(No Model.)

W. R. MACDONALD.

PNEUMATIC VENTILATOR.

No. 509,231. Patented Nov. 21, 1893.

Fig. 3.

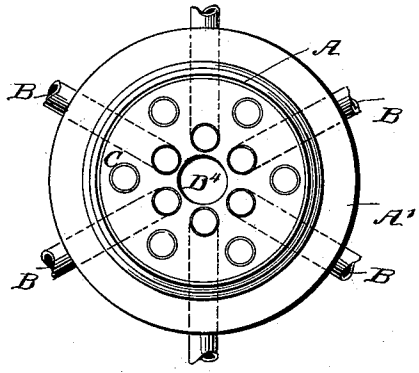


Fig. 2.

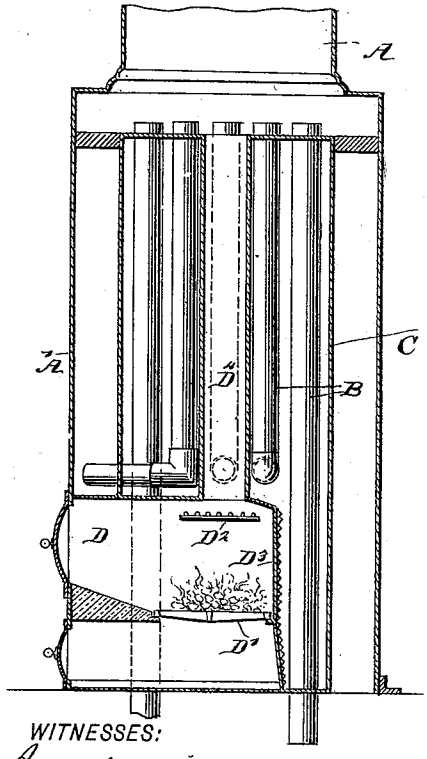
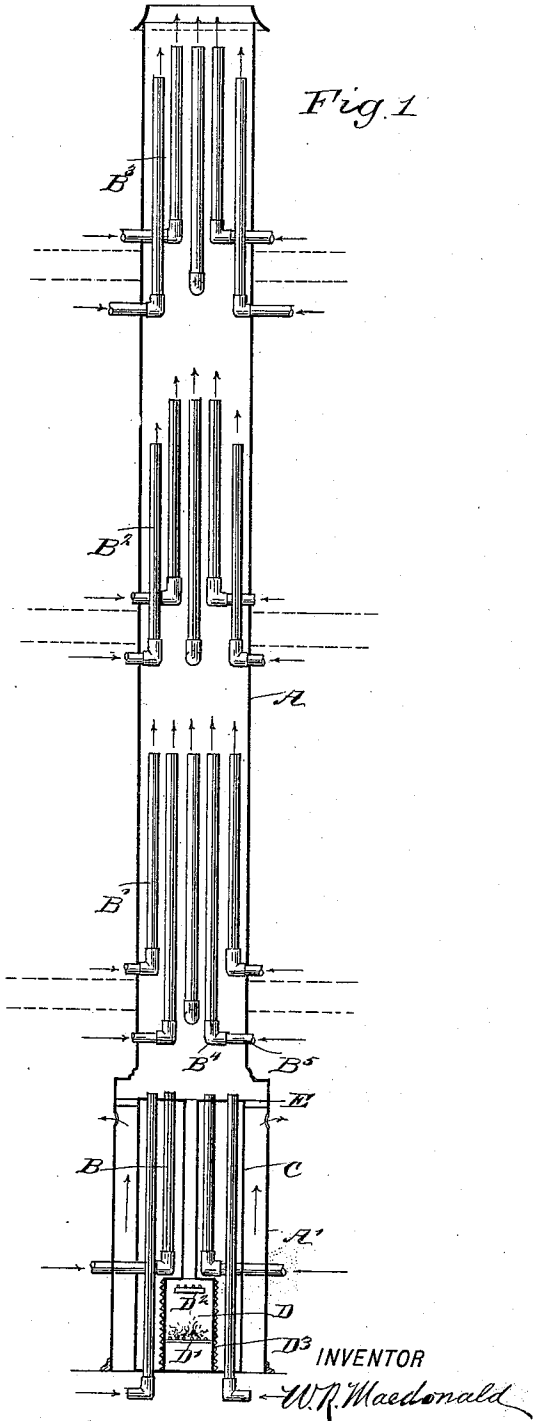


Fig. 1.



