

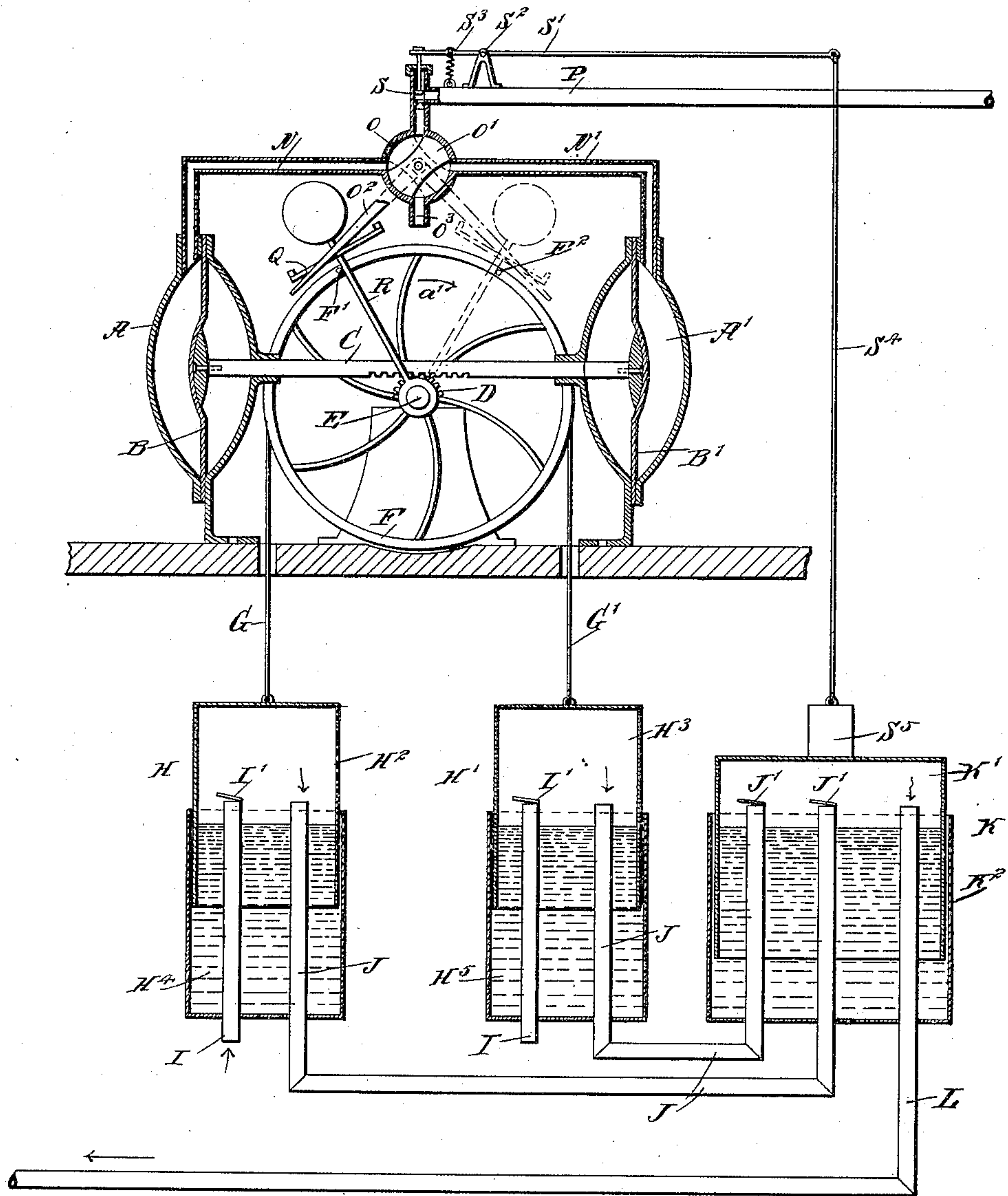
No. 652,032.

Patented June 19, 1900.

G. W. LEWIS.  
DIAPHRAGM MOTOR.

(Application filed May 24, 1899.)

(No Model.)



WITNESSES:

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# UNITED STATES PATENT OFFICE.

GEORGE W. LEWIS, OF GRINNELL, IOWA, ASSIGNOR OF ONE-HALF TO  
HARLAN P. PROCTOR, OF SAME PLACE.

