No. 850,784. PATENTED APR. 16, 1907.

H. S. RICHMOND.

VENTILATING APPARATUS.

APPLICATION FILED SEPT. 13, 1906.

Fig. 1.

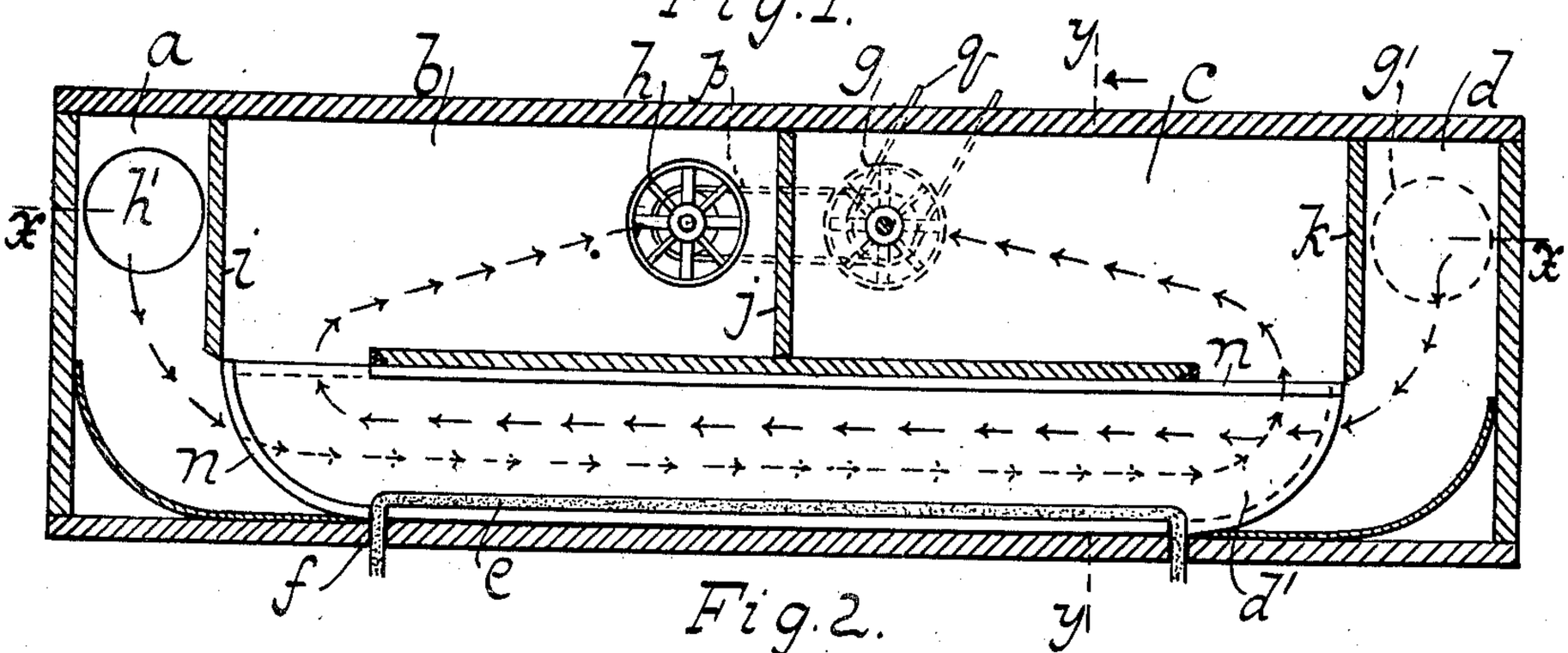


Fig. 2.

