H. Rutan.

House Ventilator,

No. 5,958. Patented Dec. 5, 1848.

Fig. 4 Top view or Section through x x Figs.

Fig. 3 Section

Fig. 2.

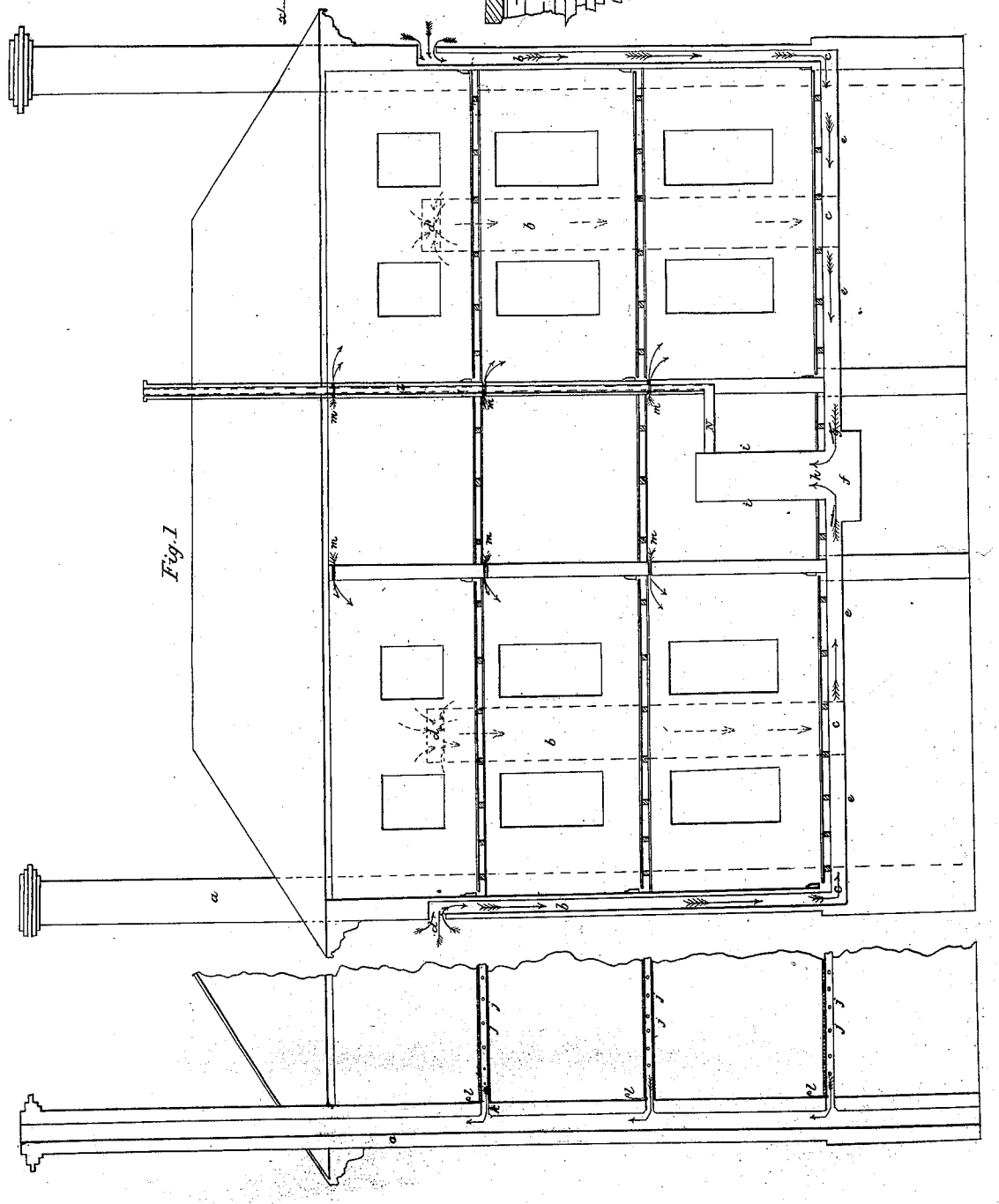

Fig. 1

Sheet 2-4 Sheets.

