

G. J. SHEPPARD & H. F. ADAMS.
 VACUUM CLEANING DEVICE.
 APPLICATION FILED DEC. 11, 1908.

1,002,324.

Patented Sept. 5, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

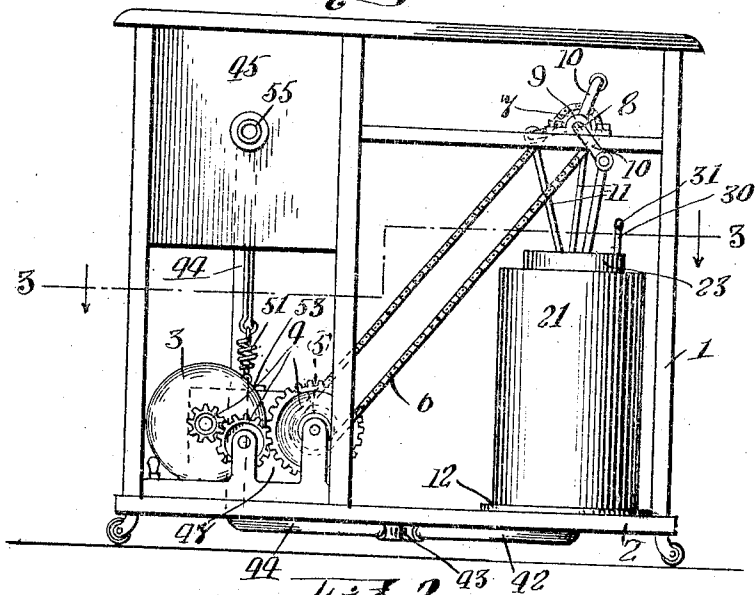
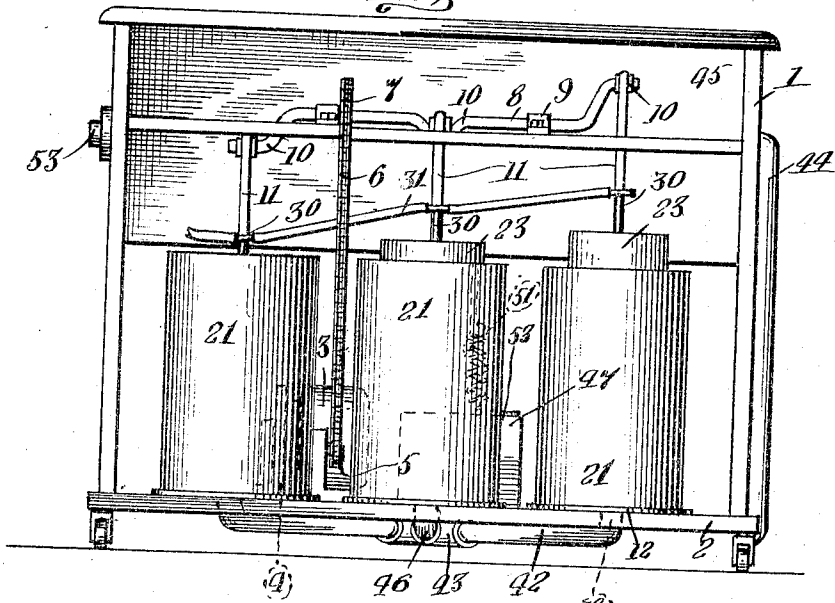


Fig. 2.



Witnesses:
 Eugene M. Siney.
 P. Harney.

