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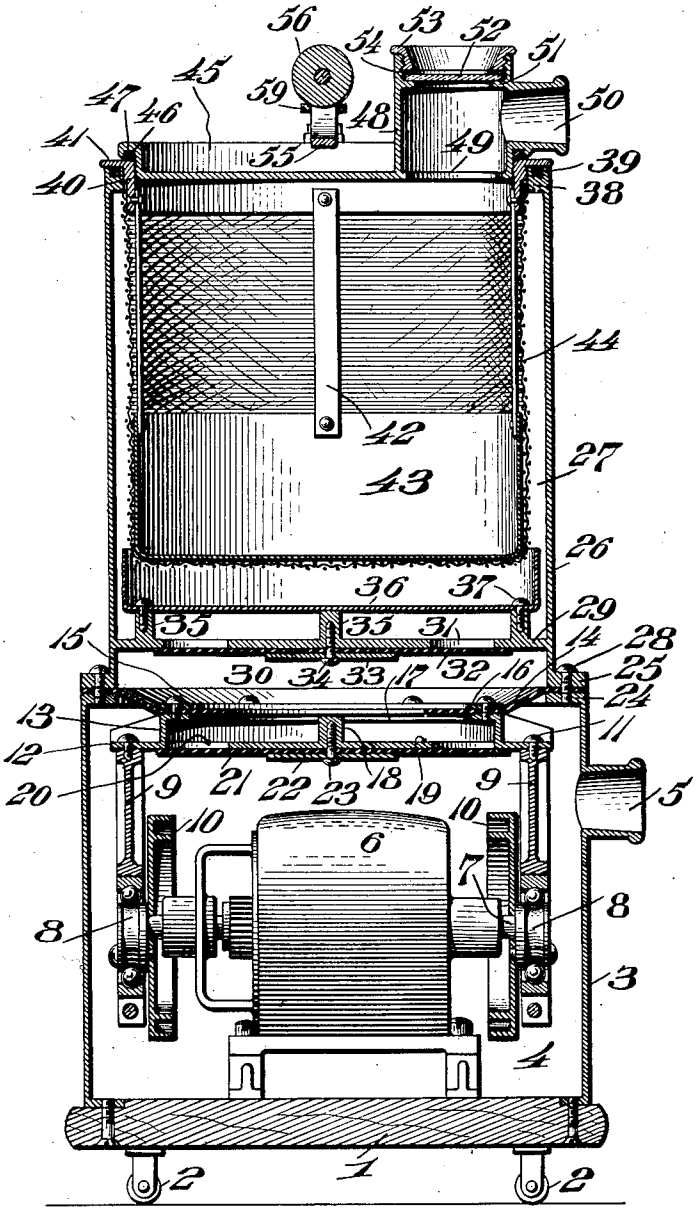
PORTABLE PNEUMATIC PUMPING APPARATUS.

APPLICATION FILED MAY 29, 1908.

**921,632.** Patented May 11, 1909.

3 SHEETS—SHEET 1.

Fig. 1.