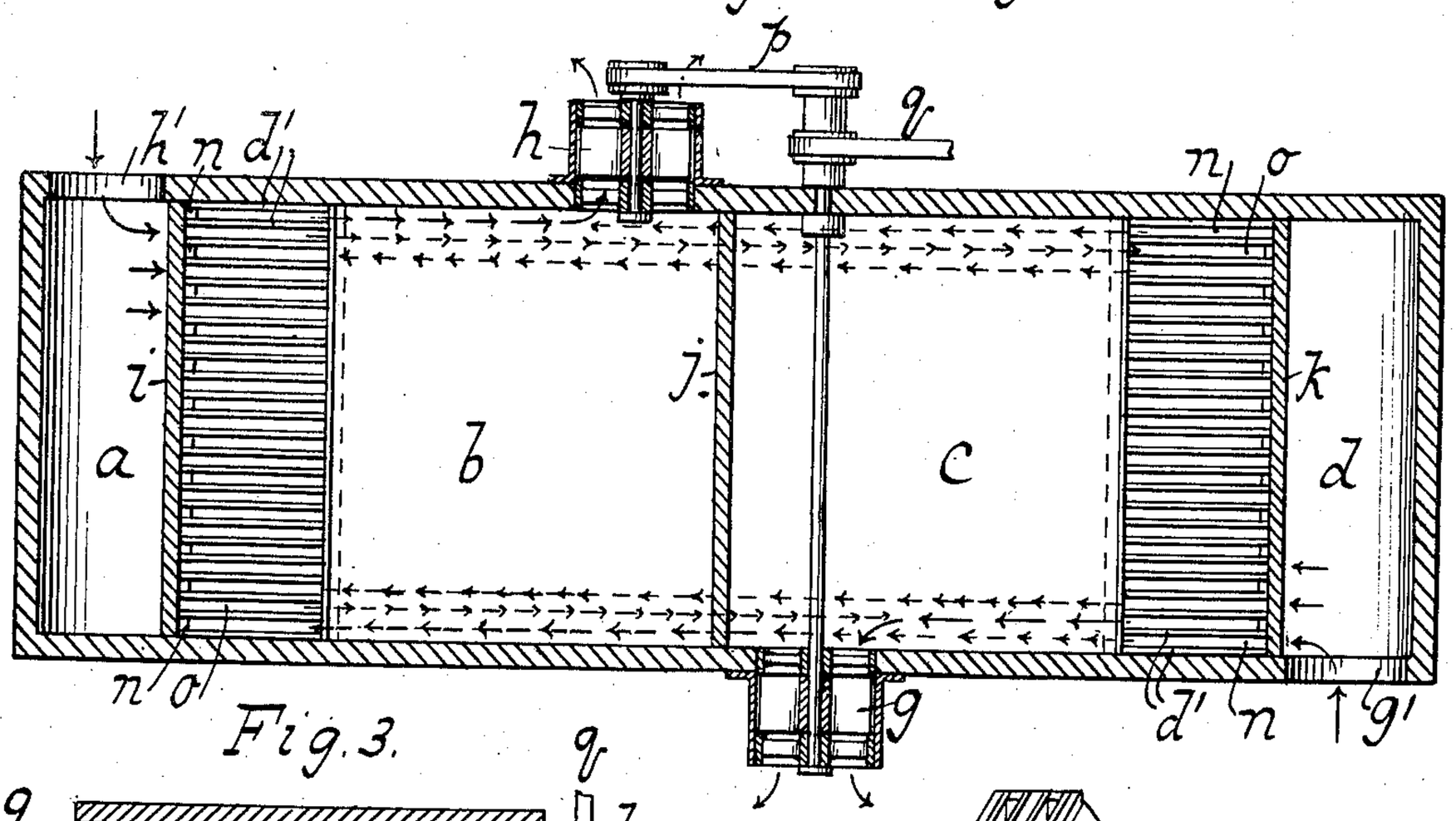


Fig. 3.

