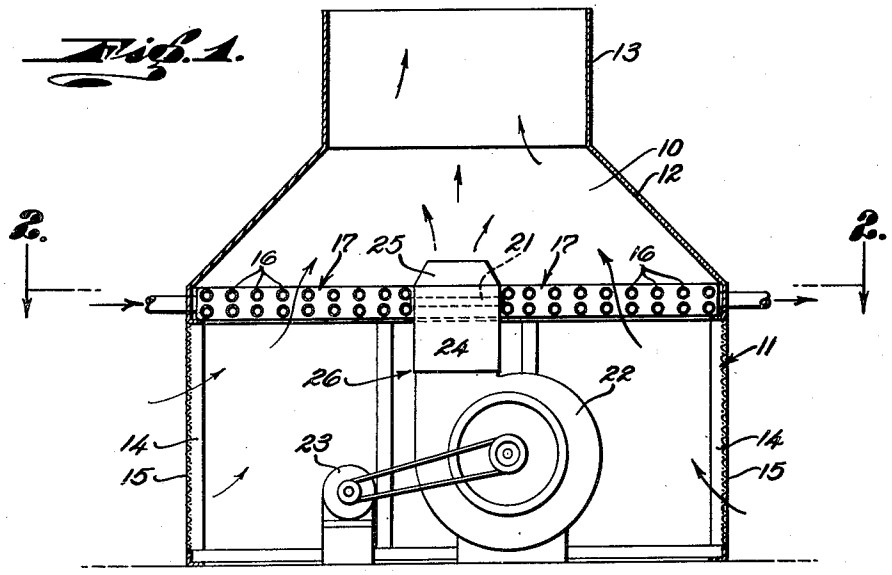
March 28, 1950 F. M. STEPHENS 2,501,795

HEAT TRANSFER EQUIPMENT

Filed July 7, 1947

Fig. 1.



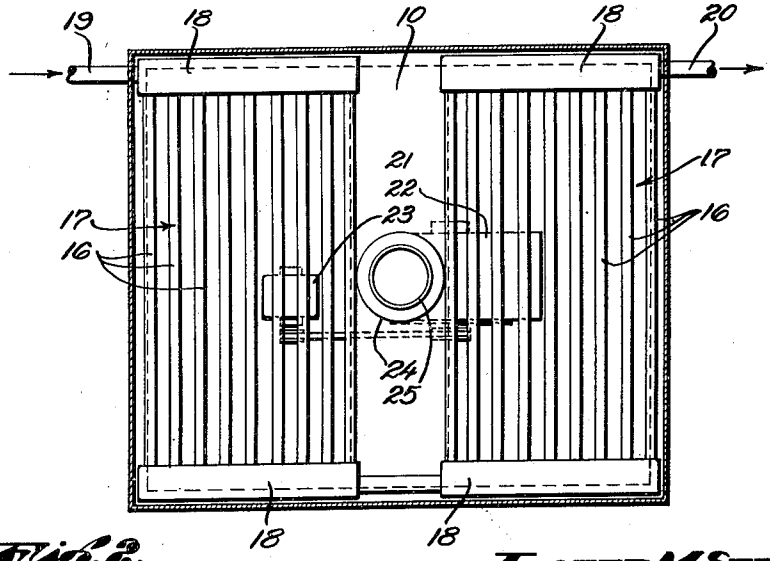


Fig. 2.

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HEAT TRANSFER EQUIPMENT

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5 Claims. (Cl. 257—137)

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This invention relates to improvements in air cooled heat transfer equipment of the general type employed in industrial plants for the cooling of fluids, and comprising one or more units, depending on the required cooling load, each including an assembly of fluid cooling tubes in the path of a mechanically displaced air stream.

Heretofore, such equipment has been made in the form of a housing structure containing a chamber through which an upward flow of air is created by a fan positioned below cooling tubes mounted above the fan.

One of my present objects is to depart from the conventional types of construction in a manner utilizing the induction effect of a primary or relatively high velocity air stream to create a secondary air flow into the cooling chamber. Also contemplated is a different relation between the position of the cooling tubes and location of high velocity air discharge into the chamber, whereby the high velocity stream is directed upwardly from above the tubes to induce a flow of secondary air upwardly against them, thus permitting the tubes to be positioned relatively low in the chamber and avoiding the structural disadvantages and expense of having to support them at a higher elevation.

The invention further contemplates an arrangement particularly adaptable and advantageous for the displacement of air by a blower as distinguished from a conventional open blade fan. Using an air blower, the primary air may be so directed at high velocity within a reduced or Venturi-shaped upper section of the chamber, as to induce the flow of a relatively high quantity of secondary air into the chamber.

The above mentioned as well as various additional features and objects of the invention will be further explained in the following detailed description of an illustrative embodiment shown by the accompanying drawing, in which:

Fig. 1 is a view showing the unit in vertical section; and

Fig. 2 is a plan section on line 2—2 of Fig. 1.

