

Jan. 9, 1945.

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2,366,906

HUMIDIFYING APPARATUS

Filed July 24, 1942

2 Sheets-Sheet 1

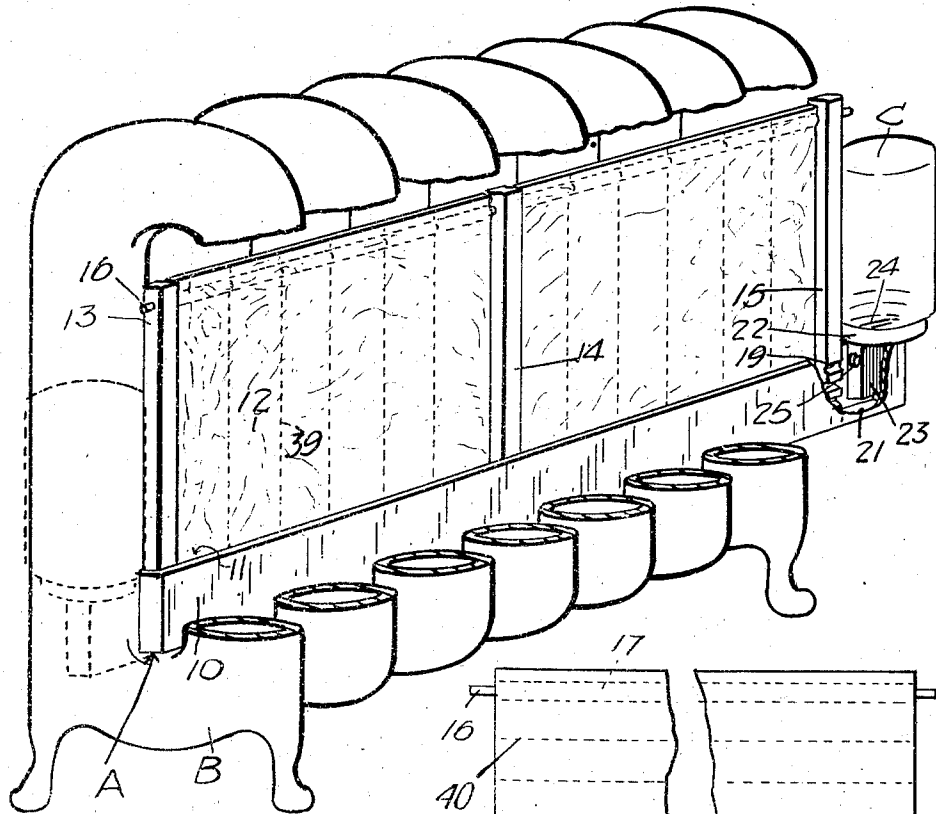


FIG. 1.

FIG. 12.

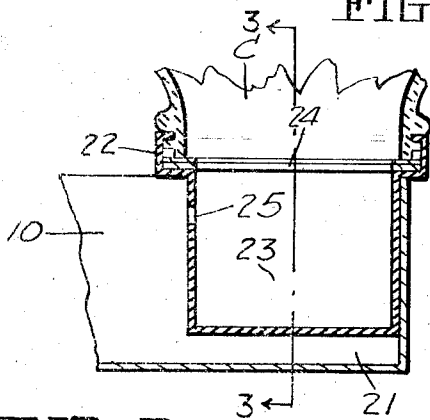
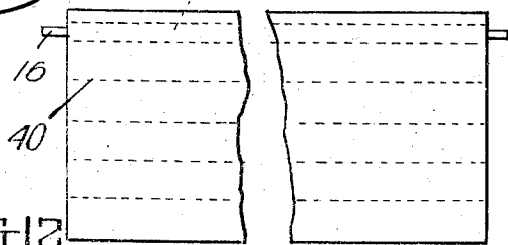


FIG. 2.



FIG. 17.

