A. E. MOORHEAD.

PNEUMATIC CLEANSING APPARATUS.

APPLICATION FILED NOV. 24, 1911.

1,043,025.

Patented Oct. 29, 1912.

5 SHEETS—SHEET 1.

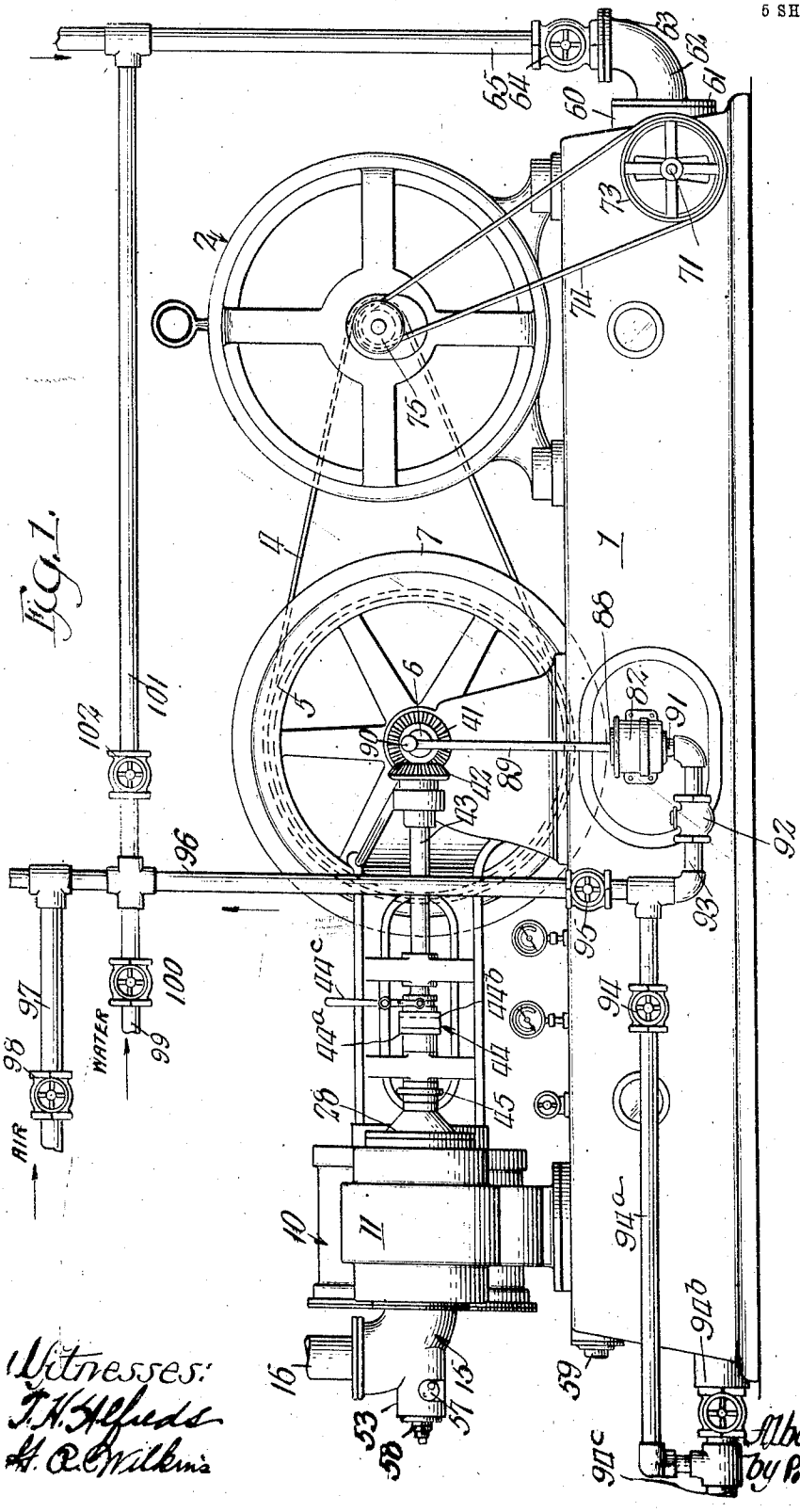

Fig. 1.

