No. 774,207. PATENTED NOV. 8, 1904.

A. STEINBART.

GAS SCRUBBER.

APPLICATION FILED MAY 12, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

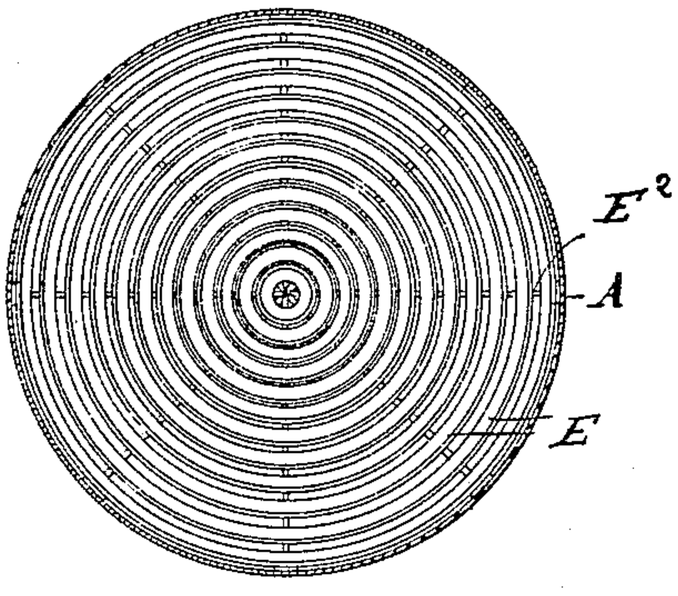

Fig: 2.

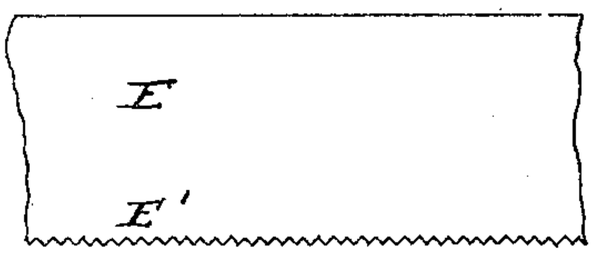

Fig: 3.

