

Aug. 29, 1933.

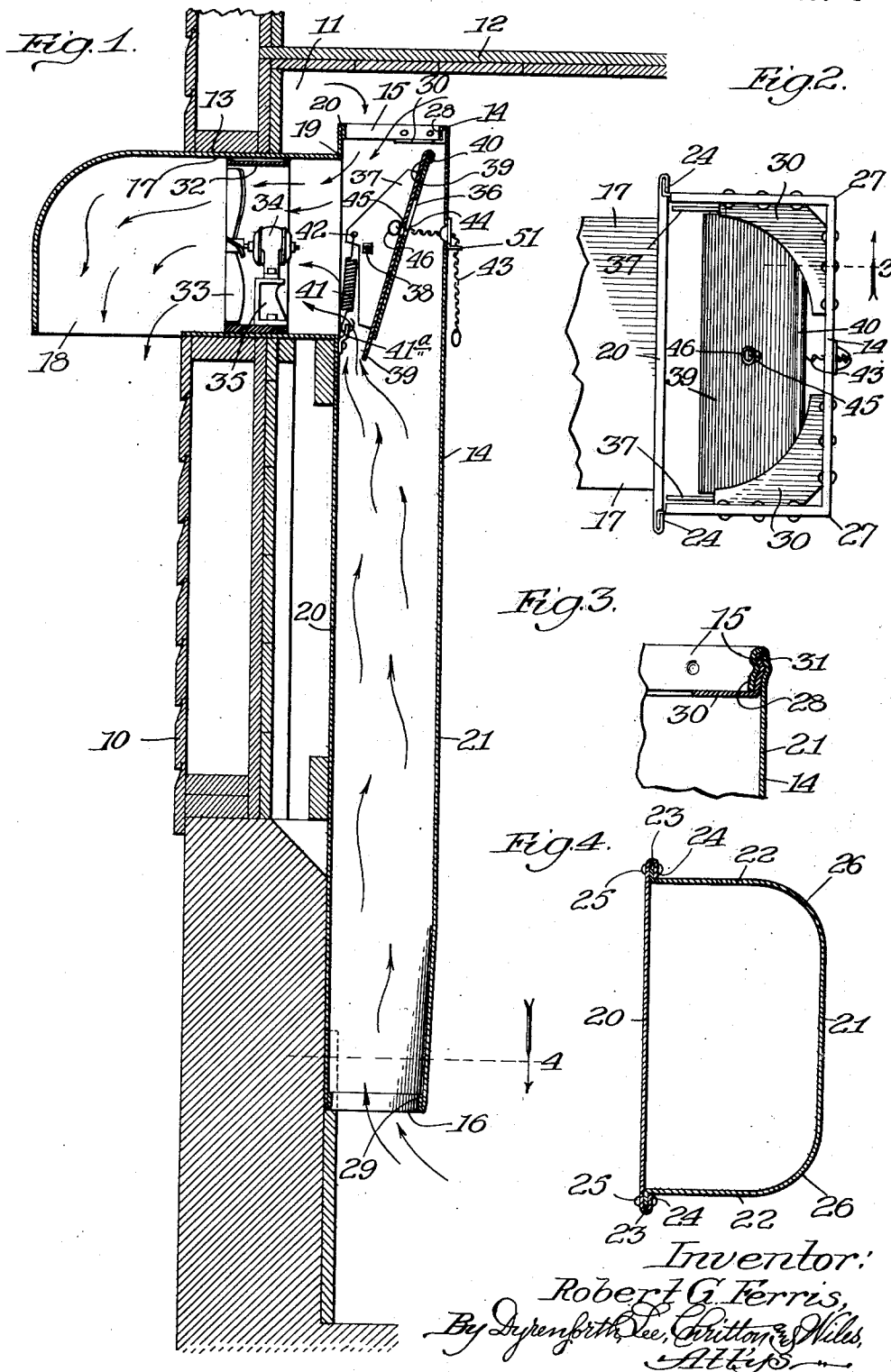
R. G. FERRIS

1,924,489

VENTILATING APPARATUS

Filed Feb. 6, 1932

2 Sheets-Sheet 1



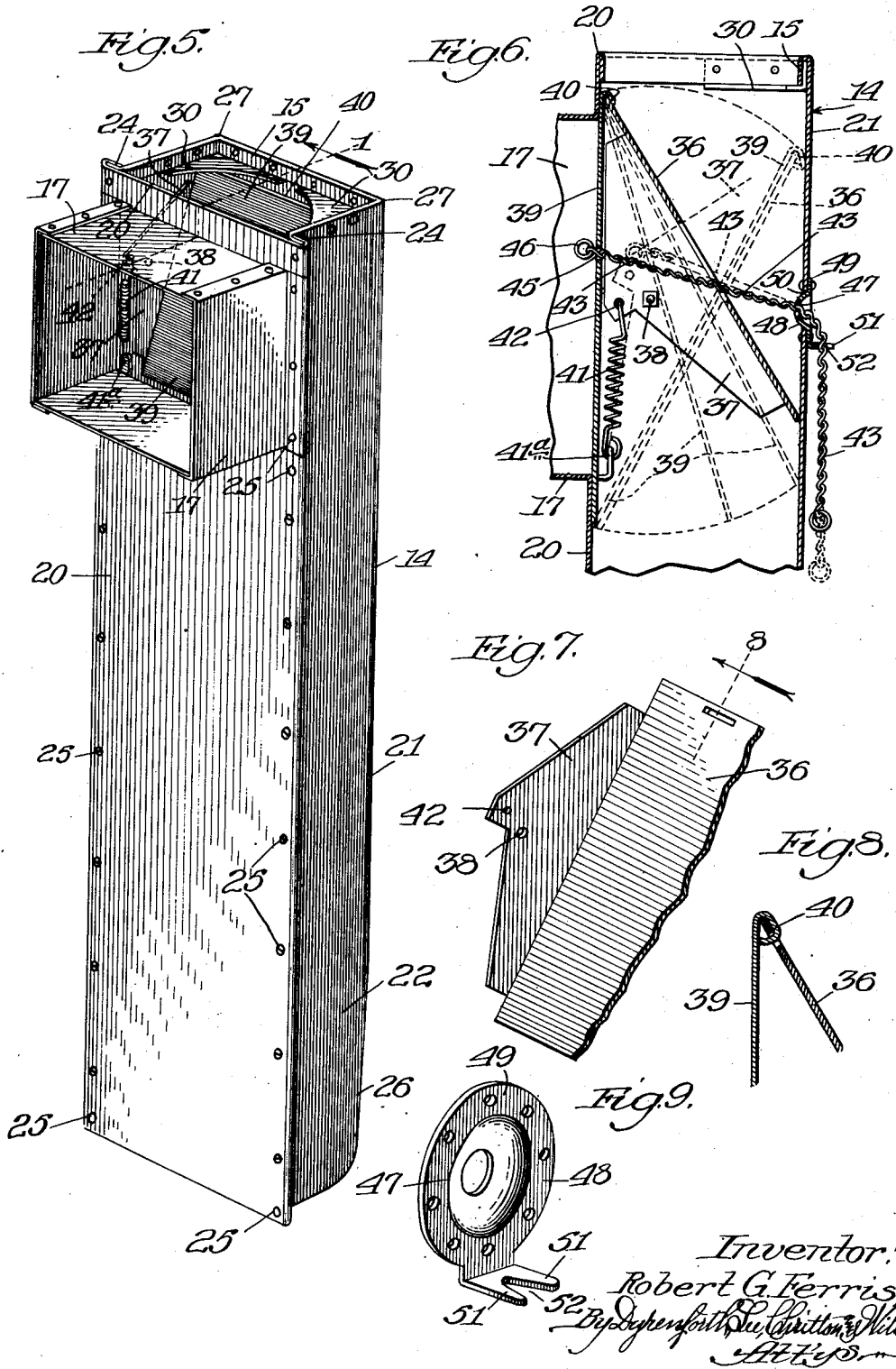
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## UNITED STATES PATENT OFFICE

1,924,489

## VENTILATING APPARATUS

Robert G. Ferris, Harvard, Ill., assignor to Starline, Inc., Harvard, Ill., a corporation of Illinois

Application February 6, 1932. Serial No. 591,415

17 Claims. (Cl. 98—43)

My invention relates to the ventilation of buildings and more particularly to the ventilation of stalls or barns, as for example cow barns, which it is desired be maintained within desired temperature limits and vented of the moisture discharged by the animals into the air within the building.

