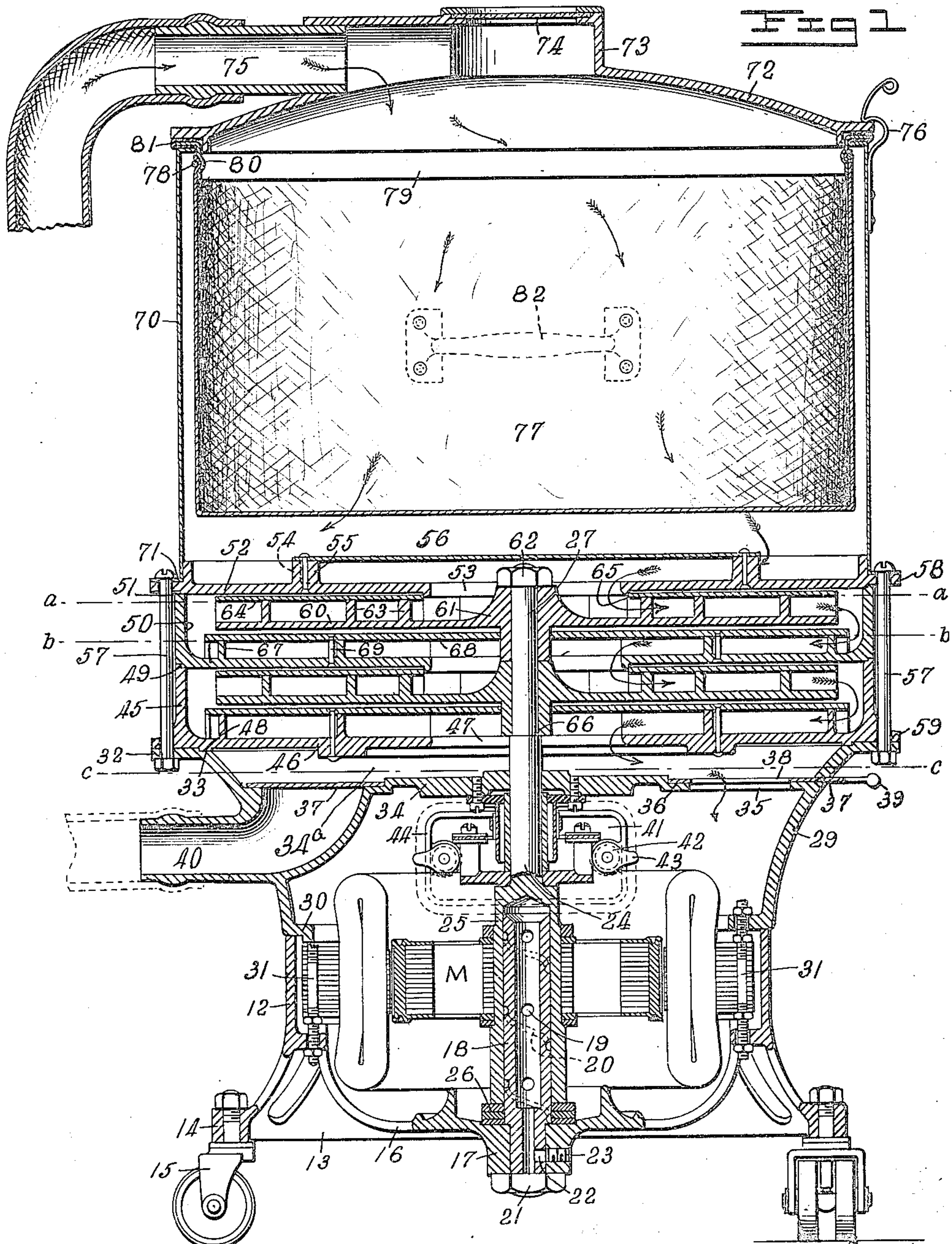


993,985.

