

Jan. 12, 1943.

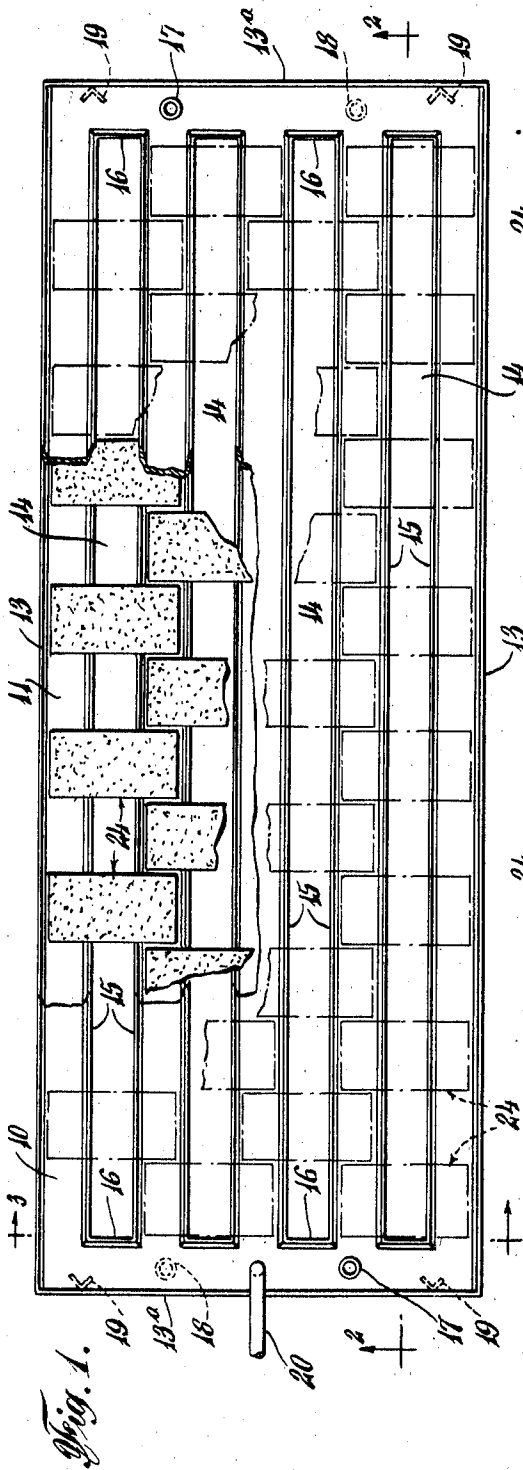
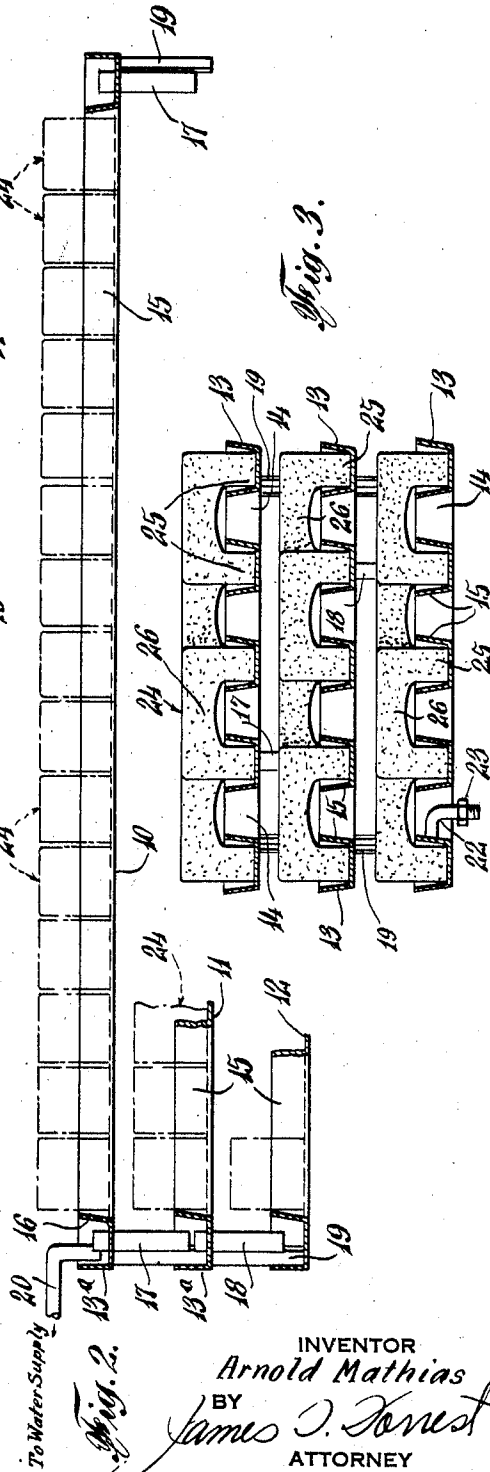
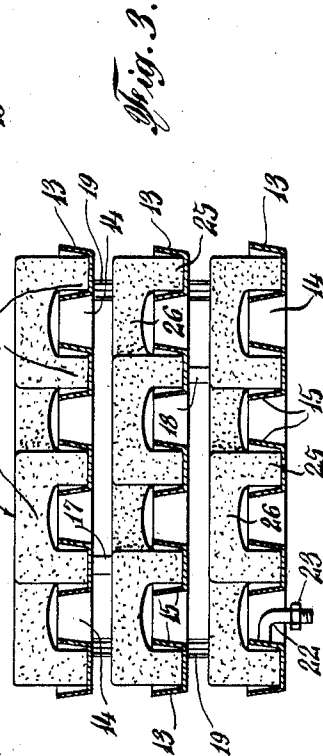
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2,307,938