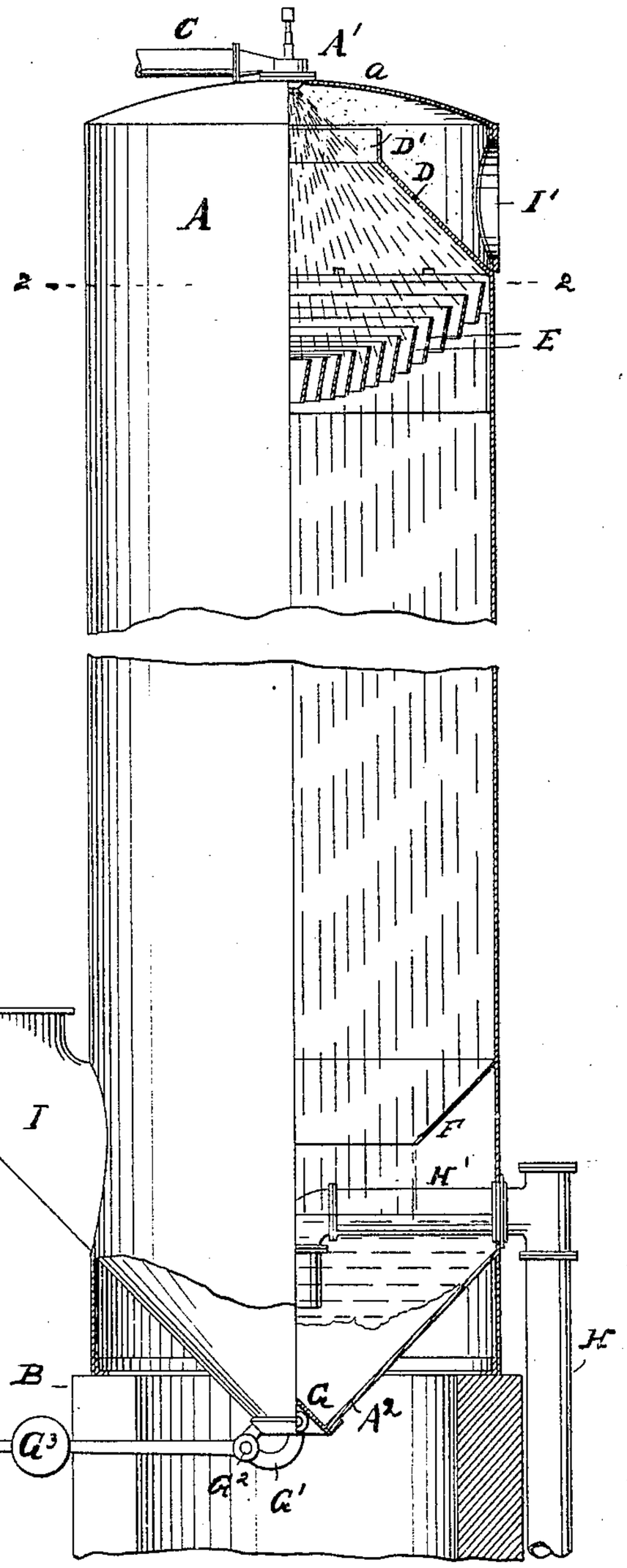

Fig: 1.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig: 4.