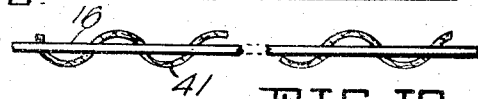


FIG. 13.

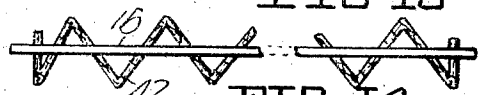


FIG. 14.



FIG. 15.

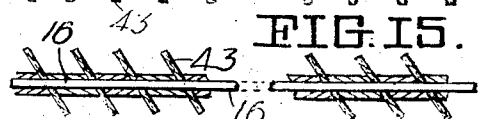


FIG. 16.

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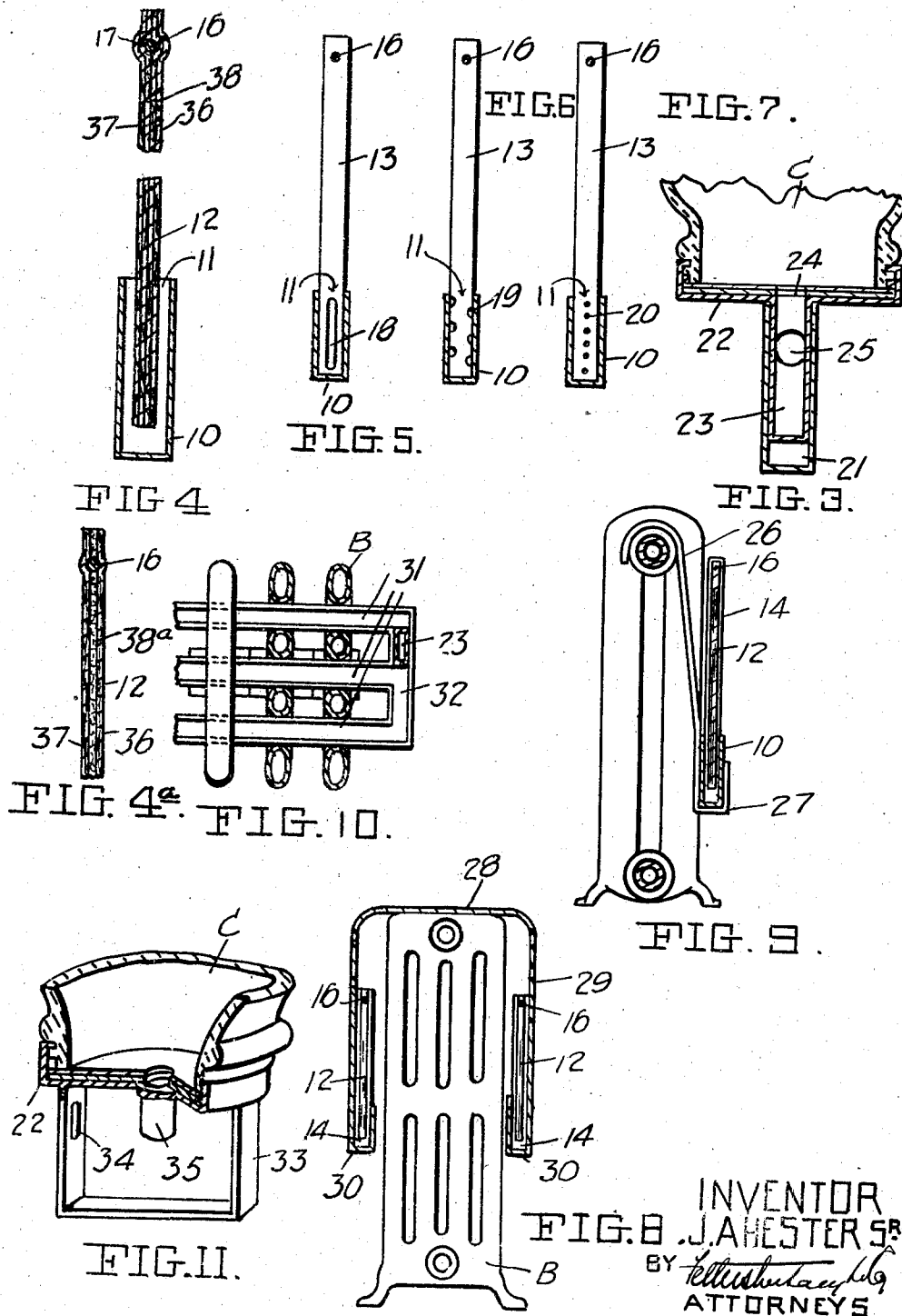
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UNITED STATES PATENT OFFICE

