No. 772,347. PATENTED OCT. 18, 1904.

Q. N. EVANS.

AIR MOISTENING APPARATUS.

APPLICATION FILED DEC. 11, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

FIG. 1.

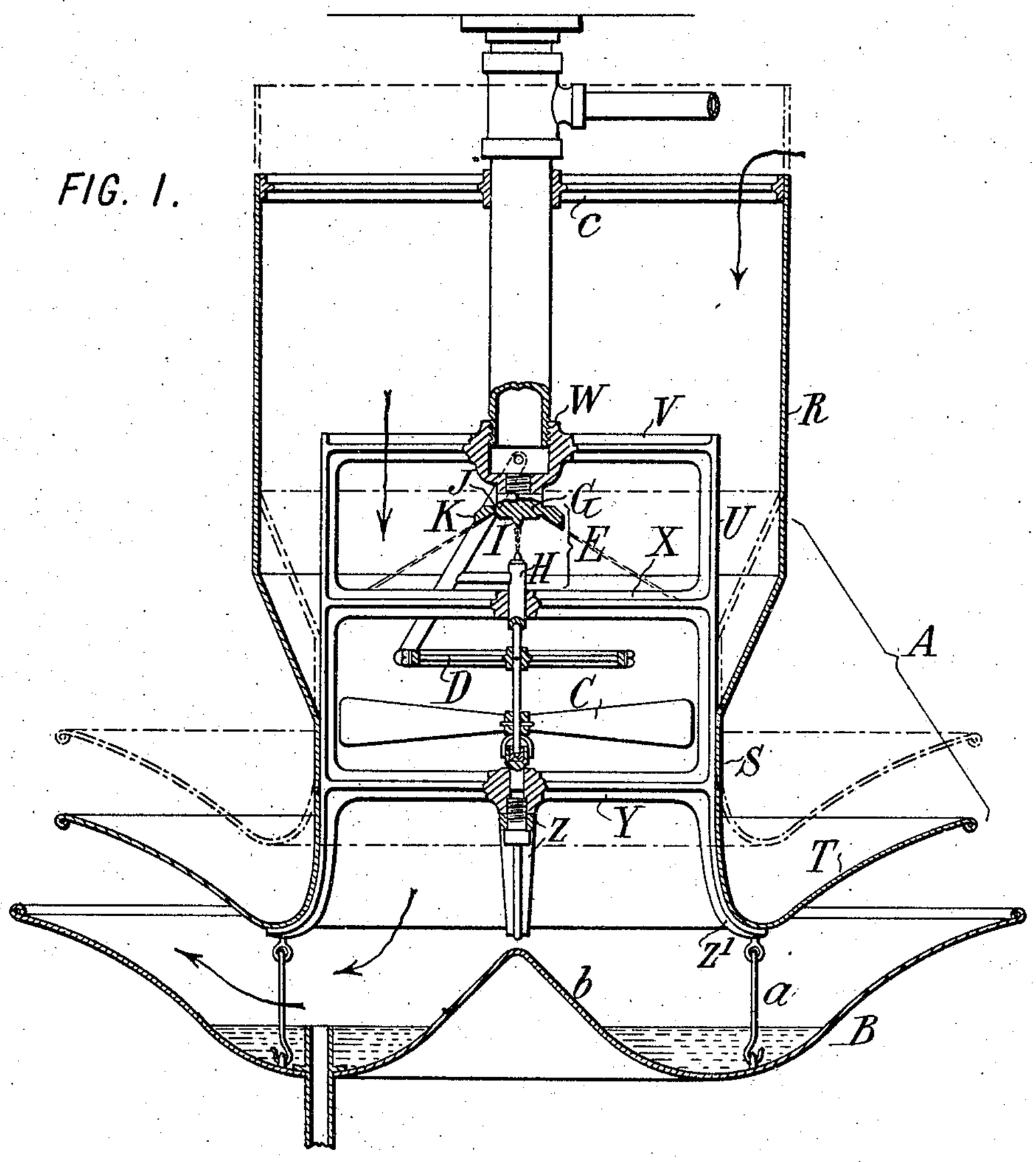
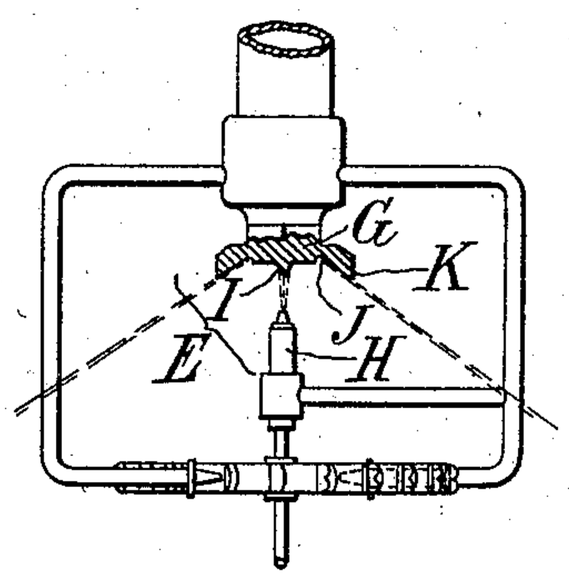