C. E. HARKER.  
PNEUMATIC PUMPING MACHINE.  
APPLICATION FILED SEPT. 7, 1909.

Patented May 30, 1911

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

Fig 2

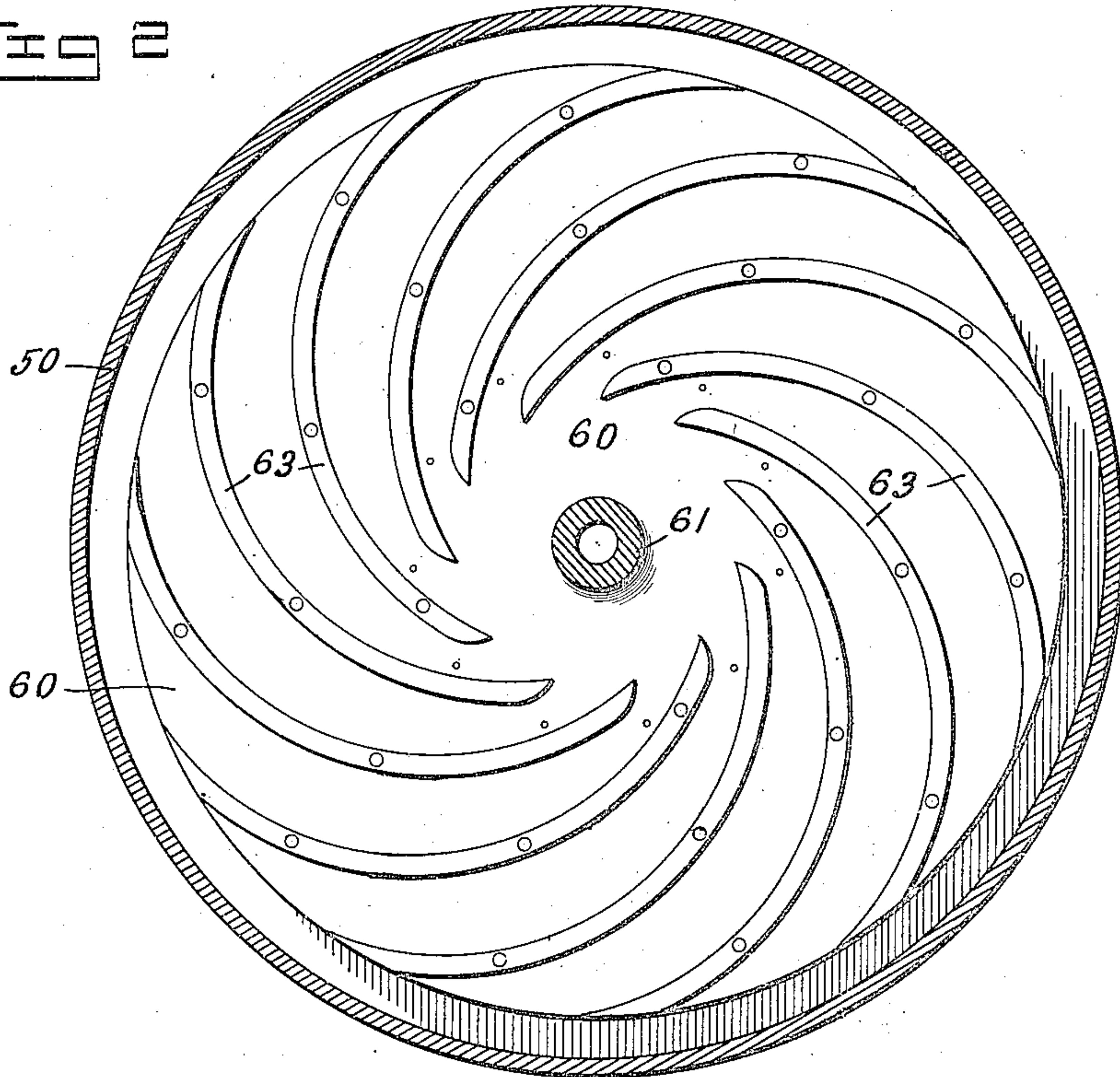
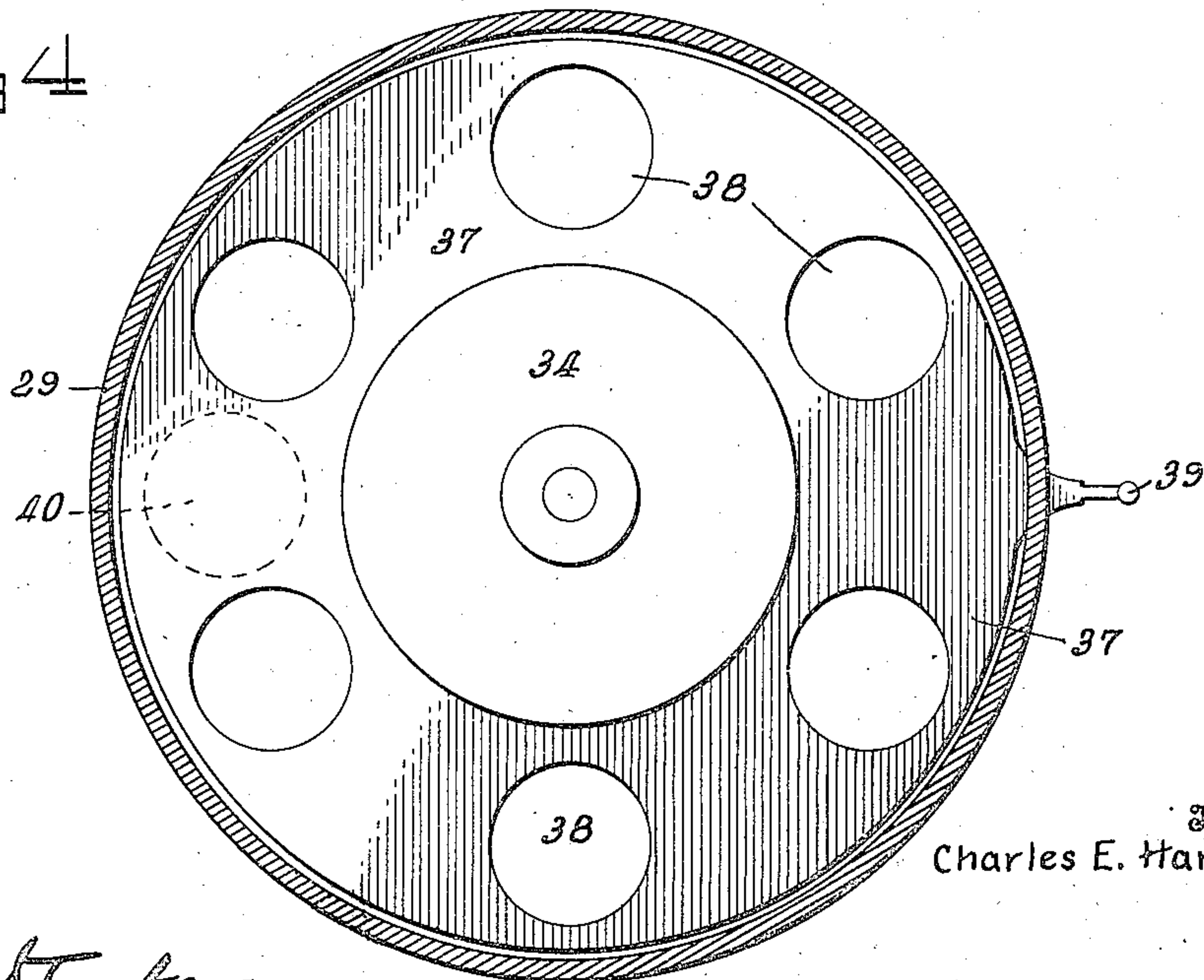