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HUMIDIFYING APPARATUS

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11 Claims. (Cl. 261-107)

This invention relates to humidifying apparatus.

It has previously been proposed to provide humidifying apparatus employing a relatively elongated narrow open top receptacle for water having associated therewith a water absorbing element disposed in the receptacle and designed to project thereabove. Such apparatus has been used mainly in conjunction with the radiators of hot water or steam heating systems on or in which they are mounted. Furthermore, such apparatus has included the use of a water container connected with the receptacle for feeding water thereto. Such apparatus, however, has had disadvantages. For instance, the water container has been permanently mounted on the receptacle forming an integral part thereof or by means of a permanent pipe fitting projecting from the end of the receptacle and having a funnel-like bracket carried thereby for the purpose of receiving the container. This has made the apparatus as a whole rather unwieldy and somewhat complicated to make. It has presented difficulties in packaging and shipping. Moreover, in the case of inserting such constructions in a radiator, where the radiator is in a confined space, it is not possible to select the manner in which it may be introduced to the latter and in many cases it can only be inserted in the one way, notwithstanding that it might be particularly desirable to locate the water feeding container in the confined space at the opposite end of the radiator where it is less conspicuous.

Further disadvantages of this type of apparatus which have been prevalent are the manner in which the water absorbing element has been mounted since a complicated form of framework has previously been employed which presents disadvantages from the point of view of manufacture, as well as the employment of additional material which is not necessary. Finally, the type of water absorbing element employed has not been as efficient particularly from the point of view of its water absorbing capacity, its capability of presenting a maximum moist surface to the circulating air in proportion to the size of the receptacle and also from the point of view of length of life.

An object of the present invention is to produce a humidifying apparatus of the general type in question which will avoid the disadvantages of the prior art and provide an apparatus which is extremely simple in construction, compact in form and convenient to use.

A further object of the invention is to provide

a humidifying apparatus employing a water absorbing element which is more efficient, has a greater water absorbing capacity, longer life and may present to the atmosphere a larger moist surface in proportion to the size of the water receptacle than has been proposed heretofore.

A further object of the invention is to provide an apparatus of this kind which is economical to manufacture.

A further object of the invention is to provide an apparatus which may be manipulated readily and which can be mounted in a radiator so as to dispose the water feeding container in a confined space where one end of the radiator is positioned closely adjacent to a wall or other projection.

A further object of the invention is to provide an apparatus of this type wherein the water absorbing element is mounted in a particularly simple and efficient manner.

A still further object of the invention is to provide a construction wherein the container is so formed as to removably connect with the water receptacle in a convenient manner avoiding the necessity of employing any fixtures for this purpose.

A still further object of the invention is to provide a humidifying apparatus including a receptacle and/or water absorbing element which may be employed generally to advantage with various types of heating and air conditioning systems.

With these and other objects in view the invention generally comprises humidifying apparatus including elongated open topped receptacle for water, a water absorbing element mounted therein and projecting thereabove, and a water feeding unit for the receptacle including a container having a mounting projection thereon designed removably to fit into the receptacle through its open top to mount the container firmly, and a water outlet from the container entering the receptacle to supply the latter. Preferably the water absorbing element is mounted by means of a plurality of standards fitting snugly into the container through its open top and supporting a suspension device designed to carry the absorbing element and the standards are so formed as to permit flow of the water from one end of the receptacle to the other.