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Fig. 2

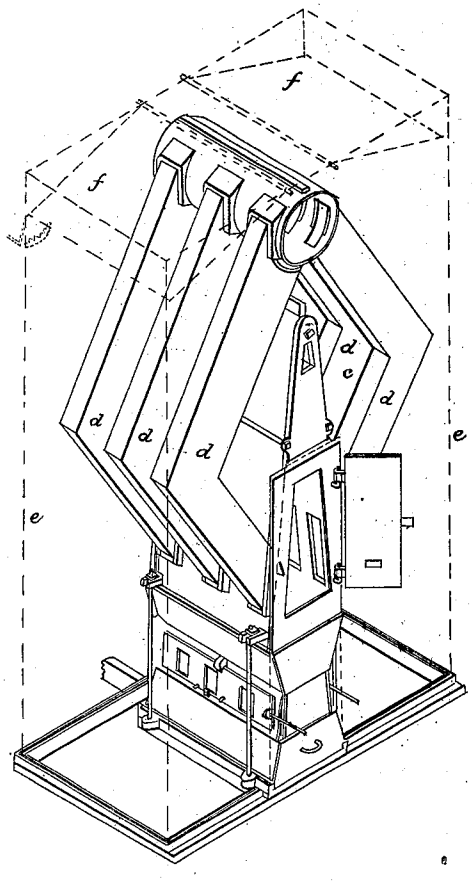

Fig. 7

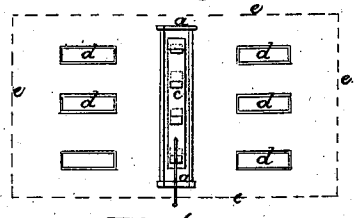

Fig. 4

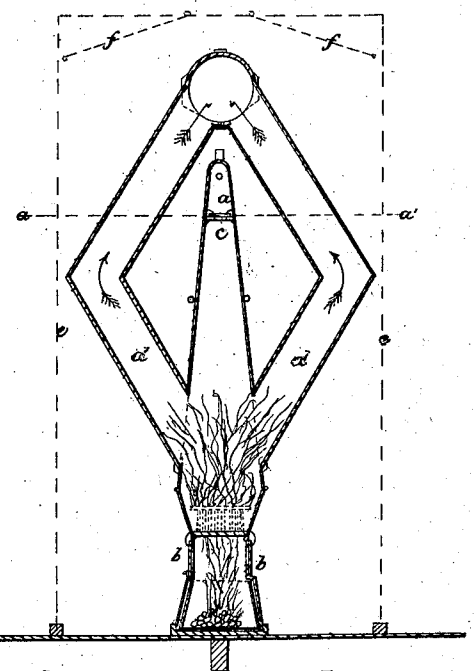

Fig. 6

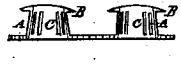

Fig. 5

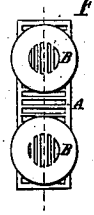

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Fig. 1

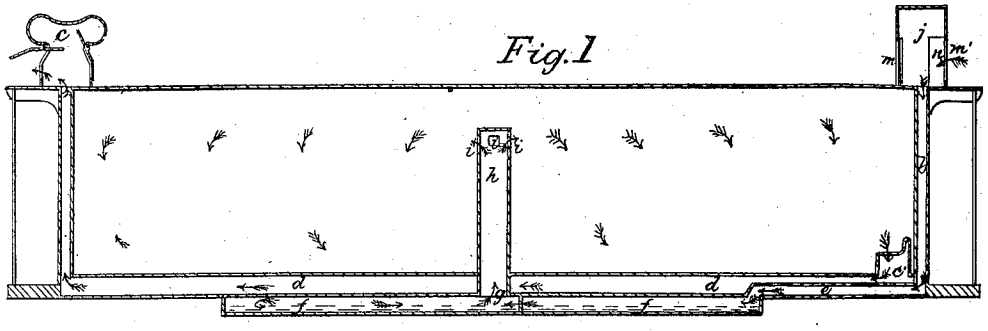

Fig. 2

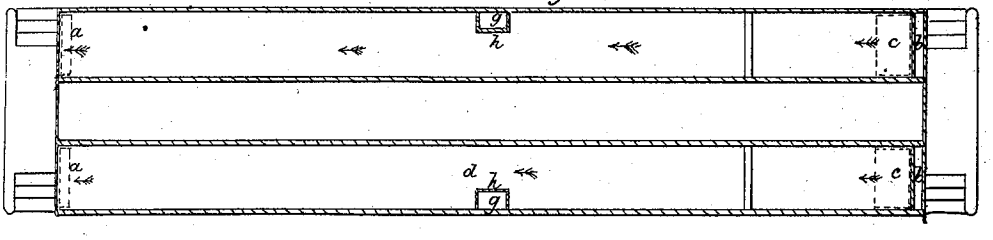

Fig. 3

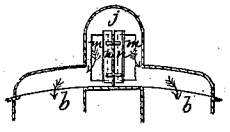

Fig. 4

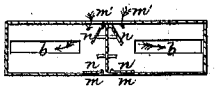

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Fig. 1

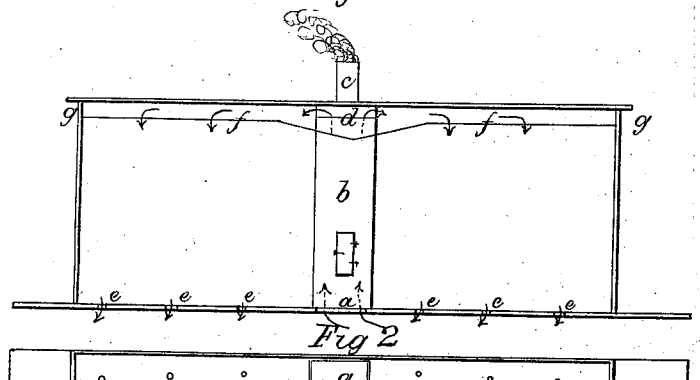
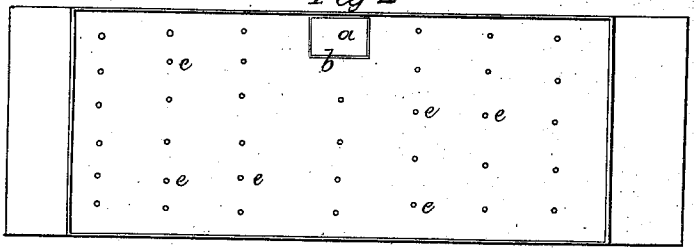


Fig 2



UNITED STATES PATENT OFFICE.

HENRY RUTTAN, OF COBOURG, CANADA.

WARMING AND VENTILATING BUILDINGS, &c.

Specification forming part of Letters Patent No. 5,958, dated December 5, 1848; Reissued August 14, 1855, No. 323.

To all whom it may concern:

Be it known that I, HENRY RUTTAN, of the town of Cobourg, in the Newcastle District, in the Province of Canada West, have invented a new mode of ventilating buildings, railway cars, steamboats, and other vessels and the machinery by which the ventilating-air may be warmed in cold weather; and I do hereby declare that the following is a full and exact description.

The importance of the ventilation of building begins now to be almost universally admitted. The only question, therefore, remaining is how is it to be accomplished. From the various materials with which dwellings, and other buildings intended for permanent or occasional habitations, are constructed—the diversity of forms and plans, and the difference in locality—it is impossible to lay down particular rules for all these cases, in their erection. A few general rules, therefore, for the erection of an ordinary dwelling house must answer for all. The walls of a dwelling house should be made to inspire pure air and expire that which has become foul—resembling in this respect the lungs of a human being. And the architect should, before he begin, understand this anatomical structure as the surgeon must that of the other. Without this provision I regard it as an utter impossibility, that the health of its inmates can be maintained. From the cellar to the attic amount of miasm from the decomposition going on from vegetables, meat and the various branches of kitchen and culinary operations, as well as the combustion from the lungs and emanations from the human body—and the hosts of vermin which in the course of a short time will infest the cellars and hollow walls and the spaces between the joists of the best kept dwellings, is such that if the senses of sight and smell were equal to its full detection, it would present a view truly horrifying.