Witnesses

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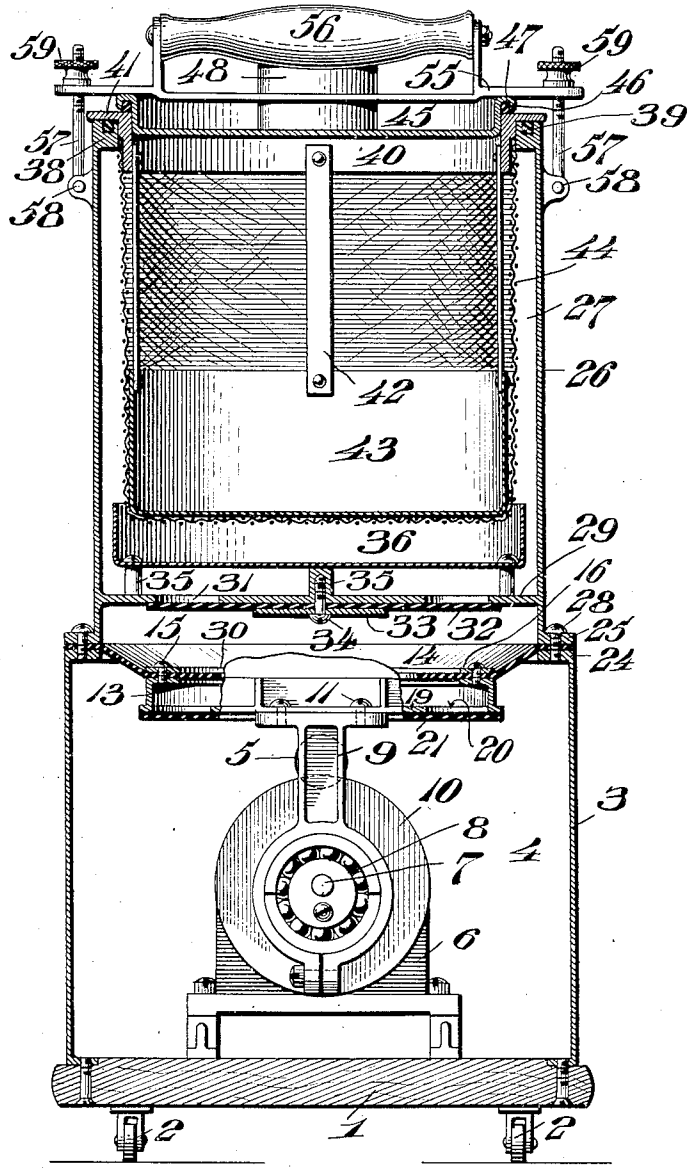
PORTABLE PNEUMATIC PUMPING APPARATUS.

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3 SHEETS—SHEET 2.

Fig. 2.




Witnesses

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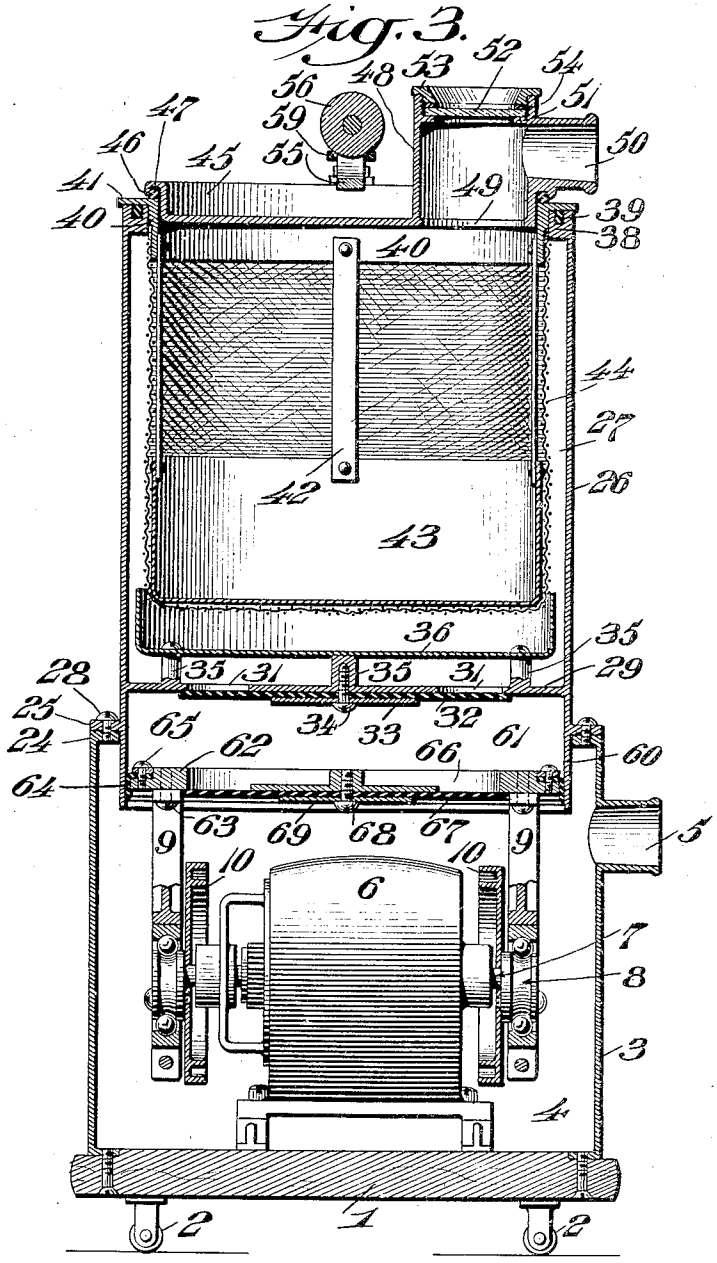
PORTABLE PNEUMATIC PUMPING APPARATUS.