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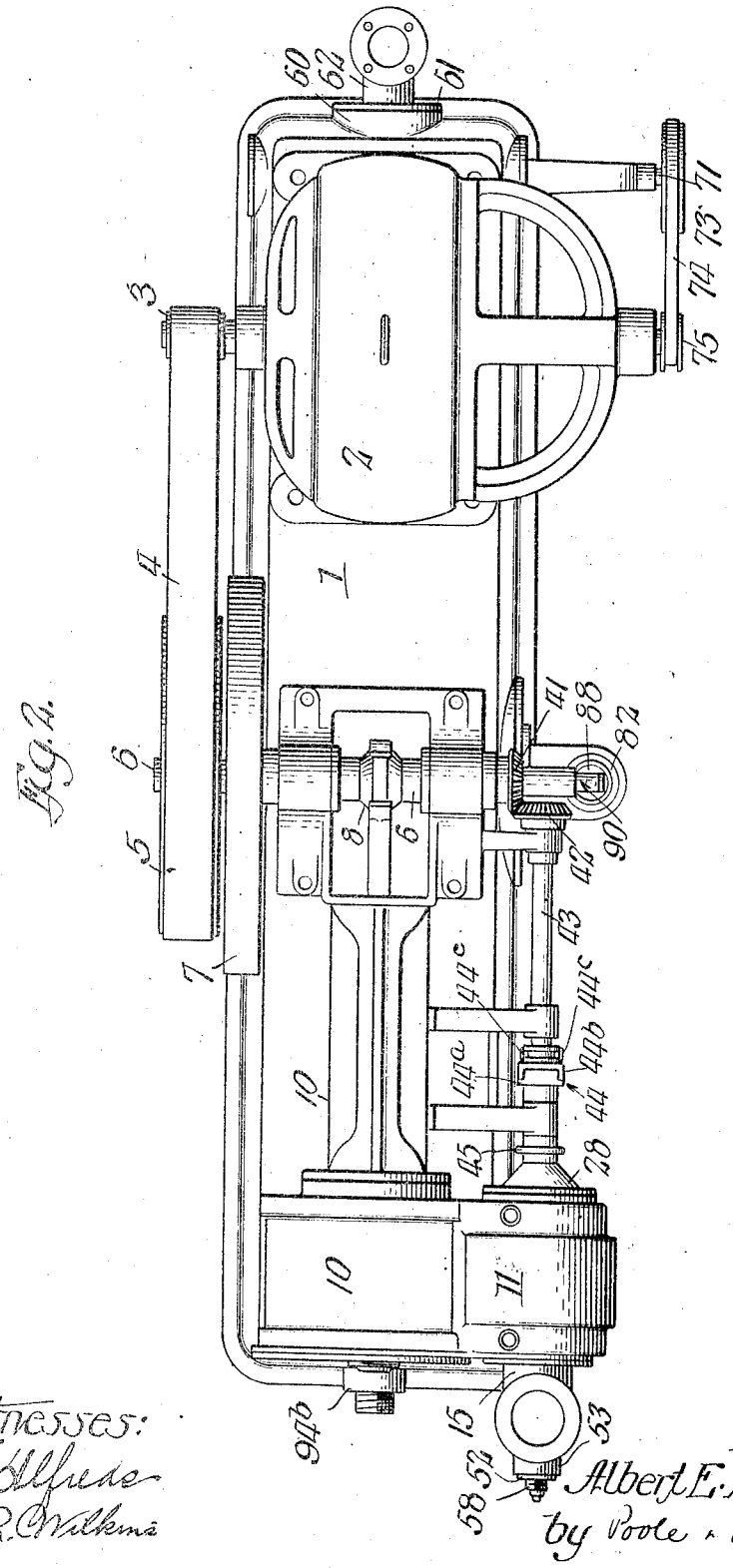

Fig. 2.

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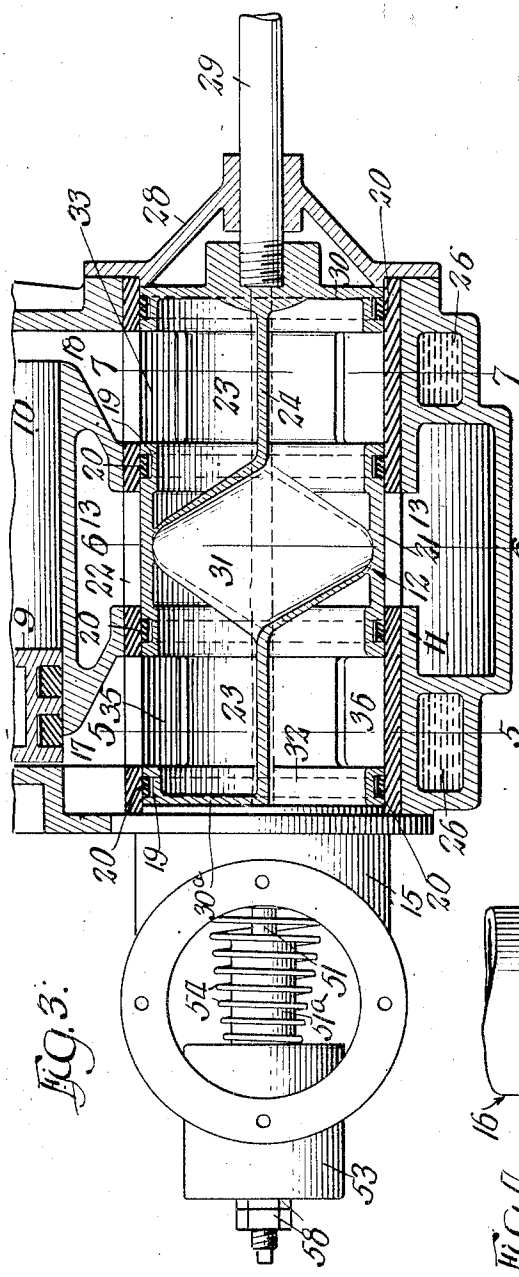

Fig. 3.

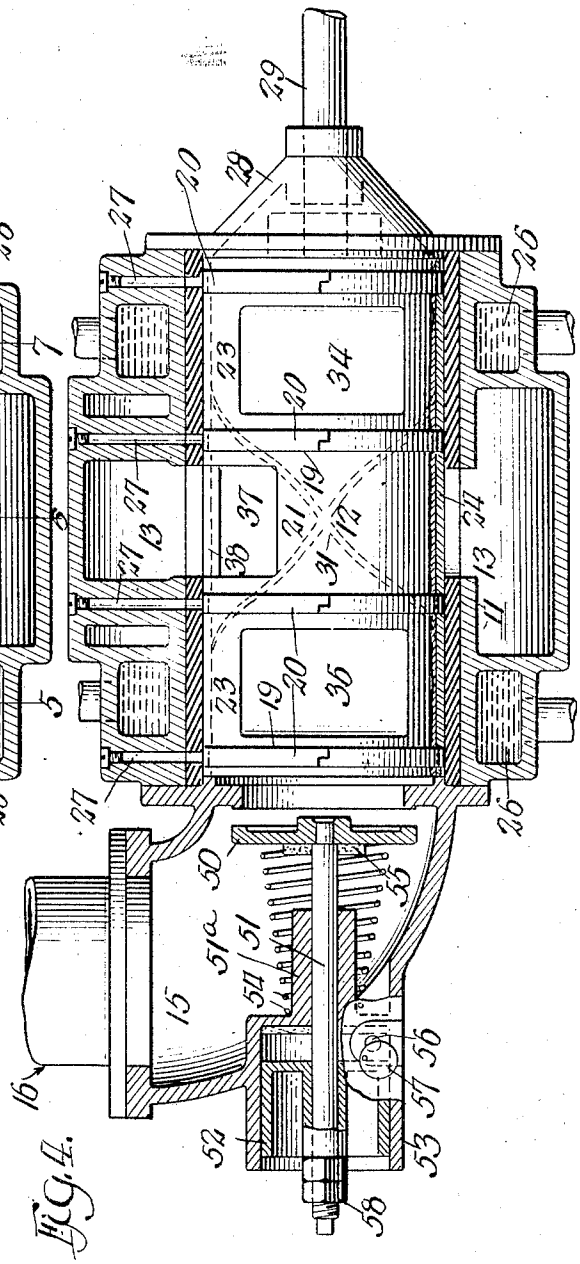

Fig. 4.

