Oct. 25, 1932. H. W. SMITH, JR 1,884,898

AIR CIRCULATING AND TEMPERATURE CHANGING UNIT

Filed May 7, 1930 2 Sheets-Sheet 1

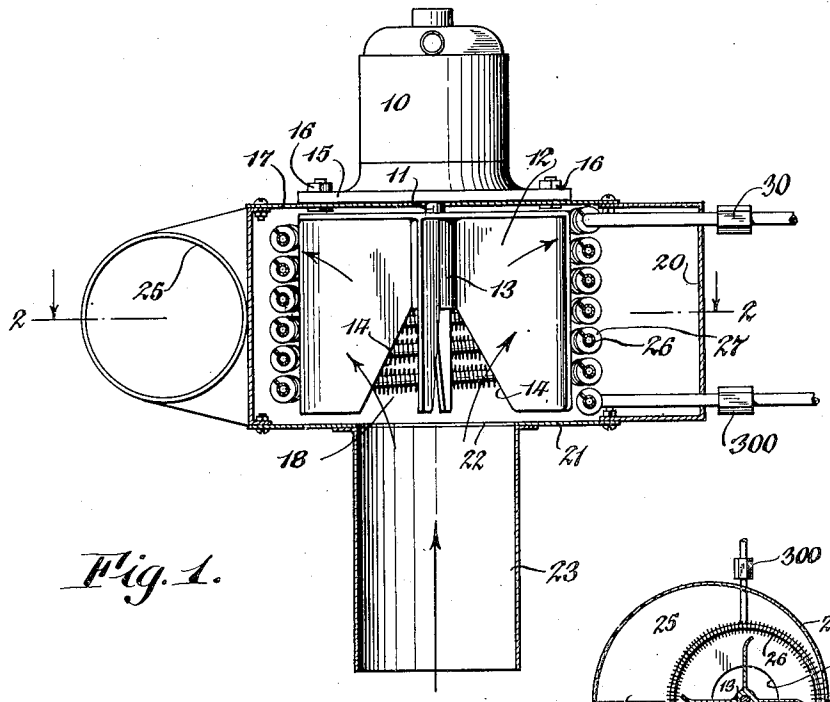


Fig. 1.

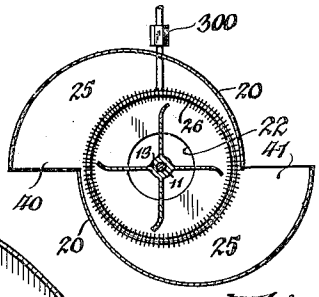


Fig. 3.

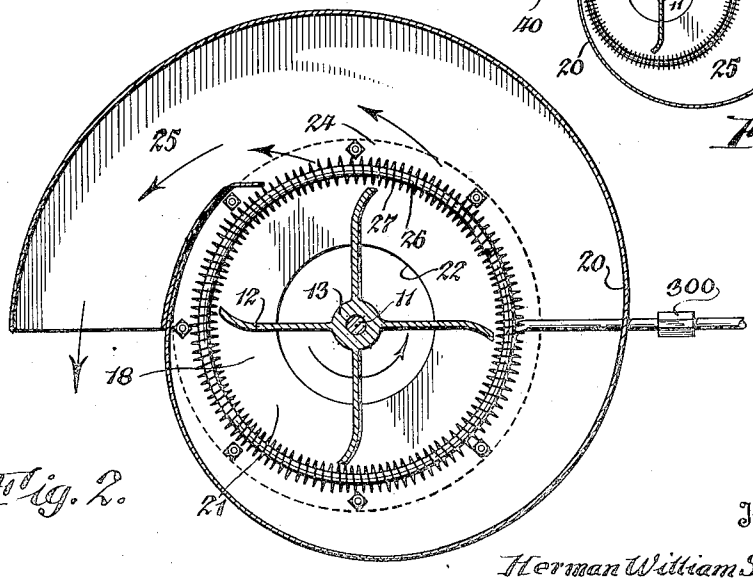


Fig. 2.

Inventor

Herman William Smith, Jr.

