April 4, 1939. C. T. MORSE 2,153,267

AIR CONDITIONING APPARATUS

Filed April 9, 1936

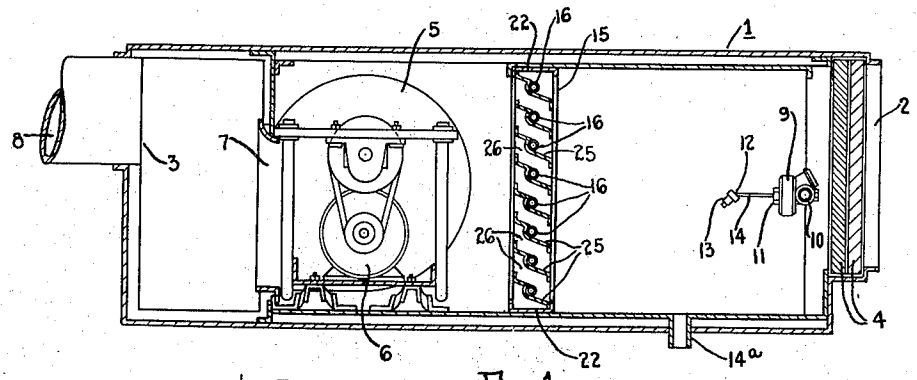

Fig. 1

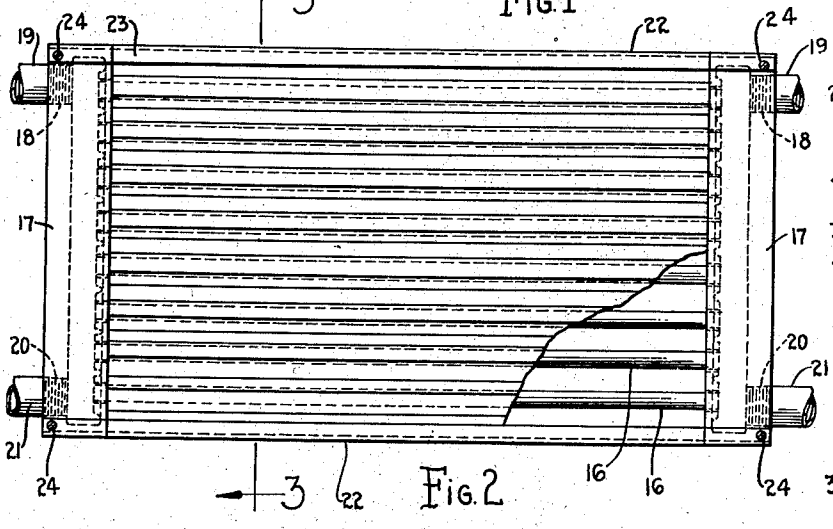

Fig. 2

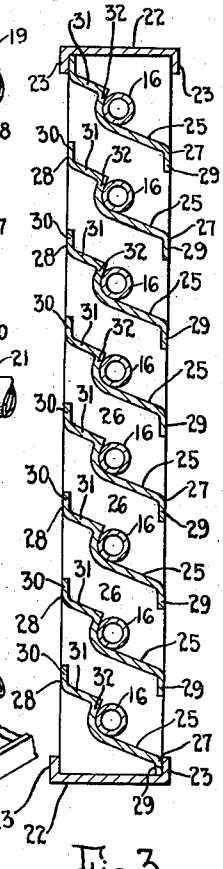

Fig. 3

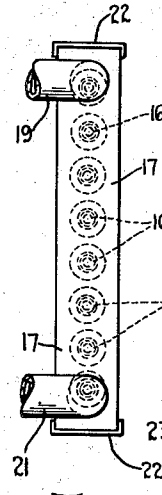

Fig. 4

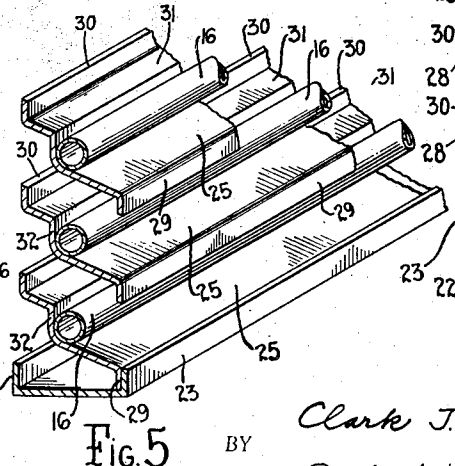

Fig. 5

INVENTOR.
Clark J. Morse
BY
Andrew K. Foulds
his ATTORNEY.