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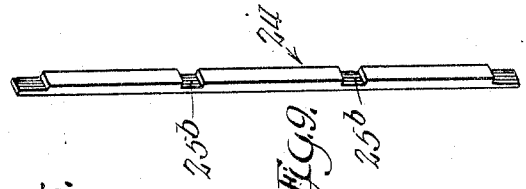


FIG. 9.

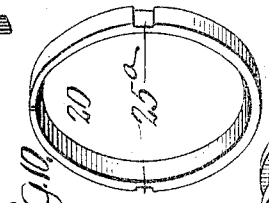


FIG. 10.

FIG. 5.

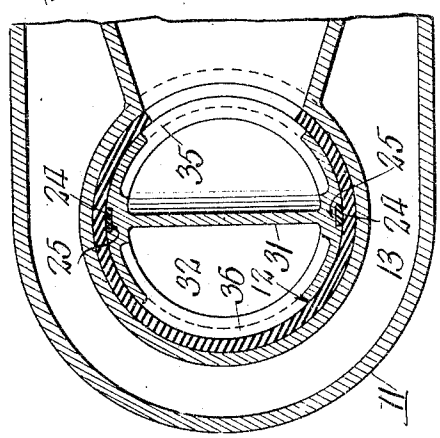
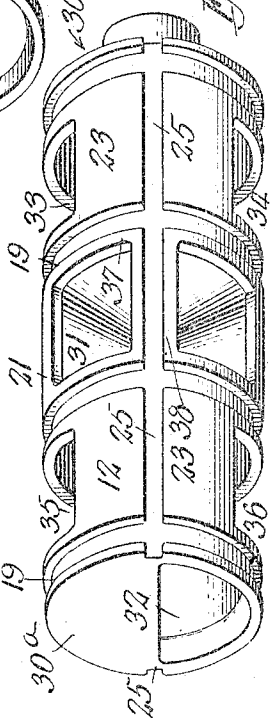


FIG. 8.



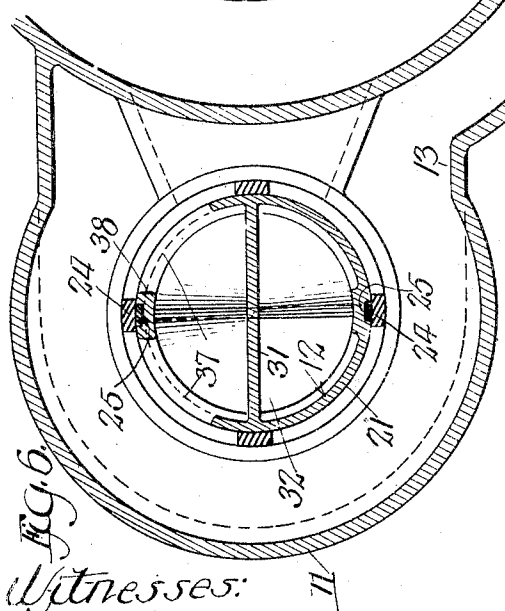


FIG. 6.

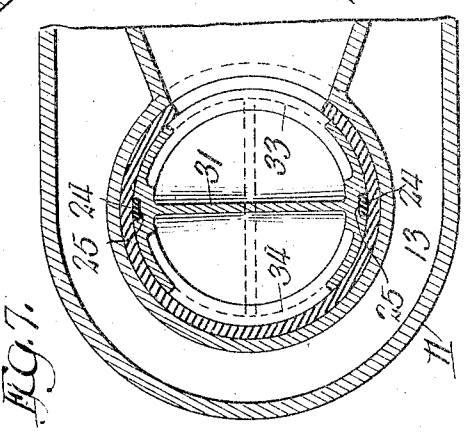


FIG. 7.

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APPLICATION FILED NOV. 24, 1911.

1,043,025.

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5 SHEETS—SHEET 5.

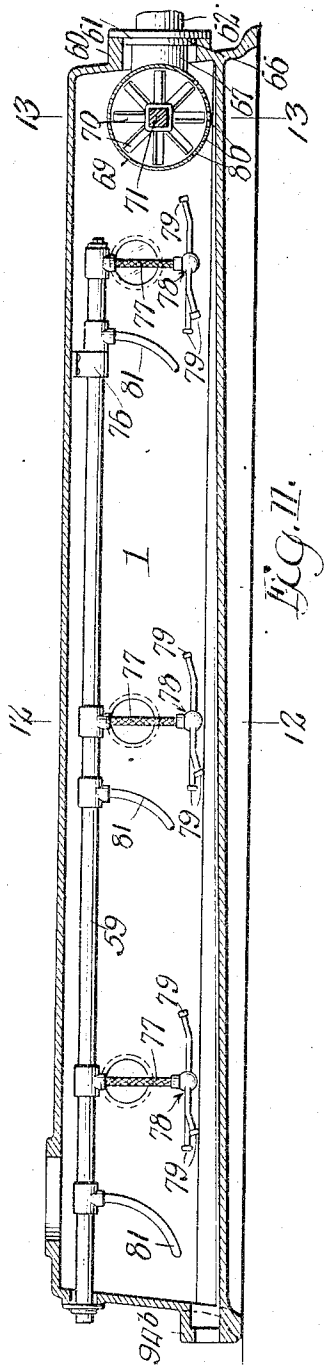

FIG. 11.