I take for example, a building (Plate 1, Figure 1,) 40x50 feet 3 stories high above the basement, with a 10 feet hall through the middle from bottom to top. The walls may be of wood brick stone or other material—say brick for this example. Hollow walls, such as any practiced brick-layer understands—terminating in flues to be carried out similar to our common chimneys—for the escape of the vitiated air, would be very efficacious but if for any reason these be objected to then I begin for this purpose as many foul air flues *a*, *a*, *a*, as may in their production upward embrace most if not all the rooms within the building. These flues should be enlarged at every ascending story upward. Four of these, answering in fact to our present smoke chimneys, will in general be found sufficient. The tops should be carried out to as great a height as practicable. I then begin one or more flue or flues (which as they are intended to be for the introduction of the pure air I shall, for distinction sake call shafts *b*, *b*, *b*, *b*,) which alone or together will in their capacity contain about 8 square feet. These are to be also commenced and open into the basement *c*, *c*, *c*, *c*, but are to open into it immediately under the joists. There should, for efficiency, be one of these in each of two opposite sides of the building—if one in each of the 4 sides, all the better. These shafts should be carried up into the walls (smoothly plastered in the inside) and opened outward at *d*, *d*, *d*, *d*, to a height above that of the surrounding vegetation and the floating miasm of stables yards and other impure localities, and below that of the influence of the smoke of adjacent chimneys. At the lower ends of these pure air shafts, and closely under the joists of the lower story, they must be inclosed in ducts *e*, *e*, *e*, *e*, common inch boards notched say) and carried to a common point directly under where it is intended that the ventilator or warming machine is to stand—say in the center of the hall, on the first floor, and there inclosed in a box *f*. The mouths of these several ducts, if there be any coming from opposite directions, should have hanging doors or shutters *g*, *g*, made of the lightest material, and so adjusted that any violent movement of the external atmosphere down one shaft should shut up the opposite one, and vice versa.

