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F. WHITE.

APPARATUS FOR TREATING AIR.

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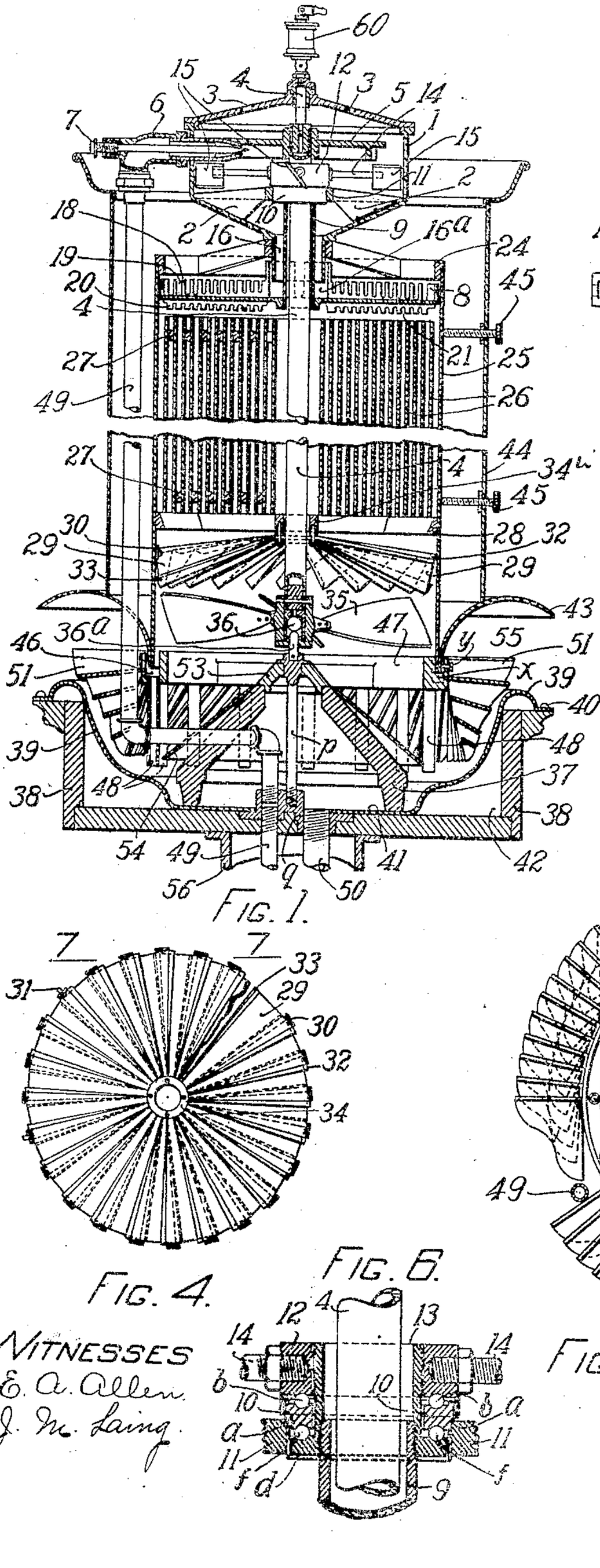

FIG. 1.