One of my objects is to provide new and improved means of economical construction for controlling the flow of the air from the upper or lower portions of the stall or barn, selectively, or in different proportions, as desired; to provide such a controlling means which will be of simple construction and operable by a single actuating element; to provide a novel construction of flue which, while presenting a cross-sectional shape at its upper end suitable for the assembly therewith in the desired relationship thereto of flow-controlling means, will be so shaped at its lower end as to resist impacts exerted against it by vehicles or animals striking it; and other objects as will be manifest from the following description.

Referring to the accompanying drawings:

Figure 1 is a broken view in sectional elevation of a building, as for example an animal stall or barn, equipped with my improved ventilating apparatus, the section being taken at the line 1 on Fig. 5 and viewed in the direction of the arrow.

Figure 2 is an enlarged plan view of the flue-portion of the apparatus.

Figure 3 is a broken view in sectional elevation of the upper portion of the flue, the section being taken at the line 3 on Fig. 2 and viewed in the direction of the arrow.

Figure 4 is an enlarged plan sectional view through the lower end of the flue, the section being taken at the line 4 on Fig. 1 and viewed in the direction of the arrow.

Figure 5 is a perspective view of a sheet-metal conduit section of the apparatus and comprising the flue above referred to.

Figure 6 is an enlarged view in sectional elevation of the upper end of the conduit-section of Fig. 5, with portions thereof broken away, showing the damper means controlling the flow of air through the conduit-section in different positions of adjustment.

Figure 7 is a broken perspective view of one of the elements of the damper means referred to.

Figure 8 is a broken section taken at the line 8 on Fig. 7 and viewed in the direction of the arrow; and

Figure 9, a perspective view of a keeper device

for holding in its different positions of adjustment the chain by which the position of the damper means is controlled.

Referring to the particular illustrated embodiment of my invention, 10 represents one of the outer side walls of a building to be ventilated, as for example a barn having a lower compartment 11, the ceiling of which is represented at 12, the compartment 11 forming a stall, or housing, for animals, the wall 10 containing a ventilating opening 13 in which a conduit communicating with the interior of the compartment 11 and with the atmosphere, is located.

The conduit is of a type commonly employed for venting the air from both the top and bottom of the compartment 11 and comprises a flue section 14 located in the compartment 11 and extending adjacent the wall 10 close to the top and bottom of the compartment 11, the upper and lower ends of the flue being open as represented at 15 and 16 for communication with the compartment.

The conduit also comprises a pipe section 17 located in the opening and presenting at its outer end, where it projects outwardly beyond the wall 10, with a hood-portion 18 open at its underside as shown. The opposite end of the conduit-section 17 extends inwardly into the compartment 11 and opens into the flue 14 through an opening 19 in the side wall of the latter between the upper and lower extremities of the flue.

The flue 14 is by preference of the construction shown comprising an upright plate section 20 at the side thereof adjacent the wall 10 and a sheet metal section 21 of general channel form in cross-section the outer edges of its side walls 22 being provided with outwardly extending flanges 23 which extend within channels 24 formed by inwardly deflecting the lateral edges of the plate.

The flanges 23 and the walls of the channels 24 are provided with registering bolts as shown, into certain of which rivets 25, or other suitable fastening devices, are inserted to prevent separation of these parts in transit. In installing the flue screws, or other suitable fastening devices (not shown) are inserted through the others of said openings in the flanges 23 and the walls of the channels 24 and into the wall 10 of the building to secure the flue in place. The rivets, together with the other fastening devices, perform the added function, after installation of the flue, of holding the flue-parts against spreading at the joints formed by the flanges 23 and the walls of

the channels 24, especially under impacts delivered against the sides of the flue.

The section 21 at its lower end where it is liable to be struck by the animals or vehicles in the compartment 11 is so shaped, as shown, as to present rounded corners 26, the cross-section of the flue at this portion thus being of substantially D-shape in cross section, whereas, the corners of the section 21 at its upper portion, which is not liable to be struck, are angular as represented at 27 whereby the flue at this portion is of rectangular form. The upper edge of the flue is bent inwardly and downwardly as represented at 28, and the lower edge of the flue is bent inwardly and upwardly as represented at 29 to render these edge portions rigid, the upper end of the flue being further reinforced by bracket-plates 30 which fit into the interior angles of the section 21 and present upwardly extending flanges at their edges, as represented of one edge at 31, which extend between the body portion of the flue-section 21 and the flanges 28 at its outer sides.