I now open the floor up into the hall (*h*). Then I put a case *i*, *i*, of some light and bright metal, say common tin, around the whole aperture, to stand about 8 feet high and within which is placed the ventilator hereafter to be more particularly described, so that the whole of the cast-iron ventilator, except the front containing the door, is completely hid from view. Upon the top of this casing are doors or other conveniences

through which the warmed air passes into the hall and by the shutting or opening of which, the temperature of the air passing up, when there is fire in the ventilator, may be regulated without waiting the tedious process of altering the power of the fire. N is the smoke pipe of the ventilator. We have now, conducted thus far 8 square feet of pure air.

With respect to the interior of this building, if the partitions could be made solid it would be well; but as in nine cases out of ten, they are constructed of wood and hollow—lath and plaster upon scantling and the floors laid upon joists—all the studs and joists must be bored or perforated *j*, *j*, *j*, &c., to give ventilation to the hollow spaces above mentioned. The number or size of these holes or perforations must, of course, be increased, as the place of exit of the vitiated air is approached.

I take it for granted that some part of all the rooms may be made to come next to or comprehend one or other of the main foul air flues, if not, small diagonal flues are to be run from the room into the main flue before it reaches the roof of the building. So also may there be small communications opened from the end of every partition with the main or some branch flue.

The floor is then laid, keeping it separate from the wall (Plate 1, Fig. 2, *a*, *a*,) sufficiently to allow the same, or a little greater quantity of air to escape between the flooring and the wall, than is allowed to come into the room—for an ordinary 20 foot room about half an inch all around the room say. The base or skirting is then put down, but before it be put down, must be so diminished or cut on the under side (Fig. 1, *o*, *o*) as to admit under it the same quantity of air to escape. I should, before, have stated that the openings *k*, *k*, *k*, from each story into the foul air flues are to be made on a level with the joists of each story, and each of these openings may be closed or opened at pleasure by a small slide or gate *l*, *l*, *l*.

It will be observed that by ejecting the air out under the base I have provided for rooms which are to be carpeted. In public or other buildings where this nuisance to the human family, may be dispensed with, I should at once perforate the floor. In putting up these partitions, the aperture *m*, *m*, &c for the admission of the fresh air should be constructed as high up as the ceiling or cornice will admit; about an inch left open the whole length of the partition is best, with here and there a pillar left of course to support the superstructure, the cornice, when one is made, covering the whole from sight.

I need not trouble you now with any lengthened remarks upon the operation which will follow this state of preparation for ventilating a building. It will be comprehended at a glance. One or the other or all of the pure air shafts *b*, *b*, *b*, &c., will always be renewing the external atmosphere, especially if facilitated by a movable door or cap at the mouth; this movement will be again accelerated when fire is necessary in the ventilator. And again the foul or vitiated air flues being carried out to a height much beyond the openings of the pure air shafts, act as exhausters by their draft, and the moment the foul air slides within the rooms are removed they will begin to fill with the pure air. Any one of the rooms in the building may thus be ventilated independently of the others—or the whole together. The whole building is constantly filled and the initiative in this system of warming or ventilating is in letting the cold and vitiated air out. Upon this principle a room or building perfectly tight, excepting the openings made for this purpose, is thoroughly ventilated, which it cannot be upon any other principle.

