A. DARROCH.

VENTILATOR.

APPLICATION FILED OCT. 22, 1907.

901,075.

Patented Oct. 13, 1908.

2 SHEETS—SHEET 1.

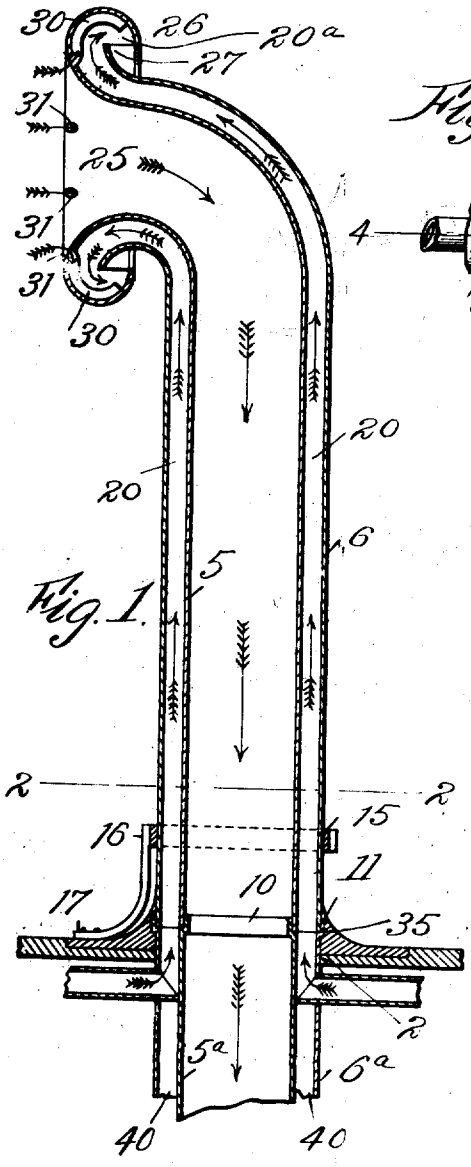


Fig. 1.

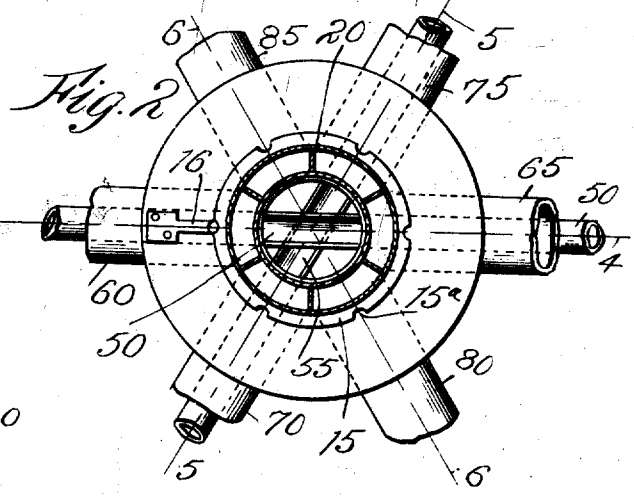


Fig. 2.

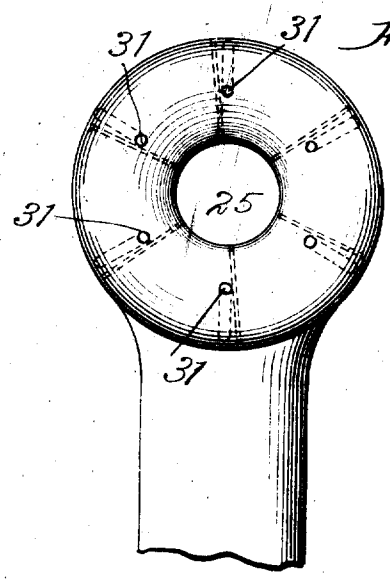


Fig. 3.

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2 SHEETS—SHEET 2.

Fig. 6.