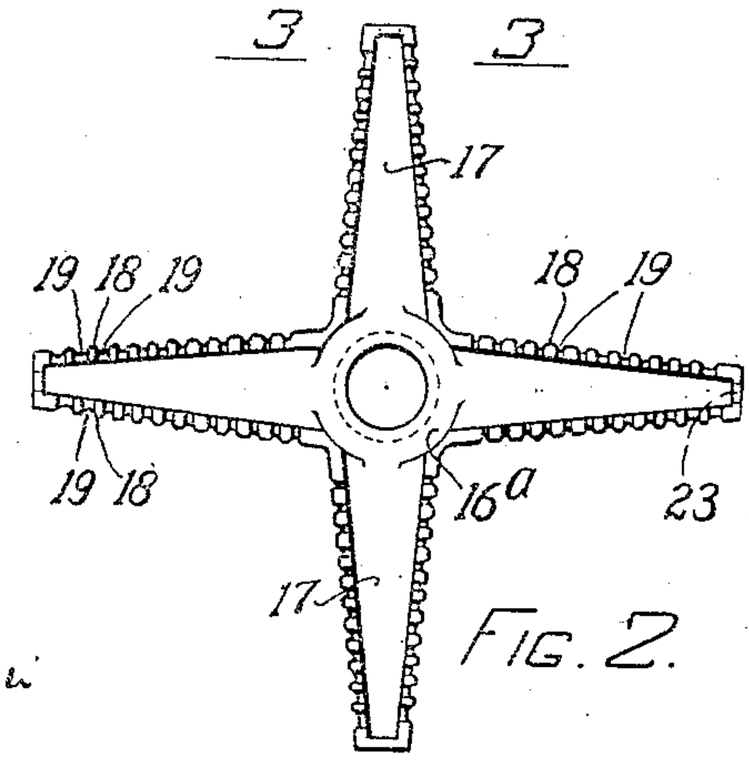

FIG. 2.

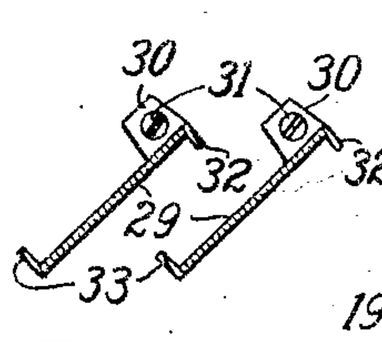

FIG. 7.

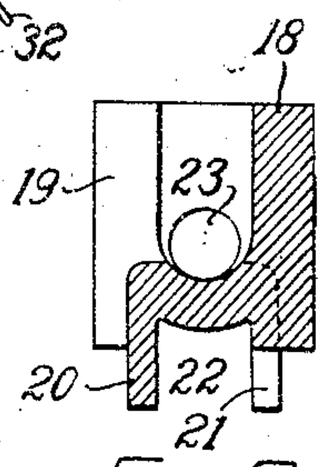

FIG. 3.

FIG. 4.

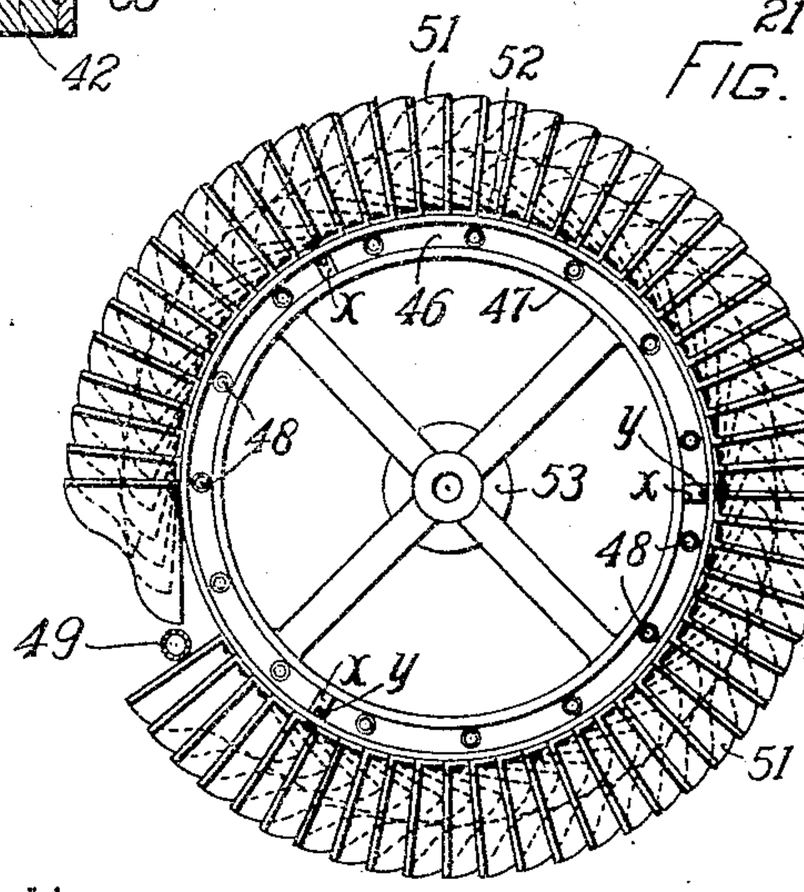

FIG. 5.

