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HEAT EXCHANGER

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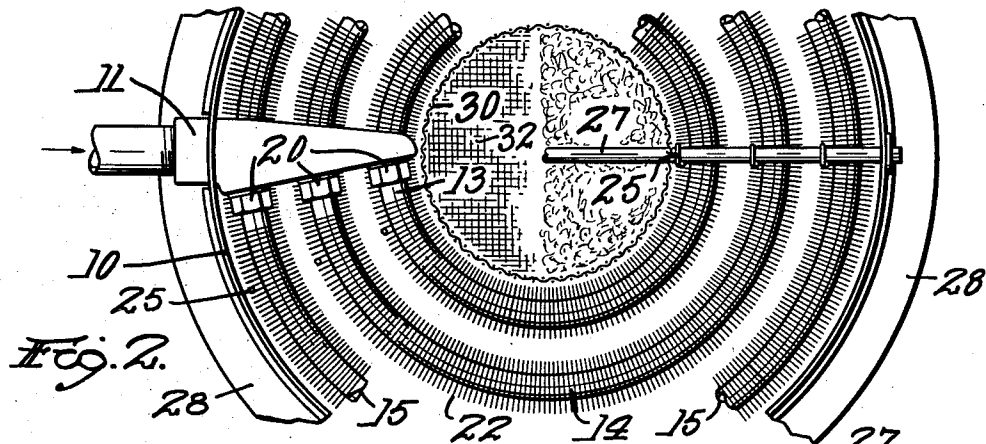


Fig. 2.

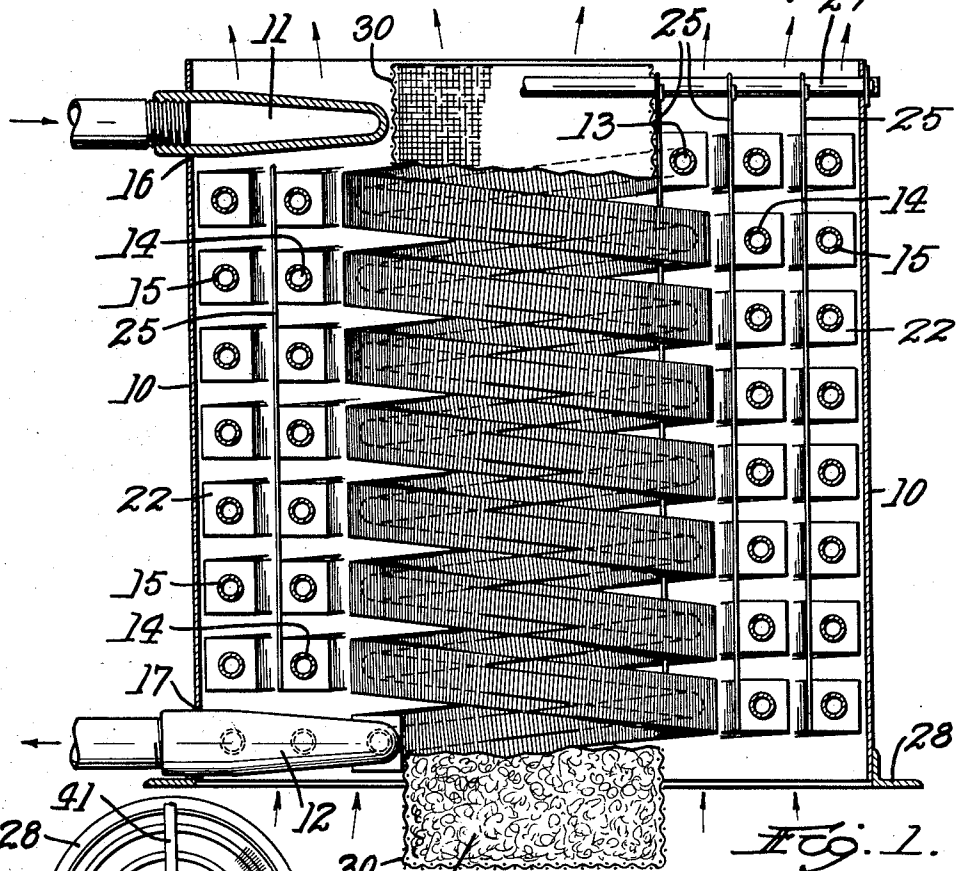


Fig. 1.

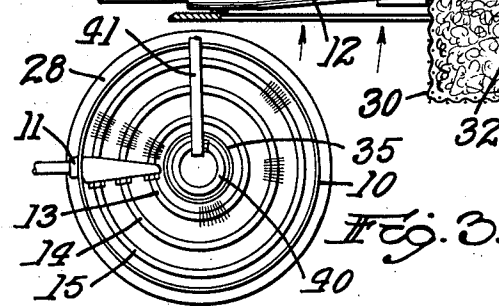


Fig. 3.

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UNITED STATES PATENT OFFICE

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HEAT EXCHANGER

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assignments, of one-half to John M. B.
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Henry R. Hayes, New York, N. Y.

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4 Claims. (Cl. 257—229)

This invention relates to a heat transferring device or heat exchanger by which heat may be imparted to or removed from a mass of air flowing through the device.

5 It is the general object of our invention to improve the construction of heat exchangers for such purposes, with the intent that they may be more effective in heat interchange, substantially noiseless in operation, and easily manufactured
10 or repaired.