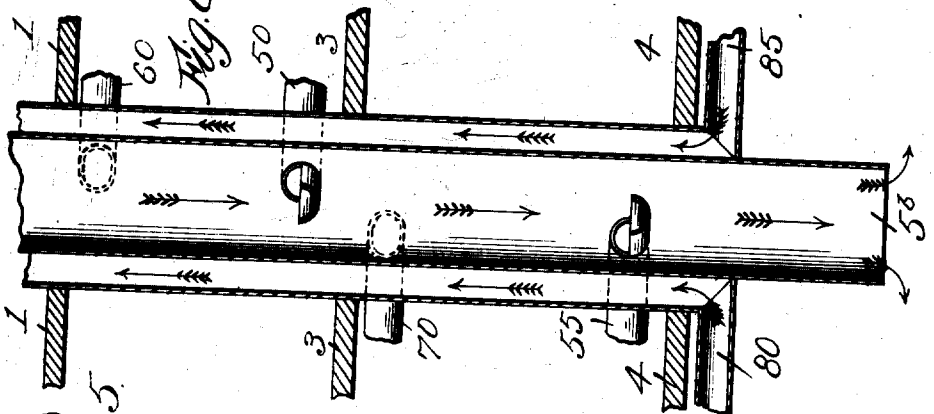


Fig. 5.

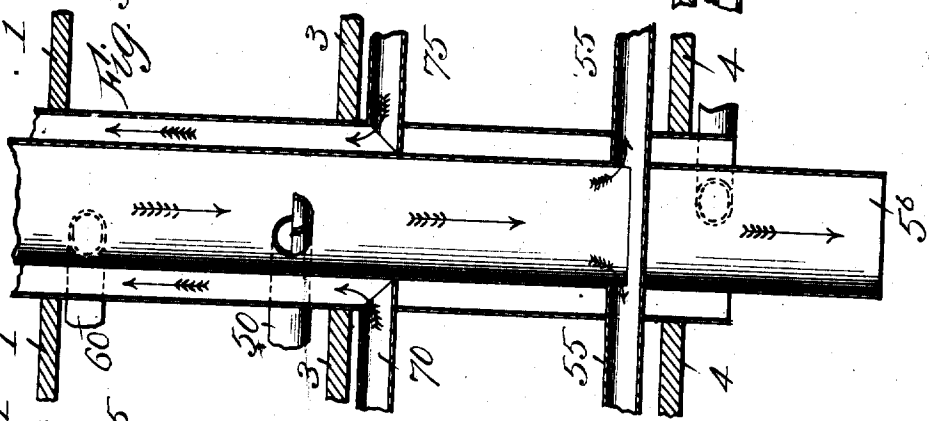
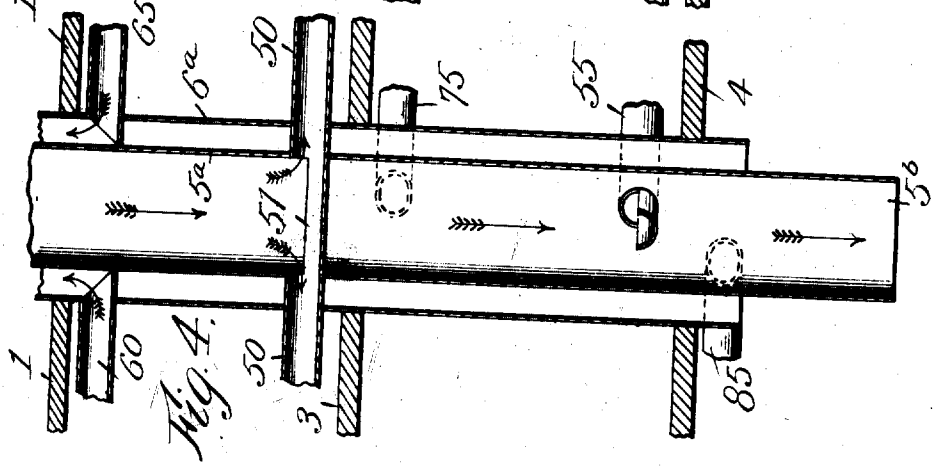


Fig. 4.



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To all whom it may concern:

Be it known that I, ANGUS DARROCH, a citizen of the United States, residing in the borough of Brooklyn, city and State of New York, have invented certain new and useful Improvements in Ventilators, of which the following is a specification.

My invention relates particularly to ventilating ships, but is also applicable to the ventilation of buildings.