FIG. 6.

WITNESSES

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APPARATUS FOR TREATING AIR.

No. 810,451. Specification of Letters Patent. Patented Jan. 23, 1906.

Application filed August 8, 1904. Renewed November 11, 1905. Serial No. 286,791.

To all whom it may concern:

Be it known that I, FREDERICK WHITE, a citizen of the United States, residing at South Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Treating Air, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention is an improvement on Frederick White's prior apparatus for drying or moistening and purifying or medicating air in dwellings, hospitals, stores, offices, factories, restaurants, &c. The prior apparatus is the subject-matter of patents or patent applications in many countries.

As generally installed the prior and present apparatus take air from near the ceiling and force the air over a large number of gravitating films of water or other liquid of any desired kind and temperature and then force the air back into the room, the air being continuously moved with maximum obtainable rapidity in a plurality of currents over a plurality of films of liquid. The velocity with which the air-currents pass through the apparatus is a matter of utmost importance for maintenance of constant and efficient treatment or modification of the air, and it is necessary to maintain the liquid in film-like form and to distribute the liquid slowly in order to prevent the liquid from choking the interspaces between cylinders on the walls of which the liquid-films are formed, because if such interspaces were choked with liquid the free and continuous passage of the air through the interspaces would be obstructed. It is important that the apparatus should operate without spattering liquid outwardly and with a minimum of noise. If the liquid films are colder than the air passed over them, then moisture in the air deposits on the colder films, and the air is thus dried by deposition of its moisture. If the liquid films are warmer than the air, then the air takes up moisture from the liquid. Thus the apparatus may be used either as an air cooler or humidifier. If antiseptics or other medicaments are put into the liquid, the air becomes medicated. The apparatus in all cases purifies the air, because air in passing through the apparatus gives up many impurities, such as flies, smoke, and dust.

Figure 1 is a vertical central section of the improved apparatus. Fig. 2 is a top plan view of a new liquid-distributer detached. Fig. 3 is an enlarged cross-sectional view at line 3 3 of Fig. 2 of one of the radial arms of the distributer. Fig. 4 is a top plan view of a new device incorporated in the apparatus for diminishing noise from its operation by checking the direct fall of liquid on the air-fan. This is desirable, but not essential. Fig. 5 is a top plan view of an annulus of baffle-plates mounted in the air-exit space to prevent outward sprinkling of water and to permit free outward escape of air. Fig. 6 is a view, partly in section, of a new device whereby grit in the liquid is kept out of grinding contact with the shaft, and the distributer is more slowly rotated than the motor-wheel and air-fan. Fig. 7 shows two adjacent plates, partly in cross-section, at line 7 7 of Fig. 4.

In the drawings, motor-wheel casing 1 has interior radial plates 2, which prevent the liquid from swirling within the casing, and thereby impeding its own exit, the casing having vents 3, whereby atmospheric pressure facilitates outflow. Vertical shaft 4 carries motor-wheel 5, driven by a liquid jet from nozzle 6, having a regulating-screw 7 controlling the amount of liquid discharged against and also the speed of the wheel. From casing 1 liquid falls into distributer 8, fast on the lower end of sleeve 9, which incloses shaft 4 and is threaded into a ball-bearing device that comprises stationary ring 10, having an annular exterior circumferential shoulder *a* resting on collar 11, connecting inner ends of plates 2. The upper side of ring 10 supports balls *b*, on which rests ring 12, threaded on annular nut 13, in the lower end of which sleeve 9 is threaded. Sleeve 9, carrying distributer 8, is free to rotate on balls *b*. Auxiliary balls *f*, between ring 10 and flange *d* of nut 13, also support and serve to steady sleeve 9 in its rotation. Ring 12 carries four thread-socketed radial arms 14, on the outer ends of which inclined vanes 15 are fast and against which liquid falling from the wheel strikes to rotate the distributer, the liquid falling past vanes 15, through

escape-port 16, into the central cup 16ª of the distributer. By turning arms 14 on their lengthwise axis the inclination of the vanes is regulated, the object being to rotate the distributer at any desired speed slower than that of the wheel and fan. Port 16 is annular and projects into cup 16ª to prevent liquid from being thrown outwardly at that point. The outer diameter of port 16 is less than the inner diameter of cup 16ª to permit free rotation of the distributer and also atmospheric pressure on the liquid in the distributer. The object of supporting the rotatable distributer on a stationary part of the apparatus instead of on a collar fixed on shaft 4, as heretofore, is to protect shaft 4 from being cut into and weakened by grinding action of grit in the liquid, and herein is an important improvement on prior apparatus of this type.

