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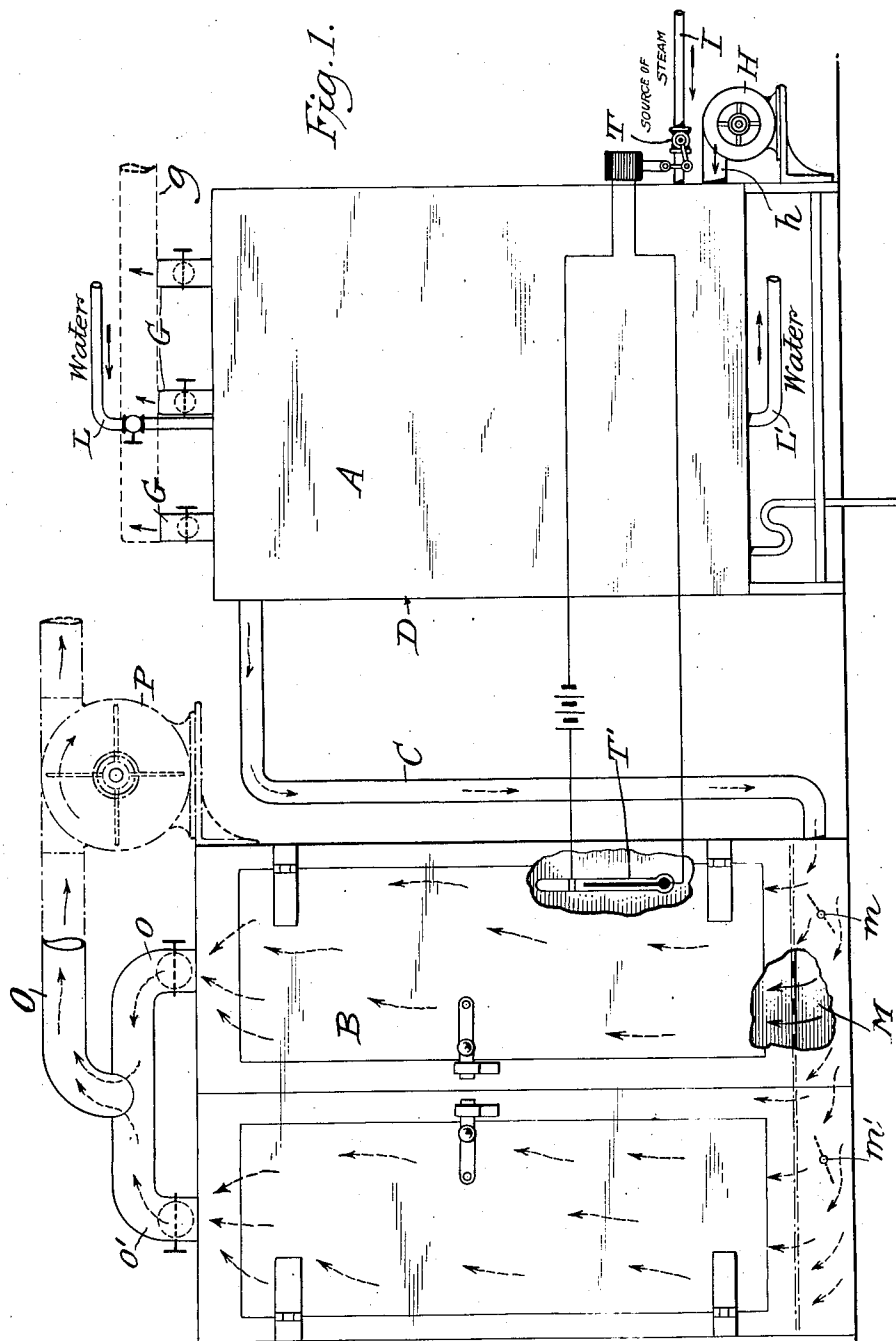
A. F. WRIGHT

HUMIDIFYING SYSTEM

1,916,455

Filed Feb. 9, 1929

2 Sheets-Sheet 1



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Fig. 2.