The object of my invention is to effectively ventilate the several compartments of a ship or building by forcing fresh air into the several compartments through a suitable ventilating pipe by the natural draft of air, and removing the heated and foul air from the compartments by suction exhaust created by the natural draft. Ventilators as heretofore designed to operate on this general principle have not been entirely effective, mainly because no provision has been made for equalizing the effect of the air currents in properly distributing the fresh air and removing the heated or foul air from the various parts of the ship or building to be ventilated. My present invention overcomes this serious defect in ventilators by so arranging the ventilating system that the supply of fresh air shall be approximately equally distributed throughout the several compartments to be ventilated, and the suction exhaust for carrying off the heated and foul air will also act equally upon the several compartments to be ventilated. In accomplishing this important result I prefer to employ concentric ventilating pipes or stacks for the passage of the fresh air and foul air in opposite directions, and, arranged upon the outer end of this double ventilating pipe, an improved form of ventilating funnel which supplies the fresh air to the inner pipe or stack and creates the suction exhaust in the outer foul air pipe. At suitable points I provide auxiliary fresh air supply pipes leading from the main fresh air ventilating pipe; and I properly proportion these auxiliary fresh air supply pipes to give the requisite proportion of fresh air to the several compartments of the vessel or building which is to be ventilated. These auxiliary fresh air pipes are preferably in the form of troughs, or pipes with the upper portions cut away, arranged radially across the fresh air ventilating pipe and supplying the fresh air to the bottom of the chambers or compartments into which they lead. The several auxiliary fresh air troughs or pipes, which intersect the main fresh air pipe in different horizontal planes, are also preferably arranged in different vertical planes, so as to avoid as much as possible interference between the several auxiliary pipes.

The hot and foul air outlet flue between the inner and outer ventilating pipes or stacks, is divided by a plurality of vertically arranged radial plates or partitions to form a series of vertical channels for the passage of the hot and foul air from the vessel or building being ventilated. Each one of these vertical foul air ventilating channels is in communication through a suitable pipe with one of the compartments or rooms to be ventilated and leads from said compartment directly to the exhaust outlet of the ventilating funnel. The ventilating funnel is so arranged that each one of these foul air channels is independently acted upon by part of the suction exhaust created by the action of the wind or natural draft upon the ventilating funnel. Since the several vertical foul air channels of the ventilator are arranged in different radial planes and are connected with compartments or rooms at different elevations, particularly in the case of ventilating the several decks of a ship, it will, of course, be understood that the pipes leading from the compartments to be ventilated will enter the vertical foul air channels in different radial planes and at different elevations.

I prefer to arrange both the auxiliary fresh air supply pipes and the foul air exhaust pipes in pairs extending from their respective fresh air and foul air ventilating pipes in diametrically opposite positions, since this has proven to be the most convenient arrangement for carrying out my invention, particularly with reference to the ventilation of ships.

The ventilating funnel of my improved ventilator is formed by extending the inner and outer ventilating pipes in concentric flaring curves and arranging in the high portion of the bell or mouth of the funnel an annular series of openings communicating with upwardly and rearwardly curved tubes which open into the outlets of the respective air exhaust channels, for creating independent suction exhaust in each of said channels. The exhaust through the foul air channels is also assisted by the rush of air past the outer edge of the ventilating funnel. By this arrangement the suction at the outer ends of the foul air channels will be equalized, since

each channel is subjected to exactly the same influence, and all of the channels are entirely independent. Each channel having independent communication with one of the compartments to be ventilated, it will be clear that the hot and foul air will be drawn from each compartment without regard to its distance from the ventilator, and entirely independently of the ventilating effect upon any or all of the other compartments.

This improved form of ventilator is not dependent upon the direction of the wind, since it can be adjusted to face the wind as in an ordinary ventilator, and no matter which direction the ventilating funnel is pointed, there will be the same equalizing effect upon all of the compartments to be ventilated.

The upper portion of the ventilator is rotatably mounted in the main deck of the vessel, or in the roof of the building, and some suitable devices provided for holding it in adjusted position. Means are provided for indicating the several positions of adjustment which cause the registry of the division plates or partitions in the stationary and adjustable sections of the foul air ventilating pipe, so that no matter what position the ventilator is adjusted to, there will always remain the independent channels from the several compartments to the outlets for foul air.

In order that my invention may be fully understood, I will first describe the same with reference to the accompanying drawings, and afterwards point out the novelty more particularly in the annexed claims.