FIG. 2.



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NO MODEL. 2 SHEETS—SHEET 2.

FIG. 3.

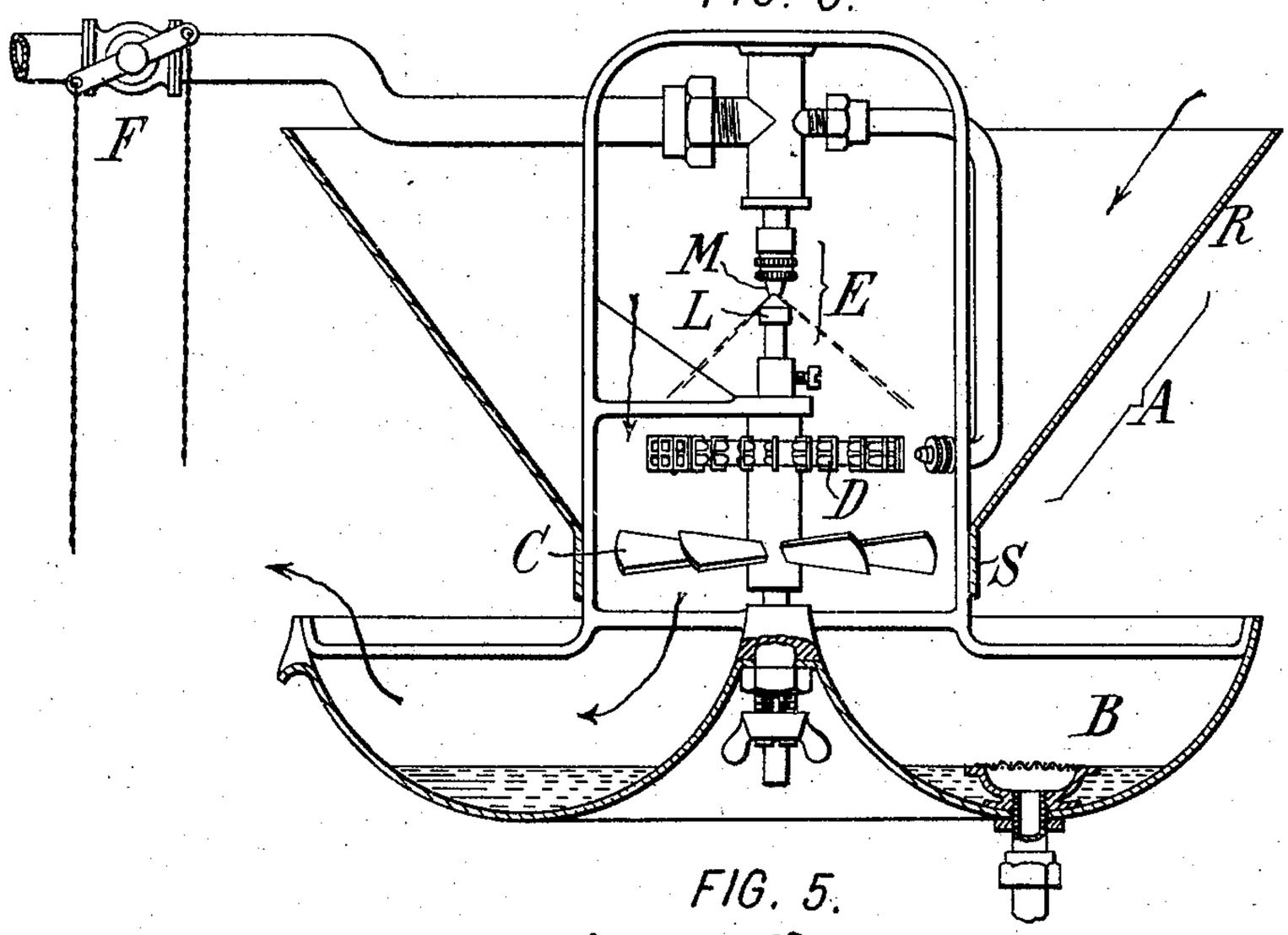


FIG. 5.