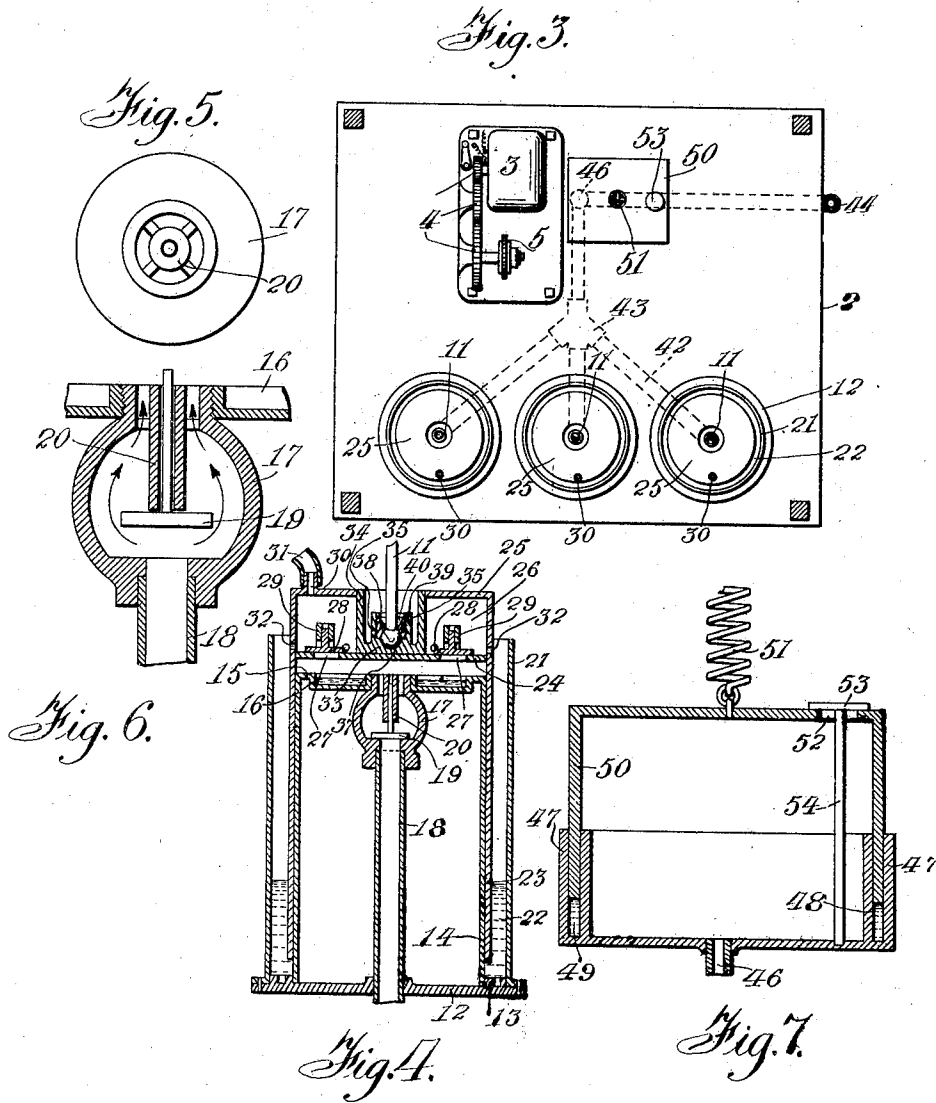
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 By Attorney
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UNITED STATES PATENT OFFICE.

GEORGE JAMES SHEPPARD AND HENRY FRANKLIN ADAMS, OF MONTREAL, QUEBEC,
CANADA.

VACUUM CLEANING DEVICE.

1,002,324

Specification of Letters Patent.

Patented Sept. 5, 1911.

Application filed December 11, 1908. Serial No. 497,118.

To all whom it may concern:

Be it known that we, GEORGE J. SHEPPARD and HENRY F. ADAMS, both of the city of Montreal, Province of Quebec, Canada, have invented certain new and useful Improvements in Vacuum Cleaning Devices; and we do hereby declare that the following is a full, clear, and exact description of the same.

The invention may be said to consist of the construction and combination of parts herein described and pointed out in the claims. For full comprehension however of our invention reference must be had to the accompanying drawings forming a part of this specification, in which similar reference characters indicate the same parts and wherein—

Figure 1 is a side elevation of the carrying frame of a portable vacuum cleaning plant for householders' use, and illustrating the internal mechanism; Fig. 2 is a front elevation thereof; Fig. 3 is a horizontal sectional view taken on line 3, 3, Fig. 1; Fig. 4 illustrates a vacuum pump which forms a part of our invention; Figs. 5 and 6 are detail plan and sectional views of a valvular member of the pump; Fig. 7 is a detail sectional view of a member for affording relief to the vacuum side of the pump.