Fig 4



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4 SHEETS—SHEET 3.

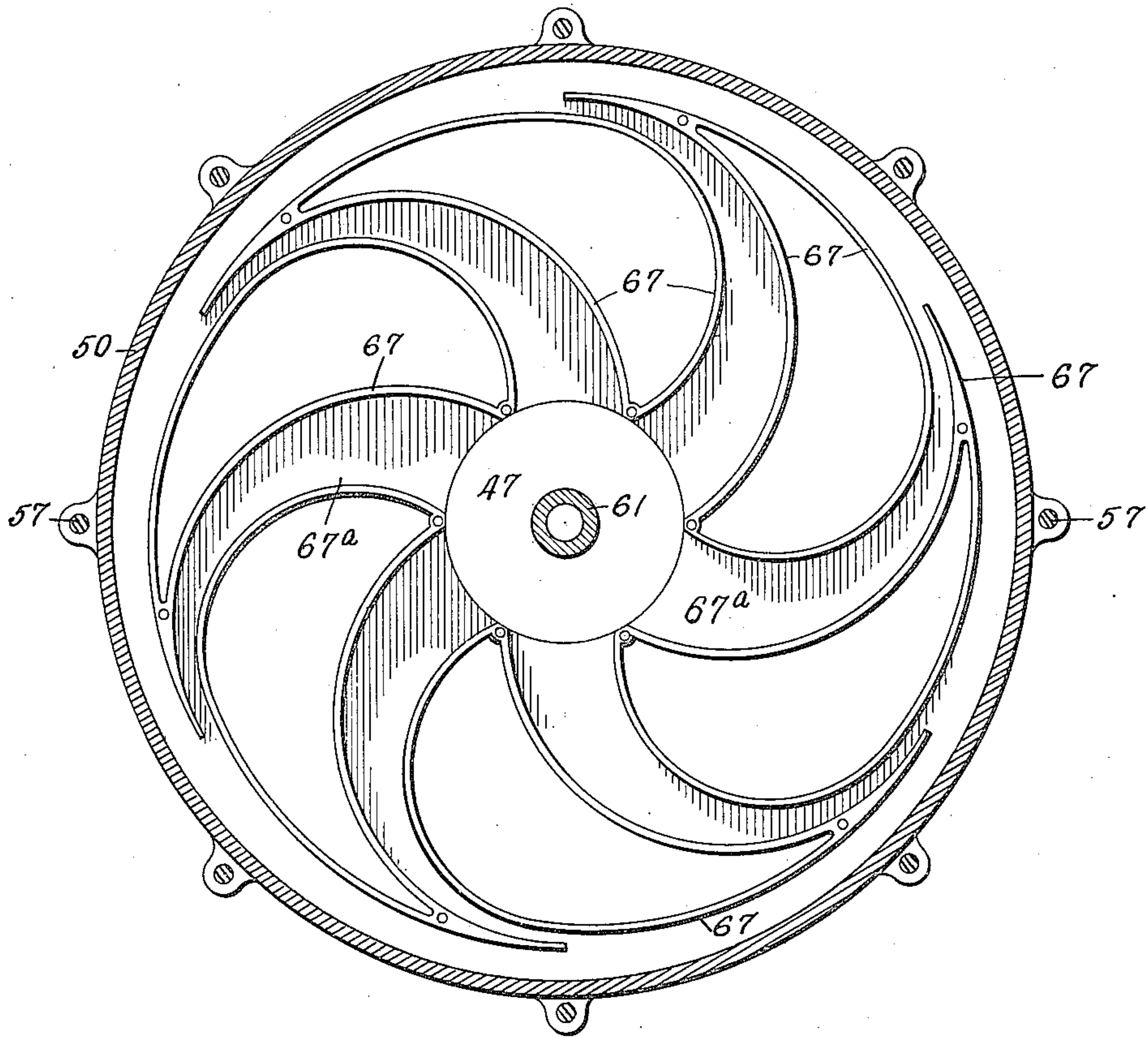


Fig. 3