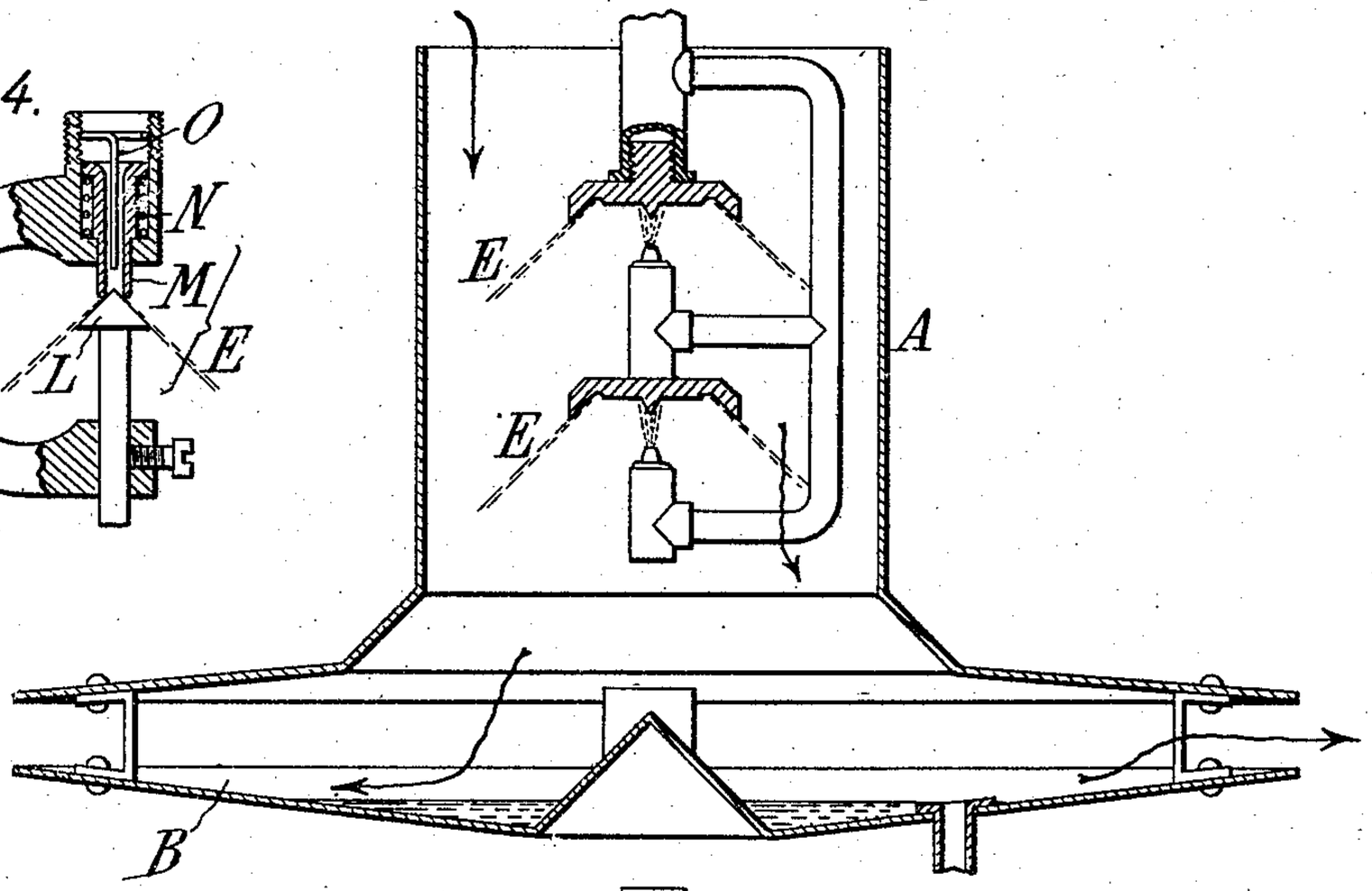
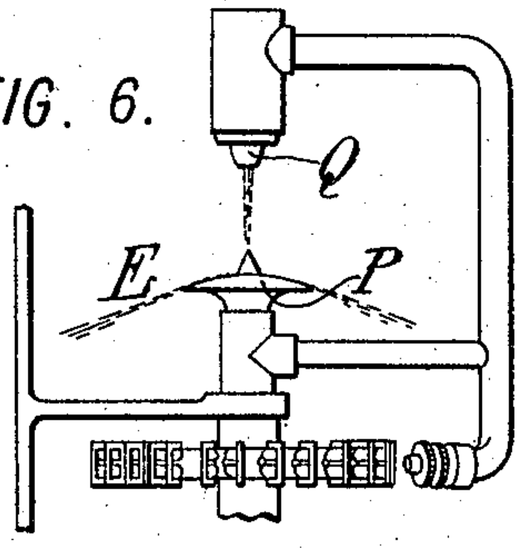


