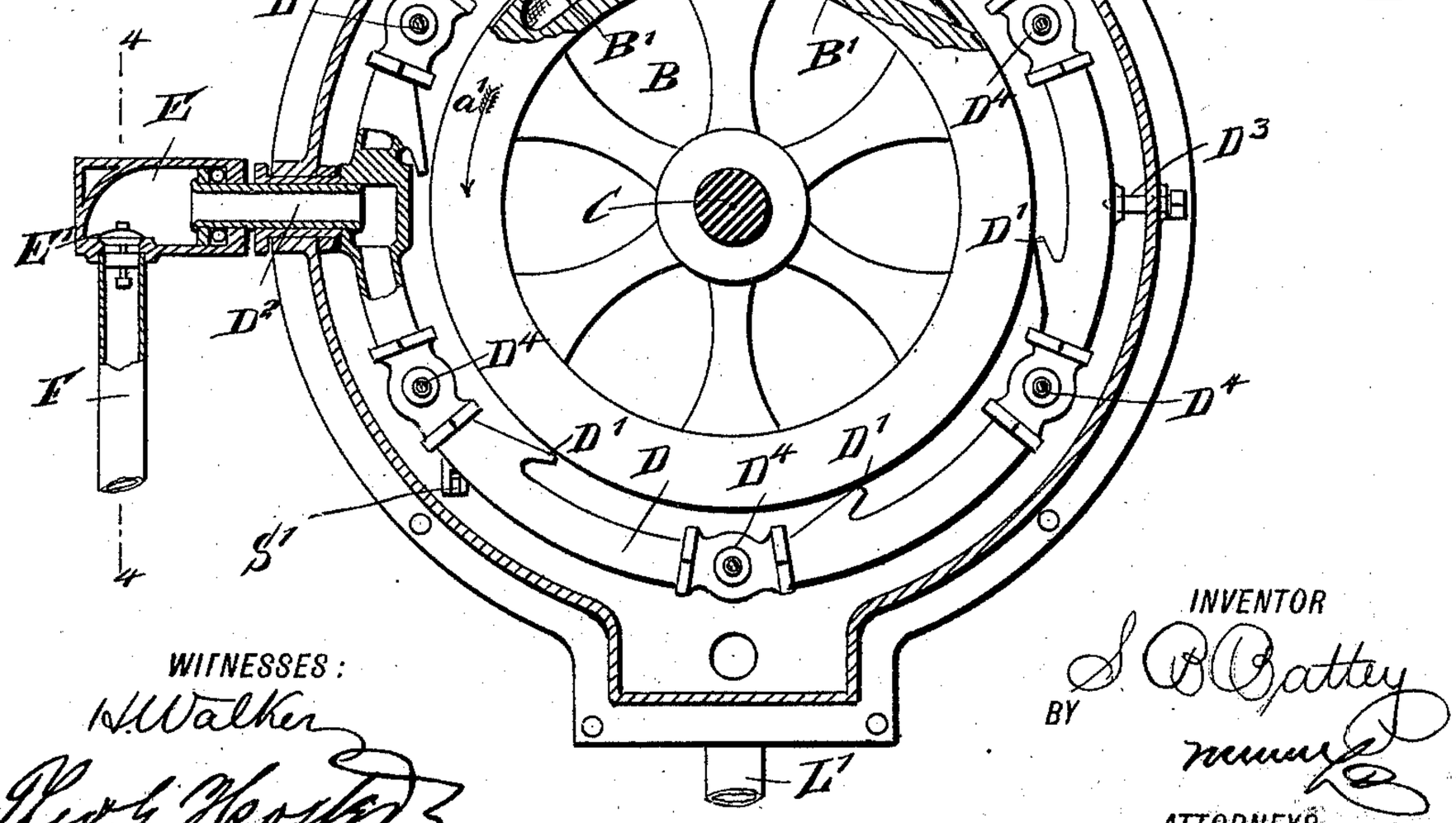


Fig. 3.



