July 8, 1924. 1,500,975

J. B. WHITTED

VACUUM OPERATED MECHANISM

Original Filed Jan. 9, 1922 2 Sheets-Sheet 1

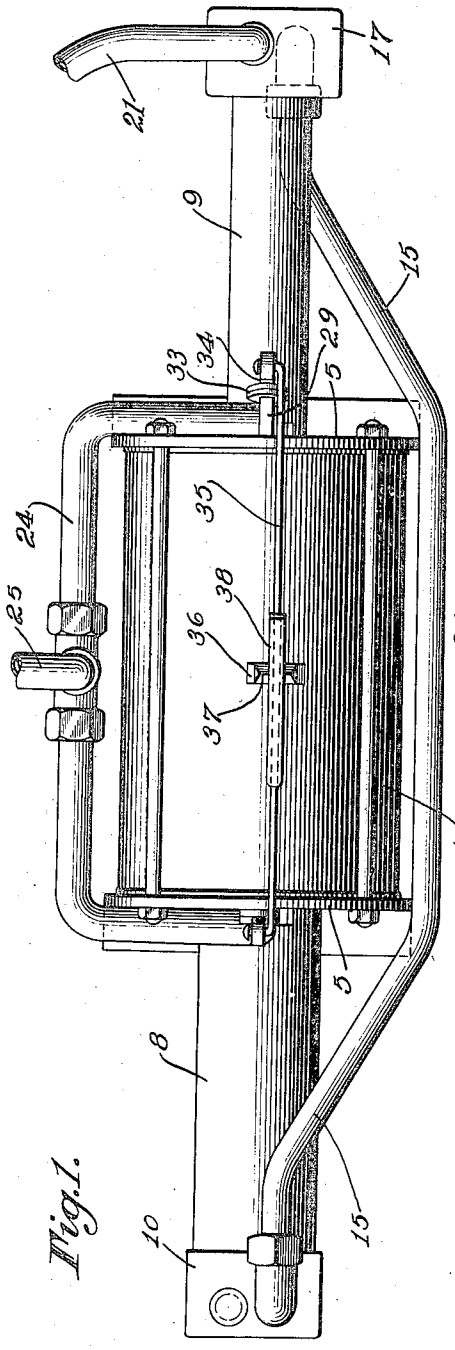

Fig. 1.

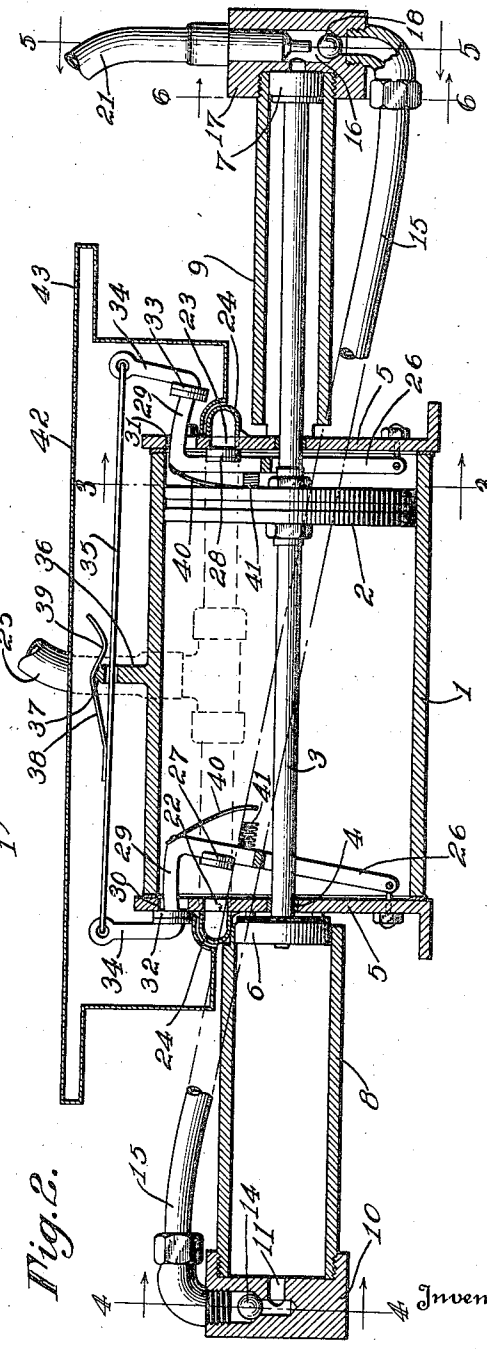

Fig. 2.