FIG. 4.

FIG. 6.



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UNITED STATES PATENT OFFICE.

QUIMBY N. EVANS, OF NEW YORK, N. Y.

AIR-MOISTENING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 772,347, dated October 18, 1904.

Application filed December 11, 1903. Serial No. 184,845. (No model.)

To all whom it may concern:

Be it known that I, QUIMBY N. EVANS, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Air-Moistening Apparatus, of which the following is a specification.

My invention provides certain improvements in the general construction and arrangement of the parts of an air-moistening apparatus whereby its efficiency is considerably increased.

My invention provides also certain other improvements hereinafter set forth in detail.

Referring to the accompanying drawings, representing certain embodiments of my improvement, Figure 1 is a diametral section of a complete apparatus. Fig. 2 is a detail of Fig. 1 viewed at right angles thereto. Fig. 3 is a section similar to Fig. 1 of another embodiment of my invention. Fig. 4 is a detail thereof shown in section. Fig. 5 is a section of a third embodiment. Fig. 6 illustrates another embodiment.

My present application is based in part upon an invention disclosed in my previous application, Serial No. 66,902, filed July 2, 1901, (Patent No. 724,685, dated April 7, 1903,) and it discloses also certain improvements over the matter taken out of said previous application.

Various kinds of air-moistening apparatus have been designed, in some of which a current of air is propelled through a spray of water by means of a fan or the like. In others the direction of the spray and the weight of the moistened air are depended on to produce the current of air. For increasing the quantity of air which is humidified there have also been designed double apparatus including two sprays acting on two bodies of air to moisten a double quantity within a given time. The principal function of my apparatus is not so much the passage of a large quantity of air through the apparatus in a given time as the complete or nearly complete saturation of the air which does pass through. For this purpose I propose to use a single tubular casing and to arrange a plurality of moisture-distributing devices in the casing in such a way that each acts to moisten the same air, as well as to assist each other in moving the air in the same direction. In order that the streams of moisture from the two distributing devices shall not interfere with each other, I arrange them to act in succession on the passing current of air. This principle I find especially useful in connection with a form of air-moistening apparatus described in my Patent No. 701,553, dated June 3, 1902, in which a water-wheel is driven by a jet of water and operates a fan which distributes moisture from the discharge of the wheel into the surrounding atmosphere. I have discovered that these parts may be so arranged that the fan produces a current of air sufficient to carry even a greater amount of water than is necessarily discharged from the wheel and that by adding another moistening device, such as a spraying device which discharges a spray of water into the current of air produced by the fan, I can very considerably increase the efficiency of the apparatus by increasing the amount of moisture which will be distributed into a room in a given time and with a given pressure of water in the pipes. I may also provide below the casing a basin having an outlet considerably above its bottom, so that it retains a supply of water over whose surface the current of air must pass. The air thus takes up moisture at every point in its passage through the apparatus and is so nearly saturated that it may be distributed effectively over a large area, being at the same time forcibly distributed over such an area by the action of the fan and other current-inducing features. The water-wheel discharges its water directly upon and through the fan and is the principal source of supply of the water in the basin. The water leaves the wheel, of course, in comparatively large drops, and these are struck by the rapidly-rotating fan-blades, which pulverize the water at the same time that they force it and the air down through the casing. The fan preferably consists of oblique blades rotating on a vertical axis, so as to produce a directly-downward current through the preferably cylindrical casing. The casing is preferably

entirely open at its top or ingress end, at which point its diameter is at least as great as the diameter at the level of the fan, and preferably greater. Free ingress of air is necessary to obtain with an economical use of power a current of considerable volume. The direct spray downward assists the fan in inducing a downward current of air.