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3 SHEETS—SHEET 3.

Fig. 3.




Witnesses

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# UNITED STATES PATENT OFFICE.

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## PORTABLE PNEUMATIC PUMPING APPARATUS.

No. 921,632. Specification of Letters Patent. Patented May 11, 1909.

Application filed May 29, 1908. Serial No. 435,633.

*To all whom it may concern:*

Be it known that I, JOHN W. SMITH, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Portable Pneumatic Pumping Apparatus, of which the following is a specification.

One of the main objects of my present invention is to devise a novel construction of a portable pumping apparatus which is exceedingly compact and light, in order that the same may be readily carried by means of a suitable handle from one place to another.

To the above ends my invention consists of a novel construction of a portable pumping apparatus which may be employed for suction purposes in which case the hose would be connected to the inlet and which may also be employed for blowing in which case the hose is connected with the exhaust or outlet.

It further consists of a novel construction of a device having a vacuum compartment and a pressure compartment, and provided with a motor in the pressure compartment for actuating a suitable pump.

It further consists of a novel construction of a cleaning apparatus in which a diaphragm pump is employed, the metallic part of said diaphragm being provided with a valve therein.

It further consists of a novel construction of a pneumatic pumping apparatus having a vacuum compartment and a pressure compartment and intermediate the vacuum compartment and the pressure compartment a suitable valve is employed.

It further consists of a novel construction of a device in which the motor is connected by means of suitable eccentrics or cranks with two connecting rods, preferably rigidly secured to the movable member of the pump.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention I have shown in the accompanying drawings those embodiments thereof which are at present preferred by me and which have been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein set forth.

Figure 1 represents a sectional elevation of a portable pneumatic pumping apparatus embodying my invention. Fig. 2 represents a sectional elevation of Fig. 1. Fig. 3 represents a sectional elevation of another embodiment of my invention wherein the movable member of the pump mechanism is shown as a piston instead of a diaphragm.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings:—1 designates a base provided with suitable rollers 2, whereby the same may be rolled along the floor when desired, although it is to be understood that my present device is so light that in practice the rollers are preferably dispensed with.

3 designates a casing which is secured to the base 1 by means of suitable fastening devices, said casing 3 forming therewith the pressure reservoir 4, it being noted that the casing 3 is provided with a suitable exhaust or outlet 5 which is adapted to be connected with a suitable hose or other connection.

6 designates a motor of any desired or conventional type, although in practice I prefer to employ an electric motor which may be readily connected with a lamp circuit and one object of my present invention is to devise an apparatus wherein I may employ a standard motor. The motor 6 is suitably supported on the base 1 and its shaft 7 has secured on opposite sides thereof, the ball bearings 8, to which are pivotally connected the connecting rods 9.

10 designates fly wheels which are secured on opposite sides of the shaft 7. The connecting rods 9 are preferably rigidly connected by means of suitable fastening devices, such as the screws 11, with the flange 12 of the follower-head or annulus 13.