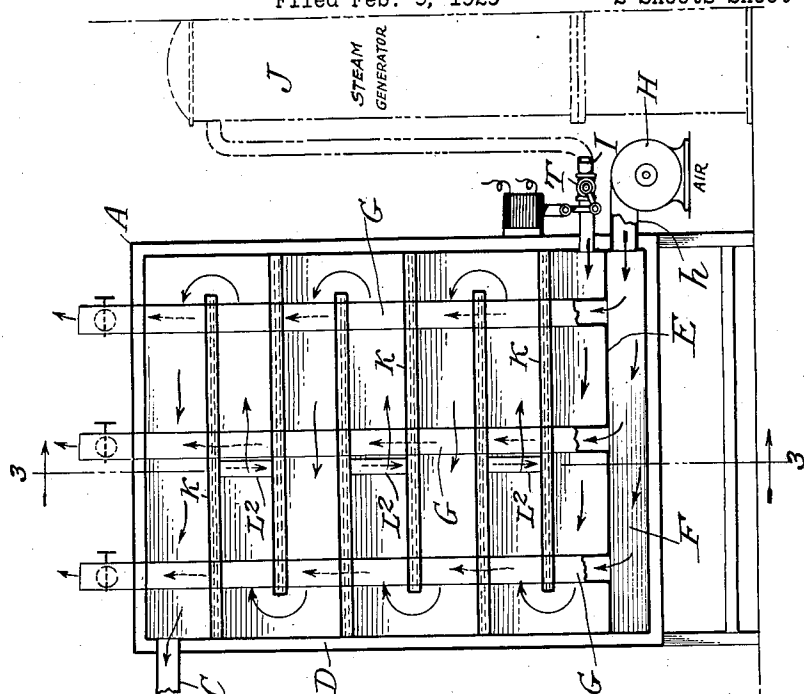


Fig. 3.

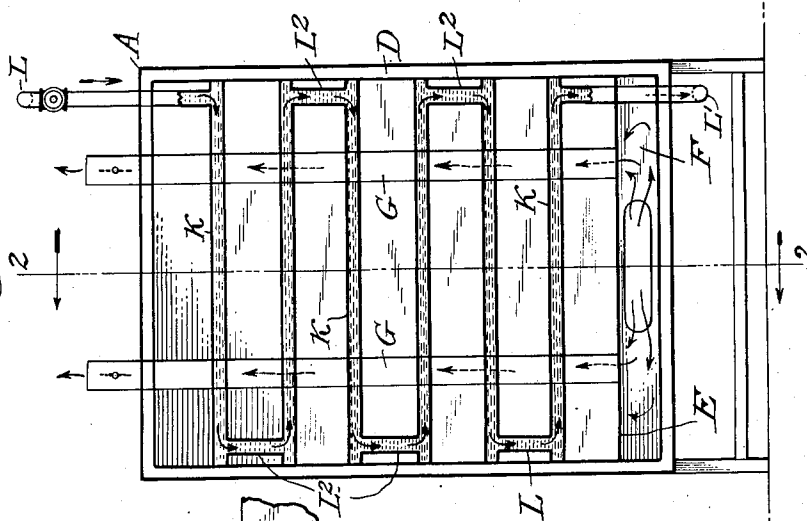
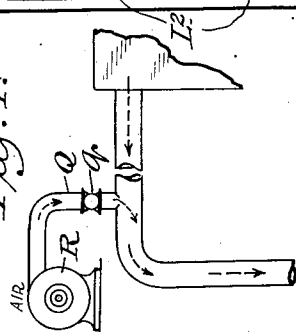


Fig. 4.



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HUMIDIFYING SYSTEM

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This invention is a system for humidifying materials of various kinds, and the object is to utilize steam from any available source of steam supply whereby the thermal units are reduced, with the result that a water vapor at a temperature suited to the product is made available by an economical mode of procedure.

It is desirable in many arts to subject material to the action of a water vapor in order to improve the condition of the product by the addition of moisture. One example is in the shoe making art, wherein shoe uppers are humidified or "mulled" for conditioning the leather to better adapt it for the operations subsequently to be performed. Other examples are in the textile art, the paper making art, tobacco, and numerous other products.