This invention embodies a vacuum pump the exhaust from which is utilized as an air blast to meet certain requirements; means for causing the circulation of a lubricant through the parts of the pump; pumping mechanism adapted to maintain a practically uniform vacuum; and means for preventing an undue suction being exerted upon the piston at the time the pump is momentarily in a state of lowest efficiency, such means being also adapted to act as a receptacle for surplus lubricant.

1 designates a wheeled frame having a floor 2 upon which is fixed a motor 3 of any preferred type, the shaft whereof drives a train of gears 4 actuating a sprocket wheel 5 over which and a second sprocket wheel 7 is looped an endless chain 6 such second sprocket wheel being secured on a shaft 8 set in bearings 9 on the supporting frame. The shaft 8 is provided with three cranks 10 each differing in angular position from that next to it by 120 degrees, and a series of vacuum pumps are operated in succession by these cranks, the object in so spacing the

cranks being to reduce to a minimum the fluctuations in the vacuum created. All these pumps are alike and each comprises a piston 23 preferably of cylindrical form and inclosing a cylinder 14 fixed to a base 12 secured to the floor 2 of the frame, such base being provided with a flange 13. The inner cylinder 14 is located with its lower end within the flange 13 and its upper end closed as at 15 and formed with a depression 16 the function whereof is to afford a space beneath the transverse face of the piston for the purpose of preventing complete displacement of air between the faces 15 and 24 of the fixed cylinder or abutment and the cylinder. This depression also serves as a receptacle for the oil which works its way up between the piston and abutment under the influence of the vacuum between such faces.

Carried by the closed end of the cylindrical abutment is a valve chamber 17 with its upper end open and having its lower end connecting with a stand pipe 18 which extends downwardly through the casing 14 and the floor 2. The valve 19 in this chamber 17 is movably retained in position or guided by means of a stem guide 20.

The base 12 also carries an outer wall 21 forming with the abutment a sealing and lubricating space 22 adapted to contain a body of oil or other sealing and lubricant or liquid seal. The depth of this seal is such that the rim of the cylindrical piston dips into it when at its lowermost point and rises clear of it during each stroke thus effectively lubricating the contacting cylindrical faces and affording a perfect seal.

The face 24 of the cylindrical piston is presented by a transverse diaphragm having a pair of valves 28 positioned relatively to a pair of ports 27 by valve-stem guides 29, the space 26 between this cylinder and the upper closed end 25 of the cylindrical piston constituting a compressed air chamber. On the downward stroke of the piston the air in the space between 24 and 25 is expelled through ports 27 and the upward stroke thereof closes these valves, opens the valve 19, and exerts a suction on pipe 18. A series of pitmen 11 effect an operative connection between the cranks 10 and the pistons. The compartment 26 is provided with a nipple 30 to which is attached a flexible pipe 31 through which an air blast is de-

livered, the purpose being to enable points inaccessible to the suction end of the apparatus, to be reached. The uniformity of the flow of air from the chamber 26 is due to the ports 27 being in the aggregate of greater capacity than the outlet at 30.

In the operation of pumping mechanism, as before mentioned, oil in 22, gradually works up into the depression 16 and the volatilization thereof causes a deposit of oil in the compartment 26 which is drained by small holes 32 in the wall of such compartment near its lower end, the oil finding its way back to the chamber 22. The body of lubricant is, under the vacuum produced slightly vaporized in the operation of the apparatus.

The connection between the piston and pitman is effected by a cylindrical casting 33, 34, braced between the closed end of the piston and the diaphragm 24 and having an internal hollow boss 35 tapped and terminating in a concavity 37 affording a seat for a ball 38 upon the lower end of the pitman 11. This ball-end is held on its seat by an exteriorly screw threaded collar or nut 39 concaved to fit the upper surface of the said ball, such collar having depression 40 to receive a common form of spanner. The closed end 25 of the piston is cut away at the circumferential line of the casting 34 to accommodate the action of the pitman. By this construction the connections between the pitmen 11 and pistons are rendered practically frictionless.