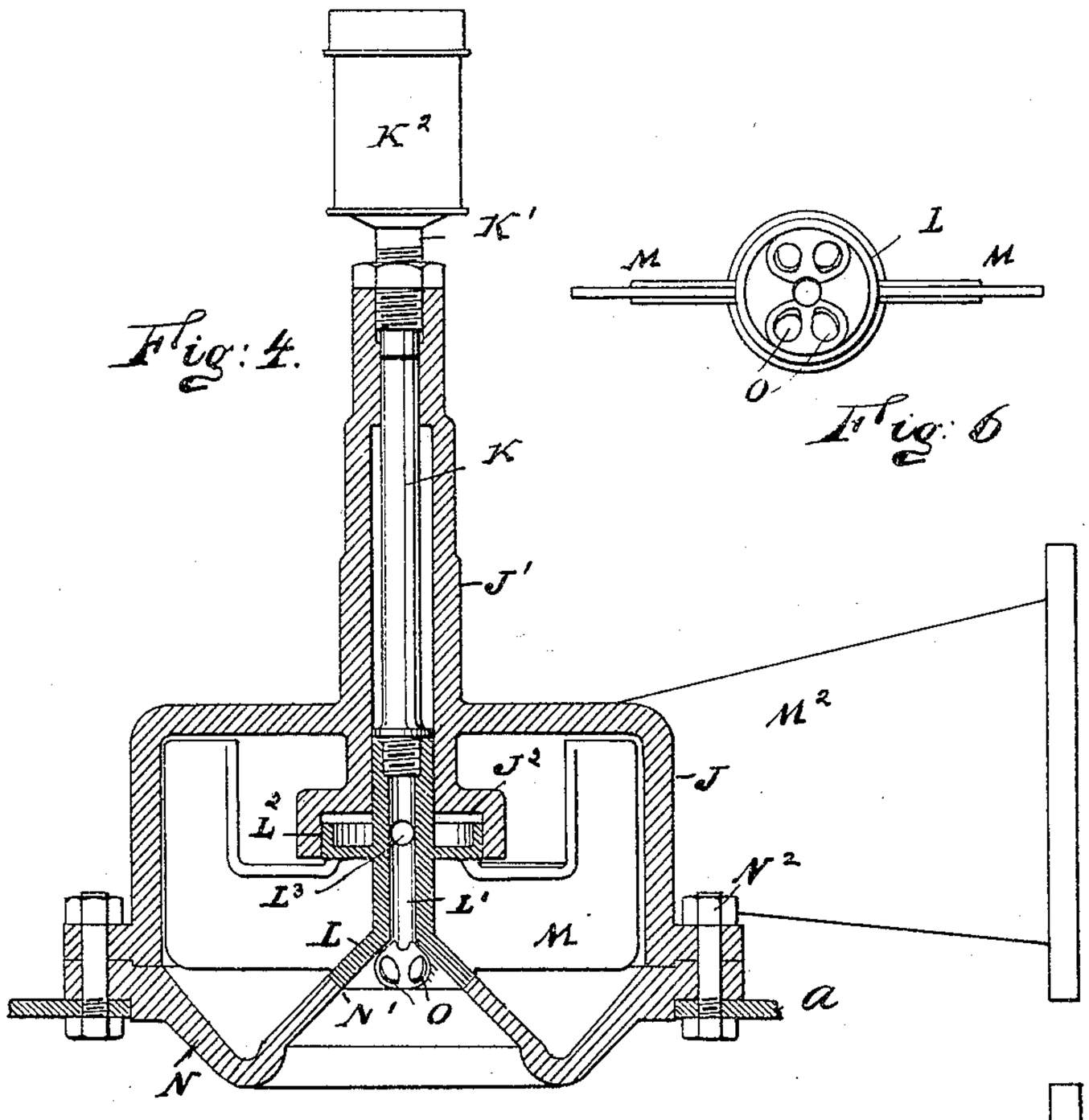
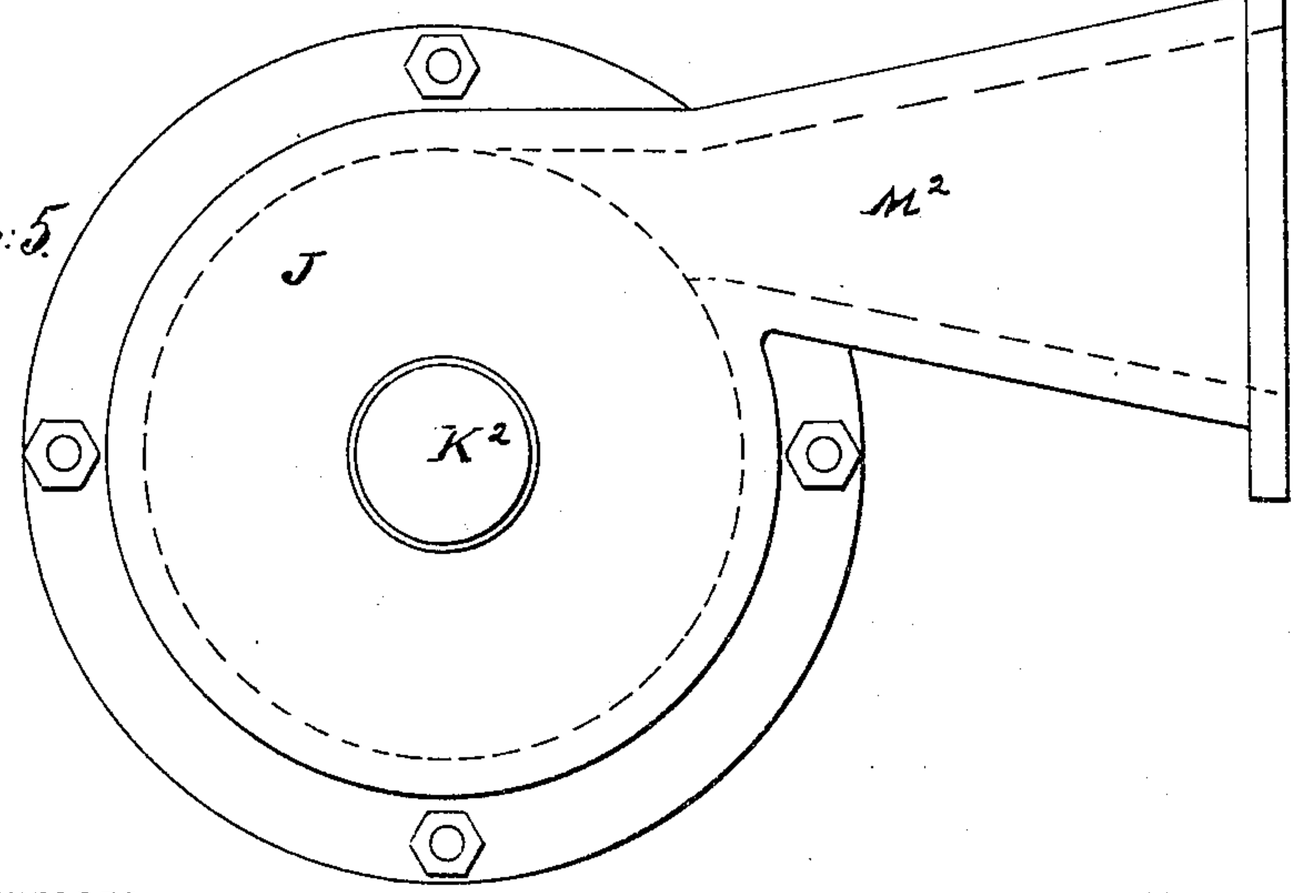


