No. 649,375. Patented May 8, 1900.

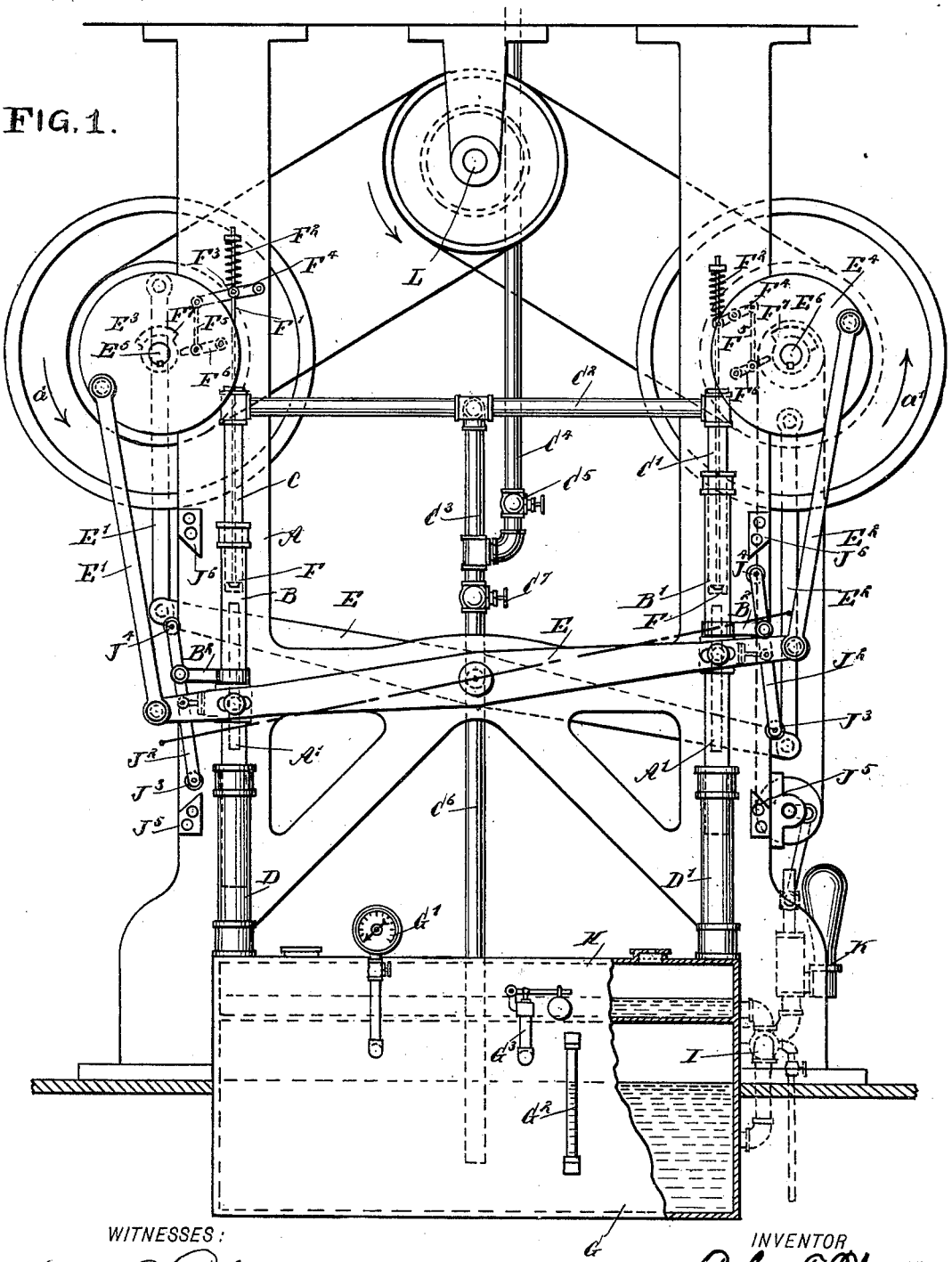
B. C. F. WALL.

HYDRAULIC MOTOR.

(Application filed Apr. 9, 1898.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.