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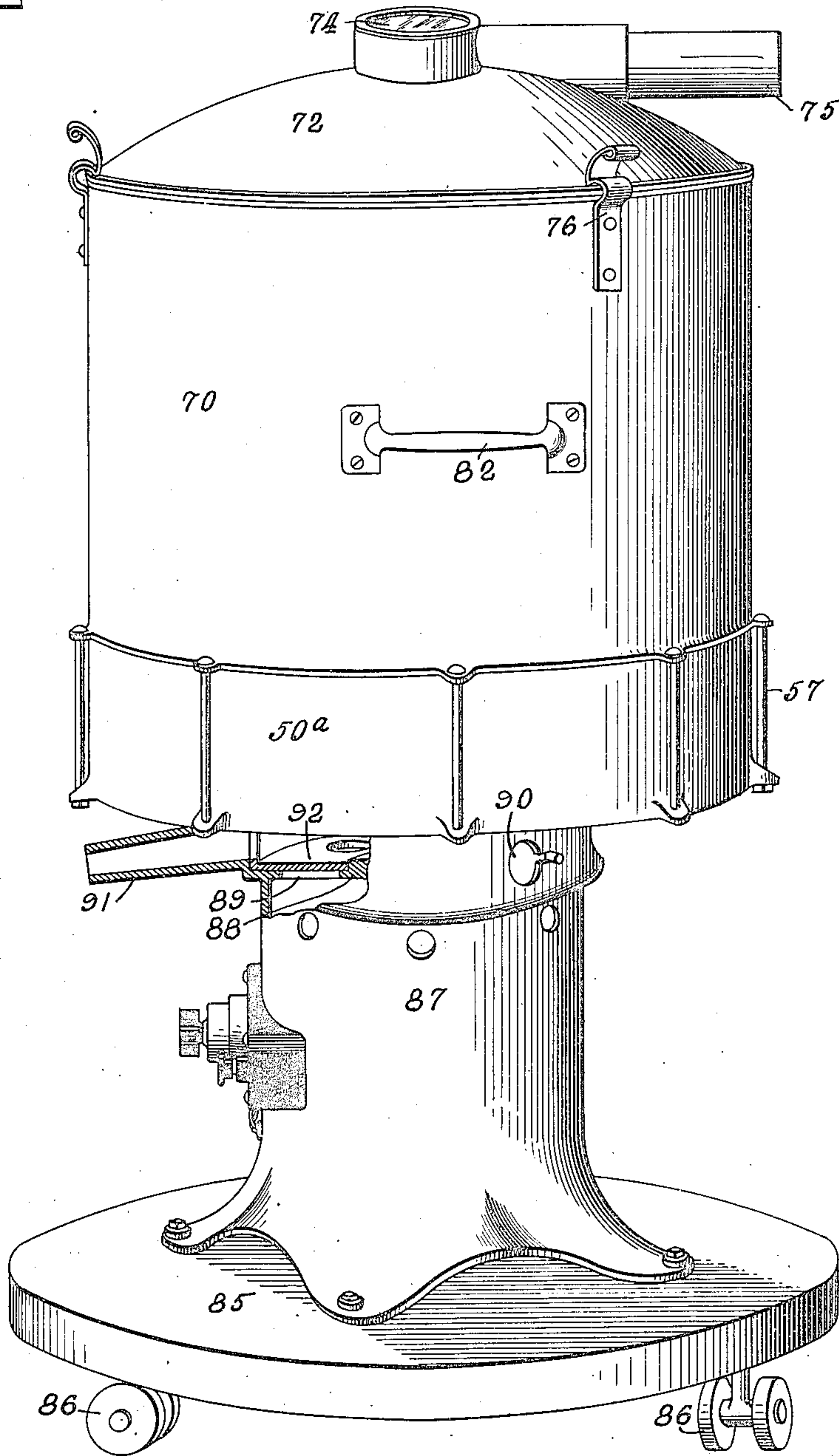
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4 SHEETS—SHEET 4.

