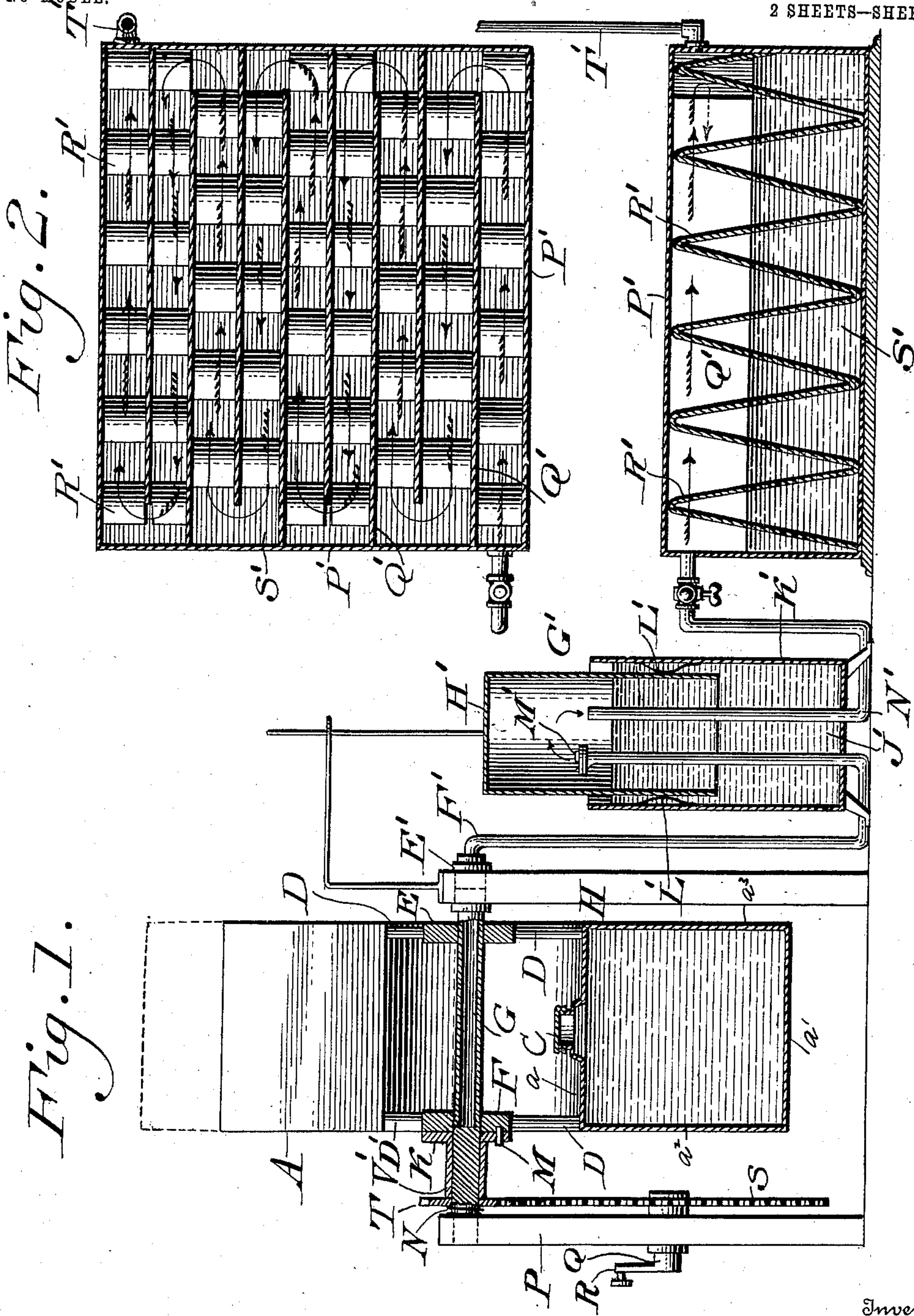


M. E. HARMSTEAD.
AIR PUMP.

APPLICATION FILED OCT. 29, 1901.

NO MODEL.

2 SHEETS—SHEET 1.



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No. 748,498.

PATENTED DEC. 29, 1903.

