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AIR HEATING AND HUMIDIFYING APPARATUS

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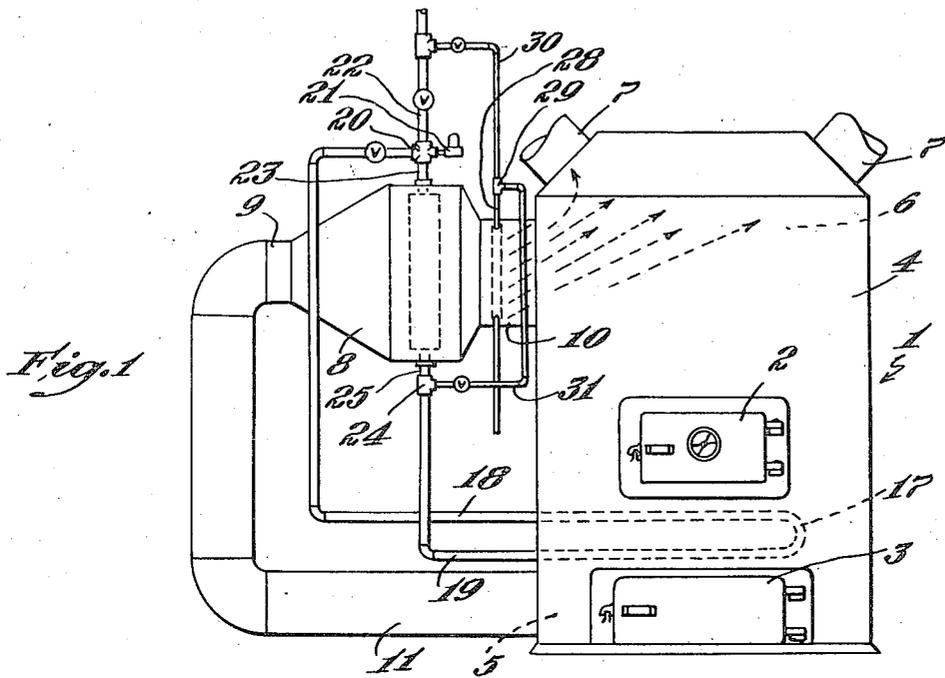


Fig. 1

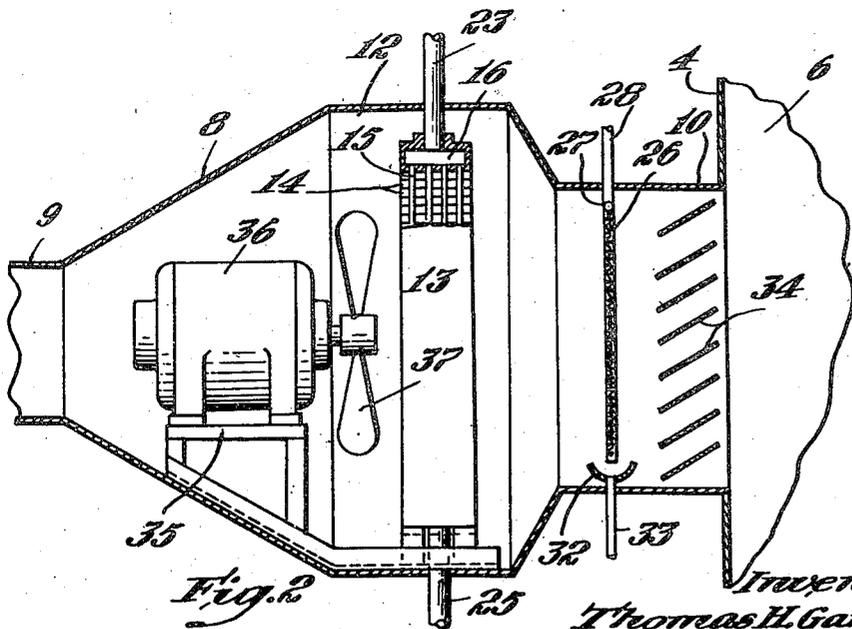


Fig. 2

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# UNITED STATES PATENT OFFICE

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## AIR HEATING AND HUMIDIFYING APPARATUS

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1 Claim. (Cl. 126—113)

**1**  
This invention pertains to air conditioning apparatus and more especially to conditioning means designed for incorporation in or association with a warm air furnace of generally conventional type.

