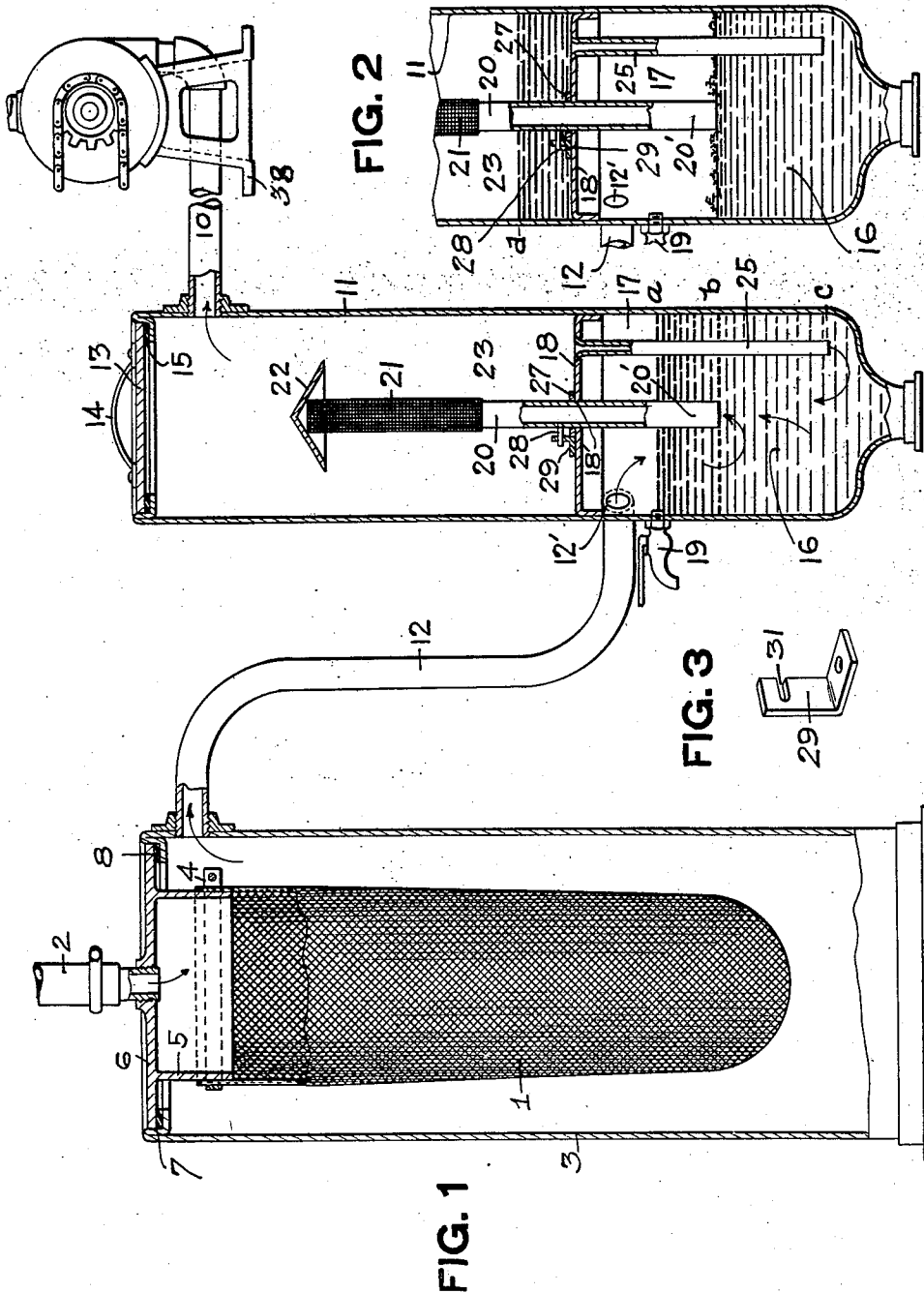


P. C. LITTLE.
VACUUM CLEANING APPARATUS.
APPLICATION FILED JUNE 27, 1910.

980,977.

Patented Jan. 10, 1911.



WITNESSES.
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To all whom it may concern:

Be it known that I, PAUL C. LITTLE, a resident of Carnegie, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Vacuum Cleaning Apparatus; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to pneumatic or suction cleaning apparatus. Its main object is to provide improved means for passing the dust laden air through water, oil or other liquid, thereby vaporizing the same and mixing it thoroughly with the dust and other impurities, and for returning the liquid after it has been condensed to its original source, so as to maintain a continuous circulation of the liquid and render it unnecessary to replenish it except at long intervals.

