M. F. COYLE.

VACUUM CREATING APPARATUS.

APPLICATION FILED MAR. 15, 1911.

1,040,641.

Patented Oct. 8, 1912.

2 SHEETS—SHEET 1.

Fig. 5.

Fig. 3.

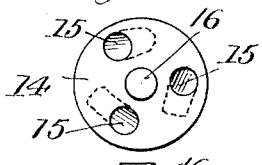


Fig. 6.

Fig. 4

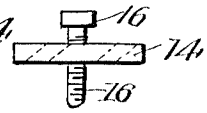
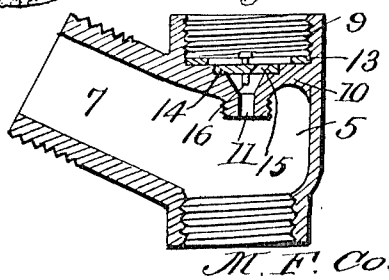


Fig. 1.

Fig. 2.



Witnesses

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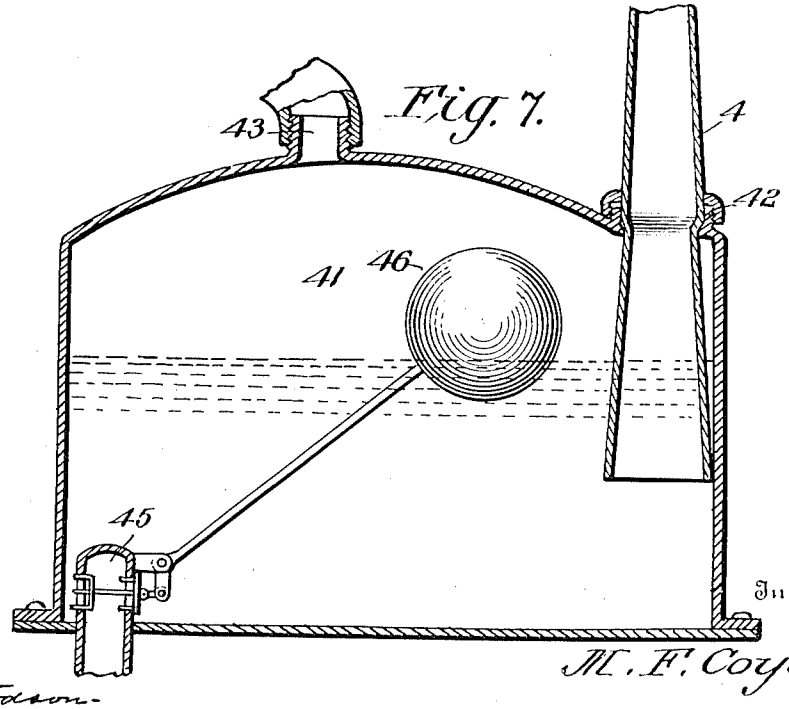
2 SHEETS—SHEET 2.

Fig. 7.



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VACUUM-CREATING APPARATUS.

1,040,641. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed March 15, 1911. Serial No. 614,725.

To all whom it may concern:

Be it known that I, MARK F. COYLE, a citizen of the United States, residing at Corry, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Vacuum-Creating Apparatus, of which the following is a specification.

My invention relates to vacuum creating apparatus and particularly to a vacuum creating apparatus for vacuum cleaners.

While relatively large and expensive vacuum cleaning machines are entirely effective for the purpose of their design, the small hand-operated machines and those operated by electric power are not commercially practical, for the reason that the hand-operated machines require too much labor to operate them and lack efficiency, while the electrically operated cleaners have a large number of complicated parts, these parts requiring constant attention and oiling. The machines are hence liable to get out of order and to require relatively expensive repairs. Small vacuum cleaners have also been provided with jet operated vacuum creating devices, but all such devices known to me lack efficiency, in that they use a solid jet of water and thus do not secure a maximum exhausting action with low water pressures.

The object of my invention is the provision of a vacuum creating device which is very light and entirely efficient and combines a powerful continuous suction together with a rapid displacement of the air, this suction positively drawing up all dust, grit or other objects to which device is applied and depositing this dirt, not so that it may contaminate the air of the room, but in the water which passes off to the sewer.

A further object is to provide a vacuum creating device of an exceedingly simple and efficient design and operated by water power, which cleaner shall be from eight to sixteen times more powerful than the ordinary hand machines and have double the strength of electrical machines.

A further object is to construct a vacuum creating device operated by water power and adapted to be used with a vacuum cleaner where the expenditure of water shall be reduced to a minimum and the vacuum creating efficiency very greatly increased over the like efficiency of ordinary water jet vacuum creators.