The water absorbing element preferably includes a plurality of layers of fibrous material fastened together to form a unit and in such a manner as to induce by capillary attraction and increase by capillary action due to special con-

struction, absorption of the water to a substantial degree throughout the extent of said element.

These features and other features of the invention will be clearly understood by reference to the following detailed specification taken in conjunction with the accompanying drawings.

In the drawings:

Fig. 1 is a perspective view of humidifying apparatus according to the present invention showing such apparatus mounted within the parts of a hot water radiator, the latter being broken away to illustrate the apparatus more clearly.

Fig. 2 is an enlarged fragmentary sectional view of a preferred form of mounting device on the container associated with the water receptacle and illustrating the manner in which it fits into the receptacle.

Fig. 3 is a transverse section taken substantially along the line 3—3 of Fig. 2.

Fig. 4 is a transverse section taken through the water absorbing element of the receptacle to show the manner in which these parts of the apparatus are co-related.

Fig. 4^a is a fragmentary sectional view through an alternative form of water absorbing element.

Figs. 5, 6 and 7 are transverse sections taken through the water receptacle adjacent the point where the standards are fitted therewithin and showing alternative manners in which water passages may be provided to by-pass the standards and permit flow of water from one end of the receptacle to the other.

Figs. 8 and 9 illustrate alternative manners in which the apparatus may be mounted in conjunction with a radiator of a hot water heating system.

Fig. 10 is a plan view of an alternative construction of receptacle shown in association with a particular type of radiator, the latter being shown partly in section, the said illustration also showing one manner in which the water container may be associated with such a receptacle.

Fig. 11 is a perspective view partly in section of an alternative form of mounting for the container.

Fig. 12 is a schematic view of an alternative method of constructing the absorbing element.

Fig. 13 is a partly sectional detail view showing an alternative form of water absorbing element which is generally corrugated.

Fig. 14 is a similar view to Fig. 13 showing an alternative form which is of general crimped formation.

Fig. 15 is a sectional view of an alternative form of element which employs a plurality of separate pieces in parallel spaced relation suspended into the receptacle.

Fig. 16 is a view similar to Fig. 15 wherein the pieces are disposed at an incline to the suspending rod so as to provide for pieces of greater area than in the case of Fig. 15; and

Fig. 17 is a similar view to Fig. 13 showing a further alternative form of absorbing element.

Referring to the drawings A indicates a complete humidifying unit according to the proposed invention which in the case of Fig. 1 is shown in one manner in which it may be mounted, within the confines of a radiator B of a hot water or steam heating system. The unit is made up of a water receptacle or trough 10 which is generally elongated in character and of a maximum width dictated by the size of the space in which it is mounted and formed with an open top 11. The receptacle is designed to have introduced thereto

through the open top 11 an absorbing element or elements 12 which are designed to dip into the water carried in the receptacle. These elements are designed to project above the receptacle to a maximum degree consistent with their capacities of water absorption and space limits. The preferred type of element will be described in detail hereinafter, it being sufficient to say at this point that a multi-ply element is preferred.

The element 12 is supported from the receptacle by means of a plurality of standards 13, 14 and 15 which may be made from any suitable material but preferably from wood and of a cross section snugly to fit the cross sectional width of the receptacle. Thus, the posts are readily held in upright position through their contact with the walls of the receptacle. Two or more standards are employed and they are designed to carry a rod or the like 16 which may be threaded through orifices in the standards in effect to provide a suspension frame. The element or elements 12 are preferably provided with a channel therethrough indicated at 17, where a multi-ply element is employed, or otherwise may be provided with a means of engaging the rod 16 so that the element is suspended from a point above the receptacle to hang down thereto.