The apparatus shown also comprises means for creating flow of air from the compartment 11 through the upper or lower ends, or both, of the flue 14 as controlled by the damper means hereinafter described, and thence into the conduit section 17 to discharge to the atmosphere through the opening in the bottom of the hood, the air-forcing means shown comprising a fan and electric motor assembly located in a lining housing 32 in the conduit section 17, the fan which is represented at 33 and preferably comprises a plurality of vanes of the aeroplane propeller type, being mounted on the armature shaft of the motor represented at 34 and supported on a base-member 35.

The apparatus also comprises damper means operative into and out of a position for closing the conduit-section 17 to the flue, opening the conduit section 17 to either the upper end or the lower end of the flue and to any desired degree, or to both ends of the flue to any desired proportionate degrees, these means comprising a damper plate 36 extending crosswise of the flue 14 opposite to, and crosswise of, the inner end of the conduit-section 17 and having side plates 37 at its opposite lateral edges at which it is pivoted to the side-walls 22 of the flue 14 as represented at 38, whereby the damper plate 36 may be rocked from a position in which the opening 15 in the flue 14 is in communication with the conduit-section 17 and the opening 16 is closed to this conduit section, to a position in which the opening 16 is in communication with the conduit section 17 and the opening 15 is out of communication therewith, or to any intermediate position in which both ends of the flue are in communication with the conduit section 14 either to the same or an unequal degree.

The damper means referred to also comprise a damper plate 39 hinged at its upper edge, as by an overhanging flange 40, to the upper edge of the damper plate 36 to extend between the plate 36 and the opening 19. Springs 41 connected with the plates 37 at points above the pivots 38 and in front thereof as represented at 42 and to the flue 14 at 41<sup>a</sup> serve, except when the damper plates are displaced, to hold the damper plate 36 in a position in which it inclines upwardly from the right toward the left as shown in Fig. 6 closing the upper opening 15 in flue 14 to the conduit-section 17 and fully opening the lower end of the flue to this conduit section, in which posi-

tion the damper plate 39 is free to swing by gravity closes the opening 19 as shown in Fig. 6.

The means for controlling the position of the damper plates 36 and 39 comprise a chain 43 which extends at one end through openings 44 and 45 in these plates abutting at an enlargement 46 against the front face of the plate 39, and at its opposite end through an openings 47 in the rear wall of the flue 14, the engagement of this chain with the front plate 39 adapting the damper means for actuation of both damper plates into the various desired positions of adjustment by a single actuating means.

Assuming the damper means to be in the position shown in Fig. 6 in which the flue 14 is closed to the conduit section 17 by the damper 39, the operator upon initially drawing on the chain 43 swings the damper plate 39 at its hinged connection with the plate 36 in a direction away from the opening 19, two positions of such adjustment of the plate 39 being represented by dotted lines in Fig. 6, thus opening the conduit section 17 to a greater or less degree to the lower end of the flue 14, depending on how far the damper 39 is moved away from the opening 19. In the further movement of the chain 43 the plate 39 is stopped at its lower edge against further swinging movement at its hinged connection with the plate 36, as by the plate 39 engaging at its lower edge with the rear wall of the flue 14 in the particular arrangement shown, and by still further moving the chain force is exerted on the plate 36 causing it to rock at its pivot 38 in clockwise direction in Fig. 6, with the plate 39, as a unit, and against the tension of the springs 41, from the full-line position shown in Fig. 6 to the dotted position therein shown, in which the lower end of the flue 14 is closed to the conduit section 17 and the upper end of the flue is open thereto.

Any suitable means for holding the chain 46 in the various positions to which it is operated may be provided. In the construction shown a keeper device represented at 48 (Figs. 6 and 9) is provided, this device comprising a disk 49 secured to the back plate of the flue 14 at an opening 50 in the latter and presenting the opening 47 above referred to shown as of arc form, the lower edge of the disk 49 being provided with an angularly disposed extension 51 having a notch 52 in which the chain 43 interlocks when inserted therein preventing retrograde movement of the chain.