FIG. 5



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# UNITED STATES PATENT OFFICE.

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## PNEUMATIC PUMPING-MACHINE.

993,985.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed September 7, 1909. Serial No. 516,545.

*To all whom it may concern:*

Be it known that I, CHARLES EDWARD HARKER, a citizen of the United States, residing at Parnassus, in the county of Westmoreland and State of Pennsylvania, have invented new and useful Improvements in Pneumatic Pumping-Machines, of which the following is a specification.

My present invention relates to certain new and useful improvements in pneumatic renovating machines more especially designed for household use, and it has for its chief objects to provide an apparatus of this character that will be light and simple in construction, compact in the organization and arrangement of its parts, and highly efficient in operation.

The machine belongs to that type of pneumatic renovators wherein the cleaning is effected by means of a suitable tool having a suction mouth which is designed to be moved over the surface to be cleaned, said tool being attached to the free end of a conduit which has communication with the renovating machine, the latter comprising essentially a suction creating device, a motor for driving the same and a dust collector into which the dust-laden air is delivered.

One of the prime objects of the present invention is to provide a comparatively small, light and compact machine of high efficiency as compared to its size, especially adapted for household use and capable of being easily moved about from place to place as desired.

Another and important object of the invention is to provide, in a machine of the character described, for converting the suction creating means from a single to a multiple stage arrangement of fans, whereby to increase the efficiency of the machine without in any way altering the construction or organization of the other parts of the apparatus.

Still another purpose of the invention is to provide means for converting the machine from a suction apparatus to a blower, whereby dirt and dust accumulations may be dislodged from places inaccessible with a cleaning tool, provision also being made for conveying the air currents from the fan through the motor to cool the same when the machine is used as a suction apparatus.

The invention has in view other more or

less important objects which will be made apparent in the accompanying detailed description of the machine when taken in connection with the accompanying drawings.

In the accompanying drawings which are illustrative of a preferred embodiment of the invention, and of a modification, Figure 1 is a vertical section taken centrally through a complete machine. Fig. 2 is a horizontal section taken on the line *a-a* of Fig. 1. Fig. 3 is a horizontal section taken on the line *b-b* of Fig. 1. Fig. 4 is a similar section taken on the line *c-c* of Fig. 1. Fig. 5 is a perspective view, partially in vertical section of a slightly different form of the invention.

Referring to the drawing, Fig. 1, the reference numeral 12, designates the supporting base of the machine, which in the instance shown is a metal casting in ring form having integral therewith a depending skirt 13, provided at suitable equidistant points with outstanding apertured lugs 14, constituting bearings for the rollers or casters 15. The skirt 13 is provided with openings for a purpose presently to be explained. Arranged centrally within the said skirt and supported therefrom by spider-arm 16, is a bearing-block 17, carrying a vertical and non-rotatable, open-ended oil-sleeve 18, having perforations 19, and peripheral spiral grooves 20, said sleeve being removably secured to the bearing block by means of a nut 21. Oil is introduced into the sleeve 18, through a lateral opening 22, at its lower end, which opening is closed by a screw-plug 23, tapped in an opening in the bearing block.

The reference letter M designates an electric motor which in the instance shown is of the well known induction type, and has its shaft 24, disposed vertically, the lower portion 25, of the shaft being bored out and fitting rotatively upon the vertical oil sleeve 18, and its extreme lower end being supported upon bearing rings or washers 26, which surround the oil sleeve 18, and rest upon the bearing-block 17. The motor shaft has a vertical extension 27, upon which is mounted one or more fan members, presently to be described.

Resting upon the upper marginal edge of the supporting ring 12, is a casing member 29, preferably, but not necessarily made up-