A further general object is to provide an improved, compact and complete apparatus for thoroughly removing the impurities from the air.

My invention contemplates, generally, a reservoir for liquid situated in the path of the dust laden air sucked from a suitable collecting tool or like source, a connection in the further path of the air leading from said reservoir, suitable means such as a pump to suck the air through said connection, means for condensing the mixed liquid and dust passing through said connection, the liquid having been vaporized by the action of the air in passing through the same, a receptacle for collecting the said condensed vapor and dust preferably situated at a higher level than the reservoir, and a connection leading back therefrom to the liquid reservoir.

As it is desirable to remove the grosser impurities by separate means before employing the above device so that the said device need be used only to remove the very fine dust, in the practice of my invention, I also preferably employ in combination with the liquid reservoir in the path of the dust laden air, a connection leading therefrom through which the mixed vapor and dust passes, the condensing and collecting means and the connection leading back to the liquid reservoir, a preliminary cleaning device preferably comprising a porous wall or sack interposed in the earlier path of the dust laden air for removing the larger particles.

In the drawings, Figure 1 is a vertical sectional view of the separating apparatus employed showing the same at rest; Fig. 2 is a detail vertical section illustrating the liquid separating means in action; and Fig. 3 is a detail perspective view showing the means employed for attaching the tube in the separating tank employed.

The porous sack 1 is employed for the purpose of interposing a porous wall to remove the greater part of the impurities before the air which is sucked through the connection 2 leading to the collecting tool or other device (not shown) has passed to the liquid separating device. The sack 1 is preferably carried within the separating tank 3, being attached as by the clamp 4 to the sleeve 5 of the removable top or cover 6. The top 6 is shown fitting the flange 7 of the tank 3, the joint being sealed by means of the rubber gasket 8. The top 6 may thus be removed by merely lifting the same when the suction producing means is not in use, the connection 2 being of a flexible nature, as is well understood in the art. The suction produced within the apparatus serves to preserve a tight joint between the removable top 6 and the tank 3. The porous sack 1 collects by far the greater part of all the impurities and dust collected by the apparatus, and may be replaced whenever necessary by merely removing the top and then removing the sack therefrom.

Suitable suction producing means, such as a pump 33, illustrated diagrammatically, sucks the air in its further path through the pipe 10 connected to the separating tank 11, to which the connecting pipe 12 leads from the separating tank 3. The separating tank 11 is closed by a suitable cover or top 13 provided with the handle 14 and sealed by the gasket 15, being held in air-tight position when in use by the suction in the air path in the same manner as the top 6 of the tank 3.

The water or other liquid 16 is carried in the reservoir 17, which is conveniently provided by the bottom portion of the tank 11 and horizontal partition or wall 18 therein. The connecting pipe 12 opens into the reservoir 17 above the high liquid level therein. The liquid level α illustrated in Fig. 1 is the level assumed by the liquid 16 when the device is not in use, the said level being maintained by the outlet cock 19, which is

opened when the liquid is changed. The pipe or tube 20 leads vertically through the wall or partition 18, and has its lower end 20' at a lower level *b* than the liquid level maintained when the apparatus is at rest. The said level *b* is thus below the level of the outlet 19 and therefore also below the opening 12' of the connection 12. The condensing means employed comprises preferably a screen of porous mesh 21 carried by the pipe 20 and provided at its top with a hood 22. The connecting tube 25 leads downwardly from the receptacle 23 through the partition 18 to the liquid 16 having its end at a lower level *c* than the opening of the pipe 20.

In operation the current of air entering through the connection 12 is sucked through the liquid and into the pipe 20, thereby vaporizing the liquid which is carried up through the pipe 20. The liquid assumes, as soon as the operation is started, the position illustrated in Fig. 2, the suction moving most of the liquid between the high level *a* and the level *b* through the pipe 20 and depositing it within the upper compartment 23 of the tank 11 above the wall 18. It assumes in said compartment 23 a level *d* which is very nearly as high above the wall 18 as the difference between the level *b* and *a*, the liquid also filling the connecting tube 25.