Our invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

15 Preferred forms of the invention are shown in the drawing, in which

Fig. 1 is a sectional side elevation of our improved heat exchanger;

Fig. 2 is a partial plan view thereof, and

20 Fig. 3 is a plan view of a modified construction.

Referring to Figs. 1 and 2, we have shown a heat exchanger comprising an outer casing 10, upper and lower manifolds or headers 11 and 12, and a series of concentric helical coils 13, 14, and
25 15. The headers 11 and 12 are loosely inserted in openings 16 and 17 in the side wall or casing 10 and are connected to the ends of the coils 13, 14, and 15 by the usual pipe couplings or union connections 20.

30 The headers 11 and 12 are preferably progressively reduced in cross section proportionate to the volume of liquid passing through different portions thereof.

The coils 13, 14, and 15 are each preferably
35 formed of a continuous piece of brass or copper tubing and each coil is preferably provided with a multiplicity of thin sheet metal fins 22 which very greatly increase the heat-exchanging surface of the coil. These fins may be made in the form
40 of flat plates having flanged central openings snugly fitting the tubing forming the coil.

Spacing rods 25 are secured to the separate turns of the pipe coils or to the fins mounted thereon, and serve to hold the turns of the coils
45 in uniform spaced relation. The spacing rods are also preferably extended upwardly above the coils and are bent around a supporting member 27, which is commonly made in the form of a cross rod or tube extending transversely of the
50 exchanger.

When it is desired to remove the coils from the casing 10, the coils are disconnected from the headers 11 and 12, the upper header being then
55 withdrawn, and the coils may then be lifted as a

unit by utilizing the cross rod or tube 27 as a handle.

A suitable supporting flange 28 may be secured around the lower edge portion of the casing 10.

When operating with relatively high velocity
5 air flow, we provide means for deadening or absorbing sound. For this purpose we place a cylindrical container 30 within the innermost coil
13. The container is preferably formed of wire cloth or some similar foraminous material, and is preferably filled with a mass 32 of fine
10 metal shavings or other similar sound-absorbing material.

We have found that our heat exchanger when
15 provided with an inner cylinder 30 and sound absorbent material 32 is practically noiseless in operation, even at high velocity air flow.

For low velocity operation, the cylinder 30 and sound absorbent material 32 may be replaced by a plain cylindrical sheet metal tube or sleeve 35
20 (Fig. 3) mounted in the same position as the cylinder 30 but entirely open at both ends.

The apparatus shown in Figs. 1 and 2 may be used for either heating or cooling the air stream. In either event, the heating or cooling liquid is
25 introduced through the upper header 11 and is removed from the lower header 12, while the direction of air flow is upward as indicated by the arrows in Fig. 1.

In all methods of operation the direction of
30 air flow is reverse to the direction of liquid flow. Consequently, when used for heating purposes, the cool air entering at the bottom of the exchanger encounters the relatively cool liquid
35 about to leave the coils, and as the air flows upward and its temperature gradually rises, it encounters continuously warmer coils and fins, so that heat exchange takes place under the most advantageous conditions.

Similarly, when used for cooling purposes, the
40 relatively warmer air entering at the bottom of the exchanger first encounters the relatively warm liquid about to be removed from the exchanger, and as the air flows upward and is gradually
45 cooled, it successively encounters coils and fins at lower temperature.

Where dehumidifying as well as cooling is desired, we may provide an additional coil 40 (Fig. 3) inside of the cylindrical sleeve 35 previously described. This coil 40 will be connected to separate headers 41 and will be supplied with a cooling liquid at relatively low temperature, while the coils 13, 14, and 15 will be supplied with liquid at a somewhat higher but yet cool tempera-
55 55

ture, such as water taken from the ordinary city mains.

5 A relatively large amount of water is removed from the air passing through the sleeve 35 and this dehumidified air, when thereafter mixed with the air cooled by the coils 13, 14, and 15, reduces the humidity of the entire mass of air to the desired point.

10 We have found that it is much more economical to remove a relatively large amount of moisture from a relatively small mass of air by the inside coil, rather than attempting to directly de-humidify the entire mass of air flowing through the apparatus.

15 When used for heating operations, the coils 13, 14, and 15 will be supplied either with hot water or steam and the inside coil 40 is not necessary.

20 Having thus described our invention and the advantages thereof, we do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what we claim is:—

25 1. A heat exchanger comprising a casing, upper and lower headers for said casing, a plurality of concentric pipe coils mounted in said casing, separate means for detachably connecting each end of each pipe coil to one of said headers, a foraminous container mounted within the innermost of said coils connected to said headers, and sound-absorbent material enclosed in said container.

30 2. A heat exchanger comprising a casing, upper

and lower headers for said casing, a plurality of concentric pipe coils mounted in said casing, separate means for detachably connecting each end of each pipe coil to one of said headers, a wire cloth sleeve mounted within the innermost of said coils connected to said headers, and a mass of metallic sound-absorbent material enclosed in said sleeve. 5

3. A heat exchanger comprising a casing, upper and lower headers for said casing, a plurality of concentric pipe coils mounted in said casing, separate means for detachably connecting each end of each pipe coil to one of said headers, a wire cloth sleeve mounted within the innermost of said coils connected to said headers, and a mass of fine metal shavings enclosed in said sleeve. 10 15

4. A heat exchanger comprising a casing, upper and lower headers for said casing, a plurality of concentric pipe coils mounted in said casing, separate means for detachably connecting each end of each pipe coil to one of said headers, a plurality of heat transferring fins on each coil, a plurality of vertically disposed rods to which fins on adjacent turns of said coils are directly secured and whereby said coils are held in spaced relation, and transverse lifting members to which the upper ends of certain of said vertically disposed rods are secured. 20 25

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