Referring to the drawings, A represents a tubular casing, and B a basin. C is a fan, and D a water-wheel driving the fan, these parts all being in their general features the same as explained in my Patent No. 701,553, above referred to. In operation the discharge from the wheel D in part falls directly through the fan C and is broken up thereby and blown into the room, another part of the discharge being thrown onto the inner wall of the tubular portion A and dropping off the lower edge of the same in a sort of rain, through which the current of air is blown. The basin retains a supply of water up to the level of the outlet, as shown, and also gives up moisture to the current of air being blown over it. I have found that the efficiency of the driving-wheel D is so great that the amount of air passing through the apparatus is such as can take up more moisture than is afforded by the means above referred to. I find also that the best results can be obtained by retaining the efficient water-wheel shown and supplying additional moisture from another source, preferably in the form of a finely-divided spray and preferably also above the water-wheel and fan in the upper enlarged part of the tubular casing, so that it is completely distributed in all parts of the air, which subsequently passes to the fan. Such a sprayer is shown at E and may be, as far as the generic features of my invention are concerned, of any usual or suitable construction in which a jet of water is converted into a fine spray extending in all directions. The arrangement of the connections may be considerably varied, it being understood that the arrangements shown are given merely as examples.

In Fig. 3 I show the usual valve F, which is controlled from below by cords or chains.

It is not essential that one of the elements of my apparatus shall be the water-wheel and fan shown in my prior application. I may substitute for these one or more moisture-distributing devices of a different character, which nevertheless serve to assist the spraying device E in producing a current of air and in producing a substantial saturation of the air, so that much moisture may be distributed with the passage of a minimum air-current. This additional element may, in fact, be another or several other sprayers E. In Fig. 5 I show two such sprayers acting in succession to cause a current and to moisten the air thereof as it passes through a single tubular casing A and thence out into the atmosphere. As explained before, the sprayers need not be of the specific type shown in Fig. 1, but may be of any other style, as shown in Fig. 6.

I have designed certain specific forms of nozzle for use in air-moistening apparatus. In the sprayer shown in Figs. 1, 2, and 5 I arrange a plate G opposite a nozzle H, which reduces the jet from the nozzle to a fine spray and distributes it in all directions outwardly. On the substantially flat central portion of the plate G, I provide a central point I and an annular groove J, cut in the face thereof near its circumference, which serves to prevent the water collecting and discharging from the plate more at one point than at another and causes it to be substantially equally distributed around the circumference of the plate, so that it flies off in a cloud of the finest spray and with substantial uniformity in all directions. Preferably the plate is arranged above the nozzle, which throws the jet upward, and the plate has a downwardly-extending edge K for projecting the spray downward, the groove J being also preferably at the angle of the downwardly-extending edge and the face of the plate. This form of nozzle is very efficient in inducing a current of air through a tubular casing open at opposite ends, and, as explained above, I may use a plurality of these nozzles in place of using one nozzle and one fan. The weight of the thoroughly-moistened air and also the direction of the spray assist in inducing a downward current.

Another efficient form of sprayer is shown in Figs. 3 and 4. In this construction a conical plate L is arranged below the nozzle, with its point extending substantially into the mouth of the nozzle during operation, so that the stream from the nozzle is not broken up by the blow produced by its contact with the plate, but is gradually spread out into a hollow cone and subdivided into fine spray at about the edge of the plate L. This form of sprayer produces also a considerable current of air and is therefore very useful in connection with my improved air-moistening apparatus and may also be substituted for the water-wheel and fan of Figs. 1 and 3. This form of sprayer is also well adapted for use with my improved self-cleaning nozzle described in my Patent No. 724,685, above referred to, as illustrated in Fig. 4. Here the movable part M of the nozzle is arranged to project down onto the end of the cone L during operation, the height of the cone L being adjustable, as indicated, in order to set it correctly. When the current of water, and consequently the pressure on movable member M of the nozzle, is cut off, the spring N lifts it to such a distance that the cleaner O enters the mouth of the same, so as to clean it out, if necessary.