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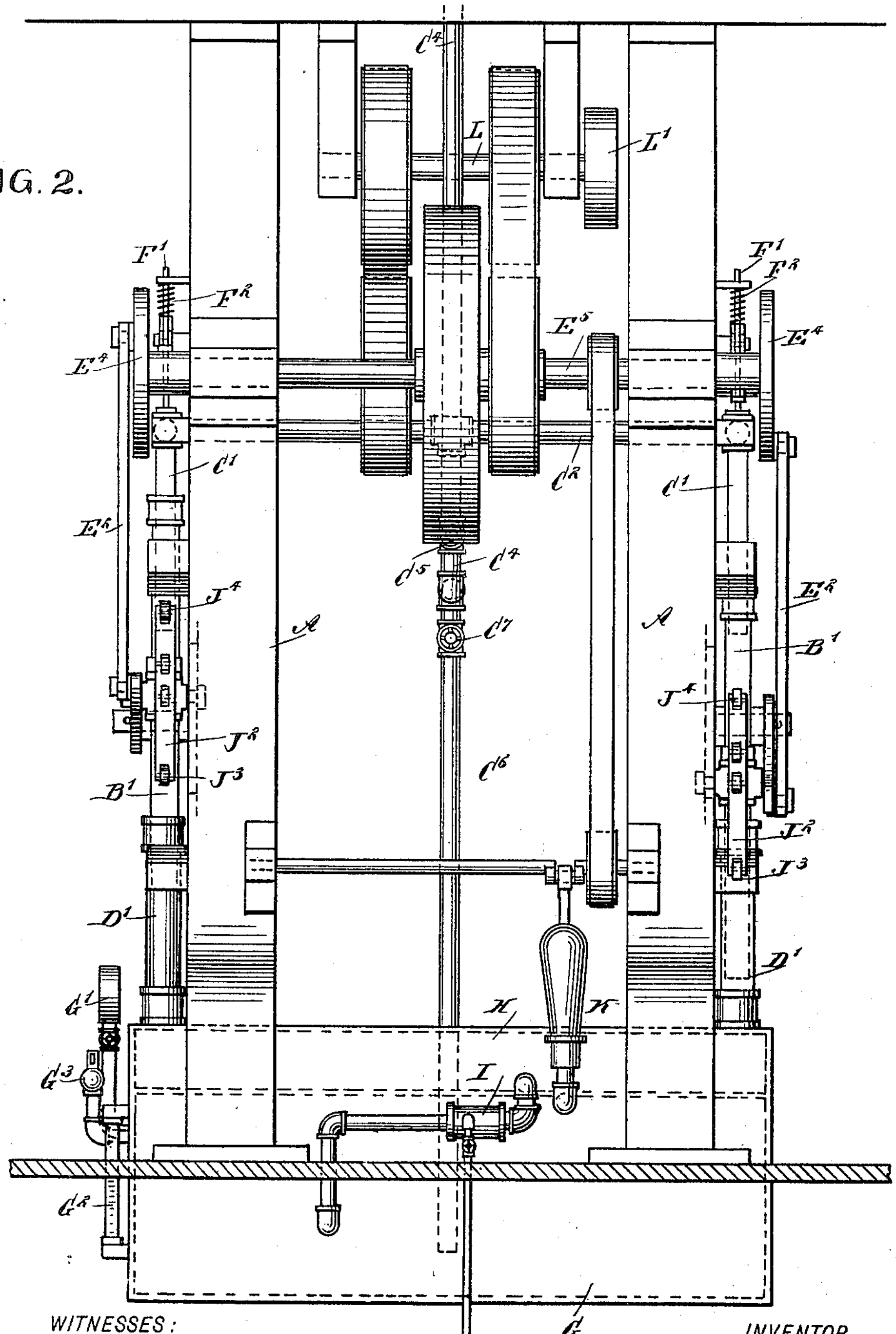
(No Model.) 3 Sheets—Sheet 2.

FIG. 2.