WITNESSES:

N. L. Walker

Rud. F. Hoster

INVENTOR

S. B. Battey

BY Munn & Co

ATTORNEYS.

(No Model.) 3 Sheets—Sheet 3.

S. B. BATTEY.

FLUID PRESSURE AND HYDRAULIC MOTOR.

No. 584,620. Patented June 15, 1897.

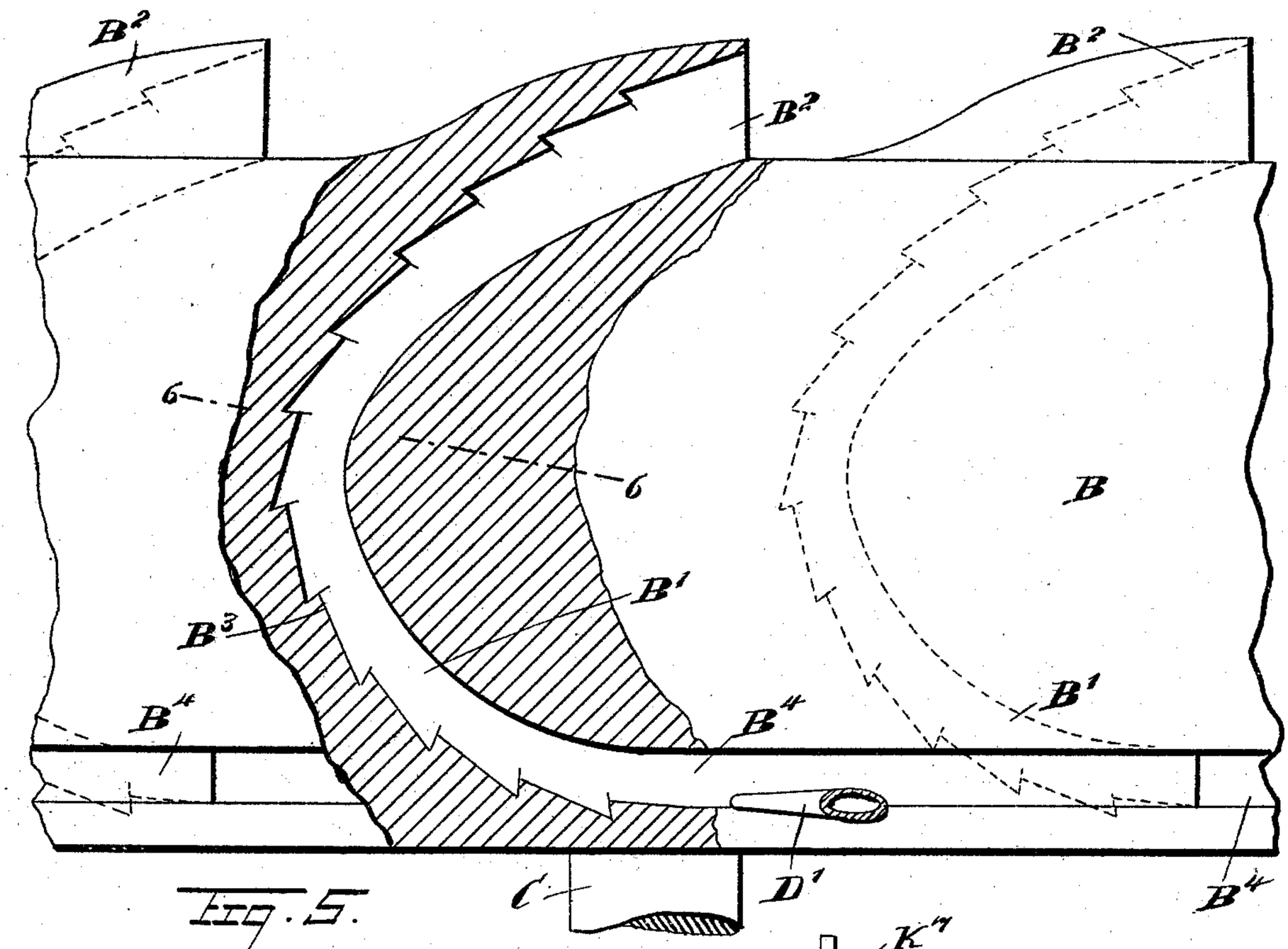


Fig. 5.