By Popp & Powers

Attorney

Oct. 25, 1932. H. W. SMITH, JR 1,884,898

AIR CIRCULATING AND TEMPERATURE CHANGING UNIT

Filed May 7, 1930 2 Sheets-Sheet 2

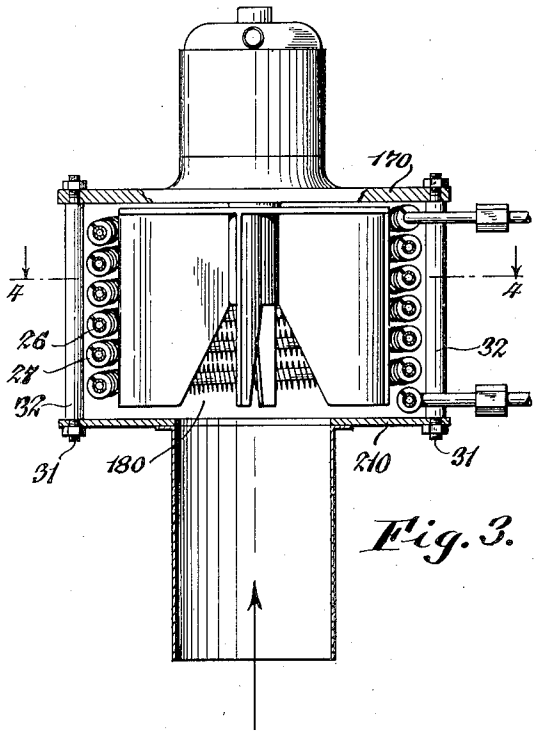


Fig. 3.

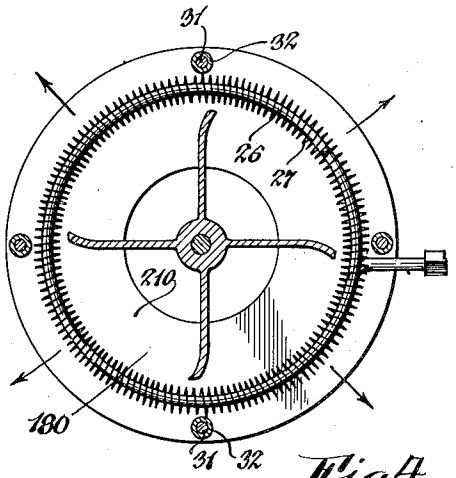


Fig 4.

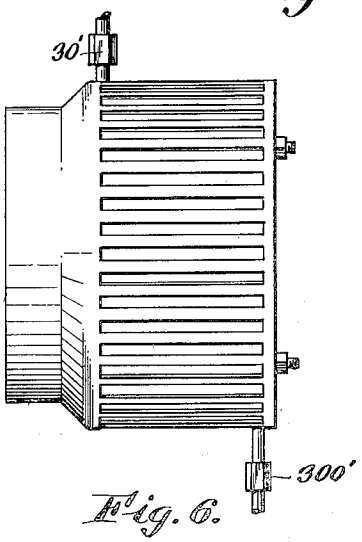


Fig. 6.

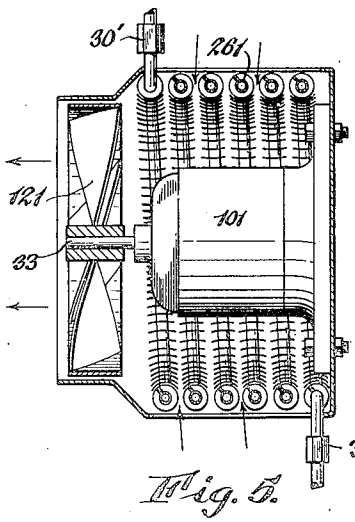


Fig. 5.

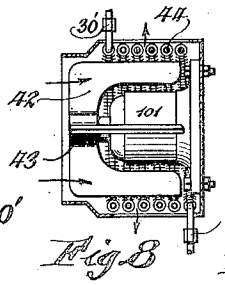


Fig. 8

Inventor

Herman William Smith, Jr.