14 designates a diaphragm which is secured to the annulus 13 by means of suitable fastening devices 15, it being noted that a suitable ring or washer 16 is provided through which the fastening devices 15 pass. The annulus 13 is provided with the rods 17, which are connected with the boss 18, which latter carries a plate 19 between the outer periphery of which and the annulus 13 is located the outlet 20 which is controlled by a valve 21, which latter is secured in place by means of the washer 22 and the set screw or

equivalent device 23, which passes through said washer 22 and has engagement with the boss 18. The valve 21 is preferably disk shaped and is preferably formed of a thin plate of metal. The casing 3 is provided with the flange 24 on which is adapted to be seated the flange 25 of the casing 26, within which is the vacuum reservoir 27.

28 designates suitable fastening devices, which pass through the flanges 24 and 25 and also through the flexible diaphragm 14, whereby the latter and the casings 3 and 26 are maintained in assembled position.

29 designates a partition member at the lower portion of the casing 26, whereby a clearance space 30 forming a pulsation chamber is formed between said member and the flexible diaphragm 14. The member 29 is provided with ports 31 therethrough, which are controlled by means of a valve 32 preferably disk shaped, and constructed in a similar manner to the valve 21, said valve 32 being secured in position by means of the disk or washer 33 and the fastening device 34 which engages one of the lugs 35 carried by the member 29.

36 designates a pan which is removably secured to the lugs 35 by means of the screws or equivalent fastening devices 37, it being noted that the diameter of the pan 36 is less than the diameter of the vacuum compartment or chamber 27. The upper end of the casing 26 is provided with an inwardly extending flange 38, which is suitably recessed at its upper end in order to adapt the same to receive a suitable gasket 39 of rubber, leather or other suitable material.

40 designates a collar which closely engages the inner periphery of the flange 38, said collar being provided with a flange 41 which is seated on the upper end of the casing 26 and engages the gasket 39.

42 designates bars, one end of which are suitably secured to the collar 40, the other end thereof being riveted or otherwise secured to a pan 43 which is adapted to receive dust or the like.

44 designates a bag of canvas or other suitable filtering fabric, which is drawn over the pan 43 and its supports 42 and the upper end of said bag being secured in place by any suitable means.

45 designates a removable cover, which is seated on the flange 41 of the collar 40, it being noted that the cover 45 is provided with an annular groove 46 in which is seated a gasket 47 of rubber, leather or other suitable material. The cover 45 has integral therewith, in the present instance, an observation chamber 48 which communicates with the interior of the casing 27 by means of the port 49, it being seen that an inlet port 50 is provided through which the incoming air enters, said port 50 being adapted to be connected with a suitable hose. The observation chamber 48 is provided with an inwardly extending flange 51 on which is seated a piece of glass or other transparent material 52, which is maintained in place by means of a nut 53 having suitable engagement with the member 48, it being seen that a suitable washer or gasket 54 is provided.

55 designates a plate, to which is secured a suitable handle 56, it being noted that said plate 55 rests on the top of the cover 45 and that rods 57 which are pivotally supported at 58 to the casing 26, pass through said plate 55 and are secured in place by means of the nuts 59 having threaded engagement with the rods 57.

In the embodiment seen in Fig. 3, I have shown a construction in which the follower-head or movable member of the pump is shown as being a piston instead of a diaphragm, the only other difference in such construction being that the inner end of the casing 26 is extended as indicated at 60 in order to form a piston chamber 61 in which the piston 62 is mounted, said piston being preferably rigidly connected with the connecting rods 9 by means of suitable fastening devices 63.

64 designates a washer of rubber or other suitable material, which is secured to the oscillating piston head 62 by means of suitable fastening devices 65. The head 62 is provided with ports 66 which are controlled by means of a valve 67, preferably consisting of a thin metal plate secured to the piston head 62 by means of the fastening device 68 and the plate or washer 69.

It will be apparent that the embodiment shown in Fig. 3 is precisely the same in all other respects to the embodiment shown in Figs. 1 and 2.

