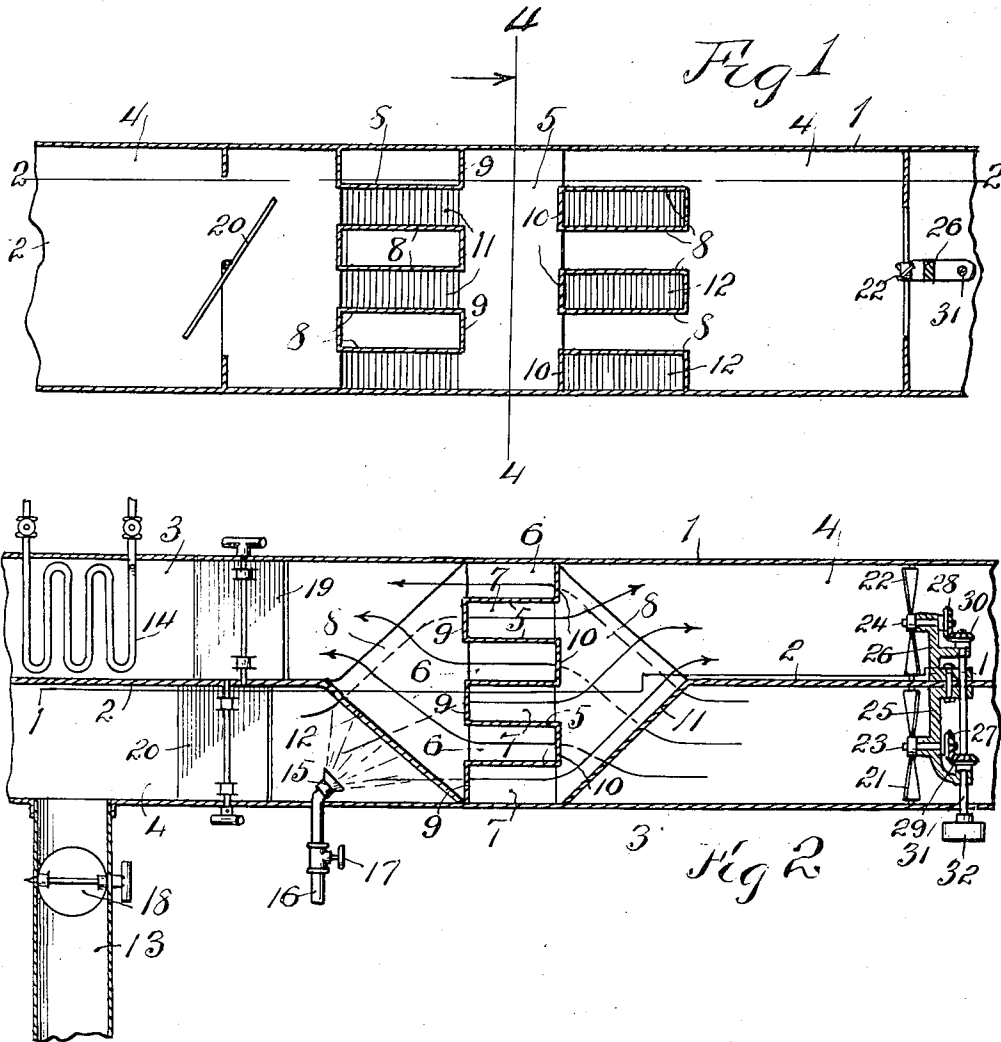


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 APPLICATION FILED MAY 8, 1920.

1,409,520.

Patented Mar. 14, 1922.