wardly flaring and having at its lower end an inwardly extending flange 30, through which and through a corresponding flange on the skirt 13, are passed bolts 31, whereby the said casing member is firmly secured to the base-ring 12. At its upper end the casing member 29, is provided with an outstanding flange or projection 32, and an annular seat 33, and between the upper and lower ends of said member 29, is a horizontal web or partition 34, provided with a central opening through which the motor shaft passes, and with an annular series of openings 35, for a purpose presently to be explained. The partition 34 is provided with an annular seat 36, upon which rests a rotatable damper ring or cut-off 37, provided with a series of openings 38, corresponding in number and arrangement with the openings 35, in the partition. The damper ring 37 may be rotated to a position to close the openings in the partition, or to a position to bring the openings therein in register with those in the partition and to accomplish this I provide the ring with an arm 39, which projects through a slot in the wall of the casing member 29. A spout 40 projects laterally from a wall of the casing member and has its inner open end terminating in the plane of the web or partition, whereby said end of the spout may be opened or closed as desired by an imperforate portion of the damper ring. The projecting end of the spout is adapted to receive a flexible hose (not shown) to be used when the machine is operated as a blower to dislodge dirt or dust accumulations from inaccessible places, and when so used it will be understood that an opening in the damper ring will be brought to register with the inlet end of the spout, while the other openings in the web or partition 34, will be closed. When, on the other hand, the machine is used as a pneumatic cleaner in the manner presently to be described, the damper ring will be brought to a position where the opening in the spout 40 will be closed and the openings in the web or partition open. In this position of the damper the exhaust from the fan or fans will pass through the annular series of openings 35, in the web or partition 34, into direct contact with the electric motor M, and thus serve to keep the motor cool during the operation of the machine.

The casing member 29, is provided in its side with an inspection opening closed by a removable closure plate 41, carrying two rotatable turn-buttons 42, each of which has a lateral portion 43, adapted to be brought to a position where it will overlie a flange 44, on the interior of the casing member around the said inspection opening. The closure plate 41 may be removed when desired in order to gain access to parts of the motor.

Located above and supported upon the marginal flange 32 of the casing member 29, is the fan casing or fan casings, as the case may be, provision being made for employing one or more fans according to the efficiency or suction pull desired, two being shown in the present instance, although it will be understood that a greater or a lesser number of units may be employed as desired. The lowermost unit of the fan casing consists of an annular ring 45 provided with a bottom 46, having a central opening 47, through which the motor shaft extension passes said opening being considerably larger than the shaft as shown. The bottom portion 46, of the said unit is provided with an annular rib 48, that takes into the annular seat 33, formed in the casing member, and the upper marginal edge of the unit is stepped, as at 49, as shown, to take into or receive the corresponding stepped lower portion of a superposed fan-casing unit 50. There may be employed as many units 50, as desired, depending upon the suction efficiency required and these units may be added or taken away at will. Supported upon the upper stepped edge 51 of the unit 50 is a cover ring or annulus 52, having the enlarged central opening 53, concentric with the motor shaft, said opening constituting the inlet to the uppermost fan casing or first fan stage if more than one fan is employed. The cover ring 52 is provided with a vertically extending marginal flange 54, and with a plurality of upstanding lugs 55, to which latter is secured a plate or disk 56 that is spaced above, but overlies the central inlet opening 53 to the fan. The several members or units of the fan casing or casings are clamped or held together by means of bolts 57, passing through apertures in the flanged or lug portions 58 and 59 of the upper and lower members 52, and 45, respectively.

Rotatably arranged within each fan casing is a fan consisting of a disk 60, having a hub 61, through which the motor shaft passes and to which the hub is fixed as by means of a nut 62, on the threaded end of said shaft. The disk 60 has attached to one face thereof a plurality of curved vanes 63, arranged as shown in Fig. 2, and over said vanes is placed a ring or annulus 64, the central opening 65, of which registers with the inlet 53, in the annulus 52. In case two fans are employed, as in the instance shown, the adjacent ends of the hubs abut one another, while the lower end of the lowermost hub rests upon a shoulder 66, formed on the motor shaft. In some instances I prefer to employ in connection with each fan, a plurality of stationary pressure increasing vanes 67, which in the instance shown, are attached to the bottom of each fan casing or unit, said vanes being covered by a disk 68 se-



cured in place by means of rivets 69. The employment of the pressure increasing vanes is of course optional in this type of machine, but I prefer to embody them in the construction as it has been found from practice that they greatly increase the efficiency of the machine due to an increase in the suction pull of the fan.

Located above the fan is a dust collector consisting of an imperforate cylinder 70 having a flange 71, at its lower end resting upon and bolted to the flange 58, of the ring or annulus 52. Removably supported upon the upper end of the cylinder is a cover 72, having a dome 73, provided with a sight opening having a transparent window 74, through which the inrush of dust-laden air may be inspected, as desired. Projecting from one side of the dome 73, is a spout 75, to which the end of a flexible hose may be attached, the said hose carrying at its free end some form of cleaning tool (not shown) having a suction mouth as is usual in machines of this type. The cover 72, may be held in place in any preferred way, as by a plurality of spring clips 76, attached to the outside of the cylinder 72, and having their free ends engaging the marginal edge of the cover, as shown in Fig. 1.

Arranged within the cylinder 72 is a removable dust collecting bag or sack 77, secured at its upper end by means of a cord or wire 78, to a flanged ring 79, the vertical or depending portion of which is grooved, as at 80, to receive the cord or wire 78, and the horizontal portion of which has a coating or covering of packing material 81, whereby a close and air-tight joint may be made between the cover and cylindrical casing.