The lower ends of the pipes 18 are connected by means of pipes 42 beneath the floor 2 and are joined by a 4-way connection 43 one branch of which is connected by a pipe 44 to a dust collecting box 45 supported in the frame 1 and from which a flexible pipe leads to the suction implement. As the piston area is many times greater than the capacity of the three pipes 18 of the pumps, and as the pumps are operated successively a continuous vacuum is produced in the dust collector box 45.

A branch 46 extends from the horizontal portion of pipe 44 to relief device for reducing the vacuum should it exceed a predetermined degree and then prevent an overload on the motor 3. This device comprises a lower fixed casing 47 provided with a double wall 48 adapted to retain oil or any suitable sealing body 49, and a dome 50 having its lower end working in the space presented by the double wall and sealed by the oil therein. The dome has a port 52 controlled by an external valve 53 the stem 54 of which extends down through the port and is fixed in the bottom of casing 47; while a spring 51 yieldingly supports the dome with the edge of the port 52 bearing upon the valve. In the operation of this element of the invention should the intake

pipe 55, which enters the collector box, become clogged and the vacuum increase to a point where there would be an overload on the motor, such abnormal vacuum will overcome the tension of the spring 51 and lower the dome 50 away from the valve 53 thus opening the port 52 and permitting the entrance of air until the vacuum is reduced to the required degree.

In the operation of the entire apparatus, the motor 3 being started power is transmitted to the pumps through train of gears 4, the sprocket chain 6, the crank shaft, and pitmen, and a vacuum is created, through pipes 18; 42, and 44, and coupling 43, in the collector box 45 which exerts a steady suction in the usual dust collecting suction implement (not shown) coupled to 53.

The piston 23 fitting comparatively loosely on the casing 14 and working into the body of oil 22 is practically frictionless and noiseless, thus requiring a minimum of power for its operation. There being three cranks 10 equally spaced apart there is no pounding of the motor and a constant vacuum is maintained.

The train of gears, sprocket wheels and chain are especially used in this construction owing to the compactness and utility of their arrangement.

The action of the pump causes the lubricant to circulate from 22, between the piston and cylindrical abutment, through ports 27, chamber 26, and openings 32 back to 22 again.

While we have described and illustrated means for relieving the vacuum should it exceed a predetermined maximum degree we do not herein claim the same as it forms the subject matter of a separate application filed by us on December 11th, 1908 under No. 467117.

What we claim is as follows:—

1. In a vacuum cleaning apparatus, a vacuum and compression pump comprising a casing having one end secured to the base and its opposite end closed and having a port therein, a pipe communicating with the port, a one way valve controlling the said port, a cylindrical piston having one end inclosing and in slidable relation with the casing and its opposite end closed, a transverse partition within the cylindrical piston and situated near the closed end thereof and forming therebetween and the closed end of the cylindrical piston a compression chamber, such chamber being provided with an outlet, the said partition having an inlet of greater capacity than the said outlet, and means for reciprocating the cylindrical piston, for the purpose set forth.

2. In a vacuum cleaning apparatus a vacuum pump, comprising a fixed casing having a port therein, a cylindrical piston inclosing and in slidable relation with such

casing and inclosing the port, the cylindrical piston having a chamber therein with an outlet port and the wall of such chamber contiguous to the main body of the casing having an intake controlled by an automatic valve, means for reciprocating the cylindrical piston for the purpose of exerting a suction upon the first mentioned port and accumulating compressed air in the said chamber, and means whereby the said suction and compressed air are utilized.

3. In a vacuum cleaning apparatus a vacuum pump comprising a fixed casing having a port therein, a cylindrical piston inclosing and in slidable relation with such casing and inclosing the port, the cylindrical piston having a chamber therein with an outlet port and the wall of such chamber contiguous to the main body of the casing having an intake of greater capacity than the outlet and controlled by an automatic valve, means for reciprocating the cylindrical piston, for the purpose of exerting a suction upon the first mentioned port and accumulating compressed air in the said chamber and means whereby the said suction and compressed air are utilized.