The operation of my novel construction will now be readily understood and is as follows:—The motor 6 is started, whereupon the connecting rods 9 are reciprocated and thereby the diaphragm 14, which it is understood is centrally apertured, as clearly indicated in the drawings. The air is drawn through the inlet 15 into the observation chamber and passes through the port 49 and thence through the filtering fabric 44, into the vacuum chamber 27 and around the pan 36, thence through the ports 31 into the clearance space 30 and thence through the ports 20 into the pressure chamber 4 and thence through the discharge outlet 5.

It will be readily apparent that in case it is desired to use the apparatus as a blower, the hose would simply be connected with the outlet 5 and such operation would be readily accomplished.

In the present instance I have shown the connecting rods 9 as being rigidly connected with the member 13 to which the diaphragm 14 is secured, but it is of course to be understood that in some instances it is desirable to

employ a jointed connecting rod instead of a jointless one, as shown.

I wish to call particular attention to the novel construction of the diaphragm pump, since in my present construction I employ a valve in the metallic part of such pump, the same comprising a single piece of thin material. It will also be seen that the valve 32 is protected under all conditions owing to the pan 36 which is employed, so that there is no danger of any heavy particles of dust or dirt coming in contact with the valve 32.

When it is desired to remove the filter it is simply necessary to remove the handle 56 by actuating the nuts 59 and removing the plate 55, whereupon the removable cover 45, together with the observation chamber 48, can be readily removed. The collar 40 is then lifted out together with the pan 43 connected therewith and the filtering bag or fabric 44.

It will thus be seen that my present device may be easily and quickly cleaned when desired and that the same may be quickly taken apart and assembled.

It has been found in practice that with a construction such as herein disclosed, a standard electric motor may be employed which may be run at a very high speed and the type of valves which I employ in the present invention is well adapted for such speeds.

It is of course to be understood that any desired motor may be employed and I do not desire to be limited to an electric motor since motors of other types may be used if desired.

The device is exceedingly compact and light and can be readily carried around by the handle 56 from one place to another when desired and when the same is to be moved only a slight distance, owing to the provision of the rollers 2, the same can be readily accomplished by simply pushing against the device.

Former types of reciprocating pumps consisted of four elements, a crank, connecting rod, a piston, and a cylinder. In one type of such pump the piston was made sufficiently long to act as a guide and this construction was used in combination with a hinged connecting rod. In a second type the connecting rod was rigidly secured to the piston and the cylinder oscillated on a hinged connection. The first type represented a guided piston in combination with a hinged connecting rod. The second type represented an oscillating or hinged cylinder in combination with a rigidly secured connecting rod.

My novel construction clearly differentiates from such types since I employ an oscillating followerhead or piston, and my cylinder or its equivalent is made rigid, while the connecting rod is preferably rigidly secured to the followerhead or piston.

My novel pump is made in practice in two styles, the piston type with an oscillating piston and the diaphragm type with an oscillating followerhead.

My novel pump would still be operative in connection with the oscillating followerhead, if there was a little flexibility in the securing of the followerhead to the connecting rod but the best results are obtained with a rigid connection between the followerhead and the connecting rod.

It will now be apparent that I have devised a novel and useful construction of a portable pneumatic apparatus, which embodies the features of advantage enumerated as desirable in the statement of invention and the above description and I have in the present instance shown and described a preferred embodiment thereof which has been found in practice to give satisfactory and reliable results.

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

1. In a portable pumping apparatus, a base, a motor mounted on said base, a shaft actuated by said motor, cranks on the outer extremities of said shaft, rods having their lower ends actuated by said cranks, an apertured plate located above said motor and having its outer opposite portions rigidly connected to the upper ends of said rods, a valve secured to said plate and controlling the apertures therein, a casing mounted on said base and extended above said plate, a diaphragm having its outer edge rigidly supported, and its inner edge fastened to said plate, a valve controlled port above said diaphragm, and an outlet from said casing below said diaphragm.