## DIAPHRAGM-MOTOR.

SPECIFICATION forming part of Letters Patent No. 652,032, dated June 19, 1900.

Application filed May 24, 1899. Serial No. 718,088. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. LEWIS, of Grinnell, in the county of Poweshiek and State of Iowa, have invented a new and Improved  
5 Diaphragm-Motor, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved diaphragm-motor which is simple and durable in construction, very  
10 effective in operation, designed for driving various machinery, and particularly adapted for use in atmospheric (gasolene) gas systems to pump the desired quantity of air to the carbureter according to the amount of  
15 motive agent used in the gas-engine.

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

20 Reference is to be had to the accompanying drawing, forming a part of this specification, in which the figure is a sectional side elevation of the improvement.

The motor for actuating a pump or other  
25 machinery is provided with cylinders A A', mounted on a suitable base and provided with flexible diaphragms B B', respectively, rigidly connected with each other by a rack-bar C, engaging with its teeth a pinion D, secured  
30 on a shaft E, mounted to turn in suitable bearings carried by the base. On the shaft E is secured a wheel F, on opposite sides of which are secured chains or bands G G', attached at their lower ends to the pistons  
35 H<sup>2</sup> H<sup>3</sup> of air-pumps H H', respectively, having fixed barrels H<sup>4</sup> H<sup>5</sup> filled with water, oil, or other fluid, and in which operate the said pistons H<sup>2</sup> H<sup>3</sup> and which pistons are in the form of inverted cups, as is plainly indicated in  
40 the drawing. Each pump is provided with a valved air-inlet pipe I, leading from the outside to the inside of the pump, a valve I' being at the upper end of the pipe, above the level of the water contained in the barrels H<sup>4</sup>  
45 and H<sup>5</sup>. An air-discharge pipe J leads from each pump to a reservoir K, provided with a bell K' and a tank K<sup>2</sup>, filled with water for the bell K' to slide and move up and down in the tank according to the pressure of the accumulating air delivered by the pump through  
50 the pipes J into said reservoir. The ends of

the pipes J within the reservoir K are provided with valves J' for preventing a return of the air from the reservoir to the pumps. A pipe L leads from the reservoir K to the  
55 carbureter or other device in which the air is to be used. Now it will be seen that when an oscillating motion is given to the wheel F the pistons H<sup>2</sup> H<sup>3</sup> of the pumps are alternately moved up and down in the barrels H<sup>4</sup> H<sup>5</sup>, and  
60 during the upstroke of a piston air is drawn in through the corresponding pipe I and valve I', and this air is discharged through the pipe J on the downstroke of the piston and forced into the reservoir K, from which the air can  
65 pass by the pipe L to the carbureter, as above mentioned.

In order to actuate the diaphragms B B' to impart an oscillating motion to the wheel F for actuating the pumps H H', as described,  
70 I connect the outer sides of the cylinders A A' by pipes N N' with a valve O, connected by a pipe P with a motive-agent supply, such as water under pressure (water-main) or other source of motive-agent supply. In the  
75 valve O is arranged a valve-plug O', on the stem of which is secured an arm O<sup>2</sup>, adapted to be engaged by lugs on the ends of a bar Q, held on an arm R, mounted to swing loosely on the shaft E as its fulcrum, said arm being  
80 engaged alternately by pins F' F<sup>2</sup> on the rim of the wheel F, so that when the wheel is rotated the pin F' or F<sup>2</sup> imparts a swinging motion to the arm R until the latter passes the vertical center and then swings to the oppo-  
85 site side by its own gravity to shift the arm O<sup>2</sup> from one side to the other to change the position of the valve-plug O'.

The valve O is provided with an outlet O<sup>3</sup> opposite the inlet-pipe P, and when the valve-plug O' is in the position shown in the draw-  
90 ing then the supply-pipe P is connected with the pipe N, while the pipe N' is connected with the outlet O<sup>3</sup>. Motive agent can now pass from the pipe P by way of the valve O and  
95 pipe N into the cylinder A, so as to press against the diaphragm B and force the same forward to cause a sliding of the bar C, which latter turns the pinion D in the direction of the arrow a' and the shaft E and the wheel  
100 F in the same direction for actuating the pumps H H', as above explained. The wheel