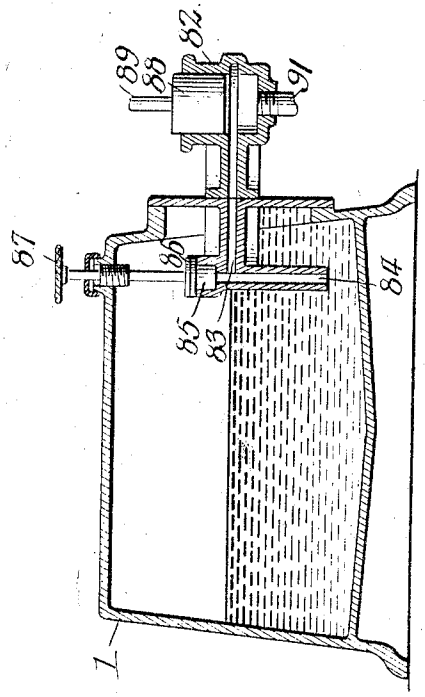

FIG. 12.

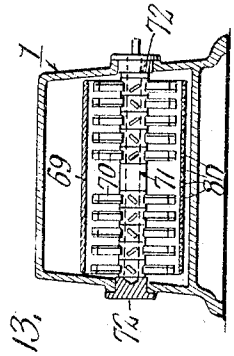

FIG. 13.

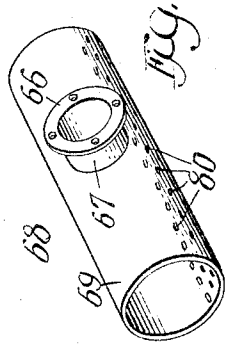

FIG. 14.

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UNITED STATES PATENT OFFICE.

ALBERT E. MOORHEAD, OF CHICAGO, ILLINOIS, ASSIGNOR TO AMERICAN ROTARY VALVE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PNEUMATIC CLEANSING APPARATUS.

1,043,025. Specification of Letters Patent. Patented Oct. 29, 1912.

Original application filed October 28, 1908, Serial No. 459,945. Divided and this application filed November 24, 1911. Serial No. 662,088.

To all whom it may concern:

Be it known that I, ALBERT E. MOORHEAD, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Pneumatic Cleansing Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to pneumatic cleansing apparatus and is shown in the accompanying drawings and herein described in connection with an apparatus embracing means adapted for use in cleansing, either by suction or by the force of compressed air, or by the use of both compressed air and suction at the same time; as may be desired, means whereby accumulated dust or refuse may be mixed with and deposited in a body of water and discharged when necessary in a convenient manner and without the necessity of opening tanks or manual removal; means by which the water used for scrubbing and conducted from the scrubbing appliances to cleansing apparatus can be automatically discharged therefrom into a sewer; means by which one or more cleansing appliances and one or more scrubbing appliances using water can be operated simultaneously; means by which scrubbing appliances may be used not only with water supplied from the city mains, but also in a circulating system with disinfectant liquid, so that, when said disinfectant has been used, it may be returned to the apparatus and used over again, and, furthermore, such operation can be carried on simultaneously with the use of pneumatic carpet sweepers or pneumatic cleansing appliances; means embracing a receptacle which can be used not only as a receptacle for dust, but also as a compressed air receiver when using air under pressure, together with other features and details of construction in such apparatus, as will be hereinafter pointed out.

In the accompanying drawings:—Figure 1 is a side elevation of the apparatus; Fig. 2 is a plan view thereof; Fig. 3 is a horizontal section on an enlarged scale of the controlling valve of the air pump; Fig. 4 is a vertical section thereof; Fig. 5 is a transverse vertical section on the line 5—5 of Fig. 3; Fig. 6 is a transverse vertical section on the line 6—6 of Fig. 3; Fig. 7 is a transverse vertical section on the line 7—7 of Fig. 3; Fig. 8 is a perspective view of the valve, detached from other parts, the packing bars and rings being omitted; Fig. 9 is a detail perspective view of one of the packing bars; Fig. 10 is a detail perspective view of one of the packing rings; Fig. 11 is a longitudinal vertical section of the receiver; Fig. 12 is a transverse section on the line 12—12 of Fig. 11; Fig. 13 is a transverse section on the line 13—13 of Fig. 11; Fig. 14 is a perspective view of the casing for the combined agitators and propellers.

Referring to the drawing, 1 indicates a rectangular hollow base, which forms both a receiver for containing a body of water and the dust and sweepings collected by pneumatic sweeping devices used in the system, and also a support for the mechanisms for producing and controlling the exhaust or compression. Said mechanisms may be actuated either by electricity, steam or otherwise, and are herein shown as actuated by the former. Referring to such actuating devices, as shown in the drawings, 2 indicates an electric motor mounted upon one end of the hollow base 1. Upon the shaft of the motor is a pulley 3 around which passes a belt 4, which also passes around a large pulley 5 on a transverse shaft 6 carrying a fly-wheel 7. The crank 8 of said shaft actuates a piston 9 reciprocating in the cylinder 10 of an air pump. Said pump may be used, as desired, either as an air compressor to deliver air to the receiver, or as an air-exhaust pump to exhaust the air from said receiver, dependently upon the adjustment of the controlling valve of the air pump

Formed integral with the casing of the working cylinder is a valve 11 (Figs. 3 and 4) having a cylindrical valve chamber containing a cylindric, rotary valve 12, these parts constituting a valve for controlling the entrance of air to and its exit from the ends of the pump cylinder. The details of construction in said controlling valve constitute the subject of a separate application, Serial Number 623,293, filed on the 25th day of April, 1911, and will be herein

described only so far as is necessary to an understanding of the present invention.