The quantity of pure air thus circulating through this building—supposing that it move at a velocity of 3 feet per second, which with the foul air apertures all open it will more than do—will be $3\times8=24\times60=$ 1,440 cubic feet per minute, and if 10 cubic feet per minute be allowed for each individual, it will be perceived that the allowance is ample for all contingencies. Thus a whole building may be washed, as it were, night and day with pure air without a single pipe or flue of any kind except those in the outer wall for bringing the pure air in and letting the vitiated air out—in other words not a pipe or flue for the distribution of the air. The passages for the escape of the vitiated air being below the floor the tendency of the draft must be downward and the miasm and carbonic acid gas always filling the space below the floor of every inhabitated apartment, is thus kept below, which with the draft any where above the floor is always drawn upward. And, as it respects the ventilation of the hollow walls and between the joists of the floor, it is only necessary to refer for its necessity to any person who may have been present at the taking up of an old floor or the opening of the ceiling or partition of an inhabited building. The stench and effluvia from noxious gases and the decomposition and putrid matter arising from the timber, vermin, and other matter are such that no one can for a moment doubt its necessity. Moreover, it may be confidently asserted that no rats, mice, or other vermin, which always more or less infest the best kept houses with their hollow walls, will ever be found where there is a constant circulation of air—neither will frost penetrate it. The sum of the areas of the sections of the vitiated air

flues carried up the walls of the building—it should have been mentioned before—should somewhat exceed the sum of those of the pure air shafts.

In the ventilation of buildings already erected, the same general arrangements should, as far as circumstances will admit, be observed. It may be difficult in this case to perforate the joists and studs; if, therefore, on account of the use of carpets the floor cannot be perforated a flue is to be made around the room by removing the base a sufficient distance from the wall. The pure air shafts may be best constructed of wood—and placed either directly against or at a distance from the building. For the ventilation of my own dwelling, mine is standing in my garden—with a movable cap to facilitate the ingress of the pure air. It may also be inconvenient in a building already erected to open the wall for receiving the pure air from the hall, its whole length, in such case a single aperture will do.

The ventilating door or cap before alluded to consists of a swinging door shown in Plate 1, Figs. 3 and 4, and made to play against the sides of a window like recess in the wall so as to deflect currents of air down the pure air shafts.

The general form and construction of this machine for warming the ventilating air in winter (Plate 2, Fig. 4), has been adopted for the purpose of favoring, as much as possible, the rapid ascent of the air, in the midst of which it stands, so as to prevent the absorption of the oxygen and the oxidation of the metal of which it is composed. To prevent the stagnant and dead body of air which always more or less collects over the tops of flat or round metal heaters, this part of this heater is made at an acute angle—the air commencing at the broadest part at the bottom, sweeps the whole length of the metal and meets at the top and is moreover thus thrown against the pipe—the partial vacuum caused by the upward receding side plates being the more rapidly filled as the column of air above is high. This I take to be the first peculiarity. Second, the combustion air is taken from the pure air only and therefore more efficacious than when taken as in the ordinary way from a cellar or room. Third, the combustion air is admitted from both top and bottom (Plate 2, *b b b* and *c c c*). Fourth, the chamber *a* provided to raise the temperature of the upper combustion air and out of which chamber it is let down by a register (Plate 2, Fig. 7, *c*) in small jets so as that it is ready for combustion when it meets the unconsumed gases of the fuel. Fifth, the fire flues *d*, *d*, *d*, divide equally all the heat of the fuel and carry it in currents co-existent with and parallel to, and between, directly ascending currents of air—thus dispersing all the heat equally through the body of air. The iron heater or ventilator thus described is placed directly over the opening before described in the floor of the hall as represented in the drawing Fig. 2, the tin case being shown in red lines. Sixth, it will readily be perceived that one of the great characteristics of this system of ventilation is the filling the building with the ventilating air, and consequently the ventilator or air warmer may for winter ventilation as well stand in the attic as in any of the lower stories—the work being as efficiently performed in the one place as the other. Seventh, the temperature of the warm air may be instantly raised or depressed by handling the doors *f*, *f*, at the top of the casing without the tedious process now required awaiting the alteration of the fire.

The grate.—This necessary appurtenance to the ventilator or air warming machine (Plate 2, Figs. 5 and 6) is constructed with a view to the three fold advantage—1st of disturbing or dispersing and mixing of the incoming combustion air—2d of covering a great portion of the apertures which admit this air, from being choked up by the fuel and 3d of contributing largely, by the hollows underneath formed by the raised portions of the grate, to the raising of the temperature of the air before it comes in contact with the fuel. These objects are effected 1st by the cross currents of air from the flat and perpendicular apertures A meeting, 2d by the cap or covering B, 3d by the hollow C underneath, as above stated. All which will appear by the drawings—reference being thereto had.