Generally, steam affords the moisture required for humidification, but as is well known, steam is water vapor accompanied by thermal units (B. t. u.), the presence of the total of which is or may be undesirable in the treatment of the product because of an injurious effect thereon.

According to my invention, steam is partially dethermalized, thereby producing a water vapor at a lower temperature than the steam, and such partially dethermalized water vapor is used, either directly or by mixing it with air or other gas, by exposing the products to the access of such dethermalized water vapor.

The steam is obtained from any source of available supply, such as a pipe line in a factory, or from a steam generator of one form or another. The steam flows within a dethermalizing unit, usually in the form of a chamber, within which the partial dethermalizing operation is conducted. The dethermalizing step is performed by the agency of air, water, or other agents, and in some instances I may use air alone, or water alone, or the air and water may be used jointly.

In a practical form of dethermalizing unit, I provide a series of air tubes extending through the steam chamber, and I provide, also, a series of water baffles positioned with-

in the chamber intermediate the steam inlet and the outlet for the dethermalized water vapor. Provision is made for the circulation of air through the tubes, and for the circulation of water within the water baffles, said tubes and said baffles being composed usually of metal, such as copper, possessing high heat absorbing and heat conducting capacities for the rapid elimination of a part of the thermal units present in the steam.

Other functions and advantages of the invention will appear from the following description taken in connection with the drawings, wherein—

Figure 1 is a side elevation of an apparatus for humidifying materials.

Figure 2 is a vertical section through the dethermalizing chamber or unit, the plane of the section being indicated by the dotted line 2—2 of Figure 3.

Figure 3 is a vertical section taken at a right angle to Figure 2, and about on the plane indicated by the dotted line 3—3 of Figure 2.

Figure 4 is a detailed view.

The apparatus embodies two chief elements which, for convenience, are designated as a dethermalizing unit A, and a product unit B, operatively connected by a duct or conduit C, wherein the partially dethermalized water vapor flows from unit A to unit B.

The unit A is provided with means of one form or another for partially eliminating thermal units from steam. It is well known that steam from an available source of supply is a water vapor containing thermal units (B. t. u.); but as the presence of excessive heat in the water vapor does or may have an undesirable or injurious effect on the material to be humidified. My invention of the dethermalizing unit reduces the thermal units present in the steam so as to obtain a water vapor the temperature of which is suited to the product to be treated. Accordingly, the apparatus or dethermalizing unit A is constructed with means for absorbing from the steam a proportion of the thermal units. Preferably, the apparatus A is equipped with means within the steam chamber for the circulation of air through it, so as to absorb a

proportion of the thermal units present in the steam. Furthermore, said apparatus A is provided with baffles within which is set up a flow of water or other liquid adapted to also absorb thermal units from the steam, as a result of which a proportion of the thermal units present in the steam are eliminated or carried off by the flowing air and the flowing liquid, and thus the temperature of the steam is reduced, resulting in a water vapor the temperature of which is suited to the product.

The apparatus A includes in its construction a casing or housing D, which is, in one form, composed of double walls for insulating purposes, the interior wall being preferably composed of an appropriate non-corrosive metal, such as copper. Near the bottom of the housing D is a horizontal partition E, spaced relatively to the bottom, and producing an air chamber F.

Extending vertically through the steam chamber of the housing D, is a series of tubes G. These tubes are joined in a suitable way at their lower ends to the partition E for the tubes G to communicate with the air chamber F, and at their upper ends these air cooling tubes extend through the top of the housing D so as to discharge heated air from the chamber; or, if desired, these tubes G at their upper ends may be connected by duct *g* for carrying the air outside of the room. The tubes G are composed of metal, such as copper, possessing high heat conductivity, and said tubes function as means for absorbing heat from the steam present in the chamber of the housing.