Now referring to the features of construction illustrated in said valve and associated parts, the same embrace features as follows: Said valve casing is provided at its central part with an annular chamber 13, connected by a conduit 14 with the interior of the receiver 1, and at its ends is connected through ports 17, 18, with the ends of the pump cylinder. Said valve 12 consists of a cylindrical shell provided exteriorly with four annular grooves 19, having therein packing rings 20, and having a central, cylindric surface 21 arranged to act in connection with a port 22 leading to the central annular chamber 13, and on its ends with cylindric surfaces 23 adapted to act in connection with the cylindric ports 17, 18. The valve 12 is also provided with two longitudinal grooves 25 in which are seated two longitudinal bars 24, arranged diametrically opposite to each other, which bars and the packing rings 20 are formed with notches 25^a, 25^b, at their intersecting points, so that the outer surfaces of the packing rings are flush with the outer surfaces of the bars. The valve casing is formed with annular water jackets 26, and also with oil passages 27, terminating over the packing rings 20. Connected with one end of the valve casing by an elbow 15 is a pipe 16 adapted to form either an inlet or exhaust passage, according to whether the pump is acting to compress air into or exhaust air from, the receiver, said pipe 16 being in communication with the interior of the valve casing through the adjacent open end thereof. Upon the end of said valve casing opposite that to which the pipe 16 is attached is secured a head 28 through which passes a stem 29, which is secured to an end wall 30 of the valve, which closes that end of the valve. Across the interior of said valve extends diametrically a partition or web 31, the terminal portions of which lie in the same plane but the intermediate portion of which is twisted through half a turn. Thus, when the valve is in the angular position shown in Figs. 3 and 4 of the drawings, the terminal portions of the web are vertical, but the web at the central portion of the valve is horizontal and is twisted from said central portion, in each direction outward, from a horizontal to a vertical position. The other end of the valve, or that adjacent to the inlet or outlet pipe 16, is closed on one side of the web 31 by an end wall 30^a, and is provided with an opening 32 at the other side of the web. Said opening 32 is always in communication with the pipe 16. Adjacent to the closed end 30 of the valve there are formed in the side wall thereof, on opposite sides of the web and extending through the cylindrical surface 23, two ports 33, 34 and, in like manner, near the partly open end of the valve there are formed, on opposite sides of the web and extending through the cylindric surface 23, two ports 35, 36. In its central part, on which is formed the cylindric surface 21, the valve is provided in its side wall with what is practically a single port 37, although the same is divided by a narrow bridge 38 on which is seated the bar 24 on that side of the valve. Said port 37 is always open to the central annular chamber 13, which latter is connected to the receiver by means of the passage 14. When the valve is in the position shown in Figs. 3 and 4, the cylinder port 17 is connected through the annular chamber with the receiver, while the cylinder port 18 is connected through the passage 32 with exhaust.

By means which will be presently described, the stem of the valve makes a half turn with each half reciprocation of the piston, and the effect is that when, for instance, the piston, moving from left to right, and drawing in air from the receiver, reaches its extreme right-hand position, the valve will have been turned through one-half a revolution, so that the outer end of the cylinder is now connected with exhaust, and the inner end of the cylinder is connected with the receiver. Then, upon the return of the piston, air is drawn from the receiver to the inner end of the cylinder and is expelled from the outer end to exhaust, and so on, thus forming a double-acting suction pump for drawing air from the receiver and expelling it through the pipe 16, which then acts as an exhaust pipe.

The valve stem is given a rotary movement in unison with the reciprocating movement of the plunger by means of a miter-gear 41 upon the transverse shaft 6, meshing with a miter-gear 42 upon a longitudinal shaft 43. Said shaft 43 is connected with the valve stem 29 through the interposition of a clutch 44 which permits the valve to be reversed to change the operation of the pump from an exhaust pump to a compressor. For this purpose, the clutch 44 consists of two parts that are adapted to be interlocked with each other in two diametrically reversed positions of one of them, and one of which is movable in a direction endwise of the shaft 43. As shown, said clutch consists of two clutch members 44^a, and 44^b. The clutch member 44^a is secured to the outer end of the valve stem 29 and is provided on its end face with a transverse rib adapted to engage a transverse groove in the clutch member 44^b. The clutch member 44^b is mounted and adapted to slide endwise, without rotation, on the shaft 43, so that it may be moved on the shaft toward and from the clutch member 44^a. A hand-

lever 44[c] is pivoted on a fixed part of the structure, and has a forked end, the arms of which engage an annular groove, in the clutch member 44[b], in a familiar manner. When it is desired to reverse the operation of the valve, the clutch member 44[b] is actuated to release the shaft 43 from the valve stem 28 and the latter is turned through half a revolution by means of a hand-wheel 45 secured to said stem, and the parts of the clutch are again interlocked, so as to connect the valve stem with the shaft 43. The valve having thus been advanced through one-half revolution, acts in the opposite manner to that already described, that is to say, so that each end of the cylinder is in communication with the receiver at the time that the piston is moving toward said end, and the other end of the cylinder is then connected with exhaust, so that the cylinder now acts as a compression pump.