AIR CONDITIONING APPARATUS

Filed May 8, 1941

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

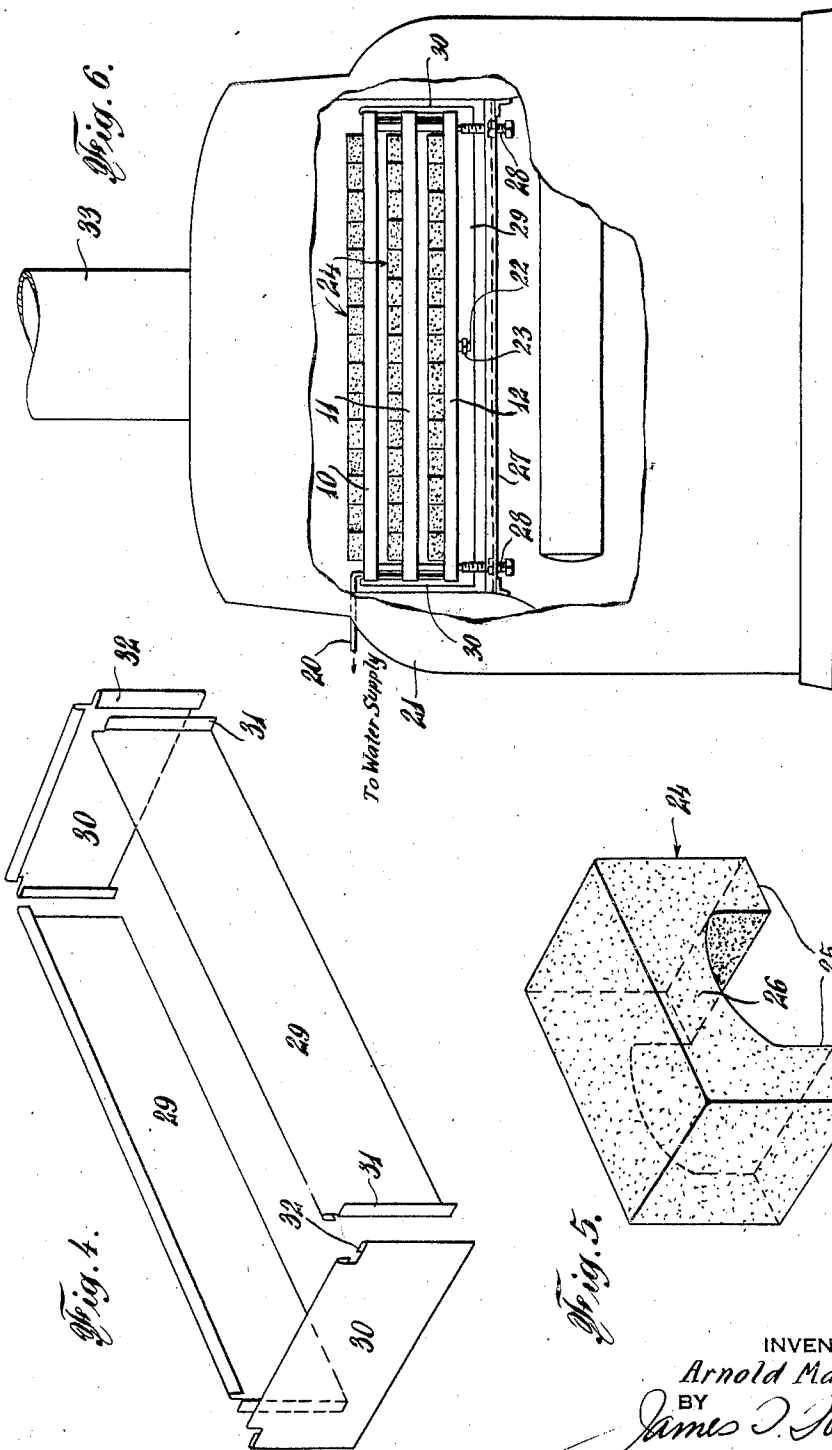


Fig. 5.

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AIR CONDITIONING APPARATUS

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Application May 8, 1941, Serial No. 392,427

4 Claims. (Cl. 261—99)

My present invention relates to an air conditioning apparatus and more particularly to a humidifying unit for conditioning air delivered to the rooms of a dwelling house or the like through ducts leading from a central station within the building.

In its underlying concept, my invention is directed to a novel form of heat exchanger and moisture evolving means which is designed to be installed within the housing of an oil burner installation, furnace, or the like, and over or through which means the air to be conditioned is caused to pass.

In its preferred construction my invention provides an air moistening means so associated with a heat exchanger as to form an air conditioning apparatus, wherein the air moistening means is of high efficiency, adapted for uniform and automatic operation and such wherein the effective evaporative area may be readily varied to suit any condition which may be met with in service. More specifically, my invention in its preferred embodiment comprises a plurality of superposed channeled troughs of novel construction adapted to hold water to a predetermined depth therein and having openings in the bottom thereof between the channels through which the air to be conditioned is caused to pass. In the channels of each of said troughs and bridging the openings in the bottom are mounted bibulous blocks or porous bricks of novel form disposed in checkered relation and with the bricks in the overlying troughs in staggered relation to the bricks in the adjacent troughs, whereby to insure dispersion of the air to be conditioned over an extensive evaporative area. The invention will be better understood from the detailed description which follows when considered in connection with the accompanying drawings wherein:

Fig. 1 is a top plan view of a humidifying unit embodying my invention with parts omitted and others broken away to better show the construction thereof.

Fig. 2 is a fractional longitudinal section taken substantially along the plane of the line 2—2 of Fig. 1.

Fig. 3 is a transverse section taken substantially along the plane of the line 3—3 of Fig. 1.

Fig. 4 is a perspective view of the constituent elements of an enclosing skirt for the humidifying unit.

Fig. 5 is a perspective view, on an enlarged scale, of one of the bibulous blocks used in my humidifying unit.

Fig. 6 is a side elevation of an oil burner in-

stallation with a part of the enclosing wall thereof broken away to show the arrangement of the humidifying unit therein.