In said drawings Figure 1 is a vertical sectional view of the upper portion of my improved ventilator. Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1. Fig. 3 is a detail face view of the upper end of the ventilating funnel. Fig. 4 is a vertical sectional view of the lower portion of my improved ventilator, this section being taken in the same plane as Fig. 1, or on the line 4—4 of Fig. 2. Fig. 5 is a view similar to Fig. 4, taken on the line 5—5 of Fig. 2. Fig. 6 is a similar view taken on the line 6—6 of Fig. 2.

While my invention may be applied to the ventilation of buildings generally, it is particularly applicable to the ventilation of ships, and I have shown in the drawings the application of the invention for the ventilation of a ship or vessel with three decks, although the principle of my invention is applicable to the ventilation of ships with a larger or smaller number of decks, and also to buildings with any number of floors or compartments.

In the drawings 1 represents the main deck of a ship or the roof of a building to be ventilated. The deck 1 has an opening 2 cut through it for the passage of my improved ventilator, which comprises the concentric inner and outer pipe or stack sections 5 and 6 projecting up from the deck, and the corresponding downwardly extending extensions 5^a and 6^a of said pipes or stacks which project beneath the deck 1 and down through similar openings formed in the lower decks 3 and 4. The sections 5, 5^a of the inner pipe or stack, and the sections 6, 6^a of the outer concentric pipe or stack constitute inner and outer ventilating pipes which are joined at 10 and 11 just above the plane of upper deck 1, the lower sections of these stacks being rigidly mounted in the vessel or building, while the upper sections are rotatably mounted upon the lower sections for the purpose of permitting the rotary adjustment of the upper sections to face the wind as hereinafter explained. To hold the upper sections of the ventilating pipes or stacks in the desired adjusted position, I arrange some suitable form of lock or catch for holding the said parts in place. As shown in the drawings, I provide a circular rack or ring 15 upon the outer pipe section 6, said ring having equally spaced notches 15^a with which may engage a spring arm or finger 16 suitably mounted on the deck 1 as shown at 17.

The inner and outer pipes or stacks 5 and 6 are rigidly secured together, and the annular space between these pipes is divided vertically by a series of partition plates 20 which are arranged in radial planes and divide the space between the stacks into a series of vertical ventilating channels for the escape of hot and foul air. In the drawings I have shown the space between the pipes 5 and 6 divided into six vertical channels because in the form of my invention which I herein specifically illustrate and describe, I have arranged for the removal of the hot and foul air from six separate compartments. The number of these vertical ventilating channels may be increased or decreased to suit the requirements of the particular ship or building which is to be ventilated.

The upper ends of the pipes 5 and 6 are curved laterally to one side to form an inlet for the pipe 5 and an outlet for the pipe 6. The flaring trumpet shaped mouth 25 of the pipe 5 is curved outwardly and rearwardly from the mouth, as shown at 26, to overlap the flared outlet end 27 of the pipe 6. The vertical division plates 20 are shaped at their upper ends to correspond with the curved and flared ends of the pipes 5 and 6, said plates extending to the extreme edge as shown at 20^a of the outlet opening of the pipe 6, so that the ventilating channels between the pipes 5 and 6 will be separate and distinct to the outlet of the pipe 6.

A series of curved tubes 30 lead from a series of openings 31 in the bell of the trumpet shaped inlet of the pipe 5 to points adjacent to the outlets of the channels between the pipes 5 and 6, for the purpose of inducing in-

dependent air currents at the outlets of these channels and thereby create independent suctions in said channels for assisting in the removal of the hot and foul air from the compartments to be ventilated. This suction at the outlets of the foul air ventilating channels is also assisted by the rush of air past the outer edge of the bell of the ventilating funnel.

As stated above the continuations of pipes 5 and 6, indicated at 5^a and 6^a, project beneath the main deck 1 and through the several under decks of the ship. The annular space between the pipe sections 5^a and 6^a is divided vertically by partition walls 40 in the same manner as above described with reference to pipe sections 5 and 6, so as to form a series of six vertical foul air channels which are adapted to register exactly with the foul air channels in the upper adjustable sections of these ventilating pipes. In Fig. 1 it will be observed that the lower ends of vertical division plates 20 of the upper pipe sections contact with the upper ends of the vertical division plates 40 of the lower pipe sections and exactly register therewith on the plane of separation between the upper and lower sections. This plane of separation is indicated at 35 in Fig. 1.