It is common practice in ventilating systems of this general type to provide thermostatically controlled means for controlling the operation of the fan to discontinue the venting of the compartment when the temperature reaches a predetermined low point. Nevertheless it is important to regulate the condition of the air within the temperature range above that which causes the thermostat to discontinue the operation of the fan, the damper mechanism described being adapted for effecting such regulation inasmuch as it makes possible the regulation of the air flow to effect the conservation of the heat within the compartment so that ventilation may be continuous even in the coldest weather, it also making it possible to control the amount of cold or warm air removed from the compartment in average temperature condition and to purposely and deliberately draw out heat when the heat in the compartment becomes excessive.

In the normal condition of the damper mechanism illustrated by full lines in Fig. 6 the damper 39 is closed and therefore practically no air can

escape from the compartment 11 into the conduit section 17 even though the fan 33 may continue to run at full speed. By opening the damper 39 as for example to the intermediate dotted line position shown in Fig. 6, the conduit section 17 becomes open to the flue 14 but to only a limited extent, in which position the moist and dead air flows from the compartment 11 upwardly through the flue 14 to the conduit section 17 but with the exhausting of very little heat therefrom, this being the desirable setting for the damper for a cold night.

The position into which the damper 39 is adjusted for moderately cold weather is the extreme full line position shown in Fig. 6, the ventilating means running at full capacity but drawing the air from the floor only of the compartment so as to avoid the drawing off, and wasting, of the heat within the compartment.

When it is desired to remove cold air from the lower portion of the compartment 11 and warm air from the upper portion thereof, the damper mechanism is actuated to a position in which both the damper 39 and the damper 36 assume more or less vertical position generally as shown in Fig. 1.

When it is desired to rapidly cool the compartment 11, the damper mechanism is swung to a position in which both the damper 39 and the damper 36 incline upwardly from the left-hand side to the right-hand side of Fig. 6 as shown by dotted lines thereby closing the lower portion of the flue 14 to the conduit section 17 and opening the upper end of this flue to said conduit section, the damper in this position permitting of the removal from the compartment 11 not only the maximum of air but the maximum of heat and without subjecting the animals in the compartment 11 to objectionable drafts.

By providing the flue 14 of the form shown, namely, to provide rounded corners at the lower end of the flue, and square corners at the upper end thereof, the flue is rendered highly resistant to distortion as by the striking of animals, or other objects, against its lower end, while adapting the flue at its upper end for use with damper 36 of rectangular shape.

While I have illustrated and described a particular construction embodying my invention, I do not wish to be understood as intending to limit it thereto, as the same may be variously modified and altered without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is:

1. In ventilating apparatus, the combination of a conduit containing an outlet in its side and having a plurality of inlets, and interconnected dampers one of which is in said conduit between said inlets for controlling communication between said inlets and said outlet and the other of which controls communication between the interior of said conduit and said outlet.

2. In ventilating apparatus, the combination of a conduit containing an outlet in its side and having a plurality of inlets, interconnected dampers one of which is in said conduit between said inlets for controlling communication between said inlets and said outlet and the other of which controls communication between the interior of said conduit and said outlet, and means normally holding said first-named damper in a position for closing one of said inlets to said outlet.

3. In ventilating apparatus, the combination

of a conduit containing an outlet in its side and having a plurality of inlets, a damper in said conduit between said inlets and pivotally supported between its ends for controlling communication between said inlets and said outlet, and a damper hingedly connected with said first-named damper for controlling communication between the interior of said conduit and said outlet.

4. In ventilating apparatus, the combination of a conduit containing an outlet in its side and having a plurality of inlets, a damper in said conduit between said inlets and pivotally supported between its ends for controlling communication between said inlets and said outlet, a damper hingedly connected with said first-named damper for controlling communication between the interior of said conduit and said outlet, and a single operating means for said dampers connected with said last-named damper.

5. In ventilating apparatus, the combination of a conduit containing an outlet in its side and having a plurality of inlets, a damper in said conduit between said inlets and pivotally supported between its ends for controlling communication between said inlets and said outlet, and a damper hinged at its upper end to the upper end of said first-named damper for controlling communication between the interior of said conduit and said outlet.

6. In ventilating apparatus, the combination of a conduit containing an outlet in its side and having a plurality of inlets, a damper in said conduit between said inlets and pivotally supported between its ends for controlling communication between said inlets and said outlet, a damper hingedly connected with said first-named damper eccentrically of the pivot for said first-named damper, and an actuating element engaging said second-named damper between said pivot and the hinge connection of said second-named damper with said first-named damper for actuating both dampers.

