June 2, 1931. E. A. SPAULDING 1,808,183

HUMIDIFIER

Filed Dec. 10, 1928 2 Sheets-Sheet 1

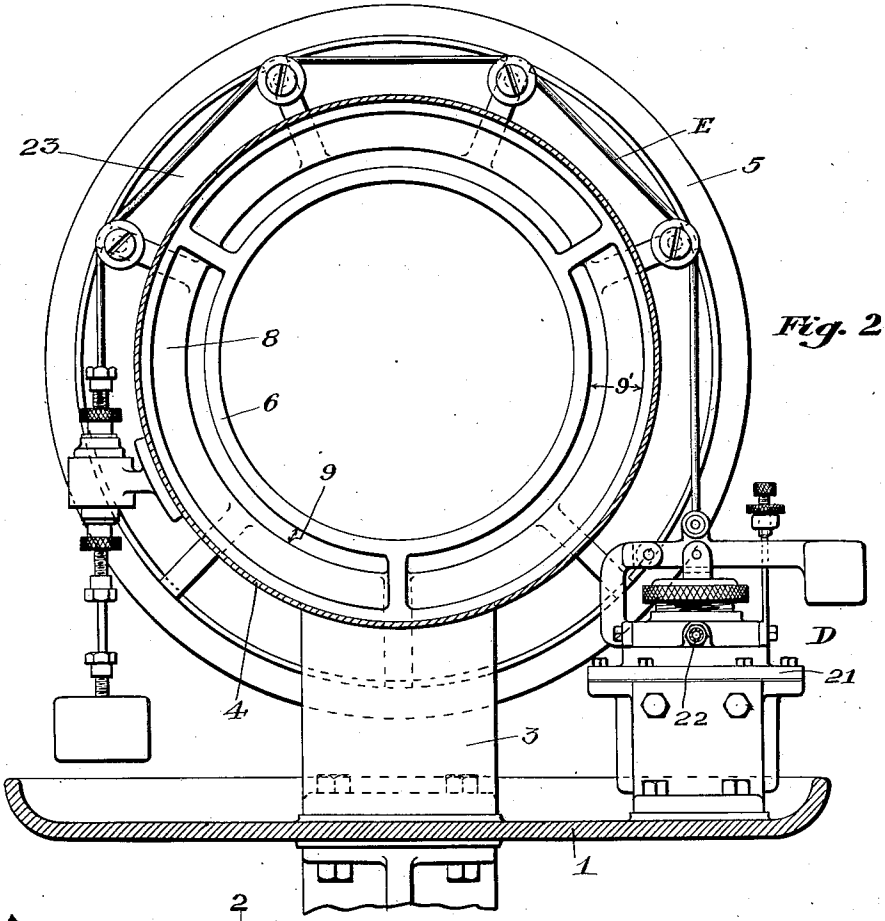


Fig. 2

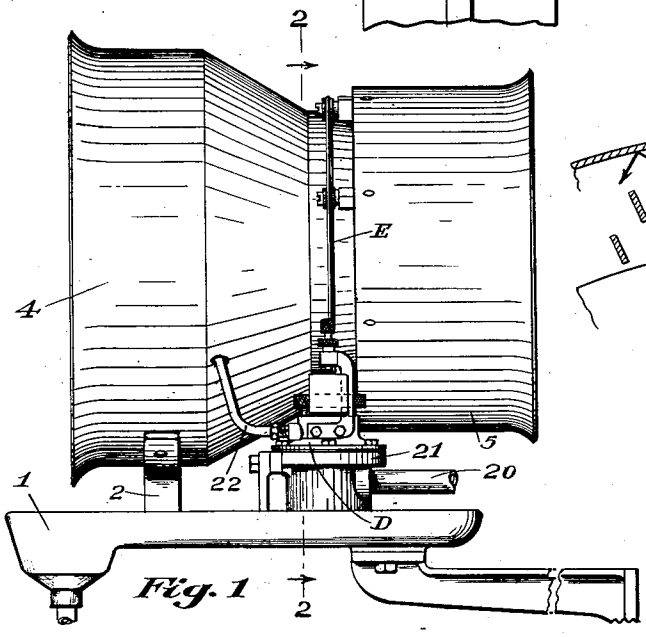


Fig. 1

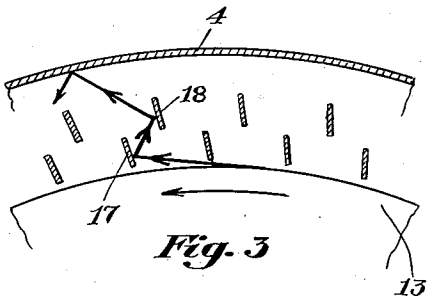


Fig. 3

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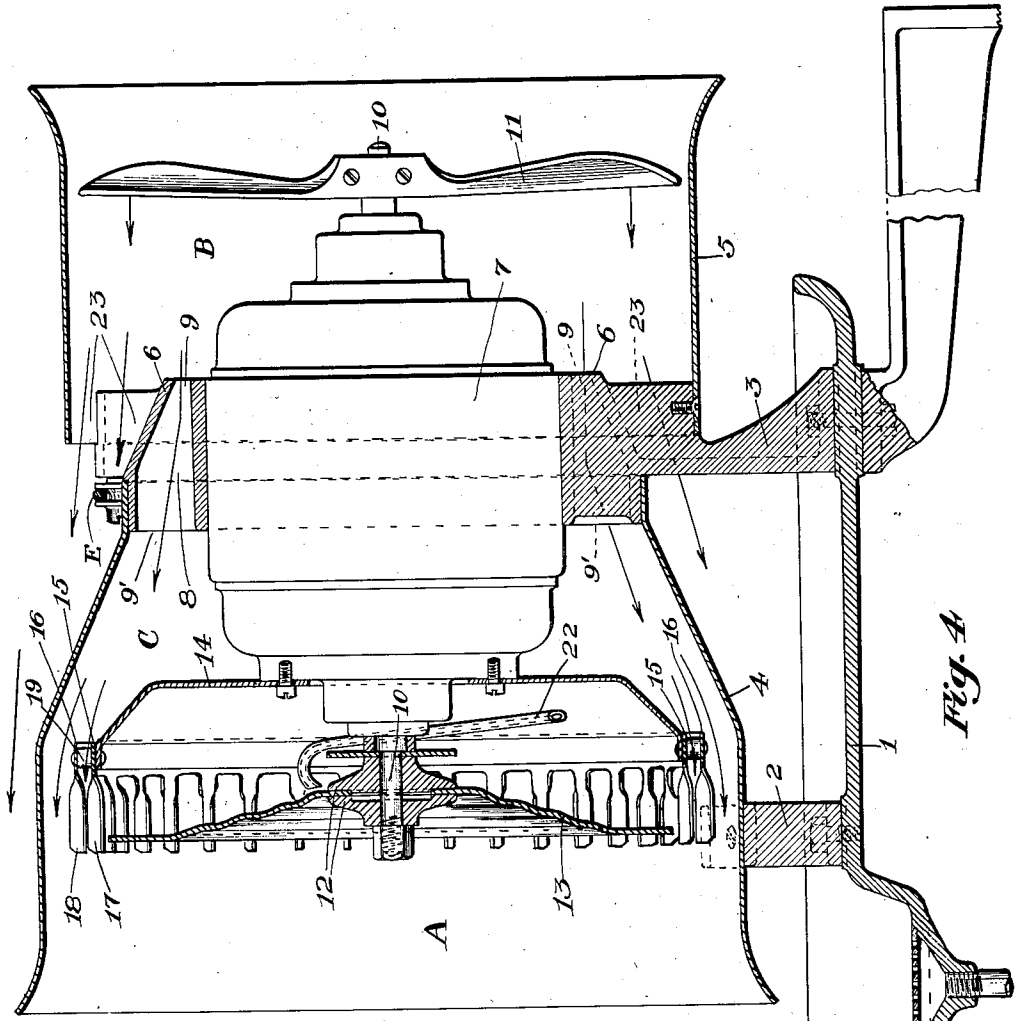