The single unit illustrated comprises a chamber 10 formed by a wall structure comprising a vertically extending lower section 11 above which the walls 12 at all four sides of the unit converge upwardly to a stack 13. Opposite side walls of the lower section 11 have air intake openings 14 occupied by screens 15. As will be understood, depending upon the cooling load in any given installation, the equipment may consist of a single unit as illustrated, or a continuous series of units having adjacent or common side walls 11 with the air inlets 14 at the outer sides of the series.

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Chamber 10 contains a suitable number of fluid cooling tubes 16 arranged, for example, in banks 17 having headers 18 supported by and at the top of the lower wall section 11. Fluid to be cooled enters the tube banks through inlet 19 and is discharged through the outlet 20. Where the tubes are arranged in spaced banks, as in the form illustrated, the space between the banks may be closed by horizontal baffle wall 21 so that the entirety of the secondary or induced air streams will pass upwardly between the tubes.

A relatively high velocity or primary air stream is discharged upwardly through the chamber 10 by a rotary blower 22 positioned within the base of the structure and driven by the motor 23. The blower is connected with a vertically positioned discharge conduit 24 extending upwardly through the baffle 21 and positioned centrally within the chamber in axial alinement with the stack 13. The conduit 24 may be connected to the blower by any type of joint at 26 permitting disconnection and removal of the blower without disturbing the conduit. The latter has an upper, nozzle shaped end 25 from which the air is discharged in a course or pattern having such relation to the convergent walls 12 and stack 13 as to create a Venturi effect and resulting induction of secondary air through the inlets 14. As will be understood, by virtue of this arrangement, the volume of secondary air may be high in relation to the quantity of air displaced by the blower.

As previously indicated, the illustrated relation between the position of the nozzle 25 and the convergent upper section of the chamber, with the nozzle being positioned above the tube banks, permits the latter to be mounted at a low elevation. Consequently it is made possible to avoid the higher construction cost necessitated in the ordinary situation where the tube banks must be supported at a relatively high elevation, and at the same time to afford equal or greater strength and rigidity in the tube bank supporting walls using conventional dimensions and materials.

In operation, the relatively high velocity air discharge from the nozzle 25 into the upper constricted section of the chamber, induces by a Venturi action, air flow in proportionately greater quantities through both of the inlets 14 upwardly between the tubes. The induction of air is further aided by the effect of the stack 13, the height of which may be selected to cause

maximum air induction at any given rate of air discharge from the nozzle **25**.

I claim:

1. Air cooled heat exchange equipment comprising walls enclosing a vertically extending chamber open at opposite sides of its lower inlet end to receive atmospheric air, fluid cooling tubes within said chamber, an atmospheric air blower below said tubes, and a discharge conduit extending upwardly from the blower to a central location in the chamber above the tubes so that air discharged from the conduit induces a flow of air into the chamber through an inlet below the tubes and thence upwardly between the tubes and through the chamber.

2. Air cooled heat exchange equipment comprising walls enclosing a vertically extending chamber open at opposite sides of its lower inlet end to receive atmospheric air, horizontally extending banks of fluid cooling tubes within said chamber, an atmospheric air blower below said tubes, and a discharge conduit extending upwardly from the blower between and to a central location in the chamber above the tube banks so that air discharged from the conduit induces a flow of air into the chamber through an inlet below the tubes and thence upwardly between the tubes and through the chamber.

3. Air cooled heat exchange equipment comprising walls enclosing a vertically extending chamber open at opposite sides of its lower inlet end to receive atmospheric air, horizontally extending banks of fluid cooling tubes within said chamber, an atmospheric air blower below said tubes, a discharge conduit extending upwardly from the blower between and to a central location in the chamber above the tube banks so that air discharged from the conduit induces a flow of air into the chamber through an inlet below the tubes and thence upwardly between the tubes and through the chamber, and baffle walls between the tube banks at opposite sides of the conduit.

4. Air cooled heat exchange equipment comprising walls enclosing a vertically extending chamber having an upwardly convergent portion and open at opposite sides of its lower inlet end to receive atmospheric air, horizontally positioned banks of fluid cooling tubes within the chamber below said convergent portion thereof, an atmospheric air blower below said tubes, and a discharge conduit extending upwardly from the blower between and to a location above the tube banks and centrally within the chamber so that air discharged upwardly from the conduit into said convergent portion of the chamber induces a flow of air into the chamber through an inlet below the tubes and thence upwardly between the tubes and through the chamber.

5. Air cooled heat exchange equipment comprising walls enclosing a vertically extending chamber having an upwardly convergent portion and a reduced cross-sectional area top stack section, said chamber being open at opposite sides of its lower inlet end to receive atmospheric air, horizontally positioned banks of fluid cooling tubes within the chamber below said convergent portion thereof, an atmospheric air blower below said tubes, and a discharge conduit extending upwardly from the blower between and to a location above the tube banks and centrally within the chamber so that air discharged upwardly from the conduit into said convergent portion of the chamber induces a flow of air into the chamber through an inlet below the tubes and thence upwardly between the tubes and through the chamber.

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