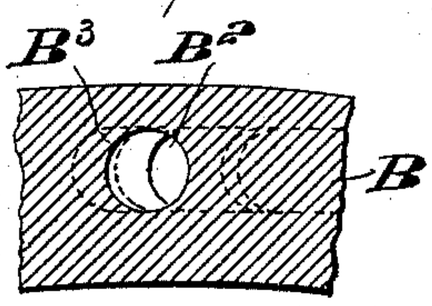


Fig. 6.

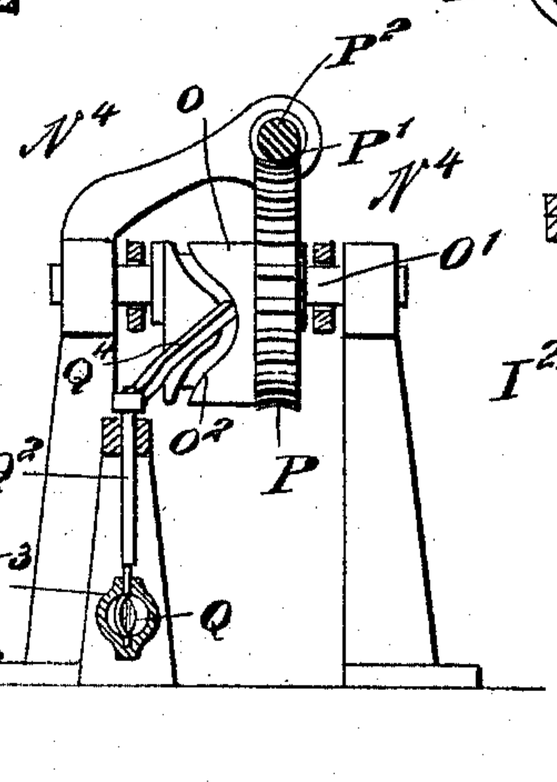


Fig. 8.