One object of the present invention is to provide air heating means which is more efficient in respect to heat exchange than warm air furnaces of usual type. A further object is to provide simple means auxiliary to, but which may readily be associated with, an existing hot air furnace installation, whereby improved heating efficiency may be obtained. A further object is to provide simple and effective means for adding moisture to the air and, in particular, whereby moisture may be added in easily regulable amounts, but in such a way that the moisture is absorbed by the air current without substantial danger of the deposit of liquid in or about the heating apparatus. A further object is to provide conditioning apparatus which may be attached to an existing warm air furnace or which may be embodied within the structure of a warm air furnace, providing for forced circulation of air in heat-exchange relation to a hot liquid. Other and further objects and advantages of the invention will be pointed out in the following more detailed description and by reference to the accompanying drawings, wherein

Fig. 1 is a diagrammatic front elevation of a warm air furnace having combined therewith air conditioning means embodying the present invention; and

Fig. 2 is a fragmentary vertical section, to larger scale, showing the casing of the conditioning apparatus and the air conditioning elements therein.

Referring to the drawings, the numeral 1 designates a warm air furnace of conventional type having the firedoor 2 giving access to a firebox; the ash door 3; and the outer casing 4 within the lower part of which is the cold air inlet chamber 5 (Fig. 1) and in the upper part of which is the plenum or air distributing chamber 6, from which the warm air pipes 7 lead to the several points of use.

As here illustrated the air conditioning apparatus which is associated with the furnace is arranged outside of the furnace structure, but it is contemplated that all or certain portions, at least, of this conditioning apparatus may be arranged within the furnace casing if desired, the casing being correspondingly designed to receive it.

**2**  
comprises a casing 8 which may be of sheet metal or the like, having the inlet portion 9 and the exit portion 10, the latter being connected directly to the casing 4 of the warm air furnace and providing communication between the interior of the casing 8 and the distributing chamber 6. As illustrated, a cold air pipe 11 leads from the cold air inlet chamber 5 of the furnace casing to the inlet 9 of the air conditioning apparatus. However, it is not necessary that the inlet 9 be connected with the cold air chamber of the furnace since the inlet 9 may be arranged to receive air from any suitable source. Between the inlet 9 and the exit portion 10, the casing is enlarged to provide the conditioning chamber 12. Within this chamber and forming a substantial barrier transversely of the latter is a radiator 13, preferably of conventional automobile type, having a multitude of horizontal air passages 14 and a large number of small vertical tubes 15 connecting a chamber 16 in the upper part of the radiator structure with a similar chamber in the lower part of the radiator structure—the tubes and these chambers forming cavities for the reception of liquid which is in very effective heat exchange relation to the air passing through the horizontal passages 14. While this type of radiator is preferred by reason of its high efficiency as a heat exchange apparatus, the invention is not necessarily limited to this particular form of radiator, as other efficient radiator devices may be substituted if desired.

Within the firebox of the warm air furnace or so located as to be exposed to the heat of the fire in the firebox, or to radiation from the firebox, there is arranged a liquid heating device 17, here illustrated as a simple coil of pipe. However, other types of liquid heating means may be used, such for example as are commonly used in warm air furnaces for heating water for domestic purposes. The delivery end of this coil 17 or equivalent heating means is connected to a pipe 18, while the inlet of the coil 17 is connected to a pipe 19, these pipes extending out through the casing 4. The pipe 18 is connected to a fitting 20 to one arm of which there is attached a safety valve device 21. To another arm of this fitting there is connected the supply pipe 22 coming from any suitable source of water at supply pressure, and from another arm of the fitting 20 a nipple 23 extends downwardly into the top of the radiator 13.