Fig. 4

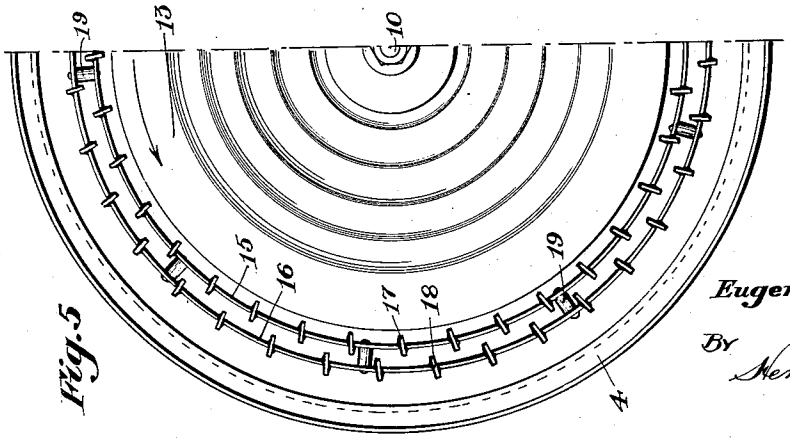


Fig. 5

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Patented June 2, 1931 1,808,183

UNITED STATES PATENT OFFICE

EUGENE A. SPAULDING, OF PORTLAND, MAINE

HUMIDIFIER

Application filed December 10, 1928. Serial No. 325,096.