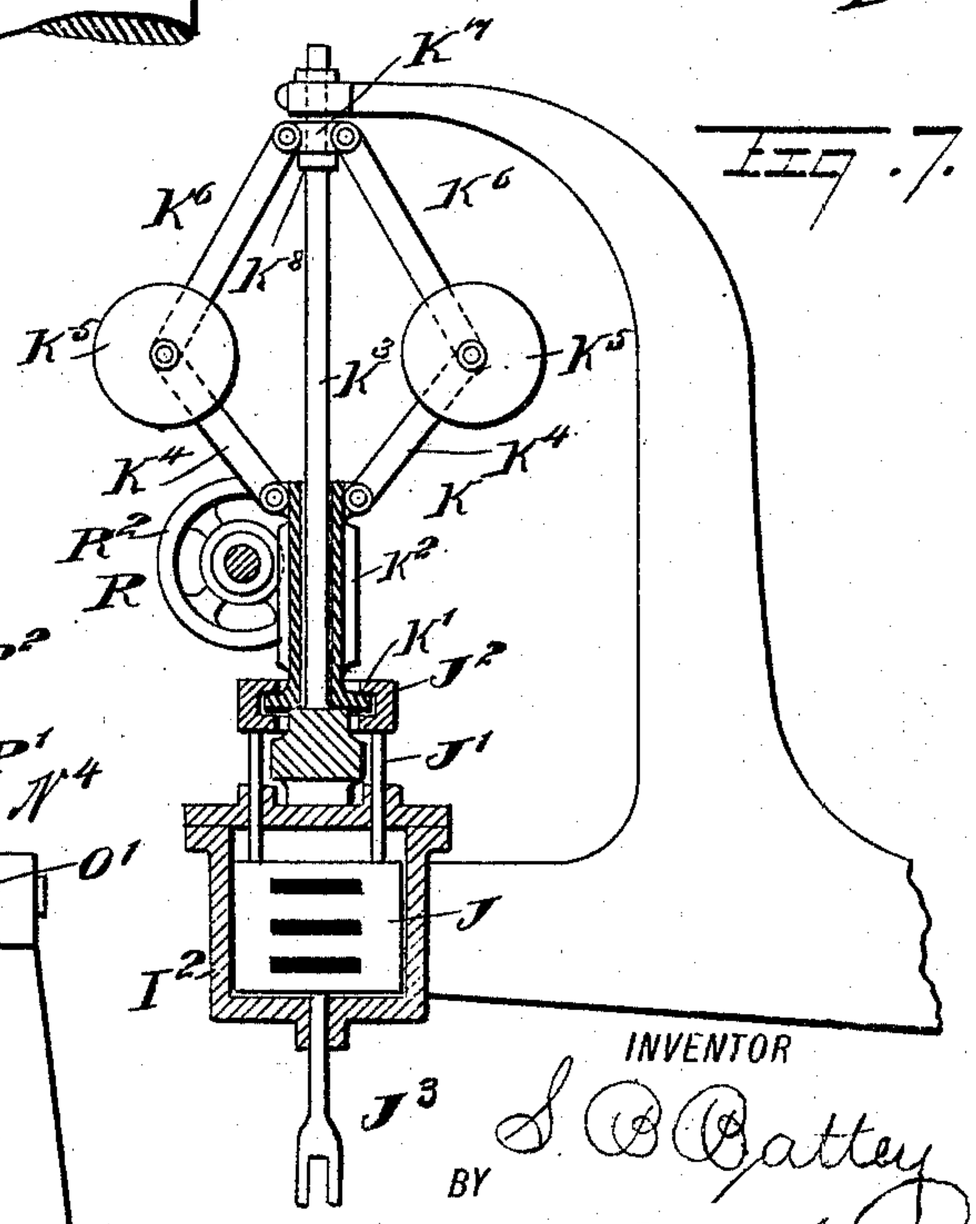


Fig. 7.

WITNESSES:
H. Walker
Rev. J. Hoober

INVENTOR
S. B. Battey
BY Munn & Co
ATTORNEYS.

UNITED STATES PATENT OFFICE.

SUMTER B. BATTEY, OF NEW YORK, N. Y.

FLUID-PRESSURE AND HYDRAULIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 584,620, dated June 15, 1897.

Application filed August 27, 1896. Serial No. 604,095. (No model.)

To all whom it may concern:

Be it known that I, SUMTER B. BATTEY, of New York city, in the county and State of New York, have invented a new and Improved Fluid-Pressure and Hydraulic Motor, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved fluid-pressure and hydraulic motor arranged to utilize the motive agent to the fullest advantage and without any waste or loss of water.

The invention consists principally of a wheel formed in its periphery with conduits, buckets, or pockets, a pipe surrounding the wheel and formed with nozzles for discharging the water under pressure into the said buckets, a vessel adapted to contain water and connected with the said pipe, and a pressure-pipe for the said vessel for forcing the water out of the vessel into the wheel-pipe and through the nozzles thereof into the buckets to rotate the said wheel.

The invention further consists of a tank connected with the motor-casing to permit the water to flow from the casing to the tank, a vessel within the said tank and connected with the supply-pipe for the motor, a valved connection between the tank and vessel, and a pressure-pipe opening into the said tank to force the water therein quickly into the said vessel.