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2,153,267

AIR CONDITIONING APPARATUS

Clark T. Morse, Detroit, Mich., assignor to American Blower Corporation, Detroit, Mich., a corporation of Delaware

Application April 9, 1936, Serial No. 73,580

4 Claims. (Cl. 257—67)

My invention relates generally to air conditioning apparatus, and more particularly to humidifying apparatus.

One of the objects of my invention is to provide a new and improved humidifying apparatus which is efficient in operation.

Another object of my invention is to provide a structure for humidifying apparatus for increasing the temperature of moisture laden air and for reducing the moisture content of the air at the heating means.

Another object of my invention is to provide a unitary structure for ridding air of excess moisture and for heating the air and one which is simple in construction and inexpensive to manufacture.

The invention consists in the improved construction and combination of parts, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, I have fully and clearly illustrated my invention. In which drawing—

Figure 1 is a side view shown in central longitudinal cross section of a humidifying apparatus embodying my invention;

Fig. 2 is a rear elevational view of my combined heater and air baffle structure shown removed from the apparatus of Fig. 1;

Fig. 3 is a view in vertical cross section taken along the line 3—3 of Fig. 2;

Fig. 4 is an end view of my combined air heating and baffle structure, and

Fig. 5 is a fragmentary view shown in perspective of my air baffle and heater structure.

Referring to the drawing by characters of reference the numeral 1 designates in general a cabinet of a humidifying apparatus, the cabinet being rectangular in shape and having an air inlet 2 at one end and an air outlet 3 at the other end. Preferably an air filter 4 is provided at the inlet 2 for cleansing the air of dust and other foreign matter. Air may be drawn into the cabinet through the inlet 2 and be discharged from the outlet 3 by means of a fan or blower enclosed in a housing 5 in cabinet 1. The fan is preferably located near the outlet 3 and may be driven by an electric motor 6. Air is drawn into the fan housing 5 which has an outlet 7 from which the air is discharged and propelled through a conduit or duct 8 to a room or other enclosed space that is to be air conditioned.

Disposed within the cabinet 1 and preferably adjacent the inlet 2 there is a moisture spray device 9 to which is connected a water supply pipe 10. The spray device 9 has a discharge nozzle 11 from which a stream of water is discharged in the direction of the air stream, or toward the outlet end of the cabinet 1, and impinges against a flat surface 12 of a baffle member 13 to produce a fine moisture spray or mist. The baffle member 13 may be supported by a bracket 14, or by any other suitable supporting means. In the bottom wall of the cabinet 1 there is preferably a drain 14a for the draining of excess moisture from the cabinet.

Disposed within the cabinet 1 between the fan and the moisture spray device 9 is my combined air heater and baffle structure which is designated in general by the numeral 15. The structure 15 is substantially rectangular in shape and extends between the top, bottom and side walls of the cabinet 1 and substantially parallel to the end walls of the cabinet, or transverse to the direction of flow of air through the cabinet. The heating means of the structure 15 preferably comprises a plurality of vertically spaced, horizontally extending pipes or conduits 16 connected and secured to end header members 17 to which a heating medium such as hot water is supplied for circulation through the pipes 16. Preferably each of the end header members 17 has an inlet 18 adjacent its upper end for receiving a supply pipe 19, and has an outlet 20 adjacent its lower end for receiving a return pipe or conduit 21. The header members 17 position against opposite inner side walls of the cabinet 1 and the spaced conduits 16 extend therebetween in the path of the air stream and transverse, or at right angles to the direction of flow of the air through the cabinet. Preferably the end header members 17 are connected together at top and bottom by rectangular shaped plate members 22. The plate members 22 preferably have reenforcing flanges 23 along their side edges which fit over upper and lower end portions of the header members 17 and may be secured to the header members by screws 24, or other suitable attaching means.

A plurality of spaced, rectangular shaped baffle plates 25 are disposed between the heating conduits 16 for the impingement of the moisture laden air thereagainst to reduce the moisture content of the air, or to eliminate any water that has not been completely taken up by the air. The rectangular shaped plates 25 extend longitudinally of the heating conduits 16, between the end header members 17, and cooperate to provide a plurality of air flow passages 26. The baffle plates 25 are secured, one to each of the heating conduits 16, in good heat transfer relation thereto and serve as extended heating surfaces for the heating conduits, as well as baffle plates for the air. The baffle plates 25 may be soldered, welded, or otherwise suitably secured to the heating conduits 16 and preferably the conduits are positioned substantially midway between the longitudinal edges of the plates and