A further object is to provide a vacuum creating device having no moving parts, packing or machinery of any kind, and wherein all the energy of the water pressure is used to secure a vacuum.

As before stated, the ideal power for creating a vacuum for small machines is a water jet, and another object of the present invention is the provision of a water jet apparatus, so constructed that the air is evenly drawn from an area surrounding the jet and larger than the intake of the suction or discharge tube, and providing means whereby a plurality of streams may be forced into the discharge nozzle, and also providing means for causing the water to spread or spray upon leaving the outlet, and this with a minimum amount of friction and loss of velocity.

A further object is to provide means whereby this spray is given a rotary motion, thus giving a fast and strong supply of water at the outer surface of the stream which is necessary to secure the greatest efficiency.

A further object of the invention is to provide the cleaner handle with an observation glass having therein a screening device whereby the quantity of dust and dirt being removed may be noted, and whereby larger particles which would cause an obstruction of the tubular connection may be caught.

Other objects will appear in the course of the following description.

An embodiment of my invention is illustrated in the accompanying drawings wherein:

Figure 1 is a partly sectional view showing my creating device applied to a faucet. Fig. 2 is an enlarged vertical sectional view of the vacuum creating nozzle. Fig. 3 is a face view of the perforated disk disposed in the nozzle. Fig. 4 is a side elevation of the disk. Fig. 5 is a perspective view of the disk. Fig. 6 is a diametrical section of the disk. Fig. 7 is a sectional view of a modified form of my apparatus.

Corresponding and like parts are referred to in the following description and indicated in all the views of the accompanying drawings by the same reference characters.

I will first describe the means for creating a vacuum, as this is the most important part of my apparatus.

Referring to Fig. 1, 2 designates a faucet connected to a supply pipe and disposed above a sink 3. This is the faucet and sink ordinarily found in houses. 4 designates a

suction tube and 5 an air inlet chamber which is connected to the upper end of the suction tube. Preferably, the chamber 5 is screw threaded at its lower end to engage with the screw threaded end of the suction tube 4. This suction tube is downwardly and outwardly expanded, and preferably it is downwardly and outwardly expanded to a point about midway of its length and is then contracted at 6 and again downwardly and outwardly expanded. The reason for this will be hereafter explained. The chamber 5 is provided on one side with the outwardly projecting nipple 7 which is larger in diameter than the diameter of the upper end of the suction tube 4. This nipple 7 is for engagement with a hose 8 which is attached to a cleaner tube as will be hereafter described. The upper end of the chamber 5 is internally screw threaded as at 9 for engagement with the screw threaded terminal end of the faucet 2 and is provided with a septum or diaphragm 10, this diaphragm having a projecting nozzle 11 at its center and being provided with a conical passage 12 in its center, this conical passage discharging through the opening or nozzle 11. The outer face of the septum 10 is annularly recessed as at 13 surrounding the conical passage 12 passing through the nozzle 11. Seated in this annular seat 13 is a disk 14 having therein a plurality of discharge openings 15. The walls of these openings, or in other words, the axis of each opening is inclined to the faces of the disk 14 in a direction parallel to the circumference of the disk, as indicated in the perspective view Fig. 5. It will be seen that these openings are all out of line with the central portion of the nozzle passage 12 and that they are so inclined as to direct the stream of water passing through the perforation of the disk in a tangential direction around the inclined wall of the passage 12 so as to communicate a swirling movement to the jet and causing the jet to break and spray as it passes from the nozzle 11. In order to adjust the opening in the nozzle to secure economy with high pressure and efficiency with low pressure, I provide the needle valve 16 which screws through the center of the disk 14. By adjusting this needle valve farther into or out of the conical passage 12, the volume of water passing through the passage may be delicately regulated so that the device will work efficiently under varying conditions.

With the apparatus above described, the water is discharged from the nozzle in the form of a conical solid spray. This spray is discharged into the suction tube with a minimum loss of energy and the spray acts with great efficiency for transforming the water pressure into air suction. Further by making the perforations in the disk at a slight angle and in one direction, the water is given a rotary motion, the centrifugal force with which it is discharged causing the water to further expand and spray. The suction tube is made upwardly tapered in order to give a large area as it extends away from the jet. A slight contraction and a further tapering of the tube beyond the contraction causes the water to more perfectly mix with the air and equalizes the velocity, by reason of the fact that the slight friction of the water with the walls of the tube causes the velocity of the fluid passing through the tube to be less at the outer surface than in the center.

