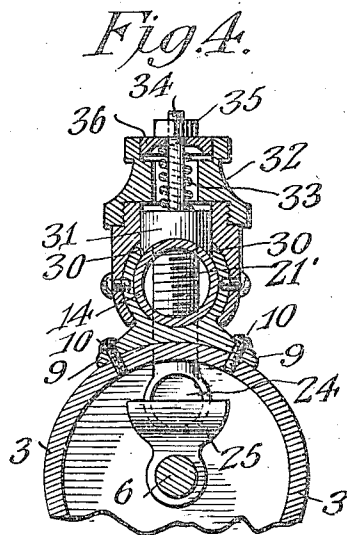
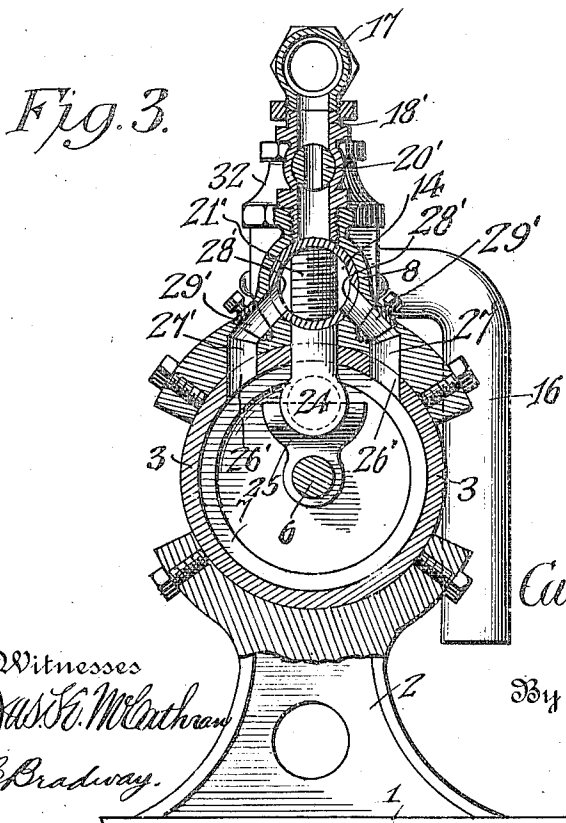
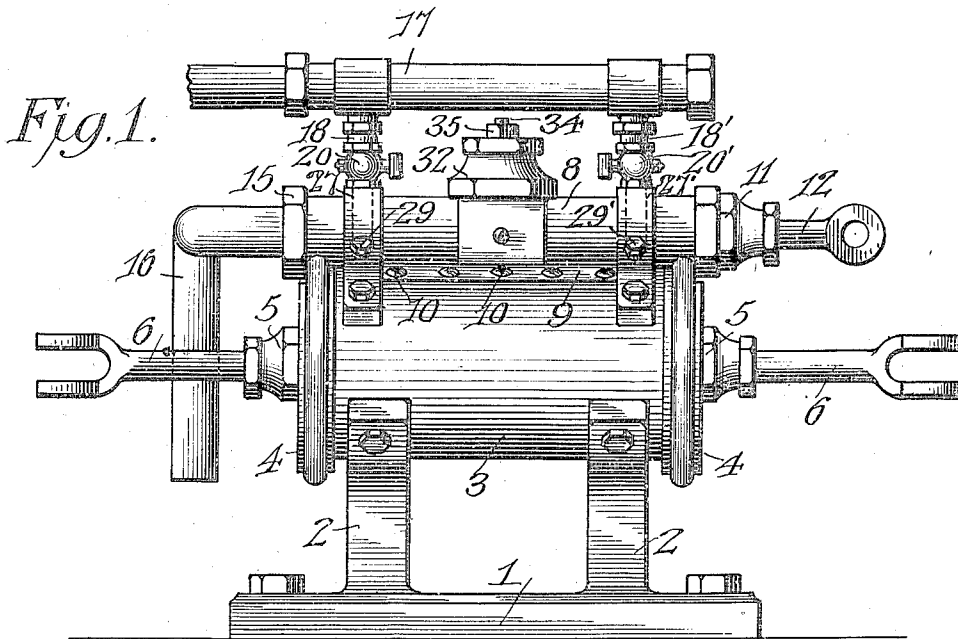


C. F. BENITEZ.
 FLUID MOTOR.
 APPLICATION FILED AUG. 13, 1908.

971,517.