against the upper surfaces thereof. The longitudinal edges of the plates **25** may be termed the front and rear edges and are designated by the numerals **27** and **28** respectively. The plates **25** are substantially parallel to each other and are angularly disposed with the front edges **27** being below the rear edges **28** so that the plates present surfaces for the impingement of moisture laden air. The front edges **27** of the plates **25** have downturned flanges **29**, while the rear edges **28** of the plates have upturned flanges **30**, and the downturned flanges of the plates overlap the upturned flanges of successive plates. The upturned and downturned flanges **29** and **30** respectively of the baffle plates **25** provide surfaces for the impingement of moisture laden air that does not impinge against the surfaces proper of the plates, and since these flanges overlap it will be seen that no air will be able to pass through the baffle structure without impinging against some part of the plates. The baffle plates **25** are preferably formed having raised offset portions **31** which extend longitudinally of the plates, providing forwardly facing shoulders **32** against which the heating conduits **16** are positioned. Preferably the shoulders **32** are concave so as to conform to the periphery or curvature of the heating conduits **16** so as to have a large surface area of the plates **25** in contact with the heating conduits.

The operation of the humidifying apparatus is as follows: Air is drawn into the cabinet **1** through the inlet **2** by the fan and entrains moisture as it passes through the moisture spray, the entraining of the moisture reducing the temperature of the moisture laden air. The moisture laden air then flows to the heating and baffle structure **12** where it comes into contact with the baffle plates **25** and the heating conduits **16**. The air impinges against the surfaces of the angularly disposed plates **25** and against the front and rear flanges **27** and **28** thereof, and moisture such as large drops of water that have not been completely taken up by the air are removed from the air. The excess moisture is drained from the cabinet **1** through the drain **14a** in the bottom wall of the cabinet. When the moisture laden air comes into contact with the heating conduits **16** and the baffle plates or extended surfaces **25**, the temperature of the air is increased to the desired temperature, which increase in temperature induces evaporation and entraining of moisture by the air. Thus it will be seen that the heating baffle plates **25** function both to rid the air of excess moisture and to induce the entraining of moisture by the air with the result that the air leaving the structure **12** contains the proper moisture content. The moisture laden air is drawn into the fan housing **5** and discharged therefrom through outlet **3** and propelled through the conduits **4** to the room or other enclosed space to be air conditioned.

What I claim and desire to secure by Letters Patent of the United States is:

1. In an extended-surface heat exchanger, a tube of heat conducting material for tempering the air and extending in a substantially horizontal direction and transverse to the direction of air flow, a plate member providing extended surface and having a longitudinally extending stepped portion conforming to the surface of said tube and secured in intimate heat transfer relation to said tube, said plate member being inclined to the path of air flow so that moisture entrained in the air to be heated will strike and be deposited upon said plate member upon deflection of the air stream by said plate member, said tube being spaced from the discharge edge of said plate member so that moisture deposited on said plate member may if unevaporated flow downward into the higher heat zone of said tube thereby increasing evaporation of the deposited moisture.

2. In an extended-surface heat exchanger, a tube of heat conducting material for tempering the air and extending in a substantially horizontal direction and transverse to the direction of air flow, a plate member providing extended surface and having a longitudinally extending stepped portion conforming to the surface of said tube and secured in intimate heat transfer relation to said tube, said plate member being inclined to the path of air flow so that moisture entrained in the air to be heated will strike and be deposited upon said plate member upon deflection of the air stream by said plate member, said tube being spaced from the air-approach edge of said plate member so that friction of the air stream on the deposited moisture will tend to move the moisture into the higher heat zone of said tube.

3. In an extended-surface heat exchanger, a tube of heat conducting material for tempering the air and extending in a substantially horizontal direction and transverse to the direction of air flow, a plate member providing extended surface and having a longitudinally extending stepped portion conforming to the surface of said tube and secured in intimate heat transfer relation to said tube, said plate member being inclined to the path of air flow so that moisture entrained in the air to be heated will strike and be deposited upon said plate member upon deflection of the air stream by said plate member, said tube being spaced from the discharge edge of said plate member so that moisture deposited on said plate member may if unevaporated flow downward into the higher heat zone of said tube thereby increasing evaporation of the deposited moisture, and a flange portion on said plate member adjacent its discharge edge to eliminate the supply of deposited moisture to the air stream at the discharge edge of said plate member.

4. In an extended-surface heat exchanger, a row of superposed spaced tubes of heat conducting material, a plurality of plate members, one for each of said tubes and having a longitudinally extending stepped portion conforming to the surface of said tubes and rigidly secured thereto in intimate heat transfer relation, said plate members being inclined to the path of air flow so that moisture entrained in the air to be heated will strike and be deposited on said plate members for evaporation, said plate members being so inclined and so spaced from each other that all of the air stream air must have an abrupt change in direction of flow and must impinge the plate member surface, each tube being positioned relative to the edges of its plate member so that deposited moisture on each plate member will be moved into the higher heat zone of the tube thereby increasing evaporation of the deposited moisture.

CLARK T. MORSE.