In handling paper during the various operations involved in the art of printing, and to a greater or less extent in the weaving of the material used in the manufacture of textile products, there are certain fundamental difficulties to overcome in order that the work may proceed under the most favorable conditions.

For instance in printing on large sheets especially in lithographic work done in multicolors, a seasoning or conditioning of the paper stock is generally required, previous to the press operations, and facilities provided in the pressroom itself whereby the proper atmospherical state with respect to humidity in the room may be established and constantly maintained throughout the entire printing period.

Varying humidity conditions, or changes in the per cent of moisture content of the air cause either shrinking or swelling of the paper, and on the constancy with which the humidity is held to any one particular degree largely depends the attainment of correct registration of the repeated imprints made on the same sheet.

Furthermore, when the air is brought to the desired state of humidity difficulties caused by static electricity are eliminated, and this greatly lessens the trouble which printers call "offsetting", a term applied in printing operations when the ink is smeared by one sheet on to another during piling. Jogging of the pile is also accomplished much more easily and advantages in many other ways accrue by the moisture treatment given the atmosphere in the rooms where the various operations are being carried on.

The effect of variations in degrees of humidity of the air applies to and is noticeable in other occupational lines in which the material used or operated on is susceptible of change of shape or form, hygrometrically; and where constancy in the condition of the material is essential, controlled artificial humidification of the surrounding air offers one of the best if not the only remedy.

In the conception of my present invention, which deals with apparatus for artificially humidifying interiors, I have had in mind, and it is the general object of this invention, to provide a device devoid of complication of parts, compact in form and efficient in operation, and characterized by such a novel design and arrangement of elements as will fulfill the requirements and bring about the desired conditions as hereinbefore recited.

With this end in view I have devised a humidifier, preferably embodying in its structure a multi-grid impeditive element; a fan-wheel having finely pitched blades and operated at a speed above that usually employed in air-blast work; a closure element around the fan-wheel by means of which all of the air projected by the fan may be utilized, either directly through the interior or along the exterior of the humidifier an air-current-dividing member through the agency of which a relatively small proportion only of the total air blasted by the fan enters the impeditive element chamber—and this portion reduced in speed by entering an expansion chamber before being impacted on the grids; and by the construction just set forth, to provide an arrangement which produces a slow impact air force on and rearwardly of the vapor in the grid chamber combined with a high speed air current along the exterior surface of the humidifier, tending to draw or suck the vapor from out of the interior thereof.

I have illustrated my invention by the use of the accompanying drawings in which is disclosed one embodiment thereof which, at the present time, I consider preferable to other possible forms in which the invention might be carried out.

In the drawings:—

Fig. 1 is a side elevation of my humidifier;

Fig. 2 is a transverse view, partly in section taken on line 2—2, Fig. 1,—the motor not being shown;

Fig. 3 is a diagrammatical view showing the direction of the water as it passes off the disc and is twice deflected on the double grid;

Fig. 4 is a longitudinal sectional elevation of the device, and,

Fig. 5 is an end view, showing the side of the disc and ends of the grid blades.

Similar reference characters are employed

to identify like parts in all views of the drawings.

Referring to the drawings, 1 represents a drip-pan forming the substructure of my humidifier and into this pan falls any water which might not have been vaporized by the elements provided for this work.

Rising from the drip-pan are pedestals 2 and 3 supporting, respectively, the larger and smaller ends of the vaporizing chamber casing 4. The pedestal 3 also serves to carry the fanwheel casing 5 and extends inwardly to provide a circular, hollow frame 6 to which the motor 7 is secured.

The interior of the frame 6 is tapering in cross-section, the annular opening 9 at the air-inlet end being very much smaller than the outlet at 9'.

Mounted on the motor shaft 10, within the casing 5, is a fan-wheel 11 having blades set on fine pitch angles. This fan-wheel is driven by a special motor capable of more than the ordinary speed of power units,—in the present instance, at 3500 or more R. P. M. On the opposite end of the motor shaft, within the vaporizing chamber A, and secured between collars 12, is a disc 13 preferably dished to provide stiffness, and secured to the front side of the motor is a vertically disposed pan-shaped partition 14 which encloses one side of the space between the motor and the disc, and prevents direct air impact on the latter, of air projected by the fan-wheel.