The passage from the valve into the pipe 16 is adapted to be closed by means of a valve disk 50 carried by a stem 51 which slides in a fixed guide-sleeve 51[a] on the elbow 40. Upon the outer end of said stem 51 is secured a cylindrical piston 52 which slides in a cylinder 53 formed on the elbow 15. The inner end of said cylinder is closed by a head on which is formed the guide-sleeve 51[a]. Said valve disk 50 is normally held in closed position by means of a helical spring 54 which acts to press it toward its seat surrounding the open end of the valve casing. A disk 55 of felt surrounds the stem 51 and is interposed between the outer side of the valve disk 50 and the inner end of the guide-sleeve 51[a] to cushion the impact of the valve against the rapid end of said guide-sleeve. In order to check the too rapid motion of the valve, there is formed in the side of the cylinder 52 a vent 56 which is adapted to allow the air to escape slowly from or to pass slowly into the cylinder, and, for the purpose of regulating the rate of flow at which it can so pass, said vent is adjustably closed by means of a pivoted door 57. It is necessary to limit the amount of air which is drawn into the pump when using it as a compressor, for if the full volume of air were drawn into the cylinder, the power required to compress the entire volume of air so admitted might be too great. In order to so limit the amount of air thus admitted, this valve is so arranged that its closing movement will be arrested when the valve disk is at a short distance from its seat, and for this purpose set nuts 58 are applied to the valve stem in contact with the outer face of the piston 52. When the pump is used as a compressor, the air being then drawn into the pump cylinder through the pipe 16, the valve disk 50 will assume a position as close to the seat as permitted by said set nuts.

Now referring to the features of construction in the apparatus, by which dust and refuse collected by vacuum operated cleansing devices and returned to the apparatus may be mixed with and deposited in a body of water contained in the receiver, these parts are made as follows: The inlet end of the receiver is provided with an inlet passage or opening, which is surrounded by a flange 60, to which is bolted a flange 61 on an elbow 62. Said elbow is provided at its outer end with a flange 63 to which is secured a valve casing 64 connecting the elbow with an inlet pipe 65 which leads to the receiver from the various parts of the building on which the pneumatic cleansing devices are to be used. Within the receiver 1, adjacent to its inlet end, is located a cylindric shell or casing 69, which is arranged horizontally and transversely of the receiver, open at its ends and perforated or apertured in its lower part, as indicated at 80. Said casing will be so arranged with respect to the water level in the receiver, that the casing will be nearly or wholly submerged, and therefore, fully or nearly filled with water. To the lower flange 61 of the elbow 62 is bolted a flange 66 formed upon a centrally arranged tubular member 67, attached to the central part of the casing 69, and extending at right angles to the same. The open ends of said shell 69 are located near the inner surfaces of the sides of the receiver, while the central member 67 extends longitudinally of the receiver, and the flange 66 on its outer end is secured to the flange 61 within the inlet opening in the end of the receiver. In said cylindric casing 69 are located a plurality of rotative agitator blades 70 carried by a transverse, horizontal shaft 71, which extends centrally through said casing and rotates in bearings 72 mounted upon the sides of the receiver. Said shaft is provided outside of the receiver with a pulley 73 driven by a belt 74 that is trained around a pulley 75 upon the shaft of the electric motor. When in operation, the agitator blades pass through or operate in the water contained in said casing. The agitator blades 70 are preferably arranged obliquely, with the blades of the alternate annular sets in reversed relation, so that, while the blades of each annular set act like propeller blades to move or impel the water in the casing in a direction endwise of the same, the blades of adjacent sets will act in opposite directions, this construction being used to increase the agitation of the water resulting from the rotation of the blades. As the air is drawn into the receiver from the pipe 65, it enters the central part of the casing 69, and passing in both directions from its center toward its open ends, passes from the latter into the air space in the upper part of the receiver. The effect of the

agitator blades, when rotated, is to continually agitate the water, and, bring it into intimate contact with the air drawn in from the suction pipe in the form of drops or spray. The air is thereby thoroughly cleansed of dust and solid refuse, which latter is mixed with and deposited in the water and accumulates in the bottom of the receiver.

It is necessary from time to time to discharge from the receiver the water therein when the latter becomes unduly ladened with dust and refuse separated from the air. To effect this, water from a suitable source of supply is admitted into a pipe 59 extending horizontally of the receiver, within the same. Said pipe is shown as extending through the end wall of the receiver, at the outlet end of the latter, and as supported by a bracket 76 from the top of the receiver. To said pipe 59 are connected depending flexible tubes 77 of rubber or the like and to the lower end of each of said tubes is connected a rotary sprinkler 78. Each sprinkler 78 consists of a plurality of hollow arms, attached to and radiating from a hollow hub, mounted to rotate on a terminal metal piece on the lower end of the flexible tube, said arms having laterally directed discharge or jet openings 79. The jets of water issuing from said jet openings operate by reaction to produce rotative motion in the arms of the sprinklers, in a well known manner. Said sprinklers are located near the bottom of the receiver, so that they are immersed in the body of water therein contained. When water under pressure is admitted to said pipe 59, it emerges with considerable force through the jet openings 79 of the sprinklers, thereby not only producing rotary motion in the same, but acting to thoroughly agitate the water and stir up the mud or deposits in the bottom of the receiver. This agitation of the water and mud is increased by the shaking motion imparted to the flexible hose itself from the back pressure of the jets of water issuing from the jet openings 79. The pipe 59 is also provided with depending branch pipes 81, the lower ends of which are provided with jet openings or nozzles directed downwardly and toward the discharge end of the container. The receiver is provided at such discharge end with a discharge outlet 94^b, located at the level of the bottom wall of the said receiver for the discharge of the mud or the muddy water therefrom. The bottom wall of the receiver is preferably sloped or inclined toward said outlet, in order to facilitate the drainage of water from the receiver. A discharge pipe 94^c will be connected with said outlet 94^b, and will lead to a sewer or other place of discharge.