4. In a vacuum cleaning apparatus, a vacuum pump comprising a fixed casing having a port therein, a cylindrical piston inclosing and in slidable relation with such casing and inclosing the port, the cylindrical piston having a chamber therein with an outlet port and the wall of such chamber contiguous to the main body of the casing having an intake controlled by an automatic valve, means for reciprocating the cylindrical piston for the purpose of exerting a suction upon the first mentioned port and accumulating compressed air in the said chamber, means whereby the said suction and compressed air are utilized, and means whereby a lubricant is automatically circulated between the bearing faces of the pump.

5. In a vacuum cleaning apparatus a vacuum pump comprising a fixed casing having a port therein, a cylindrical piston inclosing and in slidable relation with such casing and inclosing the port, the cylindrical piston having a chamber therein with an outlet port and the wall of such chamber contiguous to the main body of the casing having an intake, of greater capacity than the outlet and controlled by an automatic valve, means for reciprocating the cylindrical piston for the purpose of exerting a suction upon the first mentioned port and accumulating compressed air in the said chamber, means, whereby the said suction and compressed air are utilized, and means whereby a lubricant is automatically circulated between the bearing faces of the pump.

6. In a vacuum cleaning apparatus a vacuum pump comprising a fixed cylindrical abutment having a port and an automatic

valve controlling such port; a cylindrical piston inclosing and in slidable relation with such cylindrical abutment; a receptacle for containing a lubricant disposed in a position to have the piston dip therein at one end of its stroke.

7. In a vacuum cleaning apparatus a vacuum pump comprising a fixed cylindrical abutment, a cylindrical piston inclosing and in slidable relation with such cylindrical abutment; suitable port and air conductor; a receptacle for containing a lubricant disposed in position to have the piston dip therein at one end of its stroke.

8. In a vacuum cleaner, a pump comprising a double walled casing, a valve chamber set one end of such casing; a valve in the chamber; a pipe extending from the valve chamber outside of the casing and controlled by the valve, and a cylindrical piston working between said walls and provided with valves.

9. In a vacuum cleaner, a double-walled casing adapted to contain a liquid body between its walls, a valve pipe extending through the casing; and a cylindrical piston provided with a valved compartment having an air outlet, such cylindrical piston having its wall located slidably between the walls of the casing.

10. In a pump, the combination with a casing comprising inner and outer walls presenting between them a chamber for a lubricant and a cylindrical piston inclosing one end of the inner wall and adapted to distribute the lubricant from end to end of the latter, of a receptacle for collecting the lubricant at the inclosed end of the inner wall, such receptacle being in communication with the lubricant chamber.

11. In a vacuum pump the combination with a base 12 and an abutment casing 14 having one end secured to the base and its opposite end closed and having a port therein and a depression surrounding the latter, a pipe 18 communicating with the port; a valve 19 controlling the port,—of a wall 21 secured at one end to the base 12 and separated from and surrounding the abutment casing and adapted to contain a lubricant in the intervening space; a cylindrical piston 23 closed at one end and provided with an outlet 30 at such closed end and the opposite end inclosing and being in slidable relation with the closed end of the abutment casing and adapted to dip into the lubricant, a transverse partition 24 within the second mentioned casing near the closed end thereof presenting inlets 27 of greater capacity than the outlet 30, valves 29 controlling the inlets, the said cylindrical piston having drip ports 32, and means for reciprocating the said cylindrical piston.

12. In a vacuum pump the combination with a base 12 and an abutment casing 14

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 in and a depression surrounding the latter,
 a pipe 18 communicating with the port; a
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 mentioned casing near the closed end there-
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 than the outlet 30, valves 29 controlling the

inlets, the said cylindrical piston having
 drip ports 32, and means for reciprocating 20
 the said cylindrical piston, including a hol-
 low boss 35 upon the piston and tapped and
 terminating in a concavity 37, a pitman 11
 with a ball 38 at its end adapted to be seat- 25
 ed in the concavity and an exteriorly screw-
 threaded nut 39 screwed into the boss and
 retaining the ball 38.

In witness whereof we have hereunto set
 our hands in the presence of two witnesses.

GEORGE JAMES SHEPPARD.
 HENRY FRANKLIN ADAMS.

Witnesses:

P. HARNEY,
 E. M. SLINNEY.