In Fig. 6 I show a sprayer E as of the ordinary type, composed of a deflecting-plate P and a nozzle Q. It is to be understood that the nozzles Q may be and preferably are

of the self-cleaning type illustrated in Fig. 4 and also that the nozzles in each of the other sprayers described may be and preferably are of the same type.

The tubular casing for my apparatus may be of any usual or suitable construction. I have illustrated in Fig. 1, however, a form of casing and supporting-frame which I have designed and which is peculiarly advantageous in an apparatus of this sort. The upper part R of the tubular casing is enlarged, so as to give free access to the incoming air, and is reduced at its lower part S where it surrounds the fan to be but slightly greater in diameter than the fan, so as to subject the entire column of air to the action of the fan, at the same time compressing it somewhat as compared with its condition in the upper part of the casing, and thus increasing its velocity of movement. The casing is continued at its lower end outwardly for a considerable distance, as shown at T, so as to insure that the air shall move outward from the apparatus and shall not move directly upward and establish a local circuit by reëntering the top R of the casing. In order to prevent the dropping of water to the floor below, the outer edge of the portion T of the casing lies within the corresponding edge of the basin B below. The edge of the basin B is considerably beyond the lowest line of the tubular casing, where the latter turns upward to form the part T. It is at this lowest line that moisture which has been caught on the sides of the casing drips off in greatest quantity into the basin below, and in order to avoid the drops from being carried with the air-current out into the room the edge of the basin B is quite far beyond this lowest line of the tubular casing and preferably also above the latter, as shown. The curve of the portion T and of the outer portion of the basin B is such as to project the air in a substantially horizontal direction. The parts may be supported in any suitable way. Preferably I provide a cast open or skeleton frame U with an upper cross-bar V, having a hub W, into which the water-supply pipe is screwed and which is provided with an outlet, as shown, for attachment to the pipe which supplies the several nozzles employed. An intermediate cross-bar X is also provided with a hub which supports the nozzle H and the upper bearing of the fan-shaft, as shown. A similar cross-bar Y near the lower end supports the lower bearing for the fan-shaft and supports also a cross-bar Z at right angles to the bar Y. The ends of the bar Z correspond with the lower extensions Z′ of the casting U and, like these extensions Z′, are curved outwardly at the lower end, so as to support the tubular casing A, and also by means of the links *a* act to support the basin B. The basin is provided with a conical elevation *b* at the center, which assists in directing the current of air over the water in the basin and outwardly at the sides. The casing A is not attached to the frame U, but merely rests on the lower ends Z′ and Z thereof. It can therefore be raised when desired, so as to give access to the moving parts of the apparatus and to the inside of the basin for purposes of inspection or repair at any time, as indicated in dotted lines. The casing may be provided with a cross-bar *c* at its upper end, which serves to guide it on the water-supply pipe; but this is not essential. This manner of supporting the tubular casing movably upon the frame is not limited to the particular casing shown in Fig. 1, but may be adapted to any desired form of casing.

It will be seen that the water-wheel and fan serve primarily to determine the volume of air passed through the apparatus, and consequently the area or room which can be brought within the moistening influence of a single apparatus. For example, a larger or a smaller nozzle for the water-wheel will be used in designing an apparatus for a larger or smaller room. On the other hand, the spray serves primarily to determine the quantity of moisture to be supplied to the current of air passing through the apparatus. A larger or a smaller spray-nozzle will be used, according as the air is to be more or less humid. This adaptability of the apparatus for widely-different requirements is practically of great value.

Though I have described with great particularity of detail certain embodiments of the invention, yet it must not be understood that the invention is limited to the particular embodiments disclosed. Various modifications of the details and arrangement and combination of the parts are possible to those skilled in the art without departure from the invention.