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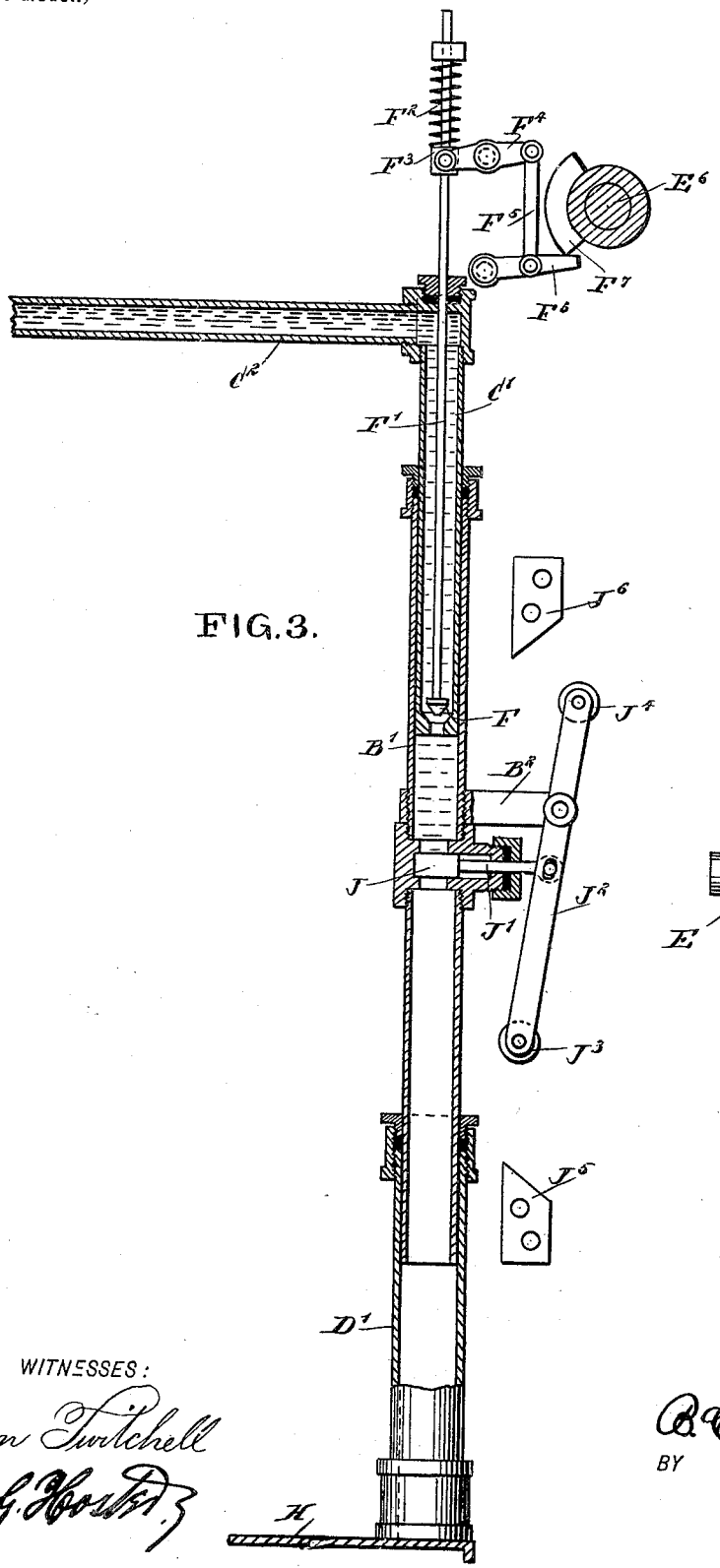

FIG. 3.

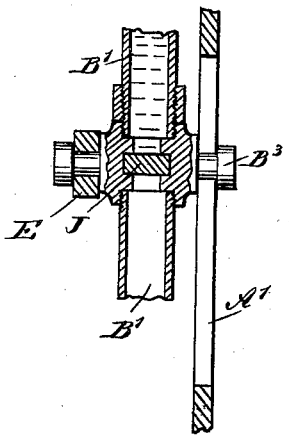

FIG. 4.

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UNITED STATES PATENT OFFICE.

BERNHARD C. F. WALL, OF BUFFALO, NEW YORK.

HYDRAULIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 649,375, dated May 8, 1900.

Application filed April 9, 1898. Serial No. 677,081. (No model.)