7. In ventilating apparatus, the combination of a conduit containing an outlet in its side and having a plurality of inlets, a damper in said conduit between said inlets and pivotally supported between its ends for controlling communication between said inlets and said outlet, a damper hingedly connected with said first-named damper eccentrically of the pivot for said first-named damper, and an actuating element engaging said second-named damper between said pivot and the hinge connection of said second-named damper with said first-named damper and extending at its free end through said first-named damper for actuating both dampers.

8. In ventilating apparatus, the combination of a conduit containing an outlet and having a plurality of inlets, a damper in said conduit between said inlets and pivotally supported between its ends for controlling communication between said inlets and said outlet, and a damper hingedly connected with said first-named damper and adapted to move by gravity to a position for rendering said outlet out of communication with the interior of said conduit.

9. In ventilating apparatus, the combination of a conduit containing an outlet and having a plurality of inlets, a damper in said conduit between said inlets and pivotally supported between its ends for controlling communication between said inlets and said outlet, a damper hingedly connected with said first-named damper for controlling communication between said outlet and

the interior of said conduit, and means normally holding said first-named damper in a position for closing one of said inlets to said outlet.

10. In ventilating apparatus, the combination  
 5 of a conduit containing an outlet and having a plurality of inlets, a damper in said conduit between said inlets and pivotally supported between its ends for controlling communication  
 10 between said inlets and said outlet, a damper hingedly connected with said first-named damper eccentrically of the pivot for said first-named damper, means normally holding said first-named damper in a position for closing one of  
 15 said inlets to said outlet, and an actuating element engaging said second-named damper between said pivot and the hinge connection of said second-named damper with said first-named damper for actuating both dampers.

11. In ventilating apparatus, the combination  
 20 of a conduit containing an outlet and having a plurality of inlets, a damper in said conduit between said inlets and pivotally supported between its ends for controlling communication between said inlets and said outlet, means normally hold-  
 25 ing said damper in a position for closing one of said inlets to said outlet, and a damper hingedly connected with said first-named damper and adapted to move by gravity in the normal position of said first-named damper, to a position  
 30 for rendering said outlet out of communication with the interior of said conduit.

12. In ventilating apparatus, the combination  
 of a conduit containing an outlet and having a plurality of inlets, a damper in said conduit be-  
 35 tween said inlets and pivotally supported between its ends for controlling communication between said inlets and said outlet, a damper hingedly connected with said first-named damper eccen-  
 40 trically of the pivot for said first-named damper, means normally holding said first-named damper in a position for closing one of said inlets to said outlet, said second-named damper being adapted to swing by gravity to closed position  
 45 in the normal position of said first-named damper, and an actuating element engaging said second-named damper between said pivot and the hinge-connection of said second-named damper with said first-named damper for actu-  
 50 ating both dampers.

13. In ventilating apparatus, the combination  
 of a conduit containing an outlet and having a

plurality of inlets, a damper in said conduit be-  
 tween said inlets for controlling communication  
 between said inlets and said outlet, and a  
 damper controlling communication between said  
 outlet and the interior of said conduit and so  
 associated with said first-named damper that  
 actuation of the latter is through the medium  
 of said second-named damper.

14. In ventilating apparatus, the combination  
 of a conduit containing an outlet and having a  
 plurality of inlets, a damper in said conduit be-  
 tween said inlets for controlling communication  
 between said inlets and said outlet, a damper con-  
 trolling communication between said outlet and  
 the interior of said conduit and so associated with  
 said first-named damper that actuation of the  
 latter is through the medium of said second-  
 named damper, and means engaging said second-  
 named damper for actuating the latter and  
 through the latter said first-named damper.

15. In ventilating apparatus, the combination  
 of a conduit containing an outlet and having a  
 plurality of inlets, unitary damper means for  
 controlling communication between said inlets and  
 said outlet and between the interior of said con-  
 100 duit and said outlet, and a single operating means for said damper means.

16. In ventilating apparatus, the combination  
 of a conduit containing an outlet and having a  
 plurality of inlets, unitary damper means com-  
 105 prising relatively movable dampers one of which is in said conduit between said inlets for control-  
 ling communication between said inlets and said  
 outlet and the other of which controls communi-  
 cation between the interior of said conduit and  
 said outlet, and a single operating means for said  
 dampers.

17. In