Secured to the periphery of the partition 14 are flat rings 15 and 16, outwardly from the forward sides of each of which, at their margins, extend twisted blades 17 and 18, respectively,—the two rings or grids being held in spaced relation by collars 19. The blades 17 are comparatively close to the periphery of the disc 13 and their ends, as also the ends of the blades 18, extend forwardly beyond the plane in which the outer or forward face of the disc revolves.

Extending from any convenient source of water supply,—as for instance, a street main, and on which is preferably placed a reducing valve (not shown), is a pipe 20. This pipe conducts water at moderate pressure to the receiver 21 of the automatic feed-water controlling device D. From the receiver a small tube 22 carries a regulated supply of water to the disc 13, a valve within the device D automatically regulating the flow of water to the disc through the agency of the hygrometrically responsive element E.

By the use of this regulatory element D, substantially no more water is fed to the disc than is needed to maintain the desired degree of humidity in the room. Occasionally, however, there may be a few drops unvaporized, and these, as has hereinbefore been stated, fall into the drip-pan 1.

As the device D forms no specific part of my present invention and is the subject of a concurrently filed application, no extended description of the same will at this time be made.

In Fig. 3 of the drawings is shown a diagram illustrating the direction of movement of the water as it is thrown centrifugally off the disc 13. The blades are so positioned that the face of one on the inner grid, which receives the first impact of the water from the disc, deflects the water so that it impacts on the blade immediately at its rear on the adjacent outer grid,—and thence to the wall of the casing 4.

The impact of the water on the blade 17 is of such potence that it readily deflects to the blade 18, against the retarding effect of the adverse current of air circulating in the same direction as the disc 13 rotates, and although it has now spent a considerable portion of its driving force, what momentum remains in the water, together with the assistance of the before mentioned current of air, acts to continue its movement toward the casing 4,— from which it rebounds and is picked up by the outgoing air and distributed into space in the form of the finest mist or fog.

While the multiple-grid feature which, as a matter of fact, may include more than two annular grids, is considered an improvement over a single grid, a characteristics feature of my humidifier which I esteem of equal and possibly of greater importance is the method employed to control the distribution of air to the interior and exterior of the humidifier with respect to the speed of the two respective bodies,—the interiorly directed body of air being of less velocity than the exterior current. The arrangement works out so satisfactorily that with but one grid the apparatus shows marked efficiency.

If reference be had to Fig. 4 it will be observed that, jointly, the frame 6 and the casing 5 provide two outlets for blasted air from the fan-wheel 11. The annular opening 9 is comparatively small and air enters it at the speed at which the air was projected from the fan; but immediately upon entering the chamber C this air fans out, so to speak, and loose a large part of its velocity and impacting force by expanding into the space (chamber C) which is many times the capacity of the entering aperture.

Thus, when the interior air current reaches the grids it is travelling at a much reduced speed from that of the air current which exits through the relatively large annular opening 23,—which latter air current is moving along the exterior of the casing 4.

So that while a high velocity air current is passing along the exterior of the casing 4 into forward space, a comparatively slow moving current of air is passing the grids.

Now, after the slow moving air and vapor moves to the outer end of the casing 4 and starts into space, it is enveloped in and picked

up by the speedily moving exterior air blast encircling the casing, and a commingling and mixing of the heavily vapor-laden air and the lighter and dryer air takes place with the result that a further disintegration of the moisture content of the air occurs.

I believe I have evolved a new principle in humidifiers, in that I transform the initial, one-speed air blast from the fan-wheel into two air currents of varying velocities, relatively,—the slower of the two acting directly on the impeditive elements and moving at such a speed as will gently move the vapor forwardly after the impaction of the water on the grids, but not of such potency as will force into the room globules of water off the grids or the casing enclosing them, and the faster moving air current, although not outwardly confined so as to be projected in too concentrated a manner, yet directed wholly in a generally forward direction, utilized exclusively to draw, by suctional effort, the slower, advancing vapor-laden air from the vaporizing chamber and effect a thorough union or re-uniting of the two currents together with the vapor, and project the combination into the room.

The foregoing recital of the operation of my humidifier has been fulfilled and accomplished by a demonstration of the device in actual practice.

A further advantage in operating the fan-wheel at an unusually high speed and confining the initial air movement within the fan-wheel casing so that substantially 100 per cent is utilized when discharged both through and around the humidifier, instead of being largely dissipated in other directions, is that a very much smaller and more compact device is provided, operating with less noise and having the same capacity for humidification purposes with greatly improved and more effective results attained than is the case with many humidifiers built on larger and more conventional lines.