2 SHEETS—SHEET 1.



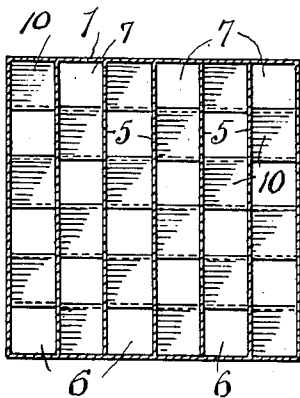
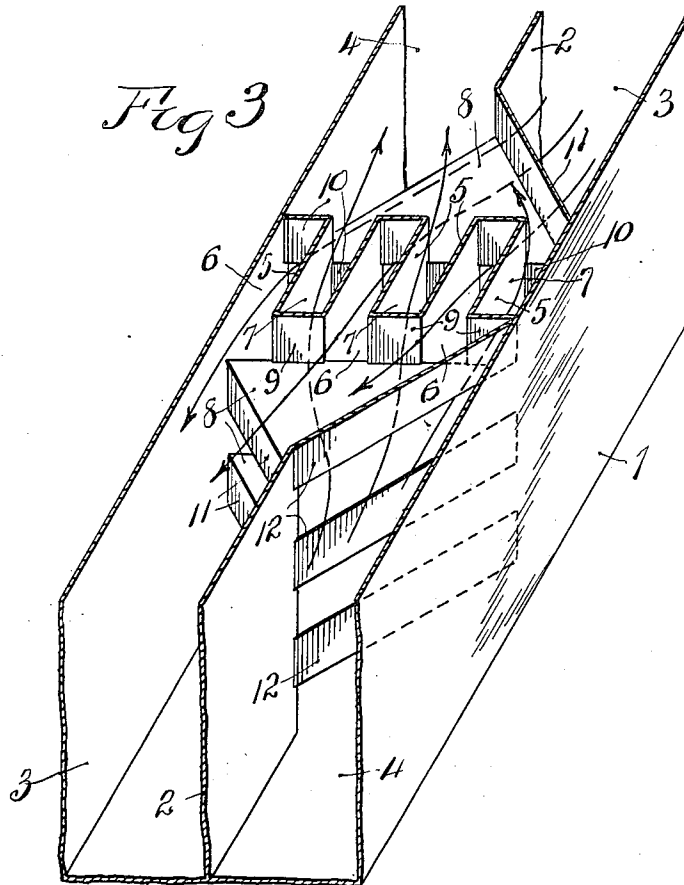
Witness:
R. Hamilton

Inventor:
John Bird
 By *Warren R. House,*
 His Attorney.

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UNITED STATES PATENT OFFICE.

JOHN BIRD, OF KANSAS CITY, MISSOURI.

COOLING, HEATING, AND VENTILATING APPARATUS.

1,409,520.

Specification of Letters Patent. Patented Mar. 14, 1922.

Application filed May 8, 1920. Serial No. 379,969.

To all whom it may concern:

Be it known that I, JOHN BIRD, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented a certain new and useful Improvement in Cooling, Heating, and Ventilating Apparatus, of which the following is a specification.

My invention relates to improvements in cooling, heating and ventilating apparatus.

The object of my invention is to provide a novel apparatus by which air may be forced into a building and withdrawn therefrom and the incoming air either heated or cooled by the outgoing air.

My invention has for its further object the provision of novel means for effecting the cooling of one current of air by another passing in the opposite direction.

My invention provides still further novel means for effecting the heating of one current of air by a current passing in the opposite direction.

The further object of my invention is to provide an apparatus of the kind described, which is simple in construction, cheap to make and install, which is durable and not liable to get out of order, which is efficient in operation, and which can be readily installed in buildings now constructed.

The novel features of my invention are hereinafter fully described and claimed.

In the accompanying drawings which illustrate the preferred embodiment of my invention,

Fig. 1 is a vertical sectional view on the line 1—1 of Fig. 2.

Fig. 2 is a horizontal sectional view on the line 2—2 of Fig. 1, showing my improved apparatus.

Fig. 3 is an enlarged perspective view of that portion of the apparatus in which the currents cross each other.

Fig. 4 is a cross section on the line 4—4 of Fig. 1.

Similar reference characters designate similar parts in the different views.

1 designates a casing divided by a vertical longitudinal partition 2 into two conductors 3 and 4, which convey respectively the incoming current of air and the outgoing current of air, the two currents being made to cross each other, as indicated by the arrows in Fig. 2, and at the point of crossing being closely adjacent to each other, whereby the heat may be conducted readily from one conductor to the other.

Each conductor 3 and 4 at the point of crossing is subdivided into a plurality of subdivisions which are arranged alternately with respect to the subdivisions of the other conductor. To effect such subdivisions, there are provided a plurality of parallel, vertical longitudinal partitions 5, which form between them and the side walls of the casing 1, passages 6 and 7, which are disposed alternately with respect to each other, the passages 6 communicating with the conductor 3 and the passages 7 communicating with the conductor 4.

At opposite vertical edges of the partitions 5 are disposed horizontal triangular partitions, arranged respectively in two sets, the partitions of each set being disposed one above the other and designated by 8.

Closures 9 close the passages 7 against communication with the passages 6, and closures 10 close the passages 6 against communication with the passages 7, the closures 9 and 10 being disposed at opposite edges respectively of the partitions 5.

Closures 11 between the partitions 8 close the conductor 3 from communication with the passages 7, and closures 12 between the partitions 8 close the conductor 4 from communication with the passages 6.

By means of the arrangement just described, the air entering the building through the conductor 3 will be subdivided and will cross and be in alternate relationship to the air which is being withdrawn from the building through the conductor 4.