The apparatus is designed to be used in connection with vacuum operated scrubbing appliances of that kind in which water used for cleansing is drawn from a floor which is being scrubbed through the action of the vacuum created in the pipe 65, when the air pump is acting as an exhaust pump to produce a partial vacuum in the receiver. In such case the continued operations of scrubbing and drawing in the water will result in the accumulation of water in the receiver, and, if such accumulation be allowed to unduly continue, the water will fill the receiver and will rise into the pump cylinder. To avoid the possibility of this taking place, there is provided a liquid delivery pump embracing a pump-cylinder 82 attached to the side wall of the receiver and communicating with the interior of the same by a conduit 83 having a depending branch 84 and an upwardly extending branch 85; the latter having an opening at its upper end adapted to be closed by a valve 86. Said valve is operated by a handle 87 attached to the upper end of a valve stem that is attached to the valve and extends upwardly through the top wall of the receiver. In said pump cylinder reciprocates a plunger 88 connected by a rod 89 with a crank-pin 90 carried by the transverse shaft 6. The discharge opening of the pump cylinder is connected by a pipe 91 with the casing of a check-valve 92 and the latter is connected with a pipe 93 with which is connected two branch pipes 96 and 94^a. The pipe 94^a leads to the waste pipe 94^b and is provided with a hand-operated valve 94. The branch 96 is provided with a hand-operated valve 95 and is connected with distributing pipes that lead to various points in the building. In the ordinary operation of the apparatus, except as hereinafter described, the valve 86 is kept open with the effect that, so long as the level of the water in the receiver remains below the top of the conduit 83, no action of the liquid pump takes place, but, when the level of the water in the receiver rises, by the accumulation due to scrubbing, above the top of the upwardly extending branch 85 of the conduit 83, the plunger 88 pumps out a part of the water and discharges it through the check-valve 92 and into the sewer.

It is sometimes desirable to distribute a disinfectant liquid within a building. For this purpose the reservoir is filled through the pipe 59 with the disinfectant liquid to a sufficient level as is indicated in Fig. 12. The valve 86 is then closed, the valve 94 is closed and the valve 95 in the pipe 96 is opened. When the pump 88 is put into operation, the disinfecting liquid is drawn from the receiver through the open depending branch 84 of the conduit 83 and is forced through the pipe 96, from which it will be carried through the distributing pipes to various points in the building where it is

desired to use the same. Such disinfecting liquid, after being used on floors and the like, may be drawn up or collected by the use of suction devices which are placed in communication with pipes in the building, that are connected with the return pipe 65. The disinfecting liquid returned by the pipe 65 to the receiver may be again pumped from the same and used over and over again, so long as necessary.

97 indicates a pipe leading from a source of supply of compressed air such as a separate air pump and connected with the pipe 96. Said pipe 97 is controlled by a hand-operated valve 98. By this means compressed air can be supplied when desired to the pipe 96, which, as before stated, is connected with distributing pipes leading to various parts of the building.

99 indicates a pipe connected with the pipe 96 and supplied with water from a city main. Said pipe 99 is controlled by a valve 100. A pipe 101, controlled by a valve 102 connects the pipe 96 with the pipe 65.

After distributing a disinfectant liquid, or plain water from the pipe 99 through the pipe 96 and the distributing pipes connected therewith, it will be necessary to thoroughly dry the pipes containing the liquid, in order that if, on the next operation, compressed air be delivered through the same pipes, no water may be thereby discharged upon the floors, furniture or other objects. To effect this result, each time that the pipe 96 has been used for distributing disinfectant liquid or water, the valves 98 and 100 are closed and the valve 102 is opened and the air-pump put in operation as a suction pump, the effect being to draw air backward through the pipe 96, and pipe 101 to the receiver, thus thoroughly drying said pipe 96 and the distributing pipes by means of the air drawn backwardly through the same.

The pipe 96 constitutes the pipe through which compressed air will be delivered when the same is desired for use in cleaning such objects as cannot well be cleaned by the use of vacuum devices. For using compressed air, the water will be discharged from the receiver and the valve of the air pump reversed, so that said air pump will operate to deliver air to said receiver. The air compressed in the receiver will then be allowed to pass from the same through the pipes 65 and 101 to the pipe 96 and delivered from the same through the distributing pipes to desired points in the building. The valve 95 in said pipe 96 at this time will be closed and the valve 102 open. When water from the city mains is to be used for cleansing, the valves 95 and 102 will be closed, and the valve 100 in the water supply pipe 99, opened, thus admitting water instead of compressed air to the pipe 97 for distribution to the different parts of the building. At this time the air pump may be operated as an exhaust pump, so that the water used may be sucked up by vacuum operated cleansing or scrubbing devices and drawn back into the receiver through the return pipe 65.

If air be supplied to the pipe 96 from the pipe 97, receiving its supply of air under pressure from a separate air-pump or some other source of supply, the compressed air will be distributed to the various parts of the building through the distributing pipes connected with said pipe 96, and the dust dislodged from the objects being cleansed by the action of the compressed air, may be drawn up or collected by vacuum operating cleansing devices, connected with the return pipe 65, and returned thereto to the receptacle of the apparatus; the air pump in this operation being operated to exhaust the air from the receiver, and the valves 95 and 102 being closed.

By the employment of the several features and combinations of parts hereinbefore described, I am enabled to obtain results and advantages as follows: By reason of the employment of an air pump provided with a valve which is reversible so that the pump is convertible into either an exhaust pump or a compressor, the apparatus may be used in connection with cleaning devices operating either by suction or by air-pressure. By the use of the air pump acting to exhaust air from the receiver, in connection with a pipe furnishing air under pressure from a separate source of air supply, air under pressure may be supplied for the purpose of dislodging dust from articles by the action of an air blast while at the same time, air may be exhausted from pipes with which are connected cleaning devices that are operated to deliver to the receiving chamber the dust so dislodged.