The invention also consists of certain parts and details and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement. Fig. 2 is a sectional side elevation of the motor-wheel on the line 2 2 of Fig. 1. Fig. 3 is a similar view of the same on the line 3 3 of Fig. 1. Fig. 4 is a cross-section of the valved supply-box. Fig. 5 is an enlarged sectional plan view of the motor-wheel. Fig. 6 is a sectional side elevation of the same on the line 6 6 of Fig. 5. Fig. 7 is an enlarged cross-section of the governor on the line 7 7 of Fig. 1, and Fig. 8 is a cross-section of the valve-shifting device on the line 8 8 of Fig. 1.

The improved motor is provided with a casing A, preferably made circular in form and containing a motor-wheel B, secured on a shaft C, journaled in suitable bearings in the heads of the casing A, one outer end of said shaft carrying a pulley C′ for transmitting the rotary motion of the wheel to other machinery. The wheel B is surrounded on one side by a pipe D, formed with nozzles D′, adapted to discharge water in a tangential direction into conduits, pockets, or buckets B′, formed in the periphery of the wheel B.

Each conduit B′ is provided on one side with an outlet B^2, extending to one side of the wheel and curved laterally backward in the inverse direction to the movement of the wheel. The forward wall B^3 of the conduit is serrated or formed with teeth extending transversely along the wall from near the entrance B^4 to the end of the outlet B^2, as plainly shown in Fig. 5. The entrance B^4 to the conduit is in the form of a groove arranged somewhat at one side of the wheel-rim and is gradually increased in depth, as will be understood by reference to Fig. 3.

It is evident that when a fluid under pressure passes in a tangential direction from the nozzles D′ through the entrance B^4 into the conduit B′ it presses against the teeth of the wall B^3 to revolve the wheel in the direction of the arrow a'. By having the teeth in the wall B^3 the fluid under pressure impinges successively on the edges of the teeth to insure a full utilization of the motor-power, and at the same time a proper forward and transverse movement of the fluid. When the latter passes into the gradually-widening outlet B^2, then a reaction of the fluid begins to insure further impulses on the teeth at the outer end to revolve the wheel in the direction of the arrow a'.

The pipe D is held on trunnions D^2 D^3, arranged in the rim of the casing A, so that said pipe can swing to move the nozzles D′ into or out of alinement with the entrances B^4 to the conduits, so as to cut off the fluid whenever the wheel runs above a normal

rate of speed. This movement of the pipe D is controlled by a governor in a manner hereinafter more fully described.

The trunnion D^2 is hollow in the form of a pipe and opens into a box E, connected with supply-pipes F F′, normally closed at their upper ends by upwardly-opening valves E′ E^2, as plainly shown in Figs. 3 and 4. The pipes F and F′ are connected with the bottoms of vessels G G′, adapted to contain water or other liquid to be forced through the said pipes into the box E, and from the latter through the pipe D^2 into the pipe D, the water under pressure finally passing through the nozzles D′ into the buckets B′ to rotate the wheel B, as above described.

Into the upper ends of the vessels G G′ lead the pressure-pipes I I′, respectively, connected with a common supply-pipe I^2, containing a valve I^5 and connected with a boiler or other source of steam, air, or gas supply to permit the steam or other fluid to pass under pressure into the said vessels G G′.

In the pipe I^2 is arranged a governor-valve J, actuated by a governor K, driven from the shaft C to regulate the amount of steam passing through the pipe I^2 to the pressure-pipes I I′. The latter are also provided with branch pipes I^3 I^4, respectively, opening into the upper ends of the two tanks H′ and H, respectively, to exert a pressure on the water contained in the tanks and force the water quickly into the vessels G G′ by way of the valves G^2 G^3.

From the lower end of the casing A lead the outlet-pipes L L′, connected with the tanks H H′, so that the water discharged from the wheel B and flowing into the casing A passes by the pipes L L′ back into the tanks H H′ to be finally forced into the vessels G G′ for reuse.