Handles 82 are secured to opposite sides of the cylinder 72, to enable the machine to be readily carried, one of said handles being shown in dotted lines in Fig. 1.

When the machine is to be used as a suction cleaner its operation is as follows:— Let it be assumed that a flexible hose having a cleaning tool provided with a suction mouth, is coupled to the spout projecting from the cover plate and the motor is started causing the fan or fans to rotate. This will effect a suction pull through the said flexible pipe. As the cleaning tool on the end of this pipe is moved over the surface to be cleaned, the dust-laden air will be pulled or sucked in great volume through the pipe and pass on until it enters the dust collecting or filtering sack or bag 77, where the air will be filtered leaving the dust and dirt in the said collector. The disk or plate 56, is employed to prevent the dust collecting bag 77, from interfering with or closing the opening 53, leading to the fan, it being understood that the air current enters beneath the disk or plate. The filtered air discharging from the fan passes through the annular series of

registering openings 35 and 38 in the partition 34 and damper ring 37, respectively, into direct contact with the motor, and thus tends to reduce the temperature of the latter, it being understood that the motor has a tendency to heat up during operation. When it is desired to remove the dust and dirt accumulations from the sack or bag 77, the cover 72 is taken off and the bag lifted out of the cylindrical casing and emptied.

When the machine is to be employed as a blower to dislodge dust and dirt accumulations from inaccessible places, the flexible hose is removed from the spout 75, and attached to the spout 40, and the damper ring is rotated so as to close the annular series of openings 35, and open the single opening leading to the spout 40. When the parts are in this position it will be apparent that if the motor is started the air current produced by the fan will be forced through the spout 40, and the pipe or hose attached thereto, in a single stream, which stream may be directed in any direction desired to remove dust and dirt accumulations.

In Fig. 5 I have illustrated a slightly modified form of the invention which however operates in the same manner as the form previously described. In said figure the reference numeral 85 designates a base or platform mounted upon rollers 86. Secured to and rising upward from the base is a hollow casing 87, within which the motor is housed, said casing being provided near its upper end with a transverse web or partition 88, having an annular series of perforations 89, and the sides of the casing being also provided with an annular series of openings 90. An outlet spout 91, corresponding to the spout 40, Fig. 1, projects from one side of the casing and a rotatable damper or cut-off ring 92, is provided to alternately cut off the opening through the spout 91, and the perforations 89, in the web or partition 88. The said ring 92 has a vertical and horizontal portion formed integral, each portion being provided with an annular series of perforations, designed and spaced to effect the operations described. As before stated, the operation of the form of machine illustrated in Fig. 5 is the same as that illustrated in Fig. 1. Supported upon the hollow casing 87, is the fan casing 50<sup>a</sup>, above which is the dust collector cylinder 70, having the removable cover 72 provided with the transparent sight opening 74, and spout 75, all as in the form of machine heretofore described.

What I claim is,—

1. A pneumatic renovator comprising a base, a horizontally disposed motor supported by said base and having a vertically extending shaft, a horizontally disposed fan on said shaft, a fan casing, an outlet spout projecting from said casing, means for di-



recting the flow of air from the fan either through the said spout or against the motor, a container supported upon the fan casing, and an inlet to said container adapted to receive an air conduit.

2. A pneumatic renovator, comprising a base, a motor supported thereon, a fan on the motor shaft, a fan casing, an outlet spout projecting from the fan casing, a container in line with the fan casing, an inlet to said container adapted to receive an air conduit, and means for at will directing the flow of air from the fan through either the said spout or through the motor.

3. A pneumatic renovator comprising a hollow base, an electric motor supported therein and having a vertically extending shaft, a horizontal web or partition above the motor having a plurality of openings, an outlet spout having its entrance end in the plane of said web or partition, a damper for at will controlling the flow of air through said spout and openings, a fan on the motor shaft, a fan casing, a container above the fan casing, and an air inlet leading into said container.

4. A pneumatic renovating machine comprising a chamber, a suction conduit opening into said chamber, a fan for drawing air through the chamber from the suction conduit, a suction opening from the fan to the chamber, a pressure chamber into which said fan discharges, a pressure outlet leading therefrom wherefrom air may be had for pressure cleaning, a motor for driving said fan, a casing for the same, and an opening from the motor casing to the pressure chamber whereby air may circulate from said pressure chamber through said motor casing.

5. In a pneumatic renovating machine, a chamber, a suction conduit opening into said chamber, a fan for drawing air through the chamber from the suction conduit and for placing the air under pressure after passing through the chamber, a suction opening from the fan to the chamber, a pressure chamber in which said fan discharges, and two discharging openings leading from said chamber, one of said openings leading directly to the open air, and the other being a pressure opening, and a pressure conduit leading from said opening wherefrom air under pressure may be had for cleaning.