Referring to the drawings, the numerals 10, 11 and 12 indicate a plurality of superposed troughs preferably made of metal, which are adapted to hold water and bibulous blocks for humidifying the air. Preferably each of the troughs 10, 11 and 12 is of rectangular form having an enclosing side wall consisting of upstanding side flanges 13 and end flanges 13a, the bottom having a plurality of parallel openings 14 therethrough, which preferably terminate short of the end flanges 13a. Extending obliquely upwardly and inwardly of the openings 14 from the edges of said openings are flanges 15 of a height substantially equal to the height of the side flanges 13. The ends of the openings 14 adjacent the end flanges 13a of the troughs are also formed with upstanding flanges 16, the upstanding edges of which are sealed to the ends of the flanges 15. The flanges 15 provide parallel channels between the openings 14, and the outermost of said flanges 15 also provide channels with the side flanges 13 of the troughs. These channels at their ends communicate with transverse channels formed by the end flanges 16 and the end flanges 13a of the trough. All the channels in the troughs are adapted to hold water to a predetermined depth which is governed by overflow pipes 17 preferably located in each end of the trough 10 and extending through the bottom thereof and overflow pipes 18 in each end of the trough 11, said overflow pipes at the respective ends of the troughs being out of alignment. Preferably the overflow pipes are of such length that the lower ends thereof will dip into the trough next below the one to which the pipe is affixed. The troughs 10 and 11 are also provided with supporting legs 19 for maintaining the troughs in predetermined spaced superposed relation. Water may be introduced into the channels of the troughs in any preferred manner, and as herein shown a pipe 20 leading from a source of water supply extends through the casing 21 of the oil burner installation to supply water to the uppermost trough 10. The lowermost trough 12 is provided with an overflow pipe 22 which preferably extends laterally from one of the flanges 15 and said pipe 22 may be provided with a coupling 23 for facilitating connection with a drain pipe (not shown).

For greatly increasing the moisture evolving area and for insuring a dispersion of the air in passing through the humidifying unit there is mounted within the channels in the troughs,

blocks 24 formed of bibulous material, for example, porous ceramic bricks. These bricks are preferably of U-shape form with substantially parallel-faced legs 24 and 25 of a thickness to engage between the walls of a channel and seat on the base thereof and with the inner face of the connecting bar 26 of the U arched. The reason for this specific construction of brick will presently be made apparent.

The bricks are mounted in the troughs in rows with the legs of the bricks engaging within and seating on the bottom of a pair of channels and with the connecting bar of the bricks bridging the openings in the troughs which is flanked by said pair of channels. Preferably also, the bricks are arranged in checkered relation within the trough, that is to say, the bricks bridging a particular opening 14 are mounted in alternate relation to the bricks bridging the adjacent opening with one leg of the bricks in each of the adjacent rows seating in a common channel in substantially abutting relation. It is also desirable that the bricks in adjacent overlying troughs be disposed in staggered relation with those in the other troughs. Because of this arrangement of the bricks, the air in passing up through the humidifying unit is not only dispersed into a large number of separate streams but is also caused to zig-zag and move under and over the bricks in passing through the respective troughs. In so doing it will be appreciated that the air will absorb a large amount of moisture.

The bibulous bricks in absorbing water to their capacity will sweat and under certain conditions the water will have a tendency to run down the sides of the legs of the bricks or drip from the under surface of the portions of the bricks which bridge the openings and drop into the heated chamber of the oil burner or furnace. By having the underside of the bridging portions of the bricks arched, the run-off water from said surface is caused to follow the inner surface of the brick and run down the side legs thereof. And by having the side legs spaced inwardly from the upper edges of the channel flanges, the width of the legs of the bricks being narrower than the width of the channels at their top, said run-off water is constrained to return into the channels.

The humidifying unit consisting of the troughs and bricks may be mounted within the casing of an oil burner installation, furnace or the like, in any desired manner. In Fig. 6 I have shown a preferred manner of mounting the humidifying unit within the casing 21 of an oil burner installation. This consists in mounting above the heating unit an angle-iron or the like support or framework 27 having extending upwardly therethrough at the four corners thereof adjustable bolts 28 adapted to support the lowermost trough 12 in level position so as to insure a uniform depth of water in the trough. The trough 11 in turn is supported by its legs 19 seating within the trough 12 and the trough 10 in turn is supported in like manner within the trough 11. The supporting legs 19 are of somewhat greater length than the height of the bricks 24 so as to provide a space between the upper surfaces of said bricks in a trough and the bottom of the trough next above it.