By Popp & Powers

Attorney

Patented Oct. 25, 1932 1,884,898

UNITED STATES PATENT OFFICE

HERMAN WILLIAM SMITH, JR., OF SCHENECTADY, NEW YORK, ASSIGNOR TO JOSEPH PORZEL, OF LOCKPORT, NEW YORK

AIR CIRCULATING AND TEMPERATURE CHANGING UNIT

Application filed May 7, 1930. Serial No. 450,423.

This invention relates to a unitary structure or assembly, one or more of which is adapted to be placed as individual units in any desired independent positions to function as either heaters or coolers of air and to circulate this thermally treated air from and to any desired points.

One of the objects of the invention is to provide a compact and efficient unit of this character and one in which the air is drawn into and discharged from said unit in the most advantageous direction. Another object of the invention is to provide that the currents of air are swept against the thermal transfer member in the direction which causes the greatest thermal effect with the least frictional resistance. Further numerous objects and advantages of the invention are disclosed in detail in the following description, wherein:

In the accompanying drawings:

Figure 1 is a vertical, longitudinal medial section through one form of my invention. Figure 2 is a horizontal, transverse section thereof taken on line 2—2, Fig. 1. Figure 3 is a vertical, longitudinal medial section similar to Fig. 1 but showing a modified form of the invention. Figure 4 is a horizontal, transverse section thereof taken on line 4—4, Fig. 3. Figure 5 is a vertical, longitudinal medial section through another modified form of the invention. Figure 6 is a side elevation thereof. Figure 7 is a horizontal transverse section of another modified form of the invention. Figure 8 is a vertical, medial section through another modified form of the invention.

In the following description, similar characters of reference indicate like parts in the several figures of the drawings.

My invention may be embodied in various forms and in air circulating and temperature changing units of different constructions, and the present applications are therefore to be regarded merely as some of the possible organizations which satisfactorily carry out the invention in practice. As here shown the invention is constructed as follows, taking up for the present only the construction illustrated in Figs. 1 and 2.

The numeral 10 represents an electric motor or other simple compact source of power in place of which may be used, if desired, a turbine or other similar fluid driven prime mover. The shaft 11 of said motor projects longitudinally and vertically downward from the motor 10 proper and has secured thereto a centrifugal fan 12, the hub 13 of which is located above the central part of the fan and in proximity to the adjacent supporting bearing of the motor 10. The lower inner parts of the blades of said centrifugal fan 12 are cut away at 14 to permit the free passage of air into the central portion of said fan.

The lower peripheral portion of the motor 10 is provided with an annular flange 15 to the lower face of which is secured by bolts 16 or otherwise an upper chamber wall 17 constructed of heavy sheet metal and constituting the upper horizontal wall of a fan chamber 18, the vertical, curved wall 20 of which is parallel to the axis of the fan while the lower wall 21 of which is horizontal and is cut away to form an annular opening 22 to permit the ingress of air into the interior of said fan chamber 18.

Adjacent said opening 22 and secured to the lower horizontal wall 21 of the fan chamber is a suction tube or air inlet duct 23 which permits air to be drawn into said fan chamber from a region more or less remote therefrom. For instance, assuming the unit to be used in the vertical position of Fig. 1, said air inlet duct 23 will draw cool air from the lower parts of the room. At 24, the curved vertical wall 20 is cut away to allow the fan to discharge air therethrough into an outlet tube or air discharge duct 25, from whence the air issues in a normally horizontal direction and

is discharged under pressure to a region remote from the unit.

Secured suitably to the main frame of the unit is a thermal transfer member which in the illustrations is shown as a helical pipe coil 26 whose axis is preferably though not necessarily concentric with the axis of the fan 12. Said coil is provided throughout its length with thermal radiating fins 27 which may be either of disk form or constructed in one spiral band as shown. In either case, however, the plane of said fins is perpendicular to the axis of the coil 26 and hence is approximately parallel to a plane passing through the axis of the fan. Hence, as air is thrown out more or less radially from said fan, said air is caused to move approximately parallel to said fins 27 and yet at a sufficiently acute angle thereto (due to the tangential component of the air stream) as to be forcibly impinged against the flat faces of said fin. In actual practice, this arrangement has been found to provide a very high rate of thermal transfer.