Means are provided for the circulation of air within the tubes G as a means for cooling the tubes interiorly thereof. As shown, a blower H is provided adjacent the apparatus A, and from this blower leads conduit *h*, connected to the chamber F, whereby the blower delivers air at a determined velocity, and in a desirable volume, to the chamber F, which in turn distributes the air into the series of tubes G so that the air flows through the steam chamber without having any communication with the steam space, the effect of which is to cool the tubes G and to carry off the thermal units absorbed by the tubes from the steam.

Steam is supplied to the chamber of apparatus A from any available source, such as a steam line or pipe I, shown in Figure 1, or from steam generator J, shown in Figure 2, said steam generator being of any desirable character. The steam line I is connected to the housing D for communication directly with the lower part of the steam chamber. The steam line I is connected to one part of the housing D, whereas the duct or conduit C is connected to another part of the housing, the two connections I, C, being distant one from the other so that the steam will flow

through the steam chamber from the intake I to the outlet C.

The flow of steam within the steam chamber is baffled, and it is preferred to use baffles K positioned in alternate or staggered order within the steam chamber, as a result of which the steam or water vapor will flow back and forth within the chamber in a g-zag, or circuitous, path. The baffles K are of hollow or chambered formation, and said baffles are composed of metal having a high heat conductivity, such as copper. Any suitable cooling fluid is admitted, and, as shown, an intake pipe L is connected to the uppermost baffle, whereas an outlet pipe L' is connected to the lower baffle of the series, but intermediate the baffles are other pipes, L², so arranged as to provide for the flow of water through the baffles of the series.

The deprivation of the thermal units from the water vapor is attended by condensation of water, which is free to flow over the baffles and the tubes so as to collect on the partition E, and from this partition the water of condensation is discharged through an appropriate trap, or through other devices, known in the art as "bleeders".

The products chamber B is of any desirable construction for containing the products to be treated by the dethermalized water vapor admitted to the apparatus B by the duct C. As shown, the products room B is provided with a plurality of compartments at the bottom of which is flue M communicating directly with the duct C. The water vapor passes from the chamber M into the compartments, or either of them, within the apparatus B. If desired, the flow of the water vapor into one compartment may be controlled by damper *m*, whereas the flow of water vapor into the other compartment is controlled by damper *m'*, see Figure 1. The water vapor fills the compartment of the apparatus B within which the products are supported in any suitable way so as to expose them to the access of the water vapor, whereby the product is humidified by taking up moisture from the water vapor. The vapor flows out of the compartment through exit pipes *o*, *o'*, connected with a duct O, and it may be desirable to exhaust the water vapor from the compartments of the apparatus B, for which purpose I provide an exhaust fan P, the action of which is for inducing the flow through said apparatus of the partially dethermalized water vapor, or for exhausting a mixture of air and water vapor, as necessary for proper circulation and/or replenishment.

In some instances the products chamber, or apparatus B, is in a close relation to the dethermalizing unit, or apparatus A; but in other instances, the apparatus B may be more or less remote to, or distant from, the dethermalizing apparatus A. In this latter event,

it becomes desirable to provide for the admission to the duct C of air acting as a carrier for the water vapor, and in Figure 3 of the drawings, I have illustrated a suitable arrangement for controlling the admission of air to the duct C. As shown in Figure 4, the duct C is provided with a fresh air intake Q, having a check valve, *q*, and in the service of the apparatus the action of the exit fan P induces the flow of the water vapor from the unit A through the duct C into the products chamber B, and at the same time draws in a proportion of atmospheric air through the air intake Q, whereby air admitted by the intake is mixed with the water vapor so as to act as a carrier for the water vapor in the space between the apparatus A and the products chamber B.

It is possible that it may become desirable to force air into the duct C, and in this event I provide a blower R connected with the intake Q so as to induce the forced circulation of air into the duct C for carrying the water vapor to the products chamber.