The central ventilating pipe or stack 5, 5^a is utilized for supplying fresh air to the several compartments to be ventilated. The fresh air is taken in at the mouth or ventilating funnel and forced downwardly by the draft into the hold of the vessel. This central pipe or stack is open at the bottom to permit the fresh air to enter freely into the lowermost compartment of the ship or building to be ventilated, the open lower end being shown at 5^b in Figs. 4, 5 and 6 of the drawings. To supply a proper proportion of the fresh air to the other compartments of the ship or building, I arrange auxiliary fresh air pipes 50 and 55 transversely of the main ventilating pipes or stacks 5^a and 6^a as shown in Figs. 4, 5 and 6.

In the specific embodiment of my invention shown in the drawings, in which provision is made for ventilating only three compartments or levels of a ship or building, I design the auxiliary fresh air pipes 50 and 55 so that each will take from the main fresh air pipe approximately one-third of the fresh air passing through the main fresh air stack, while the remaining third of the fresh air will be permitted to pass out through the lower open end of the fresh air stack, thereby supplying approximately an equal quantity of fresh air for each of the holds or levels of the ship to be ventilated. The simplest form of auxiliary fresh air pipe for accomplishing my purpose is probably the form shown in my drawings, in which an ordinary cylindrical pipe is passed diametrically through the concentric stack sections 5^a and 6^a, and the upper half of the horizontal pipe section within the internal bore of stack section 5^a is cut away as shown at 51 to provide an upwardly opened trough transversely of the fresh air pipe. The opposite ends of the auxiliary fresh air pipe 50 are led to suitable points of distribution in the compartment or compartments to be ventilated, which points of distribution may be at widely separated parts of the ship or building. The sections of the pipe 50 which pass through the annular space between stack sections 5^a and 6^a are located in opposite vertical channels between the main stack sections, but are entirely cut off from said channels or spaces, and do not interfere with the outlet of foul and hot air through said vertical ventilating channels for the reason that they are located beneath the foul air connections between the compartments and the channels in which they are located. This arrangement and coöperation will be hereinafter more fully explained. If it is desired to increase the width of the trough portion of the fresh air pipe 50 within the fresh air stack section 5^a, said trough section may be spread outwardly by bending its sides to intercept a greater proportion of the area of the fresh air stack, and if it is desired to reduce the width of the same, it may similarly be contracted by bending the sides inwardly.

The auxiliary fresh air pipe 55 is of exactly the same construction as the pipe 50 just described, these auxiliary fresh air pipes 50 and 51 are located just above the floor levels of the compartments into which they lead and so as to avoid as much as possible their interference with each other, they are placed in crossing vertical planes as indicated in Fig. 2 of the drawings.

As stated above, the vertical channels formed in the space between the main ventilating stacks 5, 5^a and 6, 6^a are utilized for conveying from the compartments to be ventilated the hot and foul air. Consequently the connections between the compartments and these hot and foul air outlet channels lead from the compartments at or near the top, as shown in Figs. 1, 4, 5 and 6.

Figs. 1 and 4 show the auxiliary hot and foul air outlet pipes 60 and 65 leading from opposite directions directly beneath the main deck 1 into two diametrically opposite vertical outlet channels, these pipes 60 and 65 being projected through the outer stack section 6^a and having their inner ends shaped to snugly fit the outer surface of the stack section 5^a and the inner surfaces of two of the vertical partition plates 40. The mounting of the pipes 60 and 65 is such that the vertical channels into which they lead are entirely cut off from beneath by the introduction of the pipes, so that said channels beneath the points of communication with the pipes 60 and 65 are dead air spaces which have no further function in my ventilator.

Since the portions of said channels beneath pipes 60 and 65 perform no function, it will be clear that the auxiliary fresh air supply pipe 50 is passed through the stack sections in the vertical plane in which pipes 60 and 65 are located so that said auxiliary fresh air pipe does not interfere wit' any other part of the ventilator.