In order to permit flow of the water from one end of the receptacle to the other the standards 13, 14 and 15 may be recessed to provide a water passage or passages. This may be accomplished in various ways some of which are clearly illustrated in Figs. 5 to 7. In Fig. 5 a slot 18 is formed in the lower end of the standards to form a water passageway. In Fig. 6 notches 19 in the sides of the standard are illustrated to form water passageways. On the other hand, a series of orifices 20 is illustrated in Fig. 7 to form passageways.

The length of the water absorbing element employed is slightly shorter than the length of the receptacle, the latter being constructed so as to accommodate as long a water absorbing element as may be required to fit the length of a given radiator or holder and extending beyond such element to form a water feeding pocket 21 designed to receive mounting means for a water feed container C. In this connection the water feed container C is provided with a downwardly depending projection such that it may be inserted in the pocket 21 at the end of the receptacle to mount the container firmly but in a readily detachable manner, which construction eliminates entirely the necessity of projecting and permanently attached fixtures and the like.

A preferred type of structure embodies a removable cap 22 on the water feeding container C which is normally in airtight and watertight engagement with the container and from which projects a mounting and water feeding casing 23 (see Figs. 1 and 2). The casing 23 is normally closed by a series of walls which make up the casing and of a general cross section corresponding to that of the water receptacle 10 so that it may be inserted in the pocket portion 21 thereof and have a neat sliding fit therein such that the casing 23 on the one hand forms a mounting member which will firmly support the container in position with the closure 22 or bottom of the container resting upon the upper edges of the receptacle.

The casing 23 is in communication with the interior of the water feeding container C by means of a slot 24 or the like in the closure 22, which communicates only with the open top of

the casing 23. In this casing a water outlet 25 is positioned, it being located at a point in one wall thereof such as to control the level of the water in the receptacle 10 when the casing 23 is inserted in the pocket 21 of such receptacle. The size of the opening 25 is chosen so that on the one hand, if desired, the receptacle may be filled and inverted and if carried carefully will not discharge water through the orifice 25 by reason of surface tension. On the other hand, the size of the orifice can be such that the user may place a finger over the orifice after the container C is filled and thus carry the container from the source of water supply to the receptacle and insert it in the latter without spilling water inadvertently. A third reason for choice of size of the opening resides in the fact that the opening 25 may be used for filling the container without making it necessary that the closure 22 be removed for this purpose.

From the foregoing broad outline of the unit it will readily be apparent that a simple type of unit is provided, the parts of which all fit together without the necessity of providing elaborate fixtures and the parts of which can be replaced individually at comparatively low cost. On the other hand, a simple but substantially durable construction is provided wherein water constantly fed to the receptacle 10 by the feeding container C is absorbed by the absorbing element and drawn upwardly therethrough for efficient contact with air currents, such as to impart a substantial volume of moisture to the surrounding air. Moreover, the unit described is such that it may be conveniently mounted in conjunction with a radiator of a hot water or steam heating system in several ways, although the invention is also applicable to other types of heating and air conditioning systems as will appear hereinafter. On the one hand, it may be inserted between the coils of the radiator so that the water feeding container C may be mounted at the end of the radiator and can be conveniently removed and reinserted as required. Alternately, of course, the receptacle may be made long enough to project at both ends of the radiator and if desired a second feeding container C may be mounted at the opposite end so as to increase the water feeding capacity of the unit. Moreover if the radiator were positioned along one wall of a room so that one end of the radiator was positioned substantially close to a second wall of the room joining the first one and forming a confined space between the second wall and the end of the radiator wherein it would be preferable to dispose the water container for the receptacle, it is only a matter of projecting the water receptacle through the radiator from its opposite end until part of the receptacle projects into the confined space whereupon the container may be introduced to the projecting end. In other words, it is a simple matter to locate the container at either end of the radiator as desired as illustrated, for instance, in dotted lines in Fig. 1, where it will be seen that if the container C is removed and the receptacle is pushed so as to project its opposite end from the other end of the radiator as shown in dotted lines, the receptacle may readily be mounted from the opposite end without removing the receptacle from the radiator.