F in turning in the direction of the arrow  $a'$  causes the pin  $F'$  to impart a swinging motion to the arm R until the latter passes its vertical center, and then the arm by its own weight suddenly swings to the right to shift the valve-stem  $O^2$  and valve-plug  $O'$  to the position indicated by dotted lines in said figure to connect the supply-pipe P with the pipe  $N'$  and to connect the pipe N with the outlet  $O^3$ . The motive agent now passes to the cylinder  $A'$  and presses against the diaphragm  $B'$  therein to shift the rack-bar C in an opposite direction and cause a turning of the shaft E and the wheel F in the inverse direction of the arrow  $a'$  to again actuate the pumps, but in a reverse order. The pin  $F^2$  during the return movement of the wheel F carries the arm R along until the latter passes to its vertical center, and then the said arm is suddenly swung to the left to again cause a shifting of the valve O back to the position shown in full lines in the drawing. It is understood that as the diaphragms B B' are rigidly connected with each other by the bar C they operate in unison and actuate the pumps uniformly and with great regularity in the manner above described.

The supply-pipe P is provided with a valve S, hung on a lever  $S'$ , fulcrumed at  $S^2$  and pressed on by a spring  $S^3$  for normally holding the valve S to its seat and preventing the motive agent from passing to the valve O. The outer end of the lever  $S'$  is provided with a rope  $S^4$ , from which is suspended a weight  $S^5$ , resting on the top of the bell  $K'$ , so that when the latter sinks the weight  $S^5$  pulls on the rope  $S^4$  to impart a swinging motion to the lever  $S'$  against the tension of the spring  $S^3$  to lift the valve S off its seat and to allow the motive agent to pass to the valve O and to the cylinders A  $A'$ , as above explained, to actuate the pumps.

When a sufficient quantity of air has accumulated in the reservoir K and the bell  $K'$  rises in consequence thereof, then the weight  $S^5$  is lifted by the bell and in doing so the lever  $S'$  is relieved of the weight and the spring  $S^3$  is free to close the valve S to prevent the motive agent from passing to the valve O and to the cylinders, so that the motor comes to a stop and pumping ceases. When the air is discharged from the reservoir K by way of the pipe L and the bell  $K'$  sinks, then the weight  $S^5$  finally exerts a pull on the rope  $S^4$  to impart a swinging motion to the lever  $S'$  to lift the valve S off its seat and the motor is again started by the passage of the motive agent to the cylinder, as above explained. Thus the motor and the pump are completely automatic in operation, the motor ceasing to work when a certain amount of air has accumu-

lated in the reservoir K and again automatically starting when this air has been used up in the carbureter. It is expressly understood, however, that the motor by itself may be used for driving other machinery and the construction of the driving-gear may be varied to suit circumstances.

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

1. The combination with a reservoir having a rising-and-falling bell, of a plurality of pumps having valved pipe connections with said reservoir and provided with valved inlets, a motor for simultaneously actuating said pumps and comprising cylinders having diaphragms, means for controlling the admission and exhaust of the motive agent to and from said cylinders, a rack-bar connected with said diaphragms, and a shaft geared with said rack-bar and connected with said pumps for actuating the same, substantially as shown and described.

2. The combination with a reservoir having a rising-and-falling bell, of a plurality of pumps having valved pipe connections with said reservoir and provided with valved inlets, a motor for simultaneously actuating said pumps and comprising cylinders having diaphragms, means for controlling the admission and exhaust of the motive agent to and from said cylinders, a rack-bar connected with said diaphragms, a shaft geared with said rack-bar and connected with said pumps for actuating the same, a supply-pipe for the cylinders of said motor, a spring-pressed valve for the said supply-pipe, and means for controlling the opening and closing of said valve from said bell, substantially as shown and described.

3. The combination with a reservoir having a rising-and-falling bell, and pumps having valved pipe connection with the reservoir and provided with valved inlets, of a motor comprising cylinders having diaphragms, a supply-pipe provided with a valve, a valve-casing connected with the supply-pipe and with the cylinders, a valve in said casing, a rack-bar connected with the diaphragms, a shaft carrying a pinion, a wheel on the shaft, bands secured to the wheel and connected with the pistons of the pumps, a swinging arm controlled by the movement of the wheel for operating the said valve, and means for operating the valve in the supply-pipe from the bell of the reservoir, substantially as described.

GEO. W. LEWIS.

Witnesses:

JAS. R. LEWIS,  
MARCH GREEN.