In Fig. 5 I have shown at 70 and 75 the auxiliary hot and foul air outlet pipes leading from compartments directly beneath the deck 3 and communicating with two other diametrically opposite vertical ventilating channels. It will be observed by reference to Fig. 2 of the drawings that the section on which Fig. 5 is taken is at an angle to the section on which Fig. 4 is taken, the channels into which pipes 70 and 75 lead being arranged along side of, or in different vertical planes from, the channels into which pipes 60 and 65 lead. It will also be observed by referring to Fig. 5 that the auxiliary air supply pipe 55 extends through the diametrically opposite channels into which the foul air outlet pipes 70 and 75 lead since said foul air outlet pipes completely cut off the vertical channels from beneath at their points of intersection.

Upon referring to Fig. 6 it will be observed that the auxiliary foul and hot air delivery pipes 80 and 85 lead into the two remaining vertical foul air channels between the stack sections in a different vertical plane from the planes shown in Figs. 4 and 5. The auxiliary foul air outlet pipes 80 and 85 are located directly beneath the lowest deck 4, and since this is the lowest compartment in the vessel or building to be ventilated, the outer stack section 6^a terminates in the horizontal plane in which the pipes 80 and 85 are located.

From the above description of my invention it will be clear that I provide a ventilating system in which there is a natural draft supply of fresh air to the several compartments to be ventilated, and that there is an independent foul and hot air channel leading from each compartment to the outlet of the ventilator, each foul air outlet channel being entirely separated from end to end from all the other channels, so that the suction exhaust, created as above described, at the outlet of each of these independent channels will act upon the particular compartment with which each communicates without reference to or influence by the ventilation of the remaining compartments. By adjusting the upper ventilating pipe or stack sections 5 and 6 rotatably upon the lower pipe or stack sections 5^a and 6^a into one of the six possible positions indicated, it will be clear that the open mouth of the funnel may be presented to catch a natural draft or wind and at the same time maintain the independence of the several foul air outlet channels from the compartments to the outlets behind the open mouth of the funnel. The possible positions of adjustment of the upper part of the ventilating stack sections correspond exactly with the positions of the several vertical partition plates so that in each possible adjustment the partition plates in the upper and lower sections of the ventilator will correspond and exactly register. When the open mouth of the funnel is presented to catch the wind, it will be observed that the outlet of each independent foul air outlet channel will receive an equal proportion of the suction inducing current so that the independent suctions for exhausting foul air from the several compartments will not be affected by the relative location of the compartments, whether near to or far away from the main ventilating stack, a defect which has sometimes been serious in forms of ventilators heretofore used.

It will be clear from the above description of my invention that I do not intend to limit myself to the specific arrangement of parts shown and described in the form which I have adopted to illustrate the principles involved. The preferred arrangement is as shown, but the system may be enlarged or reduced to any extent to ventilate a larger or a smaller number of compartments. For instance, the space between the inner and outer ventilating pipes or stacks may be divided into a larger or smaller number of vertical foul air outlet channels, and the main fresh air supply pipe or stack may have a larger number of intercepting fresh air pipes. It will also be clear that the partitions forming the foul air outlet channels may be arranged in spiral form around the inner fresh air stack without departure from the spirit of my invention. In fact the concentric arrangement of the fresh air pipes or stacks is not absolutely essential to my invention, although this is by far the most preferable form, since it enables me to embody my invention in a system involving the cutting of only one hole through the deck or roof of the ship or building.

I consider my invention to involve broadly the provision of a plurality of independent foul air outlet channels leading from the several compartments to be ventilated and each channel having an independent natural draft suction exhaust, and means for supplying fresh air to the compartments from which the independent foul air channels lead.

What I claim is:

1. In a ventilator, the combination of a plurality of independent foul air outlet channels leading from the several compartments to be ventilated, means for creating an independent suction exhaust in each channel, and means for supplying fresh air to the compartments from which the independent foul air channels lead.

2. In a ventilator, the combination of a plurality of independent foul air outlet chan-

nels leading from the several compartments to be ventilated, means for producing an independent natural draft suction exhaust in each channel, and means for supplying fresh air to the compartments from which the independent foul air channels lead.

3. In a ventilator, the combination of a plurality of independent foul air outlet channels leading from the several compartments to be ventilated, and means for supplying fresh air to the compartments from which the independent foul air channels lead, with an adjustable cowl arranged to create equal independent natural draft suction exhausts in all of said foul air outlet channels.