In the several pipes I I′ and L L′ are arranged slide-valves N N′ N^2 N^3, respectively, all secured on a common valve-stem N^4, adapted to be shifted by a cam O, acting alternately on projections N^5 and N^6 on the said stem N^4. (See Fig. 1.) The cam O is secured on a shaft O′, journaled in suitable bearings and carrying a worm-wheel P in mesh with a worm P′, having its shaft P^2, provided with a pulley P^3, connected by a belt P^4 with a pulley P^5, attached to the shaft C. Thus when the latter is rotated the pulley P^5 transmits a rotary motion by the belt P^4 and pulley P^3 to the shaft P^2 and worm P′, which in turn rotates the worm-wheel P and causes the cam O to act alternately on the projections N^5 and N^6 to shift the valve-stem N^4, so as to open the valves N N^2 and close the valves N′ N^3, or vice versa.

In the branch pipes I^3 and I^4 are arranged valves Q Q′, respectively, adapted to be turned to open and close the said pipes, so as to connect and disconnect the tanks H′ and H with and from the pipes I I′, respectively. The valves Q and Q′ are secured on vertically-disposed valve-stems Q^2 Q^3, mounted to turn in suitable bearings and carrying at their upper ends arms Q^4 Q^5, respectively, adapted to be engaged by a cam-groove O^2, formed on the peripheral surface of the cam O. Thus the latter when shifting the valves N N^2 and N′ N^3, as above described, also shifts either valve Q or Q′ to open or close the respective pipe I^3 or I^4.

In order to insure a rapid filling of the vessels G G′, I provide the tops thereof with outlet-valves G^4 G^5 for the steam to relieve the vessels of pressure during the filling operation. The valves G^4 G^5 are hung on levers G^6 G^7, respectively, connected by links G^8 G^9, respectively, with the valves G^2 G^3, so that when the latter are forced open by the water entering the vessels under pressure from the tanks it is evident that the other valves G^4 G^5 are likewise opened to relieve the vessels of pressure.

The valve J, controlled by the governor K, is in the form of a gate, as plainly shown in Fig. 7, and this gate-valve is connected by rods J′ with a collar J^2, loosely engaged by a flange K′, formed on a vertically-disposed pinion K^2, mounted to turn loosely and to slide vertically on the governor-stem K^3, held on a suitable bracket.

The pinion K^2 is in mesh with a worm R, secured or formed on a shaft R′, carrying at one end a pulley R^2, connected by a belt R^3 with a pulley R^4, attached to the reduced end C^2 of the main driving-shaft C. Thus when the latter is rotated a rotary motion is given by the pulleys R^4 R^2 and belt R^3 to the worm-shaft R′ and its worm R to revolve the pinion K^2. The latter is connected at its upper ends by links K^4 with the governor weights or balls K^5, pivotally connected by links K^6 with a collar K^7, mounted to turn loosely on the upper end of the governor-stem K^3, said collar also resting on a shoulder K^8, secured to the said stem. The pinion K^2 is of considerable length, so that when the balls K^5 open on an increase of speed the said pinion still remains in mesh with the worm R.

It is evident that when the speed increases and the governor-balls fly outward they draw the pinion K^2 upward, and the flange K′ of the pinion in acting on the collar J^2 leaves the gate-valve J to cut off the steam passing through the pipe I^2 into the pressure-pipes I I′. The pressure on the water in the vessels G G′ is thus controlled by the governor driven from the motor, and consequently the motive agent for the motor-wheel B is reduced in pressure until the wheel attains again its normal rate of speed.

The lower end of the gate-valve J is provided with a downward extension J^3, pivotally connected with a bell-crank lever S, connected by a link S′ with the pipe D, so that when the gate-valve J is lifted on an increase in speed of the wheel B then the pipe D is tilted by the action of the gate-valve on the bell-crank

lever S and link S′ to insure a cut-off of the motive agent on the wheel B, as previously explained.

