H. S. MAXIM.

APPARATUS FOR VACUUM CLEANING.

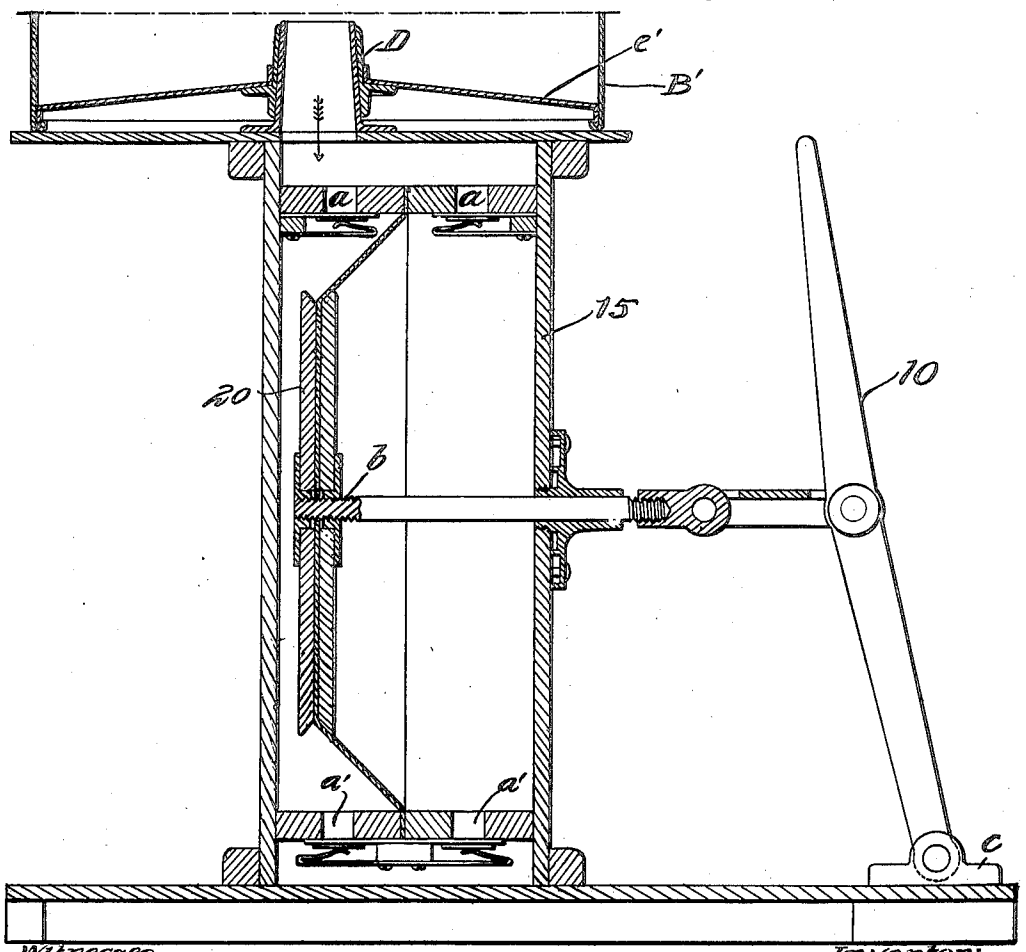
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1,101,558.

Patented June 30, 1914.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses
H. D. Penney,
Robert Ade

Inventor:
Hiram Stevens Maxim

By his Attorney, F. H. Richards.

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2 SHEETS—SHEET 2.

Fig. 2.