Inventor

J.B. Whitted.

By C. A. Snow & Co.

Attorney

July 8, 1924. 1,500,975

J. B. WHITTED

VACUUM OPERATED MECHANISM

Original Filed Jan. 9, 1922 2 Sheets-Sheet 2

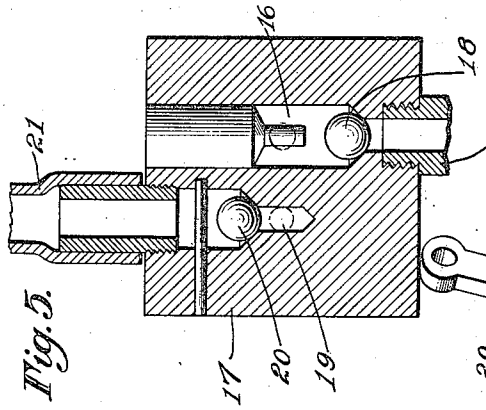

Fig. 5.

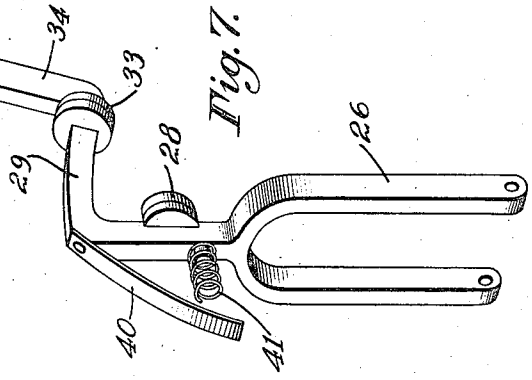

Fig. 7.

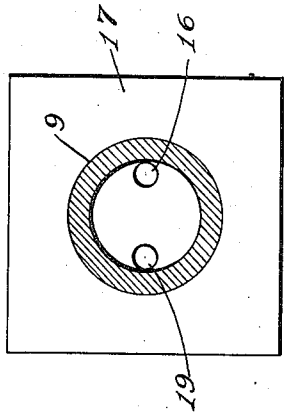

Fig. 6.

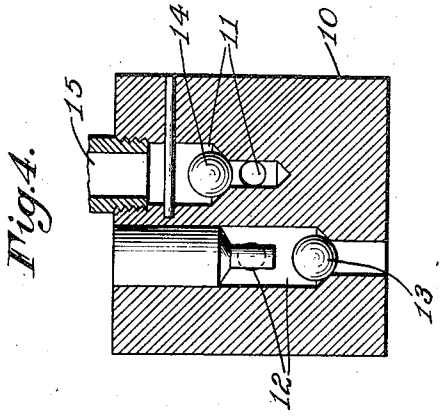

Fig. 4.

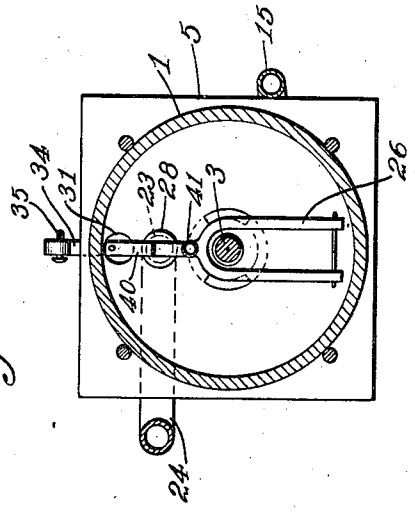

Fig. 3.

Inventor

J.B. Whitted.

By C. A. Snow & Co.

Attorney

Patented July 8, 1924. 1,500,975

UNITED STATES PATENT OFFICE.

JOHN B. WHITTED, OF ROLAND PARK, BALTIMORE, MARYLAND, ASSIGNOR OF TWENTY-FOUR AND EIGHT-TENTHS PER CENT TO J. HENRY MILLER AND TWENTY-FOUR AND EIGHT-TENTHS PER CENT TO DONALD H. WADDINGTON, BOTH OF BALTIMORE, MARYLAND.

VACUUM-OPERATED MECHANISM.

Application filed January 9, 1922, Serial No. 527,943. Renewed May 27, 1924.

To all whom it may concern:

Be it known that I, JOHN B. WHITTED, a citizen of the United States, residing at Roland Park, in the city of Baltimore and State of Maryland, have invented a new and useful Vacuum-Operated Mechanism, of which the following is a specification.