By the use of the features of construction described in the device for separating the dust from the air, the dust is positively and certainly separated from the air and mixed with and deposited in the body of water in the receiver, and by the employment of the automatically acting liquid pump, and water jet appliances, surplus water is discharged from the receiver and the mud or accumulated deposits in the receiver discharged from the latter when necessary. By the connection of a water supply pipe with the pipe leading to the places to be cleaned, in connection with the receiver and air-pump when operating as an exhaust pump, water used for scrubbing may be returned to the apparatus through the return pipe connected with the receiver, so that vacuum operated cleaning devices and scrubbing appliances can be used simultaneously. By the use of the liquid pump and its delivery pipe, in

connection with the air pump acting as an exhaust pump, a disinfecting liquid can be delivered to various points in a building; and such liquid returned through the return pipe to the receiver. By the employment, in connection with the receiver of a liquid pump adapted to withdraw water from the receiver after a certain quantity has been delivered thereto, and providing said pump with two valved discharge pipes, one leading to a waste pipe and the other to the distributing pipes in the building, the same pump may be used for removing an excess of water from the receiver and for delivering a disinfecting fluid from the same to the distributing pipe. Moreover, the employment of a receiver adapted to contain a body of water, together with an air pump adapted to compress the air into the receiver, and also exhaust air therefrom, and means for mixing the dust with the water in the receiver and for discharging the water therefrom when desired, enables the same apparatus to be used at one time for furnishing air under pressure to cleansing devices and at another time to receive and dispose of the dust and dirt gathered by the action of vacuum operated cleaning devices.

The main features of the apparatus herein illustrated, embracing a receiver, an air-pump adapted for both exhaustion and compression, and a liquid-pump connected for removing water from the receiver, constitute the subject of my application, Serial No. 459,945, filed October 28, 1908, of which this application constitutes a division.

The features of construction in the air-pump illustrated form the subject-matter of the separate application Serial No. 623,293, hereinbefore referred to, which also constitutes a division of said application, Serial Number 459,945.

The features illustrated in the accompanying drawings and herein described, whereby accumulated dust or refuse may be mixed with and deposited in the body of water contained in the receiver of the apparatus, and said water and the dust or refuse may be removed or discharged from said receiver, constitutes the subject of a separate application, Serial Number 640,967, filed by me July 28th, 1911, as another division of said application, Serial Number 459,945.

It is to be understood that an apparatus embodying the general features of construction hereinbefore set forth may be variously modified without departure from my invention, and I do not, therefore, desire to be limited to the specific features of construction illustrated in the accompanying drawings, except so far as the same may be specifically claimed in the appended claims.

I claim as my invention:

1. In a pneumatic cleansing apparatus, the combination of a receiver, an exhaust pump connected with the receiver, an air return pipe connected with the inlet passage of the receiver, a delivery pipe, and a pipe supplying compressed air from a separate source of supply connected with said delivery pipe and provided with a valve, whereby the apparatus is adapted for operating both air pressure and vacuum operated cleansing appliances.

2. In a pneumatic cleansing apparatus, the combination of a receiver, a convertible air exhaust and compression pump connected by a passage with the receiver, return and air delivery pipes connected with the receiver and a pipe supplying air under pressure from a separate source of air supply connected with the air delivery pipe, and valves controlling said pipes, whereby the apparatus may be employed to operate either separately or simultaneously, vacuum and air-pressure cleansing devices.

3. In a pneumatic cleansing apparatus, the combination of a receiver, an exhaust pump connected with the receiver, an air return pipe connected with the inlet passage of the receiver, a delivery pipe, and a pipe supplying water under pressure, connected with said delivery pipe, whereby the apparatus is adapted for operating vacuum operated cleansing appliances, or water may be supplied for scrubbing.

4. In a pneumatic cleansing apparatus, the combination of a receiver, a convertible air exhaust and compression pump, connected by a passage with the receiver, delivery and return pipes connected with the receiver, a pipe supplying water to said delivery pipe, and valves controlling said pipes, whereby the apparatus may be used for operating either pressure operating cleansing appliances or vacuum operating cleansing appliances, or water may be supplied for scrubbing.

5. In a pneumatic cleansing apparatus, the combination of a receiver, a convertible air exhaust and compression pump connected with the said receiver, a return pipe connected with the inlet of said receiver, means for supplying water to said receiver, a liquid pump having its inlet passage connected with the receiver, a delivery pipe leading from the discharge passage of said liquid pump, means for actuating said air and liquid pumps, an air pipe connected with said delivery pipe and communicating with the receiver, and valves in said delivery and air pipes, whereby liquid may be supplied through said delivery pipe at the same time that air is exhausted from the return pipe, or air under pressure may be supplied through said delivery pipe.

6. In a pneumatic cleansing apparatus, the combination of a receiver, an exhaust pump connected with the said receiver, a return pipe connected with the inlet of said

receiver, a liquid pump having its inlet passage connected with the receiver, a delivery pipe leading from the discharge passage of said liquid pump, means for actuating said air and liquid pumps, a pipe supplying compressed air from a separate source of supply connected with said delivery pipe, and valves in said delivery and air supply pipes, whereby either compressed air or liquid from the receiver may be delivered through said delivery pipe, and a partial vacuum maintained in the said return pipe.

7. In a pneumatic cleansing apparatus, the combination of a receiver, an exhaust pump connected with said receiver, a return pipe connected with the inlet of the receiver, a liquid pump having its inlet passage connected with the receiver, a delivery pipe leading from the discharge passage of said liquid pump, means for actuating said air and liquid pumps, a water supply pipe connected with said delivery pipe, and valves in said pipes, whereby liquid may be delivered to said delivery pipe from the receiver or from the water supply pipe, and a partial vacuum may be maintained in said return pipe.

8. In a pneumatic cleansing apparatus, the combination of a receiver, a convertible air-exhaust and compression pump connected with the said receiver, a return pipe connected with the inlet of the receiver, a liquid pump having its inlet passage connected with the receiver, a delivery pipe connected with the outlet of said liquid pump, an air pipe connected with said delivery pipe and communicating with the receiver, a water supply pipe connected with said delivery pipe, an air supply pipe receiving compressed air from a separate source of supply, connected with said delivery pipe, and valves in said pipes, whereby either liquid from the receiver or water may be supplied to the delivery pipe, and a partial vacuum maintained in the return pipe, or compressed air may be delivered through said delivery pipe.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses this 21st day of November, A. D. 1911.

ALBERT E. MOORHEAD.

Witnesses:
GEO. R. WILKINS,
T. H. ALFREDS.