A railway car or carriage may be ventilated in the same way as a building, with little variation. Thus—make an opening or openings (*a*) (Pl. 4, Fig. 1) through the bottom, top or sides of the vehicle of sufficient size to admit from one to two square feet of air; let this air be brought in a duct or ducts directly under the ventilator or air warmer, when intended for winter's ventilation. This metal ventilator, made in size to suit circumstances, may be placed wherever most convenient. Then make a tin box, (*b*) in size sufficient to inclose both the air warmer and the quantity of air together. Make this to reach from the bottom to the top of the vehicle and fasten both ends. The smoke pipe *c*, may be carried within it up to, and go out of, the top. Close to the top as possible *d*, open the tin box or casing sufficiently to let the same quantity of air out—a slide to regulate the temperature may be made to close this aperture when required. Then perforate the flooring of the vehicle *e*, *e*, *e*, and *e* in straight lines crosswise of the carriage; and so distribute these perforations and make them of such capacity as to cause the air to

pervade the whole carriage in making its escape through its bottom. Now put fire in the ventilator and the process is complete for winter. If the quantity of air should require to be increased, lips of tin or other material may easily be so constructed on the outside and near the orifices as that by the motion of the car the incoming or pure air may be increased in quantity and its egress assisted by sheltering on the under side of the floor, the holes or apertures from the currents of air caused by the movement.

For either summer or winter ventilation let coarse canvass, gauze, buckram fine sieve-wire or any other fabric *f*, which will distribute the air, be placed about two or three inches below the transverse beams which now generally support the roof of the cars, strips of wooden lathe of that thickness may be placed at intervals longitudinally of the vehicle, to which the fabric used may be fastened. Then conduct the fresh air into this interval between the fabric and the roof as shown in Fig. 1, and the effect of the ventilation will be much the same as in the other case.

Small sliding covers for the perforations in the bottom of the car may be constructed so that any passenger could shut or open those under his own seat or feet and thus regulate the ventilation of his locality.

In building a new steamer or vessel the space between the lining and the ship's plank might with great ease be converted into an escape place for the foul air. In ventilating an old one the foul air might be made to pass under the seats by which cabins are usually surrounded and taken out at proper intervals by wooden pipes or chimneys. The floor however ought, if possible, to be perforated in order that the mass of four air and carbonic acid gas, which is there constantly generating, and at every opportunity coming up through the cracks and crevices, might be constantly drawn off. This space in a ship is worse if possible than in a dwelling house. In the case of a steamer the expense of fuel and room occupied by an air warmer or ventilator may be saved by bringing the external air—properly confined of course, over some part of the boiler or some of the steam pipes, into the cabin or hold, through an aperture which could be closed or opened and the temperature thereby regulated at pleasure. The air would be best precipitated downward through the deck, by a wind sail. If however an air warmer be required the fresh air must be brought under it and the casing constructed similar to those in the rail-way cars.

What I claim is—

1. The mode herein substantially as described of warming and ventilating buildings. The same consisting in introducing the air from without at some point sufficiently above the ground to get a pure air, and sufficiently low down to get clear of smoke—said air so to be introduced being conducted under the floor of the building and directly under the furnace or stove for the purpose of supplying air to be warmed, for distribution; and after being thus warmed rising in a central or otherwise convenient apartment or passage and thence carried into the various rooms by openings in the walls at the upper part or near the ceilings, without the aid of pipes—and thence downward, through suitable openings in the lower part of the room, and thence outward through the various channels provided, connected with the foul air flue or chimney. I do not claim simply introducing warmed air at the top of a room, and discharging it at the bottom, but only intend to claim thus when affected in the manner substantially as above described—and thus when applied to buildings or apartments of any known description. I claim also in the air warming furnace, the arrangement of the rediating pipes or flues in combination with the fire chamber situated within or between them, in the manner above set forth: and in combination with the elevated air chamber and flues, I claim the arrangement of the openings for admitting heated air above the fire to complete the combustion as herein set forth.

2. I claim the mode as herein described of constructing the grate viz. of raising one or more cylindrical grates above the grate floor, said raised grates being capped or covered in such manner as to protect the vertical bars from the fuel substantially in the manner set forth. It is understood that the raised grate may vary in form so that the principle of action shall remain the same.

3. I also claim the mode of conducting the air into my pure air shafts whatever may be the direction of the wind viz. by placing the swinging valves or shutter at the mouth of said shafts substantially in the manner set forth.

HENRY RUTTAN.

Witnesses:
AUGUST A. VON SCHMIDT,
AZOR TABOR.

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