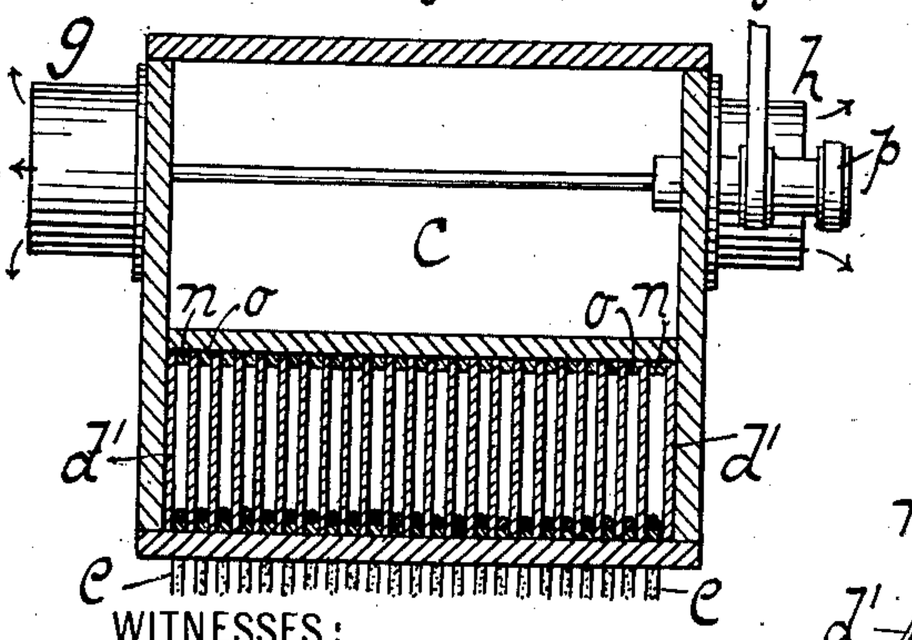
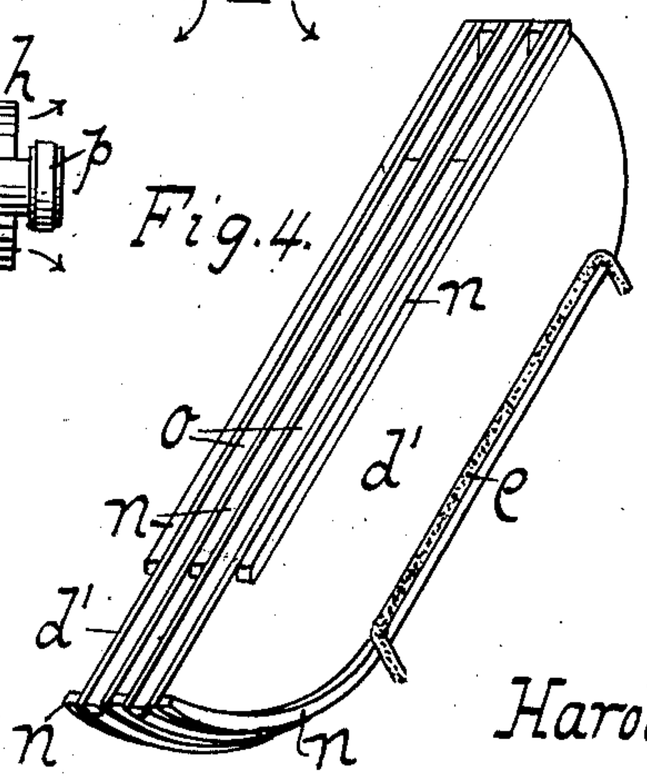


Fig. 4.



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VENTILATING APPARATUS.

No. 850,784. Specification of Letters Patent. Patented April 16, 1907.

Application filed September 13, 1906. Serial No. 334,490.

To all whom it may concern:

Be it known that I, HAROLD S. RICHMOND, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Ventilating Apparatus, of which the following is a specification.

This invention relates to means by which fresh air can be supplied or ventilation effected without great loss of heat or alteration of temperature in the rooms or space to which the apparatus is applied. By utilizing the heat of the foul air leaving a room to temper the incoming air uniformity of temperature is secured. Such device can be applied in the ventilation of a room or the like or in case of a boiler space or room for tempering the incoming air or maintaining uniformity of temperature.

This invention is set forth in the following specification and claims and illustrated in the annexed drawings, in which—

Figure 1 is a longitudinal vertical section of an apparatus embodying this invention. Fig. 2 is a horizontal longitudinal section along line *x x*, Fig. 1. Fig. 3 is a vertical transverse section along line *y y*, Fig. 1. Fig. 4 is a perspective view of a series of plates.