To all whom it may concern:

Be it known that I, BERNHARD C. F. WALL, of Buffalo, in the county of Erie and State of New York, have invented a new and Improved 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 hydraulic motor which is simple and durable in construction, very effective in operation, and arranged to utilize the motive agent to the fullest advantage.

The invention consists of novel features and parts and combinations of the same, as will be 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 side elevation of the improvement with parts in section. Fig. 2 is an end elevation of the same. Fig. 3 is an enlarged sectional side elevation of one of the actuating devices, and Fig. 4 is a transverse section of part of the same.

The improved hydraulic motor is provided with two or more pairs of actuating devices mounted on a suitably-constructed frame A. For instance, as shown in Figs. 1 and 2, two pairs of actuating devices are mounted on opposite sides of the said frame. As the pairs of actuating devices are alike in construction, it suffices to describe but one in detail.

Each pair of actuating devices is provided with hollow plungers B B′, fitted to slide at their upper ends on guide and supply pipes C C′, respectively, and at their lower ends in cylinders D D′, respectively, as plainly indicated in Fig. 1. The two plungers B B′ of a pair of actuating devices are connected with each other by a walking-beam E, having its ends connected by pitmen E′ E^2 with crank-disks E^3 E^4, respectively, secured on shafts E^5 E^6, journaled in suitable bearings on the frame A.

In each supply-pipe C C′ is arranged a valve F for closing an opening from the said pipe to the corresponding plunger, the upper or outer ends of the pipes C C′ being connected with each other by a pipe C^2, connected with a pipe C^3, from which leads a supply-pipe C^4, having a valve C^3, said pipe C^4 extending in an upward direction to connect with an overhead tank or other suitable source of water-supply. The pipe C^3 also connects by a pipe C^6, having a valve C^7, with a reservoir G, partly filled with water, received, by means of an injector I, from a tank H, located above the reservoir G and into which the lower ends of the cylinders D D′ discharge their water, as hereinafter more fully described.

The reservoir G is provided with a pressure-gage G′, a water-gage G^2, and a safety-valve G^3, as shown in Fig. 1.

The valve F (see Fig. 3) in each stationary pipe C or C′ is mounted on a valve-stem F′, pressed on at its upper end by a spring F^2 to hold the valve F normally to its seat and disconnect the corresponding pipe C or C′ from its plunger B or B′. The lower end of the spring F^2 presses on a lug F^8, secured on the stem and pivotally connected with a lever F^4, connected by a link F^5 with a pivoted arm F^6, adapted to be engaged by a lug or projection F^7, secured to the corresponding shaft E^5 or E^6. When the shaft E^5 or E^6 is rotated, then the lug F^7 comes in contact with the arm F^6. It swings the same downward (see Fig. 3) and causes the link F^5 to impart a swinging motion to the lever F^4 and push the rod F′ in an upward direction against the tension of the spring F^2 and unseat the valve F from its seat in the pipe C or C′. When this takes place, the pressure of the fluid in the pipe C or C′ can pass through the open valve-seat into the corresponding plunger B or B′ to press against the valve J, held at this time in a closed position in the corresponding plunger. When this takes place, the pressure of the fluid against the valve J forces the corresponding plunger downward, as the valve serves as an abutment for the motive agent, and consequently said plunger in moving downward imparts a swinging motion to the beam E, so that the other plunger moves upward at the time the valve F is closed and the valve J is open. The oscillating motion given to the beam E is converted by the mechanism described into a rotary motion for the shafts E^5 and E^6 to rotate the same in the direction of the arrow *a*′. When the plunger B or B′ has moved downward about three-fourths of its stroke, then the valve F is

closed, and when the plunger is at nearly the end of its stroke the valve J is opened, so that the liquid in the plunger can flow past the valve J and the lower end of the plunger into the cylinder D or D′ and from the latter into the tank H.