With my improved form of jet and suction tube, the air is evenly drawn from an area surrounding the jet, this area being larger than the intake of the suction tube, the spray or jet of water being equally distributed through the entire area and length of the suction tube and with the least friction. The volume of air displaced depends upon the difference between the area of the actuating jet and the area of the suction or discharge tube and upon the velocity of the water. The strength of the suction created by the jet of water depends on the velocity of the water, the difference in area between the actuating jet and the area of the suction or discharge tube, and upon the solidity of the water column which can be maintained in the suction or discharge tube.

The operation of my invention above described embodies all of the above features and secures a maximum degree of efficiency, both as to volume and pressure. In practical operation it is found that the device is so economical of water that the amount of water used is relatively so small that the machine may be operated practically at no cost. The hose or tube 8 which extends from the nipple 7 is of course of any desired length and is intended to be attached to the cleaner tube or handle 17, this tube 17 carrying upon its lower end the cleaner foot which will be hereafter described.

In Fig. 1 I show the suction tube 4 as discharging into a pan 40 which forms a seal for the lower end of the suction tube and this will ordinarily be the most convenient means of closing the lower end of the tube 4. I do not, however, wish to limit myself to this means as it is obvious that other methods of slitting the lower end of the tube 4 might be used. While the nozzle formed by the parts 11, 12 and 13 in connection with the air tube 7 and the discharge tube 4 are particularly adapted for creating a vacuum, it will be obvious that these parts are also adapted for use in any situation where it is desired to discharge commingled air and water. Thus for instance in Fig. 10 I show a construction wherein the parts above referred to are used in connection with an air compression tank

designated 41, the discharge tube or suction pipe 4 extending down into the tank 41 and passing through a slip joint 42 provided with packing. The tank 41 has an air outlet 43 in its upper end and a water outlet 44 in its lower end. The water outlet is controlled by a double valve 45 which in turn is actuated by a float 46. This attachment may be used in connection with the vacuum cleaning device as a compressed air or blowing attachment for the machine. It is particularly useful in blowing dust and dirt out of crevices that cannot be reached by the suction method. It is also useful for cleaning dust from hats etc., for drying the hair and for all purposes where it is desired to clean with compressed air. The down rushing water in the suction pipe 4 carries with it a large amount of air and this air and water passes into the tank 41. The air will collect in the upper portion of the receiver or tank 41 while the water collects in the lower portion thereof, and at predetermined intervals the valve 45 is opened, permitting the outward passage of water. It will be obvious that inasmuch as the air which is carried down by the water in the suction tube or discharge pipe 4 must find an outlet, the air will pass out through the opening 5. If the supply of water and air are continuous, the valves 45 remain open continuously, but if the amount of water passing into the chamber 41 lessens, the valves will close until the water has risen in the chamber 41 sufficient to lift the float.

What I claim is:

1. A vacuum creating device comprising a chambered member adapted to be secured to a supply pipe and having a relatively large inlet on one side, a septum extending across said member in the plane of the upper side of the air-inlet opening, said septum having a nozzle formed on its under side and being provided with a central passage for the flow of fluid from the supply pipe, the upper portion of said passage being flared and the lower portion thereof being cylindrical and extending through the nozzle, means for imparting a rotary motion to the fluid as it enters the said flared upper portion of the passage, and a suction tube secured in the bottom of the chambered member and depending therefrom, said tube being flared downwardly and being contracted intermediate its ends.

2. A vacuum creating device including a relatively large member adapted to be connected at one end to a supply pipe and having a relatively large air inlet opening at one side, a septum extending across the upper end of the chamber and provided with a passage downwardly tapered for a portion of its length and then having a uniform diameter, a disk disposed above the septum and resting thereon, having a plurality of openings located out of alinement with the axis of the discharge passage in the septum, the walls of said opening being inclined to the face of the plate, whereby to produce rotary motion in the liquid passing through the chamber, and a screw pin passing through the center of the plate and extending into the conical passage, said pin being adjustable through the plate to control the discharge through the passage.

3. A vacuum creating device including a relatively large chamber having a nozzle disposed in its upper portion of relatively small diameter, the side wall of the chamber being formed with a relatively large inlet air opening, a discharge pipe depending from said chamber, and downwardly expanded for a portion of its length, then contracted, and then again downwardly expanded the lower end of the discharge pipe being greater in diameter than the upper end thereof, the upper end of the discharge pipe being less in diameter than the chamber, but larger than the nozzle, and means located above the nozzle for imparting a whirl to the liquid passing through the nozzle.

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

MARK F. COYLE. [L. S.]

Witnesses:
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SARAH A. POWELL.