Patented Oct. 4, 1910.

2 SHEETS—SHEET 1.



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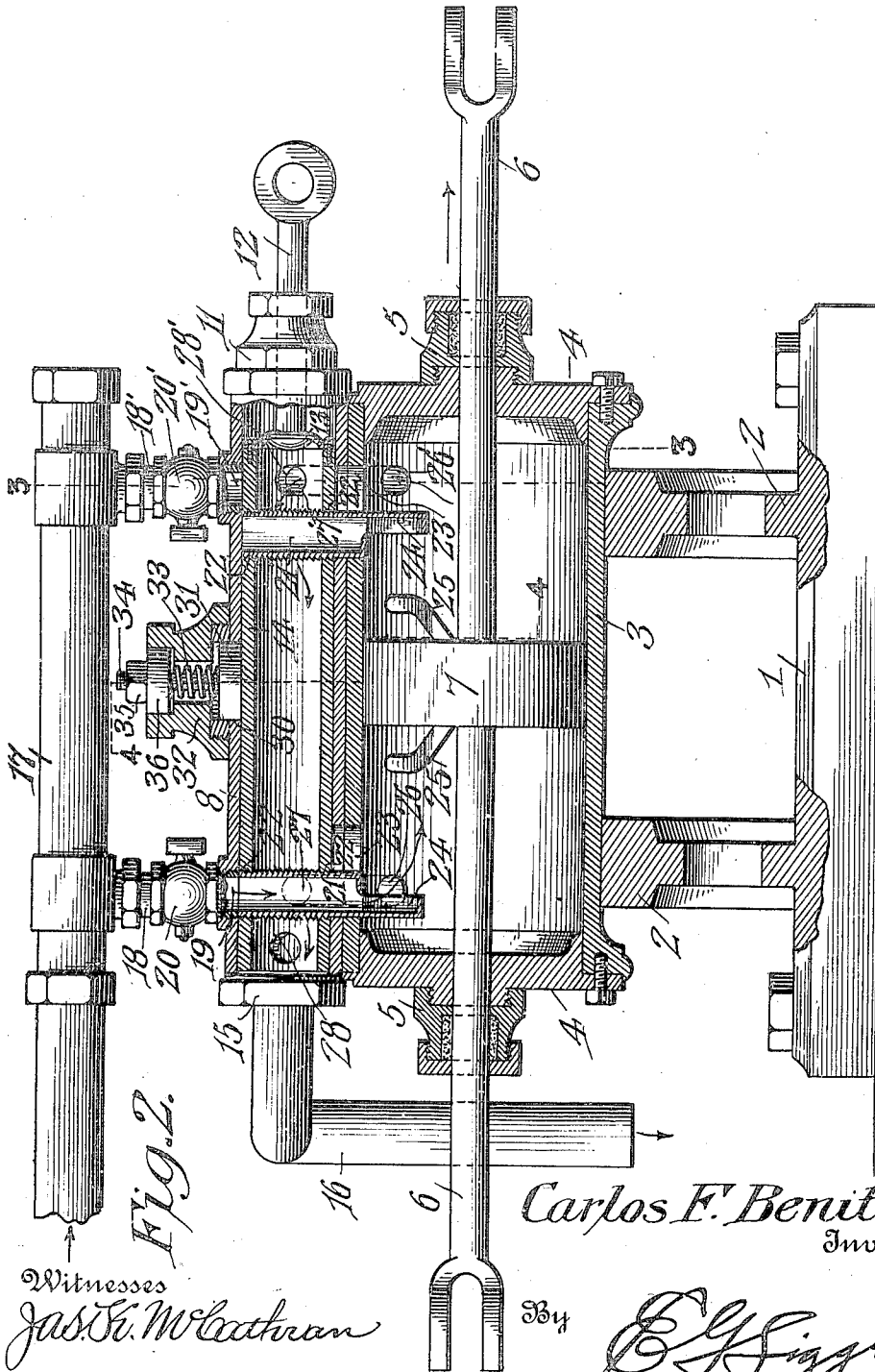


FIG. 2.