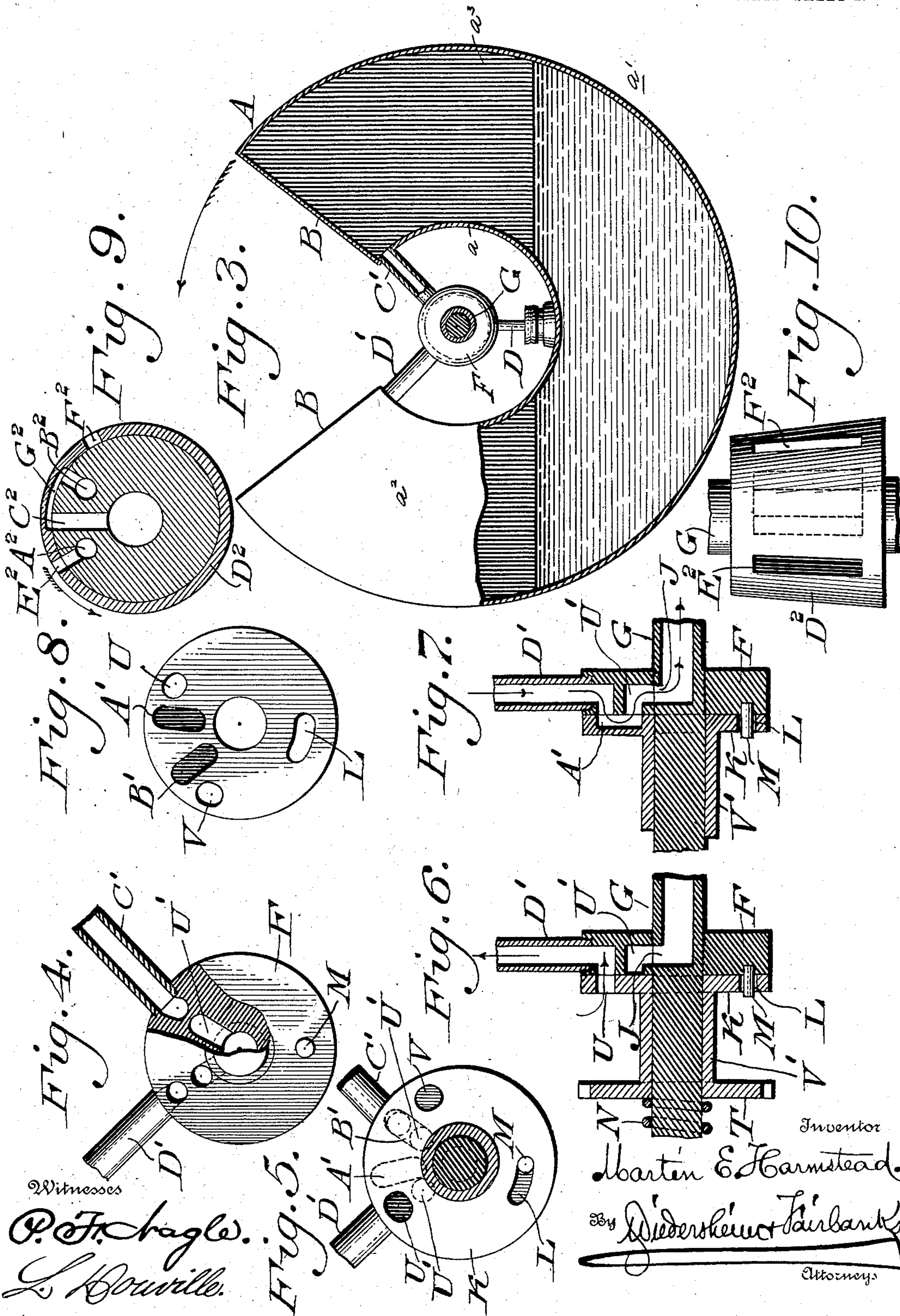
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 748,498, dated December 29, 1903.

Application filed October 29, 1901. Serial No. 80,408. (No model.)

To all whom it may concern:

Be it known that I, MARTIN E. HARMSTEAD, a citizen of the United States, residing at Burlington, in the county of Burlington, State of New Jersey, have invented a new and useful Improvement in Air-Pumps, of which the following is a specification.

My invention relates to an improvement in an apparatus for generating gas; and it consists of means for forcing air through a suitable receptacle containing a suitable fluid which is adapted to charge the air with gas, which latter can be conducted off to a point of consumption.

It further consists of novel details of construction, as will be hereinafter set forth.