Fig: 6

Fig: 5.



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UNITED STATES PATENT OFFICE.

ALFRED STEINBART, OF CARLSTADT, NEW JERSEY.

GAS-SCRUBBER.

SPECIFICATION forming part of Letters Patent No. 774,207, dated November 8, 1904.

Application filed May 12, 1904. Serial No. 207,589. (No model.)

To all whom it may concern:

Be it known that I, ALFRED STEINBART, a citizen of the United States, residing at Carlstadt, county of Bergen, State of New Jersey, have invented certain new and useful Improvements in Scrubbers, of which the following is a specification.

This invention relates to improvements in scrubbers such as are used for cleaning and cooling gas; and the object of my invention is to provide a new and improved scrubber which is especially adapted for cooling and cleaning large amounts of gases, such as obtained from iron-furnaces, gas-generators, and the like.

The scrubber is simple in construction, effective and economical in use of water, and the entire quantity of gas is compelled to pass through a space through which water drops uniformly throughout.

In the accompanying drawings, in which like letters of reference indicate like parts in all the figures, Figure 1 is an elevation of my improved scrubber, parts being shown in section and parts broken away. Fig. 2 is a horizontal sectional view on the line 2 2 of Fig. 1. Fig. 3 is a detail side view of one of the curved blades on a large scale. Fig. 4 is a vertical sectional view of the rotary water-spraying device. Fig. 5 is a plan view of the same. Fig. 6 is a detail view of the under side of the spraying-device nozzle and the propeller-wings on the same.

The scrubber consists of a vertical cylindrical vessel A, resting upon a suitable foundation B, which vessel is approximately sixty feet high, more or less. In its top the water-spraying device A′ is secured, which is supplied with water under pressure through an inlet-pipe C. In the upper part of the vessel A a partition D is secured, which has the shape of an inverted funnel, with the collar D′ on its upper end, which collar is concentric with the spraying device a short distance above the same. Beneath the conical partition D a series of circular deflector-plates E are arranged on edge, which have their lower edges toothed, as shown at E′ in Fig. 3. These plates E are arranged concentrically and rest on suitable supporting-arms E^2, secured to the sides of the cylinder, as appears in Fig. 1. The central circular plate, which is the smallest one, is lowest, and the plates successively rise one above the other toward the circumference of the cylinder A. These plates must be so arranged that the inner surface of each is exposed above the adjacent inner plate sufficiently to permit the spraying of a sufficient amount of water against the plate—that is to say that each plate will have an exposed surface above the adjacent plate in reverse proportion to the amount of water delivered by the spraying device at that particular circle. The bottom edges of the plates are toothed, so that the water will not run along the bottom edge of the plate to the lowest point in case the plates are not absolutely horizontal, but on the contrary will drop off at all points of the bottom edge of the plate.