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CARLOS F. BENITEZ, OF GUADALAJARA, MEXICO.

FLUID-MOTOR.

971,517.

Specification of Letters Patent.

Patented Oct. 4, 1910.

Application filed August 13, 1908. Serial No. 448,291.

To all whom it may concern:

Be it known that I, CARLOS F. BENITEZ, a citizen of the Republic of Mexico, residing in the city of Guadalajara, Mexico, have invented a new and useful Fluid-Motor, of which the following is a full, clear, and exact specification:

This invention relates to a motor of that type in which the valve for controlling the admission and exhaust of the motive fluid, which may be elastic or inelastic, is reciprocated directly by the piston of the motor, whereby the piston is alternately reversed or reciprocated.

The invention has for one of its objects to improve and simplify the construction and operation of motors of this character so as to be reliable and efficient in use, composed of few parts, and comparatively simple and inexpensive to manufacture and keep in repair.

Another object of the invention is the provision of a motor having a novel arrangement of ports, passages and controlling means whereby the motor can be converted from single to double acting or vice versa.

With these objects in view and others, as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawings, which illustrate one embodiment of the invention, Figure 1 is a front view of the motor or engine. Fig. 2 is an enlarged longitudinal section thereof. Fig. 3 is a vertical transverse section on line 3-3, Fig. 2. Fig. 4 is a fragmentary sectional view on line 4-4, Fig. 2.

Similar reference characters are employed to designate corresponding parts throughout the views.

Referring to the drawings, 1 designates the bed of the engine which is provided with pedestals 2 that support the horizontally-disposed cylinder 3, the cylinder having heads 4 fastened to opposite ends and provided with stuffing boxes 5 through which the piston rod 6 extends.

Mounted for reciprocation in the cylinder 3 is a piston 7 connected with the rod 6, which latter may be connected with the mechanism to be actuated by the motor. Carried by the cylinder and, preferably, al-

though not necessarily formed as a casting separate therefrom, is a cylindrical valve casing 8 which is provided with longitudinal flanges 9 which bear on the outer surface of the cylinder 3 and through which pass screws or other fastenings 10 for securing the valve casing to the cylinder. One end of the valve casing is provided with a stuffing box 11 through which passes a reciprocatory valve stem 12 that is connected by a cross piece 13 with one end of a hollow cylindrical or tubular valve 14 which is slidably mounted in the casing and snugly fits therein. The head 15 opposite from the stuffing box 11 is connected with an exhaust pipe 16 for conducting away the motive fluid after having acted on the piston 7 in the cylinder 3, the exhaust fluid being conducted from the cylinder through the bore or chamber in the valve 14. The motive fluid is supplied to the engine through a conduit 17 which has branches 18 and 18' connected with ports 19 and 19' at opposite ends of the valve casing, and in the branches are throttle valves 20 and 20' whereby the motive fluid can be supplied to either end of the cylinder or to both to adapt the engine to operate on the single or double-acting principle. The valve 14 is provided with transversely-extending diametrically-disposed passages 21 and 21' in the form of tubes which are threaded or otherwise secured in diametrically-disposed openings 22 in the walls of the valve 14, and these tubes are so arranged that the outer end of one will register with one port of the supply conduit, while the outer end of the other tube is disposed out of register with the other port. The tubes 21 and 21' are of such length as to extend into the cylinder 3, the wall of which and of the valve casing are provided with elongated openings or slots 23 for permitting the said tubes to move back and forth with the valve 14. The inner ends of the tubes are provided with openings 24 by means of which the motive fluid is conducted to the piston cylinder, and furthermore these projecting ends of the tubes form abutments disposed in coöperative relation with the piston so that the latter can impart reciprocatory movement to the valve 14.

In order to prevent shock in the movement of the valve by the piston, the latter is provided at opposite sides with cushioning devices 25 which respectively engage the tubular members 21 and 21' adjacent the end of each stroke of the piston to thereby re-

reciprocate the valve to bring one tube into register with its supply port while moving the other tube out of register with its supply port.