This invention relates to a vacuum operated engine for driving pumps and other mechanisms.

One of the objects of the invention is to improve upon the valve construction of the engine whereby fluttering of the valves during the action of the engine is prevented and said valves are held tightly in either of two extreme positions until shifted by the action of the master piston.

A further object is to provide means whereby the shifting of the valves from one extreme position to the other is effected abruptly.

A further object is to combine with the engine a vacuum pump utilizing high and low pressure cylinders whereby its efficiency is increased to the maximum.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that, within the scope of what is claimed, changes in the precise embodiment of the invention shown can be made without departing from the spirit of the invention.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings—

Figure 1 is a plan view of the vacuum engine, the cover being removed and a pump being combined therewith.

Figure 2 is a longitudinal section through the engine, the cover thereon and the pump.

Figure 3 is a section on line 3—3, Figure 2.

Figure 4 is a section on line 4—4, Figure 2.

Figure 5 is a section on line 5—5, Figure 2.

Figure 6 is a section on line 6—6, Figure 2.

Figure 7 is a perspective view of one of the double valves and its mounting.

Referring to the figures by characters of reference 1 designates the cylinder of the engine and mounted for reciprocation therein is a master piston 2 secured to an intermediate portion of a rod 3 adapted to reciprocate within openings 4 in the heads 5 of the cylinder. To the free ends of the rod are connected pump pistons 6 and 7 respectively, the piston 6 being designed to work within a low pressure cylinder 8 extending beyond one of the heads 5 while the small piston 7 is adapted to reciprocate within a high pressure cylinder 9 extending from the other head. The inner end of each of these cylinders is open. The outer end of cylinder 8 is provided with a head 10 in which are located an outlet port 11 and an inlet port 12. A ball valve 13 is normally seated by gravity in the port 12 so as to open automatically when air is drawn into the cylinder 8 but to close when the air in the cylinder is placed under compression. Another ball valve 14 is seated by gravity in the port 11 so as to open during the compression stroke of the piston 6 and close during the suction stroke. Port 12 opens into the external atmosphere when its valve 13 is unseated while port 11 opens into a pipe 15 which extends to the inlet port 16 in the head 17 at the outer end of the cylinder 9. A ball valve 18 is seated by gravity in the port 16 so as to close during the compression stroke of piston 7 and open during the suction stroke thereof. An outlet port 19 is formed in the head 17 and has a ball valve 20 normally seated by gravity therein so as to close during the suction stroke of piston 7 and open during the compression stroke thereof. This port 19 communicates with a flexible tube 21 used for conducting air to the vehicle tire or other structure in which air is to be compressed.

From the foregoing it will be apparent that when the master piston 2 is moved in one direction air will be sucked into the low pressure cylinder 8 by piston 6. When the master piston is moved in the opposite direction the air in cylinder 8 will be forced through pipe 15 into the cylinder 9 where it will be placed under compression as pis-

ton 7 is moved away from the head 17. During the next stroke of the master piston 2 the piston 7 will expel the air from the high pressure cylinder 9 through the tube 21.

The master piston 2 is to be operated by vacuum. A port 22 is formed in one head 5 of the cylinder 1 and another port 23 is correspondingly located in the other head of said cylinder. The two ports are connected by a pipe 24 in communication with a pipe 25 adapted to be connected to a tank or other structure containing a partial vacuum. Pivotally mounted on the inner side of each head 5 is a forked lever 26 which straddles the rod 3 and carries a valve for controlling the adjacent port. One of these valves has been shown at 27 while the other has been indicated at 28. An arm 29 is extended from each of the levers 26 and works freely through an inlet port 30 or 31 formed in the respective heads 5. One of these arms has a valve 32 thereon while the other is provided with a valve 33, the two valves being located outside of the cylinder. Extending from each of the valves 32 and 33 is a finger 34 and pivotally connected to these fingers is a connecting rod 35. This rod slides within a lug 36 extending from the cylinder 1 and provided with a knife edge 37. A leaf spring 38 is secured to and moves with the rod 35 and extends over the knife edge, this spring being provided with a downwardly extended V-shaped portion 39. The parts are so proportioned that when this V-shaped portion is located at the right of the lug 36 the valves 32 and 28 will be held on their seats while the valves 27 and 33 will be unseated. When the V-shaped portion 39 is positioned at the other side of the knife edge, the positions of the valves will be reversed, valves 33 and 27 being seated while valves 32 and 28 are unseated.