The air in passing through the liquid about the opening of the pipe 20 is separated from much of its dust and the impurities remaining therein are thoroughly mixed with the liquid vapor in passing upwardly through the pipe 20. I preferably employ oil or water in the practice of my invention as these liquids are both very volatile and are finely vaporized or atomized by the air current so as to be thoroughly mixed with the dust particles in passing through the pipe 20, and collect the same thoroughly, carrying them in suspension. The further path of the air leads through the screen 21, which is above the liquid level in the compartment 23 and acts to collect substantially all of the liquid vapor with the fine impurities mixed therewith. The vapor condensing upon the screen 21 trickles down the same into the liquid within the compartment 23. The said liquid is gradually returned from the tube 25 to the reservoir 17 so that a continuous circulation of liquid is maintained at all times. As most of the impurities have already been removed by the preliminary cleansing sack 1, the amount of the same collected by the circulating liquid is not relatively great. The device however, serves to thoroughly cleanse the air and prevents destruction of the pump by excessive wear due to dust, as well as delivering the air in a thoroughly cleansed condition. The condensing device comprising the screen 21

and hood 22 serve to intercept practically all of the liquid vapor so that it need not be replaced except at very long intervals.

While the compartment 23 is filled to the level *d* with liquid when the apparatus is in use, the tube 20 is never filled or blocked with liquid above the level of the same within the compartment 16, and ample opportunity is afforded for the mixing of the vapor with the dust particles. Failure of the device to operate due to the changes in the degree of vacuum produced in any part of the apparatus is absolutely prevented, as there is no tendency for the liquid to pass backwardly through the connection 12 into the dry separating device. My invention thus provides a much superior device to those in which a current of air is introduced into a separating tank below the liquid level therein, all of such devices having the disadvantage above referred to.

The tube 20 is shown removably fitting in the partition 18, being provided with the washer flange 27 and pin 28. The bracket 29 is attached to the partition 18 and has an arm provided with a notch 31 adapted to receive the pin 28, when the tube 20 is turned within the hole 18' through the partition 18. The tube is thus held in air tight engagement with the partition 18. When, at long intervals, the oil or other liquid within the reservoir 17 becomes saturated with dust, the device can be easily cleaned by opening the outlet 19 and removing the covers 13 and then the tube 20 by first merely giving it the partial turn, as just above indicated. Water can then be introduced to thoroughly flush and clean the entire separating tank 11. The cleaning liquid is then reintroduced, and its level regulated by the outlet cock 19.

What I claim is:

1. In pneumatic cleaning apparatus, the combination of a reservoir for liquid, a connection for the dust laden air leading into said reservoir, a connection in the further path of the air leading from said reservoir, suitable means for producing suction therethrough, means for condensing the vaporized liquid passing through said connection, a receptacle for collecting the mixed vapor and dust sucked therethrough, and a connection leading from said receptacle back to said liquid reservoir.

2. In pneumatic cleaning apparatus, the combination of a reservoir for liquid situated in the path of the dust laden air, a connection leading therefrom, suitable means for producing suction therethrough, a receptacle in the path of the air through said connection normally free from liquid when the apparatus is not in operation and adapted to collect the mixed liquid vapor and dust sucked through said connection and another connection leading from said

receptacle back to said liquid reservoir, whereby a continuous circulation is maintained when the apparatus is in operation.

3. In pneumatic cleaning apparatus, the combination with a reservoir for liquid situated in the path of the dust laden air, of a tube leading upwardly therefrom, suitable means for producing suction through said tube to thereby draw a liquid vapor there-
10 through, a porous wall interposed in the path of said vapor for condensing the same and thereby collecting the dust, a receptacle for collecting the vapor condensed on said porous wall, and a connection leading back to
15 said liquid reservoir to produce a continuous circulation of liquid in the apparatus.

4. In pneumatic cleaning apparatus, the combination in the path of the dust laden air of a reservoir for liquid, a tube opening
20 in said reservoir below the normal liquid level and extending upwardly, suction producing means for drawing the vaporized liquid through said tube, a porous screen carried on said tube and closing the outlet there-
25 from to thereby condense the vaporized liquid, means for collecting the condensed vapor, and a connection leading backwardly therefrom to said reservoir.

5. In pneumatic cleaning apparatus, the combination with a connection carrying dust
30 laden air, and means in its further path for producing suction therethrough, of a reservoir in the path of the air provided with a suitable quantity of liquid, said connection opening into said reservoir above the
35 level of said liquid when at rest, a connection in the further path of the air opening in said reservoir below said level, a receptacle adapted to collect the liquid passing
40 through said last mentioned connection, and a tube leading therefrom into said liquid reservoir below the level of said last mentioned connection.