5 The fluid is exhausted from the cylinder by separate ports or sets of ports 26 and 26' adjacent opposite ends of the cylinder which respectively communicate with passages 27 and 27' that lead to the chamber of the valve casing, and communication is controlled between these passages and the chamber of the valve by ports 28 and 28' in the latter. These ports 28 and 28' are spaced apart a greater distance than are the passages 27 and 27' so that when the valve is in either of its extreme positions, only one set of ports will register with its respective passages, and by this means, fluid will be exhausted from the cylinder chamber at one side of the piston while live motive fluid is supplied to the chamber at the opposite side of the piston. The passages 27 and 27' are provided respectively with valves 29 and 29' to operate with the valves 20 in controlling the flow of the motive fluid in using the apparatus as a single or double acting engine. The valve stem 12 may be connected with any suitable device for shifting the valve to reverse the flow of fluid to and from the cylinder, and hence reverse the reciprocation of the piston.

It may be desirable, in some instances, to provide a retarding device for the valve 14 to prevent excessive freedom of action thereof. For this purpose, the valve casing 8 has an opening 30 in which is arranged a saddle-shaped friction shoe or block 31 housed in a boxing 32 and pressed against or in frictional engagement with the valve by a spring 33. This spring, which is disposed in the boxing 32, surrounds a stem 34 connected with the shoe or follower 31, and its tension is adjusted by a nut 35 on the stem which acts through a washer 36 bearing on the outer end of the spring.

15 In Fig. 2, the engine is represented as operating on the double-acting principle when an impulse is being imparted to the piston to move it to the right. The motive fluid is entering the cylinder from the conduit 17 through the passage 21 to act on the left side of the piston while the fluid on the right side of the piston is passing out through the exhaust cylinder ports 26', passages 27', and valve ports 28', and thence passes longitudinally through the valve 14 and discharges through the exhaust conduit 16. As the piston nears the end of its stroke to the right, the cushioning device 25 strikes the tubular member 21' of the valve 14 and shifts the latter in the same direction the piston is moving, with the result that the ports 28' are thrown out of register with their passages 27' and the passage 21 is thrown out of register with the supply port 19, and while this is taking place, the pas-

sage 21' is moved into register with the supply port 19', and the valve ports 28 are moved into register with the exhaust passages 27. The live motive fluid is consequently admitted to the cylinder to act on the right side of the piston to drive the same to the left while the fluid in the cylinder at the left side of the piston is passing out through the ports 26, passages 27, ports 28 and chamber of the valve 14. When it is desired to operate the engine only on one side of the piston, the valves 29 of the exhaust passages 27 and the valve 20 are closed while the valves at the opposite end of the cylinder are left open, or vice versa.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely illustrative, and that such changes may be made when desired as are within the scope of the claims appended hereto.

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

1. In a motor, the combination of a cylinder having exhaust passages near its opposite ends, a piston therein, a valve casing having passages registering with the exhaust passages in the cylinder, a tubular valve in the casing having separate exhaust ports at its opposite ends spaced a greater distance apart than are the said exhaust passages whereby communication between either end of the cylinder and the bore of the valve can be established, an exhaust conduit connected with one end of the valve casing for receiving the exhaust fluid through the bore of the valve at one end thereof, and means controlled by the said valve for admitting fluid alternately to opposite ends of the cylinder.

2. In a fluid motor, the combination of a cylinder, a piston therein, a valve casing mounted on the cylinder, a hollow valve body mounted for reciprocation in the casing and provided with exhaust ports in its sides adjacent its ends, passages extending from the cylinder to the valve casing near the ends thereof with which said ports are adapted to alternately register, separate inlet ports arranged in the side of the valve casing, and means carried by the valve for alternately connecting the said inlet ports with opposite ends of the cylinder independently of the exhaust passages.

3. In a motor, the combination of a cylinder, a piston therein, a valve casing

mounted in cooperative relation with the cylinder, passages communicating with the cylinder and the valve casing near the ends thereof, a reciprocatory tubular valve transversely filling the bore of the valve casing and provided with ports arranged to respectively register with one of the passages to permit exhaust fluid to pass through either passage to the bore of the valve, an exhaust conduit in permanent communication with the bore of the valve, separate supply ports in the valve casing, and open-ended tubes carried by the valve in transverse relation thereto and spaced at such distance apart that one tube will register with a supply port while the other tube is out of register with the other supply port whereby fluid will be admitted alternately to opposite ends of the cylinder.