The unit may be mounted in other ways where this is desired, two of which are illustrated in Figs. 8 and 9. As in Fig. 9, hangers 26 may be provided and connected with a hook-like member or members 27 such that the receptacle 10 may be

carried on one side or both sides of the radiator B. In Fig. 8, a suitably perforated facing 28 is provided which may take the form of a decorative radiator cover formed with depending side aprons 29 terminating in hook-like portions 30 into which the receptacles may be projected, or the hook-like flanges may be formed as receptacles themselves.

Alternatively, of course, a unit embodying a plurality of receptacles such as 31 may be provided (see Fig. 10) in place of single units, where it is desired to employ the unit with a particular type of radiator. The plurality of receptacles 31 in this instance might be connected by a common header or the like 32 into which the casing 23 or other projection carried on the container C might be inserted so that the container through the header 32 would feed the plurality of receptacles.

In place of a casing such as 23 any suitable projection might be employed so as to feed receptacle 10 and firmly mount the container C thereon. One alternative manner of mounting the container C might take the form illustrated in Fig. 11. In this construction a U-shaped strap-like member 33 is provided which may be orificed as at 34, notched or otherwise formed so as to communicate with the body of the receptacle and the closure 22 might be formed with a suitable spout 35 for passing the water from the container to the receptacle. In this instance, the length of the spout 35 would control the height of the water within the receptacle.

The element or elements 12 which I prefer to use takes the form of a laminated sheet-like body illustrated particularly in Fig. 4 made up of a plurality of plies including the outer plies 36 and 37 and one or more inner plies 38. The material may vary as between the different plies if this is found desirable in order to achieve predetermined results. Moreover, the element may take the form shown in Fig. 4^a embodying outer plies of material 36 and 37 with an inner filling of loose fibrous or other material indicated at 38^a capable of substantial water absorption.

The plies are secured together such as by rows of stitching indicated at 39 (see Fig. 1) which rows are preferably vertically disposed or in other words in the direction of flow of the liquid absorbed by the element. On the other hand, the stitching may be arranged horizontally as indicated at 40 in Fig. 12 while, if desired the plies might be held together by stitching directed in any desired pattern or arrangement and might be held together by stitching both vertically and horizontally in the manner of quilting. Likewise the plies may be secured together by continuous stitching starting at the center of the element and extending gradually outward to cover the greater part of the surface of the element in the manner of a spiral.

The manner of connecting the elements together may, of course, vary and instead of stitching might be effected by stapling or any other mode of securing the plies together in intimate contact without interfering or closing the break between the fibres of each layer as would be the case, for instance, if a foreign material such as adhesive were used for the purpose.

By laminating the element I am able to maintain an efficient element for a long period of time since in the case of an element made from a single ply of material as is also the case to some extent in one made from two plies of material the outer surface and fibres of the element becomes clogged with lime salts from hard water, dust particles and other non-vaporizing material and

in a short time the water absorbing and transmitting qualities of the water absorbing elements are impaired to such a degree that efficient action is impossible. On the other hand, the inner plies of the material will continue to function and cause the outer plies to be permeated in an efficient manner notwithstanding the coating and impregnation of the outer plies with a quantity of lime salts or the like.

The preferred element is made from blotting paper laminated as described. I have found that such a material has the characteristic of a high degree of absorption and induces capillary action to raise the liquid from the surface of the water to a greater height than most materials of similar nature. The number of plies, the thickness thereof, quality, etc., of course, may be varied having regard to such variables as cost, efficiency and the percentage in the water of insoluble material.