Figure 1 represents a partial elevation and partial vertical sectional view of an apparatus embodying my invention. Fig. 2 represents a horizontal section of the tank containing the gas fluid. Fig. 3 represents a view, partly in side elevation and partly in section, showing the drum employed, the shaft thereof also being shown in cross-section. Fig. 4 represents a vertical sectional view and partial elevation of a portion of the device, showing the ports. Fig. 5 represents an elevation of the portion of the device shown in Fig. 4. Figs. 6 and 7 represent sectional views of a portion of the device, showing the ports in different positions. Fig. 8 represents a rear view of the plate in which the ports are situated. Figs. 9 and 10 represent views of a modified form of valves employed.

Similar letters of reference indicate corresponding parts in the figures.

Referring to the drawings, A designates the drum, which consists of the two concentric horizontal cylindrical bodies a a' , whose ends are connected by annular plates a^2 a^3 , as shown, which latter form the side plates of the drum. From the cylinders and the annular space inclosed between them a segment is cut away, and the annular space thus exposed is closed by the end plates B, connecting the circumferences of the cylinders and extending between the side plates of the drum. In the central opening is disposed a nozzle C, through which the fluid or liquid— in the present case water—is supplied to the

interior of the drum through means hereinafter described.

D designates spokes one end of each of which is connected with the inner cylinder a of said drum and the other end to the heads E and F, which latter are mounted upon the pipe or shaft G, a portion of which is hollow, as seen in Fig. 1, one end of said shaft being suitably supported and journaled in the upright or support H and the opposite end being supported by the standard P, said pipe having an opening J therein, which communicates with a passage U' in the head F, as seen in Fig. 7.

K designates a plate connected with a sleeve V', which is suitably supported on the pipe G, said plate having a slot L therein, in which is adapted to move the pin M, which is secured to the head F, the end walls of said slot engaging with the pin M to give proper movement to the drum A, as will be further described.

T designates a gear mounted on said sleeve V', between which latter and the standard P is a spring N, which holds the plate K against the head F, said standard also carrying the shaft Q, having the crank-arm R thereon, and carrying the gear S, which meshes with the gear T and imparts motion thereto, as will be described.

U and V designate ports or openings in the plate K, and A' and B' designate passages or recesses in the inner face of said plate.

C' and D' designate pipes which are connected with the head F and which form a communication therebetween and the interior of the drum A when the plate K is in proper position therefor, one of said pipes leading into one end of said drum and the other into the other end.

E' designates a stuffing-box which communicates with the pipe G and has the pipe F' leading therefrom into the pressure-regulating device G', the upper portion H' thereof being movable, and into which the end of said pipe F' discharges. The lower end of said portion H' is open and enters the fluid J', situated in the lower stationary portion K' of the regulating device, whereby said upper portion is trapped or sealed.

Suitable springs L' serve to guide and hold the upper portion H' of the device, a suitable valve M' controlling the discharge end of said pipe F'.

5 N' designates a pipe leading from the interior of the upper portion H' of the regulating device and discharges into a tank P', which may be of any preferred form of construction, although in the present instance I have
10 shown what I consider a very efficient means for this purpose and which has a series of vertical partitions Q' therein, which are alternately open at opposite ends, and between each partition is a series of pieces of felt or
15 other suitable absorbent material R', which extend from top to bottom of the tank and dip into hydrocarbon or other suitable fluid S'. A discharge-pipe T' leads from said tank to a suitable source of consumption.

20 The operation is as follows: Any suitable means for imparting motion to the crank-arm may be employed, it only being necessary to rock said arm in order to give an oscillatory motion to said tank A, which latter
25 is first filled with a suitable fluid or liquid. When now the tank A is rocked in the direction indicated by the arrow, Fig. 3, it will be seen that the fluid will flow toward the end with which the pipe D' communicates. The
30 tank A is rocked by motion being imparted to the gear S and to the gear T, which turns the sleeve V', and with it the plate K, so that the passage A' registers with the opening in the pipe D' and with one of the passages U'
35 in the head F, forming a communication between the interior of the drum A and the interior of the shaft G, as seen in Fig. 7, and the port V registers with the opening in the pipe C'. One of the said walls of the slot L
40 engages with the pin M, and as the movement continues the tank is moved so that the fluid flows toward the end with which the pipe D' communicates and forces the air therethrough into the passage U' and thence into the pas-
45 sage in the shaft G, air meanwhile being drawn in through the port V into the pipe C' and is discharged into the end of the drum A with which said pipe communicates. When now the parts are oscillated in the op-
50 posite direction, the plate K is moved to the reverse position, so that the port U communicates with the pipe D', (see Fig. 6,) and the passage B' communicates with the pipe C' and with the other passage U'. (See Fig. 5.)
55 The other end wall of the slot L engages with the pin M, and as the movement continues the drum A is rocked in the opposite direction and the air is forced through the pipe C' and the passage U' into the shaft G, while
60 air is taken in through D' and forced into the drum A. The air from the pipe G will be forced through the stuffing-box E and the pipe F' into the upper portion H' of the regulating device. From thence it will pass through
65 the pipe N' into the tank P' and be forced through the absorbent material R', the course of which is indicated by the arrow, Fig. 2,