4. In a motor, the combination of a cylinder, a reciprocatory piston mounted therein, a valve casing, separate exhaust passages connecting the ends of the cylinder with the casing, a hollow open-ended valve mounted for reciprocation in the casing and provided with separate ports adapted to alternately register with the exhaust passages upon reciprocation of the valve, an exhaust conduit communicating at all times with the valve to receive the fluid passing into the latter through both ports, separate inlet ports in the wall of the casing, and hollow members mounted in the valve to move therewith into and out of register with the said inlet ports and extending into the cylinder to supply fluid thereto and to receive motion from the piston at the end of its stroke in either direction for reciprocating the valve, said members being closed to the exhaust passages.

5. In a motor, the combination of a cylinder, a piston mounted therein, a valve casing associated with the cylinder, separate exhaust passages extending from the cylinder to the casing near the ends thereof, a hollow reciprocatory valve mounted in the casing and having ports arranged to separately register with said passages, tubular members separate from and secured to the valve and extending transversely from one side to the other thereof, said members being closed to the bore of the valve and one end of each member projecting from the valve and extending into the cylinder, the walls of the cylinder and casing being slotted to receive the projecting ends of the members and the said projecting ends being open to admit fluid to the cylinder and arranged to receive motion from the piston, and fluid-supplying devices separately connected with the casing at the opposite limits of movement of said tubular members whereby at the end of each stroke of the valve one of said tubular members will be made to register with one of the fluid supplying devices.

6. In a motor, the combination of a cylinder, a piston mounted therein, a casing mounted on the cylinder, exhaust passages connecting opposite ends of the cylinder with the ends of the casing, a reciprocatory open-ended tubular valve mounted in the casing and provided with ports arranged to alternately register with the exhaust passages, an exhaust conduit connected with the casing and communicating with the valve chamber, inlet ports in the casing, transversely arranged tubular members carried by the valve to alternately register with the inlet ports and permanently communicating with the ends of the cylinder, said members being closed to the valve and said valve having oppositely-disposed openings for receiving the ends of the said tubular members, and means for reciprocating the valve.

7. In a motor, the combination of a cylinder, a piston therein, a valve casing, separate exhaust passages between the ends of the cylinder and casing, a valve in each passage, a reciprocatory valve having separate ports arranged to alternately register with the exhaust passages and provided with a single discharge chamber, an exhaust conduit leading from the casing and permanently communicating with the discharge chamber of the valve, separate fluid supplying devices, each including a throttle valve, and means mounted in the reciprocatory valve and closed thereto for connecting the said devices alternately with the cylinder.

8. In a motor, the combination of a cylinder, a piston therein, a valve casing, separate exhaust passages between the ends of the cylinder and the valve casing, a valve in each passage, an exhaust conduit leading from one end of the casing, a supply conduit having separate connections with the valve casing, a valve in each connection, and a single valve device mounted in the casing for simultaneously admitting fluid from one of the said connections to one end of the cylinder while exhausting fluid from the opposite end of the cylinder through one of the said exhaust passages and exhaust conduit.

9. In a fluid motor, the combination of a cylinder, a piston therein, a valve casing mounted on the cylinder, there being longitudinal registering slots in the walls of the casing and cylinder, separate exhaust passages leading from the cylinder to the casing, valves in said passages, a fluid supply conduit having separate inlet branches connected with the casing, a valve in each branch, a reciprocatory open-ended tubular valve mounted in the casing and provided with ports through which the exhaust passages alternately communicate with the bore of the valve, an exhaust conduit permanently communicating with the bore of the

valve, tubular members carried by and extending across the bore of the valve and permanently open from end to end to alternately communicate with the said inlet branches for admitting fluid alternately to the opposite ends of the cylinder, said members projecting from the valve through the

slots in the walls of the cylinder and the valve casing into the path of the piston.

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