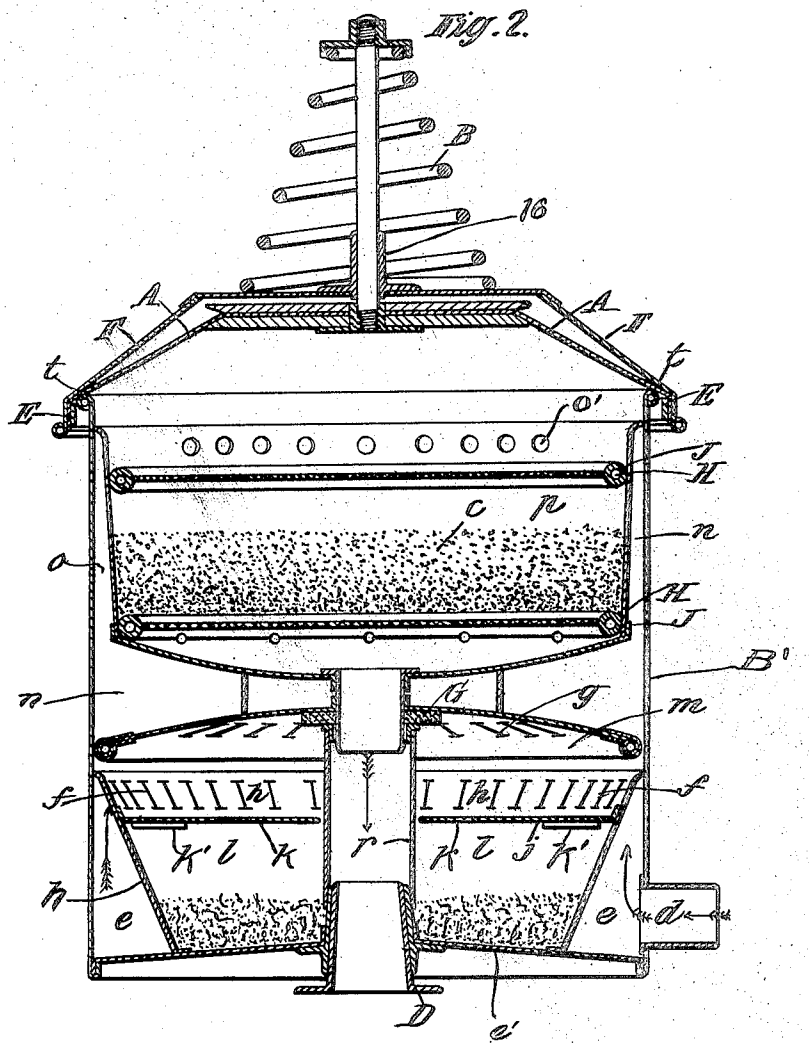


Fig. 3.



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UNITED STATES PATENT OFFICE.

HIRAM STEVENS MAXIM, OF WEST NORWOOD, ENGLAND.

APPARATUS FOR VACUUM-CLEANING.

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Application filed January 30, 1907. Serial No. 354,865.

To all whom it may concern:

Be it known that I, HIRAM STEVENS MAXIM, a subject of the King of Great Britain, residing at Thurlow Park, Norwood Road, West Norwood, in the county of Surrey, England, chevalier of the Legion of Honor, civil, mechanical, and electrical engineer, have invented certain new and useful Improvements in Apparatus for Vacuum-Cleaning, of which the following is a specification.

This invention relates to apparatus for use in vacuum cleaning and has for its object to provide a simple, cheap and effective apparatus whereby all the dust is removed from the article to be cleaned, even the smallest particles of dust being caught.

According to the said invention I provide a box or case preferably divided into two portions, the lower of which contains a suitable pump actuated by means of a lever or other device. The upper portion contains the dust collector and separator and communicates with the lower portion by means of suitable valves or the like.

In the accompanying drawings: Figure 1 shows a vertical central section of the pump and the lower portion of the dust separator in one form thereof. Fig. 2 is a vertical central section of the dust collector. Fig. 3 shows one manner of bending the tin or metal in order to allow the light particles of dust to pass and heavy ones to remain behind.

The lower part of Fig. 1 shows a rectangular box with a square diaphragm 20 and having a width equal to its height, preferably, or nearly so. The said diaphragm may be formed of a single piece without any seams or splices, or may be woven or built up. As it works back and forward it sucks in air at the top through the valves *a* and discharges it at the bottom through the valves *a'*, producing a suction at *a*. The diaphragm may be actuated by a lever 10 attached to the part *b*, said lever being attached to the bottom plate or board at *c*. By working the lever backward and forward the air is alternately sucked in and discharged first on one side of the diaphragm 20 and then on the other. This operation gives an intermittent suction and discharge under ordinary conditions but the suction is made constant by providing the cover of the dust separator with a circular diaphragm A which is held upward by a powerful spiral spring B (Fig. 2). When the pump is worked this spring is compressed and the diaphragm A works up and down as the pump is worked. When the pumping diaphragm has reached the end of its stroke there is a cessation of suction and it is at this time that the round diaphragm A moves upward and continues the suction until the next stroke is made.