6. In pneumatic cleaning apparatus, the combination with means for producing suction,
45 of a reservoir in the path of the dust laden air adapted to carry a liquid, a connection leading therefrom and having an opening in said reservoir below the level of
50 said liquid when at rest, means for collecting the mixed dust and liquid passing through said connection situated above the level of said liquid in said reservoir when at rest, and a passage leading downwardly
55 therefrom to said liquid reservoir.

7. In pneumatic cleaning apparatus, the combination with means for producing suction,
60 of a closed reservoir in the path of the dust laden air and adapted to carry a liquid, a tube opening in said reservoir below the liquid level and extending upwardly there-
65 from, means for condensing the mixed vapor and dust passing through said tube, and a receptacle above the liquid level of said reservoir adapted to collect said con-

densed vapor and a connection leading downwardly therefrom and opening into said reservoir below the opening of afore-
said tube.

8. In pneumatic cleaning apparatus, the combination in an air tight path for the
70 dust laden air, of a reservoir provided with means for maintaining a given liquid level therein, a tube leading upwardly from below said liquid level in the further path of
75 the air, and a tube connected at its upper end to the air path and leading downwardly therefrom to below the lower end of afore-
said tube in said liquid reservoir.

9. In pneumatic cleaning apparatus, the combination in the path of the dust laden
80 air of a liquid reservoir provided with means for maintaining a given liquid level therein, the connection in the previous path of the air opening into said reservoir above said
85 liquid level, a connection in the air path opening in said reservoir below said liquid level, and a return connection for the liquid connected to said air path and leading back
90 to said liquid below the opening of afore-
said connection.

10. In pneumatic cleaning apparatus, a separating tank in the path of the air current having a horizontal partition provid-
95 ing a liquid reservoir below the same, an air connection leading into said tank below said partition, a vertically extending tube extending through said partition and open-
100 ing in said reservoir below said connection, means for condensing the liquid vapor passing through said tube and a connection therefrom leading downwardly and open-
ing in said liquid reservoir below said tube.

11. In a pneumatic cleaning apparatus, a separating tank provided with a transverse
105 partition affording a receptacle for liquid above and a reservoir for liquid below the same, a connection for the dust laden air opening into said reservoir, an upwardly ex-
110 tending tube connecting said reservoir and said receptacle and opening into said reservoir below the liquid level therein when at rest, and a connection from said receptacle opening into said liquid reservoir below the
opening of said tube.

12. In a pneumatic cleaning apparatus, the combination with a reservoir for liquid
115 in the path of the dust laden air, a connection leading therefrom, a connection opening in said reservoir below the liquid level therein and means for producing suction therethrough, a porous screen in the path
120 of the air through said connection adapted to collect the mixed vapor and dust and a connection leading therefrom and opening in said reservoir below the level of said con-
125 nection.

13. In pneumatic cleaning apparatus, the combination with a reservoir for liquid in
130 the path of the dust laden air, of an up-

wardly extending tube leading therefrom and opening into said reservoir below the liquid level therein, a porous screen carried by said tube adapted to collect and condense the vaporized liquid, a receptacle above the level of said reservoir adapted to condense said liquid and a passage leading therefrom back to said liquid reservoir below the level of said tube.

10 14. In pneumatic cleaning apparatus, a separating tank in the path of the dust laden air provided with a horizontal partition and having a removable top, a connection carrying the dust laden air entering
15 said tank below said partition, and a connection leading to the suction producing means opening from said tank above said partition, means for maintaining a given liquid level in said tank below said partition,
20 an upwardly extending tube passing through said partition and ending below said liquid level and a passage opening in said tank above and below said partition.

25 15. In pneumatic cleaning apparatus provided with liquid carrying means and suction

tion producing means, a tube leading from said liquid carrying means, a porous screen forming an extension of said tube and interposed in the path of the vaporized liquid and air, means for deflecting the vaporized liquid not condensed on said screen, and a connection leading backwardly therefrom to said liquid carrying means.

16. In pneumatic cleaning apparatus, a reservoir for liquid, a tube leading backwardly therefrom, means for producing suction and thereby drawing the vaporized liquid from said tube, a porous screen carried on said tube and adapted to condense the vaporized liquid, a hood carried above said screen to deflect the liquid not condensed thereon, a receptacle containing said screen, and a connection leading therefrom to said liquid reservoir.

In testimony whereof, I the said PAUL C. LITTLE have hereunto set my hand.

PAUL C. LITTLE.

Witnesses:

ROBERT C. TOTTEN,
J. R. KELLER.