4. In a ventilator, the combination of a circular series of independent foul air outlet channels leading from the several compartments to be ventilated, a rotatably adjustable cowl having a circular series of channels adapted to register with said foul air outlet channels in all of the positions of adjustment of said cowl, means upon said cowl for creating an independent natural draft suction exhaust in each of said channels, and means for supplying fresh air to the compartments from which the independent foul air channels lead.

5. In a ventilator, the combination of two concentric pipes or stacks of unequal diameter, partitions arranged between said stacks and forming independent foul air channels, independent connections between said foul air channels and the compartments to be ventilated, independent means for creating suction at the outlet of each of said foul air channels, and means supplying fresh air to the inner stack.

6. In a ventilator, the combination of two concentric pipes or stacks of unequal diameter, partitions arranged between said stacks and forming independent foul air channels, independent connections between said foul air channels and the compartments to be ventilated, independent means for creating suction at the outlet of each of said foul air channels, means supplying fresh air to the inner stack, and auxiliary fresh air pipes leading from said inner stack to said compartments.

7. The combination of the inner and outer ventilating stacks passing through the compartments to be ventilated, the partition walls dividing the space between said stacks into channels, independent communications between said channels and the compartments to be ventilated, a ventilating funnel adjustably mounted upon said ventilating pipes and formed with vertical channels corresponding with the channels between said ventilating pipes, and independent outlets for said ventilating channels, substantially as set forth.

8. In a ventilator, the combination of the inner and outer concentric ventilating stacks, partition walls between said stacks forming foul air outlet channels, independent connections between said channels and the compartments to be ventilated, a ventilating funnel having inner and outer pipes corresponding with the inner and outer ventilating stacks and adjustable thereon, partition walls between the inner and outer pipes of the ventilating funnel registering with said walls between said stacks and forming continuations of said foul air channels, means for creating an exhaust in each of the channels of the ventilating stacks and funnel, and means for securing the ventilating funnel in the desired adjusted position.

9. A ventilating funnel comprising inner and outer concentric pipes having partition walls in the space between said pipes, and tubes leading from the face of the funnel to the outlets of the channels formed by said partition walls, whereby independent exhaust is created in each of said channels.

10. The combination of the inner and outer concentric ventilating pipes or stacks, a flaring mouth for said inner stack, and a plurality of channels leading from the mouth of the inner stack to the exit of the outer stack.

11. The combination of a plurality of independent foul air outlet channels in communication with the compartments to be ventilated, with a ventilating funnel having a flaring mouthed fresh air intake and a plurality of channels forming continuations of said foul air outlet channels, and a series of independent passages leading from the mouth of the fresh air intake to the foul air outlet channels.

12. In a ventilator, the combination of the adjustable concentric stack sections having partition walls arranged between them, a ventilating funnel for supplying fresh air to one of said adjustable stack sections and for creating suction exhaust in the channels between the adjustable stack sections, the stationary concentric stack sections extending through the compartments to be ventilated and forming continuations of the adjustable stack sections, partition walls arranged between the stationary stack sections, flues leading from the compartments to be ventilated, and communicating with the channels between the stationary stack sections, and auxiliary fresh air supply pipes intersecting the stationary stack sections and leading to the compartments to be ventilated, said auxiliary pipes having open communication with one of said stationary stack sections.

13. In a ventilator, the combination of the inner and outer ventilating stacks, vertical partition walls arranged between said stacks to form channels, pipes communicating between said channels and the compartments to be ventilated, means for supplying fresh air to the inner stack and for exhausting foul

air through said channels, and auxiliary fresh air supply pipes passing through said ventilating stacks and communicating between the inner stack and the compartments to be ventilated, the foul air outlet pipe and the auxiliary fresh air supply pipe of each compartment being in the same vertical plane.

14. In a ventilator, the combination of the inner and outer ventilating stacks, vertical partition walls arranged between said stacks to form channels, pipes communicating between said channels and the compartments to be ventilated, means for supplying fresh air to the inner stack and for exhausting foul air through said channels, and auxiliary fresh air supply pipes passing through said ventilating stacks and communicating between the inner stack and the compartments to be ventilated, each of said auxiliary fresh air pipes having its upper section cut away within the inner stack section to form an intersecting fresh air trough.

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