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PNEUMATIC VENTILATOR.

SPECIFICATION forming part of Letters Patent No. 509,231, dated November 21, 1893.

Application filed March 6, 1893. Serial No. 464,743. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM R. MACDONALD, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and Improved Pneumatic Ventilator, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved multitubular exhaust ventilator, in which the energy derived from burning fuel or other heat source imparts prime movement to manifold air exhaust currents, and by confining and heating and reheating said currents, thereby obtain pneumatic force and efficiency in their exhaust and discharge.

The invention consists of a main ventilating flue containing within itself sets of manifold auxiliary vertical tubes, having elbows and right angle connections at various levels, to make an inlet for the said tubes at the sides of the main flue, and a heater within the main flue or contiguous thereto.

The invention also consists of certain parts and details, and combination of the same, as will be hereinafter described, and then pointed out in the claim.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement. Fig. 2 is an enlarged transverse section of the lower part of the main flue, the heater and fire-box, and Fig. 3 is a plan view of the same.

The improved ventilator is provided with a vertically-disposed flue A of suitable diameter, and having a somewhat enlarged lower end A′, as plainly shown in Fig. 1. In this flue A are arranged sets of tubes B, B′, B^2, B^3 located one above the other, as shown in Fig. 1, the lower set B being arranged in a tubular hot blast ventilator C, located within the enlarged end A′ of the flue A. Each of the tubes in the several sets of tubes is provided with an elbow B^4 and a horizontal extension B^5, passing through the wall of the flue A, and in the case of the lower set of tubes B, also through the wall of the hot blast ventilator C. Some of the tubes in this lower set of tubes B extend through the bottom of the hot blast ventilator C, to make connection below the flue A, as shown in Fig. 1. The inner upper ends of the tubes discharge in an upward direction into the flue A, as indicated by the arrows, it being understood that the horizontal connections B^5 are the inlets for the tubes. The hot blast ventilator C forms an air mover, is preferably of cylindrical form, and arranged to be heated either by combustible fuel located on grate bars D′ in a fire-box D forming part of the said ventilator or it may be heated by burning gas on a suitable gas burner D^2, arranged in the said fire-box D, or it may be heated by means of an electric mat D^3 surrounding the fire-box, as illustrated in Figs. 1 and 2. The fire box D is provided with a suitable flue D^4. When the fire or other source of heat within the hot blast ventilator is started, and the entire length and circumference of the tubes B are exposed to heat, then the energy of heat motion is immediately imparted to the foul air columns within the said tubes, so that on account of the highly heated surfaces, friction and lagging is prevented, and swift propulsion of hot air jets through the said first set of tubes B into the main flue A is the result. Then the columns of hot foul air passing through the first set of tubes B into the main flue A rise into contact with the succeeding upper set of projecting tubes B′, and these, becoming heated, discharge their heated contents upon the next set of tubes B^2, and so on through the entire height of the flue A. It is designed that all the heat surfaces shall be applied to ventilation alone, and that the dimensions of the tubes and flues may be diminished or increased, as occasion may require, but if necessary, the flue A may be used as a heating surface, the air chamber being formed by putting in a cut-off and air flow, as indicated at E in Fig. 1.