Near the bottom of the cylinder A a funnel-shaped partition F is secured in the same, and the bottom of the cylinder A is made funnel-shaped, as shown at A^2, and provided with a central opening which is closed by a conical downwardly-opening valve G, mounted on the short end of a lever G′, pivoted at G^2 to a bracket on the bottom of the cylinder and held in place by a weight G^3 on the longer end of the lever. A water-outlet pipe H is connected with the cylinder directly above the conical bottom and is provided with a downwardly-extending arm H′, forming a water seal. An inlet-neck I for the gas to be passed through the scrubber is connected with the cylinder at the side beneath the funnel-shaped partition F, and an outlet I′ for the gas is provided at the upper end of the cylinder above the conical partition D.

Referring now to the spraying device, (shown in Figs. 4, 5, and 6,) the same is constructed with the cylindrical shell J, forming a chamber and having an upwardly-extending neck J′, which has a downward extension beneath the top of the chamber or shell J, which is enlarged into an inverted cup J^2. A shaft K is mounted to turn in the extension or neck J′, and its upper end has a thrust-bearing against the lower end of a neck K′, screwed

into the upper end of the extension J′ and in turn extending downward from an oil-cup K^2. The upper end of the neck or tubular stem L′ of an inverted conical nozzle L is screwed to the lower end of the shaft K, and this tubular stem L′ is provided with a lateral flange forming a cup L^2 within the inverted cup J^2, formed on the under side of the top of the shell or chamber J. The tubular stem L′ is provided with one or more apertures L^3, establishing communication between the cup L^2 and the base of said tubular stem. Wings M project laterally from the nozzle L and the stem L′ to the sides of the shell J, so that they can be rotated by a current of water entering the shell J through a lateral tapering neck M^2, which is connected with a supply-pipe C for the water under pressure. The shell J has bolted to its bottom edge a bottom plate N, shaped with V-shaped annular grooves and a central opening N′, the edge of which is adjacent to the bottom edge of the nozzle L. By means of bolts N^2 the shell and the bottom plate are secured to the top *a* of the cylinder A, which top has an opening, as shown in Fig. 4. The nozzle L is provided with suitable openings O, arranged in pairs opposite to each other, as shown in Fig. 6. The water entering through the inlet-neck M into the shell or chamber J strikes the wings M and rotates the same and the nozzle, and the water issues through the openings of the nozzle from the opposite sides in the form of jets, and these jets striking each other form a fan-shaped veil of spray. The water also exerts an upward pressure on the under side of the cup L^2, and the area of the same is larger than that of the upper side of the nozzle. It creates an upward pressure and serves to press the shaft K against its thrust-bearing and lift the nozzle out of contact with the bottom plate N. Any water that escapes through the fine space between the inverted cup J^2 and the rotating cup L^2 passes into said cup L^2 and from the same through the openings L^3 into the tubular stem of the nozzle and passes off with the water forming the fan-shaped spray. As the nozzle is rotated at a high speed, the water is constantly sprayed against the exposed inner faces of the annular deflecting-plates E and falls from the same through the cylinder A in the form of a uniform rain—that is to say, the drops of water throughout the entire cylinder are all of approximately the same size, because the plates E are so arranged that each receives the same quantity of water in proportion to its circumference—that is, the same quantity of water in each unit of transverse area of the cylinder A. The gas entering through the neck I is checked for a moment by the funnel-shaped partition F and spreads uniformly in the cylinder and rises and passes through the rain of falling water until it strikes the conical partition D and is discharged into the neck D′ and then passes over the edge of said neck into the space beyond the top of the cylinder and the conical partition D and out through the aperture I′. As the hot gas is forced to pass on its way upward in the cylinder through the uniformly-distributed rain of water it gives off its heat and its impurities to the water. The hot gas comes first into contact with the outgoing and most heated water and at last with the fresh cool water, so that the gas is cooled approximately to the temperature of the incoming water, while the amount of water used may be so small that it leaves at approximately boiling heat. Those impurities that are not carried off by the outgoing water collect in the funnel-shaped bottom of the cylinder and can be discharged from time to time through the bottom opening when the valve G is lowered.