Very great difficulty has heretofore been experienced in removing all the very fine parts of dust from the air but in my present invention I am able to remove every particle of dust. The hose of the dust collector is attached at *d*, Fig. 2. As the pump is worked, air is drawn in through *d* and passes into the annular space *e e;* it then moves upward and passes through orifices and enters the chamber *h*. These orifices are shown at *f* and the design of the same may be varied as desired. This receptacle is preferably cut in such a manner that it has vanes adjacent to its inlet openings and therefore when the dust charged air enters, said air has imparted to it a rapid rotating motion. This has a tendency to throw the heavier particles of dust outward where they encounter orifices *k* in the partition *j* which are also provided with vanes *k'*. The motion of the dust is in such a direction that it travels around over the top of the partition *j* but ultimately finds its way through the orifices *k*, the formation being such that the air in the chamber is quiet so that when the dust once enters it will not again escape. The formation of the plate *j* as shown at *k* is to enable the dust to work its way through without giving the air a chance to disturb the dust lying at the bottom of chamber *l*. In this way the coarse particles constituting about 90% of the dust are collected but about 10% still remains in a highly divided condition, and this passes with the air through the dome *m* which also has slots *g* cut in it with vanes adjacent thereto. The bendings of the projecting tongues or vanes of metal are arranged in such a manner that the coarser particles glance off and fall down allowing only the very fine ones to turn the sharp corners and enter the space *n*. The air then laden with a small portion of the very fine and elusive dust rises in the annulus *o* and ultimately finds its way through the openings *o'* into

the chamber p, where it is sucked downward through a thick layer of filter material which may be saw-dust c which removes every particle of dust, the air then descending through the tube r and entering the pump in a perfectly pure condition.

It is necessary in such an apparatus to be able to take the dust separator apart in order to remove the dust and to make air tight joints to connect the various parts, and also to connect the dust separator to the pump. To connect the collector to the pump a ground joint D is employed as shown in Figs. 1 and 2. One part is secured to the top of the pump and the other is soldered to the bottom of the separator. The cover is held on and made perfectly air-tight by the diaphragm A which makes a perfectly air tight joint at t. The cover or lid may however be readily removed when the pump is not working. The diaphragm A is secured to a metallic hoop E and then a sheet metal cover F is forced over it holding it in position and forming a neat and convenient cover, the arrangement being not only air tight but also serving to maintain a constant suction of air while the pump is stopping at either end of the stroke. The filter-chamber may be lifted out, the flange or dome m forming a good foot and giving the whole thing the appearance of a vase. This part is made air tight to the suction pipe r by a suitable packing or washer G.

The sawdust or other filter material is prevented from passing down the suction pipe by some fabric stitched over a hoop H which is provided with a kind of cushion of fabric J which should be sufficiently elastic to enable it to fit the ring surface of the filter-chamber. The lower hoop H is covered with a rather thick fabric, while the upper hoop H may be covered with canvas or wire gauze. As very little dust enters deeply into the filter mass, it is only necessary to take out the filter-chamber, reverse it and give it a sifting motion when the dirt in the filter mass may be sifted out; it then should be turned right side up and shaken so as to separate the very fine filter mass from the coarse, especially when this is sawdust. Under these conditions the dust laden air first encounters the coarse sawdust and then the fine sawdust, which removes the last particle of dust from the air.

In using material of the nature of sawdust for separating it is preferable that the air should enter at the top and escape at the bottom as is also the case with other separating materials. If the air should enter the bottom instead of the top, disturbances produced thereby in the filter mass would cause some of the dust to escape.

What I claim and desire to secure by Letters Patent of the United States, is:—

1. In apparatus for vacuum cleaning, the combination with pulsating suction means, of a filter dust collector discharging into said suction means, a dust settling chamber discharging into the filter dust collector and having an inlet for dust-laden air from the article to be cleaned, and a pressure controlled diaphragm between the settling chamber and the filter, whereby the filter is continually subjected to the pulsating effect of the suction means and the dust settling chamber is relieved of these pulsations.

2. In apparatus for vacuum cleaning, a dust collector, consisting of an outer casing provided with an inlet for the dust laden air, a receptacle provided with vaned peripheral inlet openings for imparting rotary motion to the dust laden air, a partition provided with vaned outlet openings, and a removable filter provided with an upper and lower screen and an intermediate filter mass; substantially as described.

3. In apparatus for vacuum cleaning, a dust collector consisting of an outer casing having an inlet for the dust laden air, a depositing rotary current separator contained in said casing for separating the larger particles of dust, a superjacent downdraft filter likewise contained in said casing, and a pressure-controlled diaphragm located above the filter chamber; substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HIRAM STEVENS MAXIM.

Witnesses:

T. SELBY WARDLE,

HAROLD W. LAKE.