The pipe D is provided between the nozzles D′ with valves D^4, the stems of which extend to the outside of the casing A, as is illustrated in Fig. 1, to permit of cutting off water from any desired number of nozzles, according to the desired speed.

The operation is as follows: When the several parts are in the position illustrated in Fig. 1, then the steam, air, or other fluid passing through the pipe I^2 passes into the pressure-pipe I as the valve N therein is open, the steam passing from the pipe I into the vessel G to force the water therein through the pipe F into and through the box E and pipe D^2 into the pipe D and through the nozzles D′ into the conduits of the wheel B to rotate the latter, as previously explained. The water that flows from the wheel B flows from the casing A, through the pipe L, into the tank H to accumulate therein. The water in the tank H′ is now forced by the pressure of the steam from the pipe I^3 into the vessel G′ by the way of the valve G^3 to fill this vessel with the discharged water from the wheels B. Thus when the vessel G is emptying the other vessel, G′, is filling. When the vessel G is almost empty of water, then the cam O engages the projection N^6 to shift the stem N^4 from the left to the right, so that the valves N and N^2 close the pipes I and L, and the previously-closed pipes I′ and L′ are opened by their valves N′ and N^3. The valve Q is also closed by the action of the cam O on the arm Q^4, and the valve Q′ is opened by the action of said cam on the arm Q^5. This takes place at the time the valves N′ N^3 are opening. Steam will now pass from the pipe I^2 through the pipe I′ into the vessel G′ to force the water therein through the pipe F′ into and through the box E, the pipe D^2, the pipe D, and the nozzles D′ to rotate the wheel B, as previously explained, and without interruption. The water discharged from the wheel now passes through the pipe L′ into the tank H′, in which the water accumulates until the valves are again shifted, and this water is forced back into the vessel G′. When the vessel G′ is nearly empty, then the cam O again shifts the valves back into the position shown in Fig. 1, and the above-described operation is repeated.

It will be seen that by the arrangement described the steam-pressure is utilized to force the water into the pockets of the vessel B, so as to rotate the latter. In order to insure a continuous rotation of the wheel B, I provide the two sets of vessels and tanks with automatic shifting devices, so that no interruption whatever takes place in rotating the wheel B as long as the valve I^3 is open.

It will be seen that the motor utilizes the motive agent to the fullest advantage and without any waste or loss of the water, as the latter flows directly from the casing A back into the corresponding tank H or H′, to be forced into the vessels G G′ and back to the motor, as above described.

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

1. A fluid-pressure and hydraulic motor provided with a closed tank, connections therefrom to the motor-casing for return of the water to the tank, a valve in the said connections, a vessel within the said tank, a supply or pressure pipe connecting said vessel and the motor, a valved connection between the tank and vessel, and a pressure-pipe opening into the said tank to force the water therein quickly into the said vessel, substantially as described.

2. A fluid-pressure and hydraulic motor provided with a closed tank, connections therefrom to the motor-casing for the return of the water to the tank, a valve in the said connections, a vessel within the said tank, a supply or pressure pipe connecting said vessel and the motor and valved connections between the tank and vessel, a pressure-pipe opening into said tank to force the water therein quickly into said vessel, and an escape-valve in the top of said vessel and controlled from the said valved connections, substantially as described.

3. A fluid-pressure and hydraulic motor, comprising a casing, a wheel mounted to rotate in said casing and formed in its periphery with conduits, a pipe surrounding the wheel and formed with nozzles for discharging the water under pressure into the said conduits, two vessels adapted to contain water and alternately connect with the said pipe, pressure-pipes for the said vessels to alternately force the water out of the vessels into the said nozzle-pipe and through the nozzles thereof into the conduits, to rotate the wheel, tanks containing the said vessels and having valved connections therewith, return-pipes leading from the said casing to the said tanks to fill the latter with the water discharged from the wheel, and branch pipes leading from the said pressure-pipes to the said tanks, substantially as shown and described.