What I claim and desire to secure by Letters Patent is:—

1. A humidifier comprising in combination with a revoluble shaft, a disc and a fan-wheel secured to said shaft, of a fixed impeditive element surrounding said disc, said element including a plurality of annular grids disposed in transverse alignment, relatively, each grid having a plurality of blades respectively disposed obliquely to a radial line, a cylindrical casing concentrically disposed around said impeditive element and spaced therefrom to provide an annular space, a frusto-conical portion on the rearward end of said casing, a frame adapted to support said casing and said frusto-conical portion thereof, an annular aperture through said frame, another cylindrical casing, said second casing adapted to surround said fan-wheel and extend forwardly to provide, between it and said frusto-conical portion, an annular outlet for air projected from said fan-wheel on to the exterior of said first mentioned casing, said outlet being of relatively greater width than the annular aperture through said frame, an interior partition extending inwardly from said impeditive element and adapted to prevent impingement of the projected air from said fan-wheel on to said disc, and means to conduct water to said disc.

2. A humidifier comprising in combination, a revoluble shaft, a disc secured to said shaft, a plurality of annular grids diametrically aligning and positioned outwardly of the periphery of said disc, each of said grids including a plurality of blades each thereof disposed obliquely to a radial line, the blades in one grid circumferentially spaced on radial lines located intermediate the radial lines on which the blades of the grid next adjacent are circumferentially spaced, a casing concentrically disposed around said grids and spaced therefrom to provide an annular air-passage-way, a frusto-conical portion on the rearward end of said casing, a frame supporting said casing, an annular aperture through said frame, the walls surrounding the same diverging toward the front of said humidifier, an expansion chamber forwardly of said frame adapted to reduce the impact pressure of the air passing through the aperture in said frame, a fan-wheel on said shaft, a second casing adapted to circumvent the air projected by said fan-wheel and control and direct its movement in a generally forward direction, an annular air-passage-way between said fan-wheel casing and said frame of relatively larger dimensions than the aperture through said frame, a partition adapted to deflect the air coming from said fan-wheel, but reduced in impact pressure in said expansion chamber, over said grids and to provide also against impact of said current of air on said disc, means to conduct water to said disc, and means to rotate said shaft.

3. A humidifier comprising in combination a revoluble shaft, a fan-wheel fixed on said shaft, a casing surrounding and spaced from said fan-wheel and extending forwardly thereof, a disc secured to said shaft, an impeditive element located outwardly of and in radial alignment with said disc, said element including a plurality of blades each thereof disposed obliquely to a radial line, a second casing spaced from and adapted to surround said impeditive element, the rearward end being reduced in diameter, a frame joining said casings and extending for a substantial distance into the said first casing, whereby there is formed between the rearward end of said frame and the forward end of said first casing an annular space opening out of the forward end of said

first casing, an annular opening through said frame providing communication between the interiors of the two said casings, said last mentioned annular opening being of relatively smaller width than the annular opening between the said frame and the said first casing, and means to rotate said shaft.

4. A humidifier comprising a revoluble disc, a fan wheel, an impeditive element, a casing surrounding said impeditive element, a casing surrounding said fan wheel and disposed rearwardly of said first mentioned casing, a partition protecting said revoluble disc from direct impaction thereon of air projected by said fan wheel, a passage-way from said fan wheel casing permitting air to be projected therethrough over the outside of said first mentioned casing, and a passage-way of smaller cross-sectional area than said first mentioned passage-way, through which a lesser volume of air may be projected into the interior of said first mentioned casing, said interior constituting an expansion chamber for the air entering it from said smaller passage-way.

5. A humidifier comprising a revoluble disc, a stationary impeditive element, a casing surrounding said impeditive element, the rear end thereof being of smaller diameter than its front end, a fan wheel, a casing surrounding said fan wheel and extending forwardly thereof, the front end of said second casing being of larger diameter than the rear end of said first casing, providing thereby an annular space between the two said casings through which air projected by said fan wheel may pass and continue over the outside of said first casing, a frame within the smaller end of said first casing, a relatively large chamber forwardly of said frame, an annular opening through said frame of less transverse area than that of the annular space between said casings, said opening constituting a passage-way into said chamber for air projected by said fan wheel, a partition transversely disposed within and being of lesser diameter than the larger portion of said first casing, measured interiorly of the latter, said partition located rearwardly of said revoluble disc and adapted to prevent impaction of air thereon from said fan wheel, and means to rotate said fan wheel and said revoluble disc.

In testimony whereof I affix my signature.

EUGENE A. SPAULDING.