The laminated element I have found is also desirable from another standpoint as it provides definite aid to capillary action entirely apart from the contact of the fibres throughout each layer. The space between the layers of absorbent fibres functions to aid capillary action, thus materially increasing the efficiency of the element. Thus, the element acts as a very efficient wick which is disposed in intimate contact with the currents of air around the location of the unit and due to the fact also that the receptacle 19 is of a depth to permit preliminary preheating of the water, the unit will function very efficiently to supply to the atmosphere a high percentage of moisture. It will be noted, of course, that the container located closely adjacent to the end of the radiator as shown in Fig. 1 will also provide for preheating of the water.

The element in itself constitutes a salient feature of my invention and it is apparent, of course, that it may be employed not only in conjunction with hot water and steam heating radiators as described but may also be employed with a hot air system and in fact with air conditioning systems. In this instance, the efficiency from the point of view of water absorption produced by this laminated element renders it very adaptable for general service of this kind.

Alternative forms of elements are illustrated in Figs. 13 to 17. In Fig. 13 I have illustrated an element which takes a generally corrugated form having a series of corrugations indicated at 41. This element is preferably threaded upon the supporting rod 16 by merely forming its upper end with a series of orifices and may be supported similarly at its base by a similar rod. This type of element produces increased surface capacity which can be used to advantage and particularly in the case of small units for instance where an ordinary flat element would not give sufficient capacity in the space available as to make it practical for such an installation. Thus, the capacity can be increased by the corrugated element without increasing the longitudinal space which it takes up. A similar result might be achieved with the form of construction illustrated in Fig. 14 which employs a similar principle. In this construction the element is crimped as at 42. An even greater surface capacity may be achieved by forming the element as illustrated in Fig. 17. These elements may, of course, be employed as single ply elements if this were desired but preferably are constructed as laminated elements.

I provide a laminated element such as has been described. It should be noted that it is not necessary that the laminations be relatively thin sheet-

like bodies of blotting paper or the like. On the other hand, it will be appreciated that the intermediate ply or plies of the laminated element might constitute a filling of material (similar to Fig. 4^a) having a desired degree of water absorbing characteristics, the filling being disposed within the outer plies which might be secured around their marginal edges, as an alternative to being secured, as may be the case, at intervals throughout the extent of the area of the construction.

It should be noted also that the elements employed do not necessarily have to be produced from continuous sheets of a given length. For instance, the element is such that it may be composed of several pieces of material secured together as in one instance, by the securing stitching so that smaller pieces of material that ordinarily might be considered waste could be efficiently secured together to form an element of a given length and height.

Further alternative forms of element are shown in Figs. 15 and 16 in which case the element is made up of a plurality of pieces of material 43 which may be multi-ply, preferably disposed in parallel relation to one another and spaced apart longitudinally of the unit by suitable spacers. Such pieces may be suspended from the supporting rod 16 to dip into the water in the receptacle. The arrangement in Fig. 16 at an incline to the plane of the rod permits a slightly wider piece to be used than in the case of Fig. 15 and this presents a greater surface in the element. In both cases, of course, the pieces may be similarly supported at their lower ends.

While I have illustrated my invention chiefly in conjunction with a unit or units which may be employed practicably in conjunction with radiators of hot water or steam heating systems, it is apparent that the principles of the invention may readily be applied to hot air systems. This may be done in various ways and, for instance, if desired a multiple unit such as shown in Fig. 10 might be disposed within the hot air duct, or if desired other types of units and employing elements such as illustrated in Figs. 13 to 17 might be employed in such ducts if the capacity of a simple element were not great enough for the purpose. In other words, it is merely a matter of the capacity of the unit in relation to the size and space available in the duct.