Means are provided for stopping or controlling the flow of steam to the dethermalizing unit should the temperature within the products chamber exceed that temperature desirable for the products, to thus overcome too high a temperature in the products chamber. Said means is desirably in the form of a valve T in the steam line I, and a thermostat T' in the products chamber, said valve and said thermostat being operatively connected by an appropriate circuit to the end that an increased temperature in the products chamber influences the thermostat and closes the steam valve temporarily, there being an intermittent action of the thermostat and the valve to the end that the steam flow is controlled for the cooling mechanism of the dethermalizing unit to reduce the temperature of the water vapor supplied to the products chamber.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. In a humidifying apparatus, a products chamber, a steam dethermalizing chamber, a duct connecting said chambers, and means for the inflow of air to the duct for admixture with the partially dethermalized water vapor.

2. In a humidifying apparatus, a products chamber, a steam dethermalizing chamber, a duct for connecting said chambers, and means for exhausting water vapor from the products chamber and for inducing the inflow of air to the duct, or for exhausting a mixture of air and water vapor, as necessary for proper circulation and/or replenishment.

3. The method of conditioning leather, fabrics, tobacco or the like, which comprises subjecting steam to a dethermalizing operation to reduce the temperature thereof, mix-

ing a small amount of air with a relatively large volume of the cooled steam, and then conducting the mixture to a chamber for humidifying the atmosphere therein.

4. The method of conditioning leather, fabrics, tobacco or the like, which comprises subjecting steam to a dethermalizing operation to reduce the temperature thereof, adding a small amount of outside air and mixing it with the cooled steam, and then causing the mixture to enter a chamber for humidifying the air therein.

5. The method of conditioning leather, fabrics, tobacco or the like, which comprises subjecting steam to a dethermalizing operation to reduce the temperature thereof, adding air to the system and mixing it with the cooled steam, and then conducting the mixture into a chamber for humidifying the air therein.

6. In a device of the character described, a products chamber, a steam dethermalizing chamber, a conduit connecting said chambers, means permitting the inflow of air to said conduit for admixture with the partially dethermalized water vapor, and means for preventing the temperature from exceeding a predetermined limit in said products chamber.

7. In a device of the character described, a products chamber, a steam dethermalizing chamber, a conduit connecting said chambers, means permitting the inflow of air to said conduit for admixture with the partially dethermalized steam, and thermostatic means for automatically regulating the flow of steam to said dethermalizing chamber.

8. In a device of the character described, a products chamber, a steam dethermalizing chamber, a conduit connecting said chambers, and thermostatic means controlled by the temperature in said products chamber for cutting off the flow of steam to said steam dethermalizing chamber.

9. The method of conditioning leather, fabrics, tobacco, or the like, which comprises, subjecting steam to a dethermalizing operation to reduce the temperature thereof, mixing outside air with the cooled steam, conducting the mixture to a chamber for humidifying the atmosphere therein and regulating the amount of steam being dethermalized to prevent the temperature from exceeding a predetermined limit in the humidifying chamber.

10. The method of conditioning leather, fabrics, tobacco, or the like, which comprises, subjecting steam to a dethermalizing operation to reduce the temperature thereof and then conducting the dethermalized steam to a chamber for humidifying the atmosphere therein.

11. The method of conditioning leather, fabrics, tobacco, or the like, which comprises, subjecting steam to a dethermalizing opera-

tion to reduce the temperature thereof, conducting the cooled steam to a chamber for humidifying the atmosphere therein, and regulating the amount of steam which is subjected to the dethermalizing operation so as to prevent excessive temperatures in the humidifying chamber.

12. The method of conditioning leather, fabrics, tobacco, or the like, which comprises, subjecting steam to a dethermalizing operation to reduce the temperature thereof, mixing air with such cooled steam, conducting the mixture to a products chamber for humidifying the atmosphere therein, and then discharging the used mixture into the atmosphere.

13. The method of conditioning leather, fabrics, tobacco, or the like, which comprises, subjecting steam to a dethermalizing operation to reduce the temperature thereof, mixing a small amount of air therewith to act as a carrier so that a relatively large volume of dethermalized steam is utilized and a high humidity at a reduced temperature ensured, conducting the dethermalized steam with its carrier to a products chamber for humidifying the atmosphere therein with substantially no surface condensation in the products chamber.

In testimony whereof I have hereto signed my name this 30th day of January, 1929.

ARCHIBALD F. WRIGHT.

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