Distributer-arms 17 are now trough-shaped in cross-section, preferably tapering outwardly from their junction with central cup 16ª. The sides of the troughed arms now have alternating solid parts 18 and exit-notches 19, the solid parts 18 of each side being opposite a notch 19 in the opposite wall. The under side of each distributing-arm is formed with a downwardly-extending projection 20 below each notch 19 and with a downwardly-extending notch 21 below each solid part 18, there being a central lengthwise groove 22 along the under side of each distributing-arm, which preferably has an end discharge-port 23. The purpose of this construction of the distributing-arms is to secure a distribution of liquid from the distributer in a great number of separate streams, which are formed by passa re of liquid through notches 19 in the sides of the troughed arms. The separate streams flowing out through notches 19 would run together and form continuous sheets below the lower outer corners of the arms if it were not for the projections 20 and notches 21, which maintain the separate streams intact when they fall on, over, and between the subjacent concentric sheet-metal cylinders 26, which are apt to become choked with fluid falling in sheet form from the distributer. Groove 22 secures two rows of separate streams from each arm. This construction secures a maximum number of these separate streams from each side of each distributer-arm.

Casing 1 is supported on open frame 24, resting on open-ended cylindrical shell 25, within which said cylinders are mounted and separated by small blocks 27 at intervals apart to keep the cylinders stationary. The cylinders rest on an open cross-frame 28, fast to shell 25, shaft 4 passing downwardly through the inner cylinder and carrying immediately below frame 28 a sound-deadening arrangement of inclined radial-separated baffle-plates 29, the outer ends of which have ears 30, through which fasteners 31 pass into shell 25. The upper edge of each baffle-plate 29 overhangs its subjacent plate and has a depending lip 32 extending from end to end of the plate to prevent liquid on its upper edge from running down its under side and from directly striking on the subjacent air-fan. The lower edge of each baffle-plate has an upturned lip 33, which extends from end to end of the plate and prevents unimpeded flow of liquid down the upper side of the plate. Therefore when the liquid falls from the cylinders it does not strike directly against the vanes 35 of the air-fan, and noise from such cause is diminished. The inner ends of plates 29 are secured to a central ring 34, which is fast to central ring 34ª of frame 28, shaft 4 passing freely through both rings. An air-fan having blades 35 is fast to the bottom of shaft 4, which rests on a ball-bearing 36. The air-fan pulls air through the interspaces of the cylinders over gravitating fluid films thereon. Ball-bearing 36 is indirectly supported on conical frame 37 in pan 38. An upwardly and outwardly extending sheet-metal bowl-like deflector 39, the outer margin of which is secured to the edge of the pan at 40, has a bottom portion 41, which lines the bottom of the pan, and this deflector, together with the pan side and bottom, forms a dead-air space 42 around the lower corner of the pan. This dead-air space tends to prevent the deposition of moisture from exterior atmosphere on the outside of the pan, and consequently to prevent dripping from the machine.

An outwardly-extending annular deflector 43 is fast to the bottom of shell 25, and its upper side supports the ornamental open-ended cylindrical casing 44, through which fasteners 45 pass and engage shell 25 to hold the casing in place. Casing 44 may be omitted; but it is desirable and extends well above the cylinders and shell to prevent liquid from being spattered out at the upper end of the apparatus. The lower edges of shell 25 and deflector 43 rest on ledges x in the bottom of an annular trough 46 in open cross-frame 47, being clamped therein by fasteners y. From the bottom of the trough vertical discharge-tubes 48 depend, discharging into the pan liquid which runs down the shell into the trough. A liquid-supply pipe 49 extends from any suitable source under head to jet-nozzle 6. 50 is the liquid-discharge pipe from the pan.