The pipe 19 leads to a T-fitting 24 from which a nipple 25 extends upwardly into the lower part of the radiator 13. There is thus established a

As here illustrated, the conditioning apparatus

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continuous path for liquid to circulate through the heater device 17 and the liquid-receiving cavities of the radiator.

Within the exit portion 10 of the conditioning casing there is arranged a transverse vertical screen 26, preferably of foraminous material, for example wire mesh fabric or an open mesh textile material, and just above this screen there is arranged a distributing pipe 27 having drip openings or spray nozzles from which water may be delivered onto the upper portion of the screen 26 so as to flow down over the screen in a very thin film easily absorbed by air passing through the interstices of the screen. A supply pipe 28 brings water to the distributing pipe 27, the pipe 28 being connected to a T-fitting 29 which is connected by a pipe 30 to the cold water supply. Preferably another pipe 31 is connected to this T-fitting 29 and is designed to receive warm water flowing out from the radiator 13 so that when desired warm water may be supplied to the screen 26 instead of cold water.

Immediately below the screen 26 there is provided a collecting trough 32 designed to receive any moisture which may drip from the lower edge of the screen, and a drain pipe 33 leads from this trough to any desired point.

Within the exit portion 10 of the casing there is preferably arranged a series of air guiding louvres 34 which may be adjustable, if desired, or which may be fixed at an angle found experimentally to give the best results in the particular installation. These louvres tend to smooth out eddies in the flowing air and to provide a smoothly flowing stream where the air enters the distributing chamber 6 of the furnace. As illustrated, they are so arranged as to direct the air upwardly where it enters the distributing chamber so that the flow of air into the pipes 7 is facilitated.

While the apparatus may depend upon gravity flow of air for circulation or upon the employment of a fan located at some other point in the heating system, it is preferred to provide a support 35 within the casing 8 and to mount thereon a motor 36, driving a fan 37 so arranged as to draw in air through the inlet 9 and to deliver it in a substantially horizontal stream to flow through the passages 14 of the radiator 13.

Suitable valves are provided in the pipes which supply the water to the apparatus, so that the supply of circulating hot water may be replenished from time to time without difficulty and so that when desired the water for moistening the screen 26 may be drawn from the hot water circulating system or alternatively, for example in the summer time if it be desired to use the apparatus for cooling air, to deliver cold water to the screen 26.

With this arrangement a portion at least of the air which is delivered to the rooms to be heated is supplied with moisture and a portion at least of the heat absorbed by this air is received through heat exchange with hot liquid flowing through the cavities of the radiator 13. The liquid circulating in the system absorbs heat directly from the fire in the firebox of the fur-

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nace, and this heat is transferred to the flowing air by the very effective heat exchange apparatus provided by the radiator 13. With this arrangement the efficiency of the hot air furnace from the heating standpoint is increased very substantially as compared with an apparatus in which the air is warmed solely by contact with the heated metal surfaces of the furnace itself.

Certain of the subject matter disclosed but not claimed herein is claimed in our copending application Serial No. 753,606, filed June 10, 1947, entitled Air conditioner.

While one desirable embodiment of the invention has been illustrated by way of example, it is to be understood that the invention is broadly inclusive of any and all modifications falling within the scope of the appended claim.

We claim:

In a hot air furnace, a fire box, a casing external to the firebox defining an air heating chamber, means defining a cold air receiving chamber communicating with said air heating chamber at the lower portion thereof, means defining a hot air distributing chamber communicating with the air heating chamber at the top thereof, a conduit external to the furnace leading from said cold air receiving chamber to the hot air distributing chamber, said conduit defining an air conditioning chamber, liquid-heated air heating means located in said conduit, air moistening means located in said conduit between the liquid-heated air heating means and the junction between the conduit and the hot air distributing chamber, air circulating means within the conduit for causing a current of air to flow from the cold air chamber through the conduit and into the hot air distributing chamber, liquid heating means in heat exchange relationship with said fire box, valve controlled means for conveying heated liquid from said liquid heating means to said liquid-heated air heating means, and additional valve controlled means communicating with said liquid conveying means for supplying heated liquid to said air moistening means to moisten the air flowing through the conduit.

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