What I claim is—

1. In an air-moistening apparatus, in combination, a vertical tubular casing open at its opposite ends for free ingress and egress of air, a basin beneath its bottom with a space between for free lateral discharge of air, and with means for retaining a quantity of water in said basin, a fan within said casing rotating on a vertical axis and having oblique blades for producing a directly-downward current of air therethrough, said fan serving primarily to determine the volume of air passed through the apparatus and the area or room moistened thereby, a water-wheel arranged to drive said fan and to discharge into said basin, and a moistening device in said casing comprising a spraying-nozzle producing a fine spray which is distributed with the downward current of air and any precipitation from which is caught in said basin, said spray serving primarily to determine the quantity of moisture or degree of humidification in the current passing through the apparatus.

2. In an air-moistening apparatus, in com-

bination, a vertical tubular casing open at opposite ends for free ingress and egress of air, a basin beneath its bottom with a space between for free lateral discharge of air and with means for retaining a quantity of water therein, a fan within said casing rotating on a vertical axis and having oblique blades for producing a directly-downward current of air therethrough, a water-wheel within said casing arranged to drive said fan and to discharge its water directly upon and through said fan and into said basin, and an additional moistening device in said casing comprising a spraying-nozzle arranged to produce a fine spray which is distributed with the downward current of air so that any precipitation is caught by the basin, said fan serving primarily to determine the volume of air passed through the apparatus and the area or room moistened thereby, and said spray serving primarily to determine the quantity of moisture or degree of humidification of the air.

3. In an air-moistening apparatus, in combination, a vertical tubular casing entirely open at opposite ends for free ingress and egress of air, a basin beneath its bottom with a space between for free lateral discharge of air and with means for retaining a quantity of water in said basin, a fan within said casing rotating on a vertical axis and having oblique blades for producing a directly-downward current of air therethrough, the diameter of the casing being at least as great at the ingress end as at the level of said fan, and said fan serving primarily to determine the volume of air passed through the apparatus and the area or room moistened thereby, a water-wheel arranged to drive said fan and to discharge into said basin, and a moistening device in said casing comprising a spraying-nozzle producing a fine downwardly-directed spray which assists the downward current and is distributed with the downward current of air so that any precipitation is caught in said basin, said spray serving primarily to determine the quantity of moisture or degree of humidification in the current passing through the apparatus, said casing being extended outwardly at its lower end to direct the moist air a considerable distance outward from the apparatus, and the edge of the basin being a considerable distance beyond the lowest line of the casing so as to catch the drops blown off the casing along said line.

4. In an air-moistening apparatus, the combination with a vertical tubular casing open at opposite ends, of a fan within said casing for producing a downward current of air therethrough, a water-wheel arranged to drive said fan and to discharge into said current of air, and an additional moistening device comprising a spraying device arranged to discharge a spray into said current of air, said casing being but slightly larger than said fan at the point where it surrounds said fan, and being enlarged at its upper end to give free access to the incoming air, and said water-wheel and additional moistening device being located in the enlarged end of said casing.

5. In an air-moistening apparatus, the combination with a tubular casing open at opposite ends, of means normally within said casing for distributing moisture, an open supporting-frame for said distributing means, said casing being supported upon said frame and movable thereon to permit access to said distributing means.

6. In an air-moistening apparatus, the combination with a tubular casing open at opposite ends, of a basin below said tubular casing, and an open supporting-frame for said basin, said tubular casing being supported upon said frame and movable thereon to permit access to the inside of said basin.

7. In an air-moistening apparatus, the combination with a tubular casing open at opposite ends, of means normally within said casing for distributing moisture, a basin below said distributing means, and an open supporting-frame for said distributing means and basin, said casing surrounding said distributing means and supported upon said frame and movable thereon to permit access to said distributing means and the inside of said basin.

8. In an air-moistening apparatus, the combination with a vertical tubular casing open at opposite ends, of means for inducing a downward current of air through said casing including a nozzle therein, and a plate arranged opposite said nozzle for reducing the jet to a spray, said plate having a substantially flat central portion and an annular groove J cut in the face thereof near its circumference for insuring the exit of the water from the plate in a subdivided state.

9. In an air-moistening apparatus, the combination with a vertical tubular casing open at opposite ends, of a nozzle therein arranged to throw a jet upward, and a plate G opposite said nozzle for reducing the jet to a spray, said plate having a substantially flat central portion, a downwardly-extending edge for projecting the spray downward to induce a downward current of air through said casing, and an annular groove J cut in the flat face thereof at the angle of said edge for insuring the exit of the water from the plate in a divided state.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

QUIMBY N. EVANS.

Witnesses:
DOMINGO A. USINA,
FRED WHITE.