4. A wheel for hydraulic or fluid-pressure motor having conduits passing through the rim thereof from side to side, said conduits being curved from their inlet forward in the direction of motion and then rearward to their outlet, the outer or forward surface of these conduits being shaped as a series of stepped cylindrical surfaces with the steps facing the outlet, substantially as described.

5. A wheel for hydraulic or fluid-pressure motor having conduits passing through the rim thereof from side to side, said conduits being curved from their inlet forward in the direction of motion and then rearward to their outlet, the outer or forward surface of these conduits being shaped as a series of stepped cylindrical surfaces having the steps facing the outlet, a pipe surrounding the wheel and

connected to the water-supply, and a series of nozzles attached to said pipe and discharging upon said conduits, substantially as described.

6. A fluid-pressure and hydraulic motor, provided with a wheel formed in its periphery with conduits having side outlets, each conduit having an entrance in the form of a groove, and a pipe surrounding said wheel and formed with nozzles adapted to discharge at one side into the said entrances of the conduits, the said pipe being hung on trunnions and adapted to swing to move the nozzles into or out of alinement with the entrances, as set forth.

7. A fluid-pressure and hydraulic motor, provided with a wheel formed in its periphery with conduits having side outlets, each conduit having an entrance in the form of a groove, a pipe surrounding said wheel and formed with nozzles adapted to discharge into the said entrances of the conduits at one side, the said pipe being hung on trunnions and adapted to swing to move the nozzles into or out of alinement with the entrances, and a governor driven from the said wheel and controlling the swinging motion of the said pipe, as set forth.

8. A fluid-pressure and hydraulic motor, comprising a casing, a wheel mounted to rotate in said casing and formed in its periphery with conduits, a pipe surrounding the wheel and formed with nozzles for discharging the water under pressure into the said conduits, two vessels adapted to contain water and alternately connect with the said pipe, pressure-pipes for the said vessels to alternately force the water out of the vessels into the said nozzle-pipe and through the nozzles thereof into the conduits, to rotate the wheel, valves held in said pressure-pipes, and a shifting mechanism controlled from the said wheel for opening and closing said valves, as set forth.

9. A fluid-pressure and hydraulic motor, comprising a casing, a wheel mounted to rotate in said casing and formed in its periphery with conduits, a pipe surrounding the wheel and formed with nozzles for discharging the water under pressure into the said conduits, two vessels adapted to contain water and alternately connect with the said pipe, pressure-pipes for the said vessels to alternately force the water out of the vessels into the said nozzle-pipe and through the nozzles thereof into the conduits, to rotate the wheel, tanks containing the said vessels and having valved connections therewith, return-pipes leading from the said casing to the said tanks to fill the latter with the water discharged from the wheel, valves in the said pressure-pipes and return-pipes, and a shifting device controlled by the said wheel and connected with the said valves, to open and close the same, substantially as shown and described.

10. A fluid-pressure and hydraulic motor, comprising a casing, a wheel mounted to rotate in said casing and formed in its periphery with conduits, a pipe surrounding the wheel and formed with nozzles for discharging the water under pressure into the said conduits, two vessels adapted to contain water and alternately connect with the said pipe, pressure-pipes for the said vessels to alternately force the water out of the vessels into the said nozzle-pipe and through the nozzles thereof into the conduits, to rotate the wheel, tanks containing the said vessels and having valved connections therewith, return-pipes leading from the said casing to the said tanks to fill the latter with the water discharged from the wheel, branch pipes leading from the said pressure-pipes to the said tanks, valves in the said pressure-pipes, outlet-pipes and branch pipes, and a shifting mechanism controlled from the said wheel and operating the said valves, substantially as shown and described.

SUMTER B. BATTEY.

Witnesses:
THEO. G. HOSTER,
JNO. M. RITTER.