For constraining the air to be conditioned to pass up through the superposed troughs I enclose the troughs in a depending skirt formed of a pair of sideaprons 29 and a pair of end aprons 30 each of which aprons at its top has a reversely bent flange adapted to hook over the top edges

of the enclosing wall of the uppermost trough. To lock the aprons of the skirt together, the side aprons 29 have at their ends outwardly extending flanges 31 which are adapted to interlock with inwardly directed hook flanges 32 on the ends of the end aprons 30.

In the operation of an installation such as hereinbefore described, water will be supplied at a slow rate of the uppermost trough 10 and will flow to the various channels wherein, after the bibulous blocks 24 therein have absorbed water to their capacity, the water will build up to a predetermined depth in said trough and then overflow through the pipes 17 into the trough 11 wherein after the blocks therein have absorbed their capacity of water, the channels will fill up and overflow through the pipes 18 into the trough 12 and after a similar procedure as defined with respect to troughs 10 and 11, the water will overflow through the outlet 22 to a drain pipe. The air to be conditioned may be conveniently blown with the aid of a fan (not shown) up past the heating unit of the burner or furnace into the confining space provided by the depending skirt which encompasses the troughs. The air in passing upwardly through the humidifying unit will absorb a quantity of moisture depending upon the temperature to which the air has been heated and the rate at which it is caused to pass through the unit. This same air after being conducted through ducts such as 33 to the various rooms of the house may be reheated and again passed through the humidifier until said air reaches the proper temperature and moisture content desired. By varying the rate, that is the volume per minute of air which is caused to pass through the humidifier, or by varying the number of bibulous blocks within the humidifying unit any desired degree of humidification of the air can be obtained.

It will be appreciated that the air conditioning apparatus hereinbefore described although primarily intended for use in hot air heating systems, can also be used for cooling and humidifying air in the summer time. This can be readily accomplished by supplying to the troughs pre-cooled or iced water which upon being absorbed by the bibulous blocks will substantially cool normally warm summer air when passed through the conditioning apparatus.

Accordingly, while I have shown and described a preferred embodiment of my invention and the manner in which the same is constructed and may be used, I do not wish to be limited to the details of construction disclosed except insofar as constrained by the scope of the appended claims.

What I claim is:

1. In an air conditioning apparatus of the type wherein the air to be conditioned is caused to pass over the surfaces of bibulous material; a humidifying unit comprising a plurality of superposed troughs having openings through their bottoms, channels between said openings adapted to contain water to a predetermined depth, blocks of bibulous material having portions bridging the openings in the respective troughs and portions extending into and seating on the base of the channels, the blocks in each of the troughs being arranged in checkered relation to each other and in horizontally staggered relation to the blocks in the adjacent trough and means for supporting the troughs at a greater distance

apart than the height of the blocks within the troughs.

2. An air conditioning apparatus according to claim 1 wherein means are provided for supplying water to the channels in the uppermost trough, and each of the troughs above the lowermost trough having overflow means to the trough next below it.

3. An air conditioning apparatus according to claim 1 wherein the humidifying unit includes a depending skirt confining the superposed troughs, and said unit is disposed within the casing of a heat exchanger through which the air to be conditioned is caused to pass.

4. In an air conditioning apparatus of the type

wherein the air to be conditioned is caused to pass over the surfaces of bibulous material; a humidifying unit comprising a trough having parallel openings through its bottom, channels having inwardly tapered walls adapted to contain water to a predetermined depth flanking said openings, water communicating passages between said channels and rows of blocks of bibulous material having portions bridging the openings in the trough and portions of less width than the tops of the channels extending into and seating on the base of the channels, the blocks in the adjacent rows being arranged in staggered relation.

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