Thus, if the outgoing air is colder than the incoming air passing into the building through the conductor 3, the heat will be absorbed from the incoming air, and the latter will enter the building at a temperature lower than its initial temperature. In a corresponding manner, if the outgoing air is warmer than the incoming air, the latter will be heated by the outgoing air.

For heating the outgoing air, the inner end of the conductor 4 may be connected with a smoke pipe 13 of a furnace in the building. The heated products of combustion will thus be drawn into the conductor 4 instead of passing out of the chimney, and the heat therefrom will be utilized in heating the incoming air.

Or another means of heating the incoming air may be provided in a radiator 14 located in the conductor 3 at the inner side of the place of crossing of the incoming and outgoing air.

For cooling the outgoing air, there may be provided in the conductor 4, at the inner side of the place the air currents cross, a spraying nozzle 15 mounted on a supply pipe 16 having a shut off valve 17, Fig. 2.

The smoke pipe 13 may have a damper 18, which can be closed when disconnection with the smoke pipe is desired.

Respectively located in the conductors 3 and 4 are valves or dampers 19 and 20, by which the currents of air may be controlled.

Respectively located in the conductors 3 and 4, at the outer side of the place where the air currents cross, are two fans 21 and 22, the disposition of the blades of the fan 21 being such that the air is forced thereby inwardly along the conductor 3. The disposition of the blades of the fan 22 is such that air will be drawn outwardly through the conductor 4.

The fans 21 and 22 may be respectively secured to shafts 23 and 24 mounted respectively in bearings 25 and 26 mounted in the conductors 3 and 4 respectively.

Respectively secured to the shafts 23 and 24 are two bevel gear wheels 27 and 28 which respectively mesh with bevel gear wheels 29 and 30 secured to a horizontal driving shaft 31 rotatable in the casing 1 and having at the outside of the casing a pulley 32, which may be connected with any suitable source of power, not shown.

The shaft 31 being driven, the fans 21 and 22 will respectively force air through the conductor 3 into the building and draw the air from the building through the conductor 4. If the outgoing air is colder, the ingoing air will be cooled. If the outgoing air is warmer, the ingoing air will be warmed thereby. By subdividing the currents of air and making them cross each other in alternate relationship to each other, the maximum amount of heat conduction between the oppositely traveling currents will be effected.

In summer time, the outgoing air will be cooler than the incoming air and the latter will be cooled. In winter time, the outgoing air will be warmer and the incoming air will be warmed.

I do not limit my invention to the structure shown and described, as many modifications, within the scope of the appended claims, may be made, without departing from the spirit of my invention.

What I claim is:—

1. In a cooling, heating and ventilating apparatus, two conductors disposed closely adjacent to each other and so arranged that heat will be conducted from one to the other, a smoke pipe to which one of the conductors is connected, means for drawing air from the last named conductor and from the smoke pipe into said conductor with which

the smoke pipe is connected, and means for forcing air through the other conductor in the opposite direction, substantially as set forth.

2. In a cooling, heating and ventilating apparatus, two conductors which cross each other and are closely adjacent to each other at the place of crossing, a smoke pipe arranged to discharge into one of said conductors, means for drawing air from the smoke pipe through the last named conductor, and means for forcing air through the other conductor in the opposite direction, substantially as set forth.

3. In a cooling, heating and ventilating apparatus, two conductors each of which is provided with a plurality of subdivisions which cross the subdivisions of the other conductor and at the point of crossing are closely adjacent to the subdivisions of the other conductor, the subdivisions of the conductors being respectively in alternate relationship to each other, a smoke pipe discharging into one of the conductors, means for drawing air from the smoke pipe through the conductor connected with the smoke pipe and through the subdivisions of the last named conductor, and means for forcing air in the opposite direction through the other conductor, substantially as set forth.

4. In a cooling, heating and ventilating apparatus, means for forcing a current of air into a building and for withdrawing a current of air from the building, means by which the two currents of air are made to cross each other closely adjacent to each other, and means for heating the outgoing current prior to its crossing the other current, substantially as set forth.

5. In a cooling, heating and ventilating apparatus, means for forcing a current of air into a building and for withdrawing a current of air from the building, means for crossing the two currents closely adjacent to each other, and a smoke pipe arranged to discharge products of combustion therefrom into the current which is being withdrawn from the building and at a point prior to the current crossing the other current, substantially as set forth.

6. In a cooling, heating and ventilating apparatus, means for forcing a current of air into a building and for withdrawing a current of air therefrom, means for subdividing each current and for making the subdivisions of one current cross the subdivisions of the other current in alternate relationship to the other current, and means for heating one of said currents prior to its crossing the other current, substantially as set forth.

In testimony whereof I have signed my name to this specification.

JOHN BIRD.