Now in order to open and close the valve J at the proper time I provide the said valve with a stem J′, pivotally connected with a lever J^2, fulcrumed on a bracket B^2, carried by the plunger B or B′. On the ends of the lever J^2 are journaled the friction-rollers J^3 and J^4, adapted to move alternately in engagement with inclines J^5 J^6, respectively, secured on the frame A and serving to impart a swinging motion to the lever J^2 in such a manner that when the friction-roller J^3 travels over the incline J^5 the lever J^2 receives an outward swinging motion to open the valve J, and when the plunger moves upward and the friction-roller J^4 comes in contact with the incline J^6 then the lever J^2 is swung in the opposite direction and the valve J is moved into a closed position.

It is to be understood that the inclines J^5 J^6 are so arranged with respect to the movement of the plunger that the valve J will be operated just before the plunger reaches the end of its stroke, whereby the valve, which has been closed on the upward movement of the plunger, will remain closed until the plunger has nearly reached the end of its downward movement, when it will be opened and will remain open until the plunger has nearly reached the end of its upward movement, when it will be again closed.

It is evident by reference to Fig. 1 that the wrist-pins of the crank-disks E^3 and E^4 stand in diametrically-opposite positions, and if two pairs of actuating devices are employed, as shown, the second pair of actuating devices will have the wrist-pins extending approximately at three-fourths of the stroke in advance of the wrist-pins on the crank-disks for the first pair of actuating devices, as indicated in Fig. 1.

In starting the motor the valve C^7 is closed and the valve C^5 is opened, so that water under pressure flows through the pipes C^4 C^3 C^2 into the pipes C C′, and when one of the valves F is open and the other valve of the same pair of actuating devices is closed then water under pressure passes through the open valve into the corresponding plunger, and the valve J being at this time closed the water abutting against the valve J forces the plunger downward and at the time the other plunger moves upward, owing to the connection of the beam E with the second plunger having its valve F closed and its valve J open. When the downwardly-moving plunger has reached about three-fourths of its stroke, the projection F^7 will be disengaged from the arm F^6 and the spring F^2 will close the valve F, and when the plunger has nearly reached the end of its stroke the friction-roller J^3 comes in contact with the incline J^5 and the valve J is shifted into an open position. The water now within the downwardly-moving plunger flows through the cylinder D into the tank H, from which it may be forced into the reservoir G by the injector I. By the time the downwardly-moving plunger is relieved of the pressure of the motive agent an actuating device of the second pair moves into action, so that the fluid under pressure is continually in action on one of the plungers to impart a uniform rotary motion to the shafts E^5 E^6. One of the shafts is connected by suitable means with an air-compressor K of any approved construction, connected with the upper end of the reservoir G, so that the compressed air passes into the latter to press on the water stored therein, the pressure of the air being indicated on the gage G′.

When the supply in the overhead tank has given out and sufficient air has accumulated in the reservoir G, then the operator closes the valve C^5 and opens the valve C^7, so that the water from the reservoir G is forced by the compressed air up through the pipe C^6 into the pipes C^3 C^2 and C C′ for actuating the plungers, as above described. In the meantime the overhead tank can be replenished, so that it may again be brought into action about the time the compressed air in the reservoir G is nearly used up. When this takes place, the valve C^7 is closed and the valve C^5 is opened, and the above-described operation is repeated. The rotary motion of the shafts E^5 E^6 may be transmitted by suitable pulleys and belts to a common driving-shaft L, carrying a pulley L′ for transmitting the rotary motion to other machinery.

In order to properly guide the plungers B B′ in their up-and-down movement, I provide the same with guide-pins B^3, fitted to slide in suitable bearings A′, formed on the frame A, as indicated in Figs. 1 and 4.

If desired, each walking-beam may be connected at each end with two oppositely-arranged plungers, instead of with only one plunger, as shown. In such case the guide-pin B^3 and guide A′ are omitted.

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

1. A hydraulic motor comprising a pressure-supply pipe, an actuating device adapted to be actuated by the fluid from said pipe, a driving-shaft connected with the plunger of the actuating device, a valve-gear for automatically opening and closing the valves of the actuating device, an air-compressor driven from the said shaft, and a compressed-air and water storage reservoir adapted to contain water and filled with compressed air from the said air-compressor, the water in the reservoir being connected with the said supply-pipe, substantially as shown and described.