Referring to the drawings, *a*, *b*, *c*, and *d* represent four air-tight chambers completely separated from each other, except as follows: Chamber *d* communicates with chamber *b* by means of every alternate passage formed between thin metal plates *d'*, separated by means of thin strips and very close together. Likewise, chamber *a* communicates with chamber *c* through the remaining passages, but chamber *c* is entirely separated from *d*. Likewise, chamber *a* is separate from chamber *b*. Each passage from *d* to *b* contains at the bottom a strip of wicking *e*, of some absorbent material, leading out through a hole or slot *f* in the bottom of the box and communicating with a receptacle outside. The remaining passages may or may not contain wicking.

Air is drawn from chambers *b* and *c* by means of two exhaust-fans in openings *g* and *h* or by other mechanical means.

The operation of the device is as follows: Air is drawn by fan *h* from the interior of the room through an opening *g'* into chamber *d*, thence through every alternate passage between plates *d'* into chamber *b* and out to the open air. At the same time a practically equal quantity of fresh air from the external atmosphere is drawn by fan *g* through an opening *h'* into chamber *a*, thence through the remaining passages between plates into chamber *c* and to the interior of the room. The air entering chamber *a* is cold, and the air entering chamber *d* is warm. After the apparatus is in operation the incoming air is heated by means of conduction through and radiation and convection from the surface of the plates at the expense of the outgoing air.

By reason of the incoming and outgoing currents of air moving in opposite directions the following condition pertains, namely: The end of each set of passages nearest chamber *d* is comparatively warm, and the end nearest chamber *a* is comparatively cold, the temperature of each set being nearly uniformly graduated between the ends; but in order that heat may be radiated from one set to another the air traveling outward is slightly warmer than the air traveling inward at points directly opposite on the plate, and the difference in temperature between the air directly opposite in the two sets of passages is nearly constant for all points in the passages. This difference of temperature depends, first, upon the difference in temperature between the external and internal atmosphere; second, upon the area and radiating quality of the plates; third, the quantity of air delivered in each direction, and may be reduced to a very small quantity by increasing the area and number of plates, so that the outgoing air is discharged at but a little above the temperature of the outside atmosphere, and the incoming air enters the room but a little below the temperature of the internal atmosphere. As the outgoing air cools it deposits moisture upon the surface of the plate, which is absorbed and conducted away by the wicking *e*; otherwise it would be held in capillary suspension between the plates. Other wicks may be placed in the passages from *a* to *c* and kept moist from a receptacle for the purpose of supplying moisture by evaporation to the incoming air. The fresh and foul air are delivered in approximately equal quantities in order that as little air as possible shall escape from or enter the room by any other route.

The partition between the spaces *a* and *b* is shown at *i* and that between *b* and *c* at *j*. The partition *k* is placed between the spaces *c* and *d*. The strips *n* partly close the spaces

for the air going in one direction, and the strips *o* are applied to the space for the counter-current.

The fans or ventilators *g h* are shown connected by belt *p*, and a suitable source of power (not shown) can drive belt *q*.

I claim—

1. A ventilator comprising two extreme and two intermediate chambers, each extreme chamber having an inlet and each intermediate chamber having an outlet and each extreme chamber being respectively made to communicate with the non-adjacent or farther intermediate chamber by suitably-partitioned alternating passages.

2. A ventilator comprising inlet-chambers and intermediate outlet-chambers and partitions under the outlet-chambers alternately arranged to form communicating passages connecting each inlet-chamber with the farther outlet-chamber, said passages being made in each case to lead into the outlet-chamber at the farthest point from the communicating inlet-chamber so as to enable the outgoing air to warm the incoming air.

3. A ventilator adapted to utilize the heat of outgoing air for warming the incoming or fresh air, said ventilator comprising air inlet and outlet, and passages for the incoming and outgoing air respectively, said passages being separated by thin or heat-conducting partitions, and provided with moisture-absorbent or wick-like material.

4. A ventilating apparatus adapted to utilize the heat of outgoing air for warming the incoming or fresh air, said ventilator comprising air inlet and outlet, and passages for the incoming and outgoing air respectively, said passages being separated by thin or heat-conducting partitions, a partitioned inlet-space and receiving-box at opposite portions of the inlet-passages, and a partitioned entrance-space and receiving-box at opposite portions of the outlet-passages.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HAROLD S. RICHMOND.

Witnesses:

EDUARD WIESNER,

GEORGE HULSBERG