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

1. The combination with a vessel, of a spraying-nozzle in the top of said vessel, circular deflector-plates in the top of said vessel only placed on edge for converting the spray from said nozzle into a vertically-falling rain, and means for conducting gas through said vessel, substantially as set forth.

2. The combination with a vessel, of a spraying-nozzle at the top of the same, deflector-plates placed on edge to convert the spray from said nozzle into a vertically-falling rain, the edges of said deflector-plates facing the nozzle being in different elevations from the center toward the circumference of said vessel, and means for conducting gas through the vessel, substantially as set forth.

3. The combination with a vessel, of a spraying-nozzle at the top of the same, a series of concentric deflector-plates on edge below said spraying-nozzle, said deflectors having their lower edge toothed and means for conducting gas through said vessel, substantially as set forth.

4. The combination with a vessel, of a spraying-nozzle at the top of the same, a series of concentric annular deflector-plates on edge beneath said spraying-nozzle, the edge of each annular plate rising above the edge of the adjacent inner annular plate from the center toward the circumference of the vessel and means for conducting the gas through said vessel, substantially as set forth.

5. The combination with a vessel, of a spraying-nozzle in the top of the same, a conical partition directly beneath the nozzle, a series of fixed circular concentric deflector-plates placed on edge below the partition, means for conducting gas upward through said vessel, and means for conducting the water from the bottom of the vessel, substantially as set forth.

6. The combination with a vessel, of a spray-

ing device in the top of the same, a conical partition directly below the nozzle, fixed circular concentric deflector-plates below said partition, a funnel-shaped partition near the bottom of the vessel, a water-outlet beneath the funnel-shaped partition, a gas-inlet beneath said funnel-shaped partition, a gas-outlet between the top of the vessel and the conical partition directly beneath the spraying device, substantially as set forth.

7. The combination with a vertical cylindrical vessel, of a rotating nozzle in and concentric with said cylindrical vessel and fixed circular deflecting-plates on edge and concentric with said cylindrical vessel and nozzle, substantially as set forth.

8. The combination with a vessel, of a rotating spraying device in the top of the same, means for rotating said spraying device by the water that is to be sprayed, deflector-plates below the spraying device at the top of said vessel only, and which plates are placed on edge and means for conducting gas through said vessel, substantially as set forth.

9. The combination with a vessel, of a chamber secured on the top of the same, a nozzle rotating in said chamber, wings projecting laterally from said nozzle, and a water-inlet for said chamber, substantially as set forth.

10. The combination with a vessel, of a chamber held in the top of the same and provided with an upwardly-extending neck, a shaft in said neck, a thrust-bearing for said shaft in the upper end of the neck, a rotating nozzle on the lower end of said shaft, wings projecting from the nozzle into the chamber and a water-inlet for said chamber, substantially as set forth.

11. The combination with a vessel, of a chamber held in the top of the same, a rotating shaft in said chamber, a nozzle on the lower end of said shaft, wings projecting from the nozzle into the chamber, a thrust-bearing on the shaft, a thrust-cup on the nozzle and a water-inlet for said chamber, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALFRED STEINBART.

Witnesses:

OSCAR A. GUNN,

SOPHIE M. BAEDER.