In the position of Fig. 1, it is assumed that the air passing through the unit is being heated in which case cold air is drawn up from the lower air strata of the room. In such case steam, hot water, etc., is fed into what in this case is a heating coil from any suitable source of thermally potential power. Suitable pipe couplings or unions 30 and 300 are provided at opposite termini of said coil 26 to permit of detachably connecting said coil with the source of thermal power. If the latter is in the form of electrical power, an electrical resistance wire is preferably used instead of a pipe but the radiating fins 27 are retained as before and in this case the pipe or wire is suitably insulated from the frame of the unit.

When it is desired to cool the air instead of warming it, the whole unit as shown in Fig. 1 is preferably inverted so as to suck into the unit the warmer air to be found in the upper strata of the room. In such a case a suitable refrigerant is used such as carbon dioxide, ammonia gas, or a cool liquid such as brine, etc. this cool source of thermally potential power being coupled up with the pipe unions 30 and 300 as before.

Figures 3 and 4 show a modified form of the invention in which the vertical, curved wall 20 and air discharge duct 25 are omitted, the discharged air passing directly laterally from the chamber 180 against the coil 26 and its radiating fins 27 and thence into the surrounding atmosphere. In this case the upper and lower walls 170 and 210 of the chamber 180 are connected together by a plurality of securing bolts 31 whose shanks are disposed within the bores or hollow interiors of a plurality of companion tubular spacers 32.

Another modified form of the invention is shown in Figs. 5 and 6. In this case a propeller type of fan 121 is employed and turns about a horizontal shaft 33 rotated by a suitable motor or other source of mechanical power 101. In this case also the axis of the helical thermal transfer coil 261 is concentric with the axis of fan and motor, but the coil itself is in this case around the motor instead of around the periphery of the fan. This makes a more compact construction which is very suitable for certain installations. It will be noted that in this construction, the air is drawn radially inward against the thermal transfer coil 261 and thence passes to the fan which discharges the same directly into the atmosphere.

In Fig. 7 is shown another modified form of the invention analogous to the construction of Fig. 2, but having two outlets 40 and 41 arranged at 180° relatively to each other.

In Fig. 8 is shown another modified form of the invention analogous to the construction of Fig. 5 but using a centrifugal fan 42 instead of a propeller fan. In this case said centrifugal fan is constructed of vanes which lie in planes which are longitudinal of the axis of rotation and which extend radially out from the hub 43 of said fan and then project longitudinally forward in proximity to the heating element 44. It is obvious that the direction of air flow in this construction is opposite to that shown in Fig. 5.

While in the foregoing description the different forms of the invention have been termed modifications, they are in reality and as viewed from the commercial viewpoint, specific "adaptations" of the invention for use under various installation conditions. With this in mind, it will be obvious that this invention as a practical unit for the circulation and the changing of temperature of air under any and all installation conditions has genuine practical merit due to its unusual simplicity, low cost and operating efficiency.

I claim as my invention:

1. An air circulating and temperature changing unit comprising a frame and a motor secured thereto; a fan driven by said motor; a vertical air inlet duct arranged at the lower part of said frame; a horizontal air discharge duct arranged upon the side of said frame; an annular thermal transfer member connected with a source of thermal power and secured to said frame; and conducting means for directing air from said inlet duct and radially against said thermal transfer member and through said fan and into said discharge duct.

2. An air circulating and temperature changing unit comprising a frame and a motor secured thereto having a vertical axis; a centrifugal fan disposed coaxially below said motor and driven thereby; a vertical air inlet duct arranged coaxially below said fan; a

helical thermal transfer element having a vertical axis and disposed in proximity to the periphery of said fan; fins and said element disposed radially parallel to the axis of said fan; a casing around said fan; an air exhaust duct extending horizontally out from the side of said casing; means for providing said thermal transfer element with thermally potential fluid; and means for turning the whole unit about its generally vertical axis so as to alter the direction of air flow from the horizontal air discharge duct.

In testimony whereof I hereby affix my signature.

HERMAN WILLIAM SMITH, JR.