Between deflectors 39 and 43 an annulus of inclined baffle-plates 51 is mounted, the inner ends of the plates being fast at 52 to the outer wall of frame 47, which has radial arms terminating in a central cap 53, that rests on frame 37. A long screw p, the head of which clamps against the top of cap 53, extends downwardly and is threaded into a block q, into openings through which the supply and

outlet pipes are threaded. Frames 37 and 47, with the parts supported by them, are thus held in place, and the ball-bearing 36 rests on a pin 36^a in the head of screw *p*. A sheet-metal truncated cone 54 forms a deflecting-covering for frame 37. The lower ends of tubes 48 are below the lower edges of baffle-plates 51. An annular air-escape passage is formed by the space 55 between deflectors 39 and 43. Baffle-plates 51 are set at an incline which is crosswise to the inclination of the vanes of the air-fan, which hurls liquid downwardly with violence and would tend to cause outward spattering were it not for the baffle-plates 51. The crosswise arrangement tends to prevent liquid from being spattered out between the baffle-plates. The air-fan expels air freely out between the baffle-plates, the air being deflected by cover 54 and deflectors 39 and 43 through space 55. By carrying the lower ends of tubes 48 below the lower edge of baffle-plates 51, the air-blast does not drive the liquid (falling from the tubes) through the space 55, as might otherwise happen.

The apparatus is adapted for overhead use, and 56 indicates a tubular standard on which the apparatus may be supported near the ceiling, pipes 49 and 50 in such case being concealed within the standard, which may rest on the floor. An oil-cup 60 is desirable for the upper bearing of the shaft.

What is claimed is—

1. The combination of a motor-wheel casing; a motor-wheel fast on its shaft; an air-fan fast on said shaft; between said wheel and fan, a series of concentric, open-ended cylinders spaced apart; and a rotatable liquid-distributer which rotates slower than the fan, is opposed to the cylinder ends, and supported by a stationary part of the machine, the casing being vented.

2. The combination of a motor-wheel casing; a motor-wheel fast on its shaft; an air-fan fast on said shaft; between said wheel and fan, a series of concentric, open-ended cylinders spaced apart; a rotatable liquid-distributer which rotates slower than the fan, is opposed to the cylinder ends, and supported by a stationary part of the machine; a pair of annular air-deflectors spaced apart; and an annulus of separated baffle-plates in said space.

3. The combination of a motor-wheel casing; a motor-wheel fast on its shaft; an air-fan fast on said shaft; between said wheel and fan, a series of concentric, open-ended cylinders spaced apart; a rotatable liquid-distributer which rotates slower than the fan, is opposed to the cylinder ends and supported by a stationary part of the machine; a pair of annular air-deflectors spaced apart; an annulus of separated baffle-plates in said space; and an annulus of separated baffle-plates between the cylinders and air-fan.

4. The combination of a motor-wheel casing; a motor-wheel fast on its shaft; an air-fan fast on said shaft; between said wheel and fan, a series of concentric, open-ended cylinders spaced apart; a rotatable liquid-distributer which rotates slower than the fan, is opposed to the cylinder ends and supported by a stationary part of the machine; a pair of annular air-deflectors spaced apart; an annulus of separated baffle-plates in said space; a shell inclosing said cylinders; a troughed annular frame into which the shell discharges; and a series of discharge-tubes depending from the trough and extending below the baffle-plates which are inclined crosswise to the inclination of the vanes of the air-fan.

5. The combination with a motor-wheel casing; motor-wheel; its shaft; an air-fan fast on the shaft; a series of concentric open-ended cylinders; annular air-deflectors spaced apart; a supply-pipe and an escape-pipe, all substantially such as described, of means for preventing the escape of water through the space between the air-deflectors; and means for distributing water over said cylinders in a series of separated streams.

6. In apparatus substantially such as described, the combination of a motor-wheel casing; a regulable liquid-jet nozzle therefor; an air-fan fast on a shaft on which the motor-wheel is fast; and a liquid-distributer which has arms provided with regulable vanes against which liquid from said wheel strikes, and also has troughed arms with liquid-escape ports.

7. In apparatus substantially such as described, the combination of a pan; an upwardly and outwardly extending air-deflector therein having such shape as to form a dead-air space at the lower corner of the pan.

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

FREDERICK WITTE.

Witnesses:

EDWARD S. BEACH,

E. A. ALLEN.