2. A hydraulic motor comprising a pressure-supply pipe, an actuating device adapted to be actuated by the fluid from said pipe, a

driving-shaft connected with the plunger of the actuating device, a valve-gear for automatically opening and closing the valves of the actuating device, an air-compressor driven from the said shaft, a compressed-air and water storage reservoir adapted to contain water and filled with compressed air from the said compressor, the water in the reservoir being connected with the said supply-pipe, a tank adapted to receive the discharge-water from the said actuating device and an injector for connecting the tank with the said reservoir, substantially as shown and described.

3. A motor, comprising cylinders, hollow plungers working in the cylinders, a walking-beam connecting the plungers, supply-pipes upon which the plungers reciprocate, valves in the supply-pipes and operated from the walking-beam, valves in the plungers and serving as abutments, and means for operating the last-named valves near the ends of the strokes of the plungers, substantially as described.

4. A motor, comprising cylinders, hollow plungers working in the cylinders, a walking-beam connecting the cylinders, supply-pipes upon which the plungers reciprocate, valves in the supply-pipes, a driving-shaft operated from the walking-beam, means for actuating the valves from the said shafts, valves in the plungers and serving as abutments, and means for operating the last-named valves near the ends of the strokes of the plungers, substantially as described.

5. A motor provided with an actuating device, comprising a cylinder, a hollow plunger fitted to slide in the said cylinder, an inlet-pipe upon which the plunger slides, a valve in said pipe, means for operating the said valve, a valve in the plunger and forming an abutment for the fluid, and an external valve-gear controlled by the movement of the plunger, for opening and closing the said valve, substantially as described.

6. A motor, provided with an actuating device, comprising a cylinder, a hollow plunger fitted to slide in said cylinder, a guide and inlet-pipe for the said plunger, a valve in said plunger to form an abutment for the fluid-pressure to act against, an external valve-gear controlled by the movement of the plunger, for opening and closing the said valve, and an inlet-valve in the stationary guide-pipe, for controlling the fluid-pressure to the plunger and the said abutment-valve, substantially as shown and described.

7. In a motor, the combination with cylinders, and a branched fluid-supply pipe having an inlet-valve in each member thereof, of a hollow plunger reciprocating in each cylinder and on each member of the supply-pipe, a connection between the plungers whereby when one is raised the other is lowered, a valve in each plunger, said valves serving as abutments, and means for alternately opening and closing the said valves near the ends of the strokes of the plungers, substantially as described.

8. In a motor, the combination with cylinders, and a branched supply-pipe, of a hollow plunger reciprocating in each cylinder and on each member of the supply-pipe, a connection between the plungers, whereby when one is raised the other will be lowered, an inlet-valve in each member of the said pipe and operated from the connection between the plungers, valves in the plungers below the inlet-valves and forming abutments, and means for alternately operating the valves of the plungers by the reciprocation of the said plungers near the ends of the strokes of the same, substantially as described.

9. In a motor, the combination with cylinders, and a branched supply-pipe, of a hollow plunger reciprocating in the cylinders and on each member of the supply-pipe, a walking-beam connected at its ends with the plungers, shafts, connections between the shafts and ends of the walking-beam to operate the former from the latter, spring-pressed inlet-valve in each member of the supply-pipe, means for raising the valves to open them against the action of their springs from the said shafts, a valve in each plunger below the inlet-valves, and means for alternately operating the valves of the plungers by the reciprocation of the said plungers, substantially as described.

10. In a motor, the combination with a cylinder, and a supply-pipe, of a hollow plunger reciprocating in the cylinder and upon the supply-pipe, a valve in the plunger and serving as an abutment, means for operating the valve as the plunger reciprocates, a shaft operated from the plunger, a spring-pressed valve in the supply-pipe above the valve of the plunger, a lever pivoted to the stem of the valve, a pivoted arm, a link connecting the lever and arm, and means for operating the arm from the drive-shaft to raise the valve against the action of its spring, substantially as described.

11. In a hydraulic motor, the combination with a valved supply-pipe, of a hollow plunger reciprocating on the supply-pipe, a drive-shaft operated from the plunger, a valve in the plunger a pivoted lever, to which the valve-stem is connected, and stationary inclines with which the ends of the levers engage, substantially as described.

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Witnesses:
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