6. In combination, a base casing, a rotary motor in the bottom of said casing, the rotary element of which lies in and rotates in a horizontal plane and the shaft of which is vertically extended, a diaphragm in said casing above the motor, a pressure chamber above the diaphragm surrounding said shaft, a fan casing attached to the top of said base casing, fan blades within said fan casing driven by the motor shaft, an opening from the fan casing to said pressure chamber, an opening from the pressure chamber to a

pressure conduit, and an opening from the pressure chamber to the motor chamber in the bottom of said casing.

7. In combination, a base casing, a rotary motor in the bottom of said casing, the rotary element of which lies in and rotates in a horizontal plane and the shaft of which is vertically extended, a diaphragm in said casing above the motor, a pressure chamber above the diaphragm surrounding said shaft, a fan casing attached to the top of said base casing, fan blades within said fan casing driven by the motor shaft, an opening from the fan casing to said pressure chamber, an opening from the pressure chamber to a pressure conduit, an opening from the pressure chamber to the motor chamber in the bottom of said casing, and means controlling said last two openings to admit air to the pressure conduit or the motor chamber at will.

8. In combination, a base casing, an electric motor element in a horizontal plane in the lowermost part of said casing, a shaft associated with said element which extends centrally and vertically of said casing and beyond its upper end, a diaphragm near the top of said casing through which said shaft passes, a plurality of openings in said diaphragm disposed on an arc of a circle concentric to said shaft, a closure for the same also mounted concentric with respect to the shaft, a fan casing concentric with said shaft secured to the top of said base casing, fan blades within said casing mounted on the motor shaft, a fan inlet chamber concentric with the motor shaft mounted on the top of said fan casing, a distributor plate beyond the end of said shaft, concentric openings between the fan chamber and the pressure chamber and between the inlet chamber and the fan chamber, and an inlet opening located concentric of said shaft at the top of said inlet chamber.

9. In combination, a base casing, an electric motor element in a horizontal plane in the lowermost part of said casing, a shaft associated with said element which extends centrally and vertically to said casing and beyond its upper end, a diaphragm near the top of said casing through which said shaft passes and which defines a pressure chamber at the top of said casing, an opening in said diaphragm to the motor chamber, a fan casing concentric with said shaft secured to the top of said base casing, fan blades within said casing mounted on said motor shaft, a fan inlet chamber concentric with the motor shaft mounted on the top of said fan casing, a distributor plate beyond the end of said shaft, an opening between the fan chamber and pressure chamber and between the inlet chamber and the fan chamber, and an inlet opening located at the top of said inlet chamber.



10. In an air pump, a casing, a motor chamber, and an air chamber within said casing, a fan which discharges air into said air chamber, a partition between the motor and air chambers, a pressure conduit leading from said air chamber, and an opening from the air chamber communicating with said motor chamber.

11. In an air pump, a casing, a motor chamber, an air chamber within said casing, a fan which discharges air into said air chamber, a partition between the motor and air chambers, a plurality of openings in said partition, and a conduit leading from one of said openings to the outside of said casing, the remainder of said openings communicating with the motor chamber.

12. In an air pump, a casing, a motor chamber within said casing, a rotary motor mounted therein, the rotary element of said motor being mounted in the plane transversely of said casing, a motor associated with the rotary element of said motor, a partition across said casing in a plane substantially parallel to the plane of said rotary motor element, and a plurality of openings in said partition on an arc of a circle concentric with said motor shaft and juxtaposed to said motor, a conduit communicating with one of said openings which leads to the outside of said casing, an air chamber on the opposite side of said casing from said motor, and means for controlling the flow of air through said openings.

13. In an air pump, a casing, a motor chamber therein, a rotary motor mounted therein, the rotary element of said motor be-

ing mounted in the plane transversely of said casing, a motor shaft associated with the rotary element of said motor, a partition across said casing in a plane substantially parallel to the plane of said rotary motor element, and a plurality of openings in said partition on an arc of a circle concentric with said motor shaft and juxtaposed to said motor, a conduit communicating with one of said openings which leads to the outside of said casing, an air chamber on the opposite side of said casing from said motor, means for controlling the flow of air through said openings, said means comprising a disk concentric with the motor shaft having holes registering in certain positions with the openings in said partition, and means for operating said disk from without the casing.

14. In an air pump, a casing, a motor chamber in said casing open to the atmosphere, an air pressure chamber adjacent said motor chamber, a partition therebetween, an opening from said air chamber to said motor chamber, a conduit leading from said air chamber without the casing, and means for directing air into said conduit at relatively high pressure or into said motor chamber at relatively low pressure at will.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES EDWARD HARKER.

Witnesses:

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E. J. BAXTER.