and will be charged with gas from the fluid S' and can be conducted off from the pipe T' to the point of consumption.

70 It will be seen that I have placed the valve M' at the end of the pipe F' to prevent sucking back of the air from the upper portion of the regulating device, which is made of such size that as the drum reverses in its motion
75 flickering of the gas will be prevented. I may also construct the parts in such a manner that when the consumption of the gas ceases the machinery will automatically stop
80 and as soon as the gas is turned on the machinery will automatically start.

In Figs. 9 and 10 I have shown a different form of valve employed to provide for the charging and discharging of the air from the drum A, the operation of the parts being
85 similar to that already described, excepting that instead of employing a plate K, I place passages A² and B² in the axis G, which communicate, respectively, with the pipes D' and C', a passage C² communicates with the
90 bore of the said axis G, and around the latter I place a collar or sleeve D², which has the ports E² and F², which by the proper movement of the said sleeve or collar communi-
95 cate with the said passages A² and B², respectively, in order that air may be taken in therethrough and forced into either end of the drum A. A recess G² is also provided on
100 the interior of the sleeve D², which is in communication with the passage C² and with either one of the passages A² or B², depending upon the position of the sleeve D², whereby
105 it will be seen that a communication is established between the bore of the axis G and either of the passages A² and B², whereby the air from either side of the tank A can be
110 forced into the bore of the axis G and from thence to the required point, it being understood, as above stated, that the operation is similar to that already described. It will
115 also be understood that the collar D², with its ports, is to be substituted for the plate K and the head F and is mounted upon the axis G, the sleeve V' and other parts being modified accordingly. This sleeve D² may
120 be turned in any suitable manner, as by hand.

It will be evident that various changes may be made by those skilled in the art which will come within the scope of my invention, and I do not, therefore, desire to be limited
125 in every instance to the exact construction herein shown and described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a device of the character described, a drum, a hollow axis therefor, a fluid partly filling the drum air-inlets, pipes communicating with the interior of the drum upon opposite sides of said fluid, and means concentric
130 with said shaft for forming communication alternately between one or the other of said pipes and the interior of said hollow shaft as the drum is oscillated in opposite directions

whereby the direction of flow of the air is automatically controlled and reversed.

2. In a device of the character described, a drum, a hollow shaft supporting the same, means for rocking said drum, a fluid partly filling said drum, a pipe communicating with the interior of said drum on one side of said fluid, a second pipe communicating with the interior of said drum on the opposite side of said fluid, and means embracing said shaft for forming a communication alternately between one or the other of said pipes and the interior of said shaft, said means cooperating with the rocking means and controlled thereby.

3. In a device of the character described, a drum having a segment thereof removed, a fluid partly filling the same, a hollow axis for said drum, pipes communicating with the interior of said drum on opposite sides of said fluid, ports controlled by the rocking means for said drum and adapted to be operated to alternately communicate with said pipes forming an intake therefor, and passages adapted to alternately communicate with said pipes for conducting air therefrom, and means embracing said hollow axis for governing the flow through said passages.

4. In a device of the character described, a

drum having a segmental portion removed, means for rocking the same, a fluid partly filling the same, pipes communicating with the interior of said drum on opposite sides of said fluid, means operatively connected with and controlled by said rocking means to charge or discharge air into and from the interior of said drum, a shaft supporting said drum having a passage therethrough, means for alternately forming a communication between said pipes and the interior of said shaft, and means for conducting air from said shaft to a suitable place.

5. In a device of the character described, a drum having a segmental portion thereof removed, a hollow axis for said drum, heads supporting said axis, means for rocking said drum, a rotatable sleeve operatively connected with the rocking means, inlets and outlets for the drum connected with the hollow axis and controlled by the rotation of said sleeve, a regulating device into which the discharge-pipe extends, and a valve on the discharge-pipe within said regulating device.

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