Secured to each of the levers 26 is a leaf spring 40 and secured to each lever and in the path of the free end of the leaf spring thereon is a coiled spring 41, the two springs 40 and 41 being normally spaced apart.

When the pipe 25 is connected to a vacuum tank or the like the following action will take place, assuming that the parts are positioned as shown in Figure 2: The air will be sucked through the open port 22 and cause the master piston 2 to move toward said port. During this action air will be admitted through the port 31 back of the master piston 2. The suction upon the valve 32 during the exhausting of air through port 22 will hold said valve seated, this seating being supplemented by the action of the spring 38 on the knife edge 37. As the piston 2 approaches the limit of its stroke it will come against spring 40 and flex it against spring 41. This latter spring will likewise be placed under compression until the stored energy is sufficient to overcome the spring 38. Immediately thereafter the springs 40 and 41 will snap the V-shaped portion 39 of spring 38 past the knife edge 37 and seat the valve 27 while valve 32 will be opened. Motion will at the same time be transmitted through rod 35 to valves 33 and 28 so that valve 33 will be seated and valve 28 will be unseated. The action of the suction on piston 2 will thus be reversed and the piston will be caused to move in the opposite direction after which the operation hereinbefore described will again take place. It will be obvious that reciprocation of piston 2 will cause a corresponding reciprocation of the pump pistons 6 and 7. Air sucked into the cylinder 8 through port 12 will subsequently be expelled through port 11 and pipe 15 into the cylinder 9 where it will be compressed behind the receding piston 7. On the next stroke of the pistons a new supply of air will be sucked into cylinder 8 by piston 6 while the air held under pressure in cylinder 9 will be expelled by piston 7. Thus by the use of high and low pressure cylinders the efficiency of the pump is increased to the maximum and a pressure much higher than atmospheric pressure can be obtained within the tire or other container being inflated.

A suitable cover 42 can be placed over the cylinder 1 and can be provided with projecting end flanges 43 around which the tube 21 can be wrapped when not in use.

It will be noted that spring 38 by cooperating with the knife edge 37 constitutes an efficient means for preventing the valves from fluttering. Consequently they will be held firmly to their seats until unseated by the master piston in the manner explained.

The term "vacuum" as herein used is not intended to mean a complete vacuum, but applies to any area rarified by the suction or withdrawal of air therefrom.

What is claimed is:—

1. In a vacuum operated engine the combination with a cylinder having inlet and outlet ports, of a piston mounted for reciprocation within the cylinder, members mounted for movement adjacent each limit of the stroke of the piston, a pair of valves carried by each member for alternately closing the respective inlet and outlet ports adjacent thereto, a connection between the members for insuring simultaneous movement thereof, cooperating means upon said connection and the cylinder for holding the members yieldingly in either of two extreme positions, the outlets of the cylinder being in communication with a vacuum, and yielding means on the members for engagement by the piston to actuate the members.

2. A vacuum operated engine including a cylinder having inlet and outlet ports in each head thereof, the outlet ports being in communication with a vacuum, movably

supported valves for successively closing the ports in each head, a connection between all of the valves to insure simultaneous movement thereof, cooperating fixed and yielding means for holding all of the valves in either of their extreme positions, a piston within the cylinder and resilient means for transmitting motion therefrom to the valves.

3. A vacuum operated engine including a cylinder having inlet and outlet ports in each head thereof, the outlet ports being in communication with a vacuum, movably supported valves for successively closing the ports in each head, a connection between all of the valves to insure simultaneous movement thereof, yielding means for holding all of the valves rigidly in either of their extreme positions, a piston within the cylinder, and yielding means operated by the piston for gradually overcoming the resistance of the holding means and abruptly shifting all the valves simultaneously from one extreme position to the other.

4. A vacuum operated engine including a cylinder having inlet and outlet ports in each head thereof, the outlet ports being in communication with a vacuum, movably supported valves for successively closing the ports in each head, a connection between all of the valves to insure simultaneous movement thereof, cooperating fixed and yielding means for holding all of the valves in either of their extreme positions, a piston within the cylinder, and resilient means engaged by the piston during the completion of each of its strokes for transmitting thrust to the valves thereby to abruptly release them from their holding means and shift them to their other extreme position.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN B. WHITTED.

Witnesses:
IVY E. SIMPSON,
AGNES ROCKELLE.