The invention is particularly applicable to ventilation of water-closets, in large buildings and public institutions, and in all large buildings heated either by steam or hot water, and where an exhaust is required from the room so that the circulation of the heat may be more effective. In fire-proof buildings where with windows closed the rooms are very tight, the sets of small tubes with pneumatic force will carry away warm air and dust in summer, and cold air and dust in win-

ter. In all cases bath-rooms or water-closet rooms may be made foul air gathering-rooms and the draft will be inward to the rooms and downward through the closet seats at all seasons of the year. The improvement is also particularly applicable to mines were ventilation is required by law. The divided exhaust would then gather by hose conduits or connections from remote entries or chambers and being a prime mover, engineer's wages and the expense and wear and tear of fans, &c., are saved.

It will be seen that by this improved method all air entering the main flue is heated before being discharged into the said flue, thus adding to the velocity of the upward current and not diminishing in any way its force. I do not confine myself to the use of the heat source at the base or lower end of the main flue A, as it may be located at any higher convenient point, or two or more heat sources may be employed in the same flue when necessary. The sets of tubes may be placed in a boiler stack and operated by the waste heat from the boiler or other furnaces.

A chief feature of excellence in this multitubular method of ventilating is that the combined area of all the sets of tubes may exceed the area of the main flue A and still the operation of both main flue and sets of tubes be effective. This efficiency is produced and maintained solely by the numerous hot air jets and concentrated force, and as air is a fluid, the principle of action in the main flue A and the sets of tubes, is similar to that of the steam jet pump, and the capacity of the flue is governed by heat force and velocity, and not, by the diameter of the said flue. With the multitubular shaft located at the sides or corner of a school-room or legislative chamber, or any apartment where a number of desks are used, the exhausts may lead from each individual desk or seat to the stack, thus creating a partial vacuum at each seat and insuring circulation and delivery of fresh air from the air inlet to each pupil or person, and where such desks are used, an independent air inlet tube connecting with a fresh air chamber or reservoir, and terminating in telescopic joint at the desk of each individual, will deliver uncontaminated air to each and every person, the only conditions being that doors, windows and transoms are closed and the multitubular flue and auxiliaries be of sufficient proportions and properly worked.

The object in specifying carbonaceous fuel, electric heat, or gas, is mainly because in main tubes of small diameter, a fire-box would be so small that constant attention would be required and a gas burner would be sufficient; more than this, the flame being inclosed and shielded from drafts, will be much more effective than when exposed to drafts in a larger open flue. The electric mat is intended for small and medium shafts, and when used the mat should encircle upper sections; large shafts should preferably use the larger fire-pot and grate.

Where many exhaust tubes are grouped together in a building they may easily be concealed behind wainscoting, or ceiling cornices, raised floor sections, between joists, or above sub-ceilings, and effective service may be had by the use of tubes of small diameters, notably speaking tubes; and in hospitals, pest-houses, and inclosed air spaces in morgues, where the draft should be continuously inward so as to prevent spread of noxious odors and gases, such spaces would be fresh air flushed and all particulate contagion removed by this multitubular pneumatic ventilator; and in stores and salesrooms where electric fans do not change air but stir and mix dust with the respired air of salespeople and customers, by this system the vitiated air and dust would be removed at the rear and by the partial vacuum thus created, and a continuous inflow of fresh air from the front would be the result. When main and auxiliary flues are heated to high degree, all infectious atmosphere passing through said flues or tubes is thoroughly sterilized or disinfected by heat and thoroughly rendered innocuous before being discharged into the outer air. When electric heat is used, the passing air will be purified by electrolysis.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

A pneumatic ventilator, consisting of the combination, with a vertical main flue located in a building, and having a closed wall, of a heater located at the bottom of the said flue, a set of parallel tubes passed upwardly through the heater and having inlets at their lower ends outside the flue, and discharging into the said flue at their upper ends, and separate superposed sets of vertical tubes disposed in the main flue above the said heater, said tubes having inlets at their lower ends leading to the several rooms of the building, and outlets at their upper ends discharging into the said main flue, the outlets of one set of tubes being located at a lower level than the inlets of the next set above, substantially as shown and described.

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Witnesses:
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