From the foregoing it will be clearly apparent that I have produced a simple, practical humidifying apparatus which will function with a high degree of efficiency for the purpose intended and which at the same time may be manufactured at a comparatively low cost, particularly in view of the simple construction of the component parts of the apparatus and the apparatus and the relatively wide choice of materials and relatively low cost in each instance. Moreover, it will be clearly appreciated that there are no complicated or projecting parts which would interfere with the mounting of the device, its packing or its shipping whereas the unit may be readily set up or knocked down quickly and simply while replacement parts may easily be obtained at low cost.

What I claim as my invention is:

1. In a humidifier having an open-topped receptacle for water fed by a feeding container, a feeding container having a removable cover and a mounting projection extending at right angles from the cover and of a width and depth snugly to fit slidably into the open top of said receptacle to mount said container on and wholly above said receptacle, said cover being orificed for the pas-

sage of water therethrough from the container, said mounting projection being recessed to establish communication between the orifice of the cover and the receptacle upon which said container may be mounted.

2. In a humidifying apparatus employing a water container designed to feed an open-topped water receptacle, a removable cover for said container orificed to permit egress of water therefrom and having a mounting projection extending at right angles to its normal plane and of a width and depth snugly to fit slidably into the open top of said receptacle to mount the container on and wholly above said receptacle.

3. A humidifier comprising an open topped receptacle for water, an absorbing element mounted therein and projecting thereabove, a plurality of standards slidably fitted into the open mouth of the receptacle and carrying therebetween a supporting element slottable through and slidably detachable from said standards for suspending the absorbing element into the open mouth of the receptacle, said supporting element being slidably from supporting engagement with said absorbing element as it is slidably detached from said standard.

4. A humidifier as claimed in claim 3 in which the standards are solid and recessed in that area normally submerged to permit flow of the water to any part of the receptacle.

5. A humidifier as claimed in claim 3 in which the standards include end standards at each end of the receptacle and at least one intermediate standard are orificed adjacent their upper ends and have a bar slotted through said orifices slidable to and from mountable position therein, and water absorbing elements supported by said bar between each adjacent pair of standards and suspended into the open mouth of the receptacle.

6. A humidifier comprising an open topped receptacle for water, a fibrous water absorbing element mounted therein and projecting thereabove, a plurality of standards connected with said receptacle and projecting thereabove, a suspension rod extending between said standards, said absorbing element having at least two plies adjacent its upper edge secured together to form a longitudinal channel for reception of said rod to suspend the element therefrom and into the open top of said receptacle.

7. A humidifier as claimed in claim 6 in which the element is formed from a plurality of pre-formed sheets of absorbent material with means passing therethrough at spaced apart points throughout the extent of said element to secure said sheets in intimate contact, said securing means forming adjacent the upper edge of the sheet a longitudinal passage through which the supporting rod is slotted.

8. A humidifier comprising an open-topped symmetrical receptacle for water, a water absorbing element mounted therein and projecting thereabove, means for mounting said element, and a removable water feeding unit for said receptacle including a container, a mounting projection thereon extending beyond the end of the container and of a width and depth snugly to fit slidably into the open top of said receptacle to mount the container, said container and attached mounting projection being bodily removable from mounted position for filling purposes and a water outlet from the container communicating with the receptacle to supply the latter with water.

9. A humidifier as claimed in claim 8 in which the mounting projection takes the form of a hollow casing shaped to conform with the cross section of the water receptacle and communicating with the interior of the container, said casing being orificed to provide a feeding outlet communicating with the interior of the receptacle.

10. A humidifier as claimed in claim 8 in which the mounting projection of the water container comprises a casing projecting from one end of the container and communicating with the latter, said casing being orificed in one wall at a predetermined point to establish communication between the container and the receptacle when said container is mounted on said receptacle, said predetermined point controlling the height of the water in the receptacle.

11. A humidifier as claimed in claim 8 in which the mounting projection takes the form of an angular strap-like member projecting from one end of the container, the latter being formed with an outlet spout projecting downwardly therefrom into the receptacle, said strap-like member being orificed to provide communication between said spout-like member and the major portion of said receptacle.

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