2. In a vacuum pump, the combination with a casing containing a vacuum reservoir provided with an inlet port, a pressure reservoir provided with an outlet port, and a pumping chamber between and completely separating the said reservoirs, the three chambers thus produced being arranged in linear order, of pumping mechanism coöperating with said pumping chamber, a motor located within said casing, and driving connections between said motor and said pumping mechanism.

3. In a vacuum pump, the combination with a casing containing a vacuum reservoir provided with an inlet port, a pressure reservoir provided with an outlet port, and a pumping chamber between and completely separating said reservoirs, the three chambers thus produced being arranged in linear order, of pumping mechanism coöperating with the pumping chamber and comprising a reciprocatory element which is confined in its movement against lateral vibrations and which reciprocates within a portion only of the pumping chamber, whereby a relatively large clearance space is provided, and a mo-

tor operatively connected with said pumping mechanism.

4. In a vacuum pump, the combination with a casing containing a vacuum reservoir provided with an inlet port, a pressure reservoir provided with an outlet port, and a pumping chamber between and completely separating said reservoirs, the three chambers thus produced being arranged in linear order, of pumping mechanism coöperating with the pumping chamber which comprises a reciprocatory element which bounds the pumping chamber upon one side within the casing, a motor, and a crank connection between said motor and said reciprocatory element which comprises a pitman rigidly connected to said reciprocatory element.

5. In a vacuum pump, the combination with a casing containing a vacuum reservoir provided with an inlet port, a pressure reservoir provided with an outlet port, and a pumping chamber between and completely separating said reservoirs, the three chambers thus produced being arranged in linear order, of pumping mechanism coöperating with the pumping chamber which comprises a reciprocatory element which bounds the pumping chamber upon one side within the casing and which is confined in its movement against lateral vibrations, a motor, and a crank connection between said motor and said reciprocatory element which comprises a pitman rigidly connected to said reciprocatory element.

6. In a vacuum pump, the combination with a casing containing a vacuum reservoir provided with an inlet port, a pressure reservoir provided with an outlet port, and a pumping chamber between and completely separating said reservoirs, of pumping mechanism coöperating with the pumping chamber and comprising a reciprocatory element which is confined in its movement against lateral vibrations and which reciprocates within a portion only of the pumping chamber, whereby a relatively large clearance space is provided, and a motor operatively connected with said pumping mechanism.

7. In a vacuum pump, the combination with a casing containing a vacuum reservoir provided with an inlet port, a pressure reservoir provided with an outlet port, and a pumping chamber between and completely separating said reservoirs, of pumping mechanism coöperating with the pumping chamber and comprising a reciprocatory element which is confined in its movement against lateral vibrations and which reciprocates within a portion only of the pumping chamber, whereby a relatively large clearance space is provided, and a motor operatively connected with said pumping mechanism and located within the casing.

8. In a vacuum pump, the combination with a casing containing a vacuum reservoir provided with an inlet port, a pressure reservoir provided with an outlet port, and a pumping chamber between and completely separating said reservoirs, the three chambers thus produced being arranged in linear order, of pumping mechanism coöperating with the pumping chamber which comprises a reciprocatory element which bounds the pumping chamber on its side adjacent to the pressure reservoir and which is confined in its movement against lateral vibrations, a motor located in the pressure reservoir, and a crank connection between said motor and said reciprocatory element which comprises a pitman rigidly connected to said reciprocatory element.

9. In a vacuum pump, the combination with a casing containing a vacuum reservoir provided with an inlet port, a pressure reservoir provided with an outlet port sufficiently restricted to substantially equalize the flow through the chamber, and a pumping chamber between and completely separating said reservoirs, the three chambers thus produced being arranged in linear order, of pumping mechanism coöperating with the pumping chamber which comprises a reciprocatory element which bounds the pumping chamber on its side adjacent to the pressure reservoir and which is confined in its movement against lateral vibrations and which reciprocates within a portion only of the pumping chamber, whereby a relatively large clearance space is provided, a motor located in the pressure reservoir, and a crank connection between said motor and said reciprocatory element which comprises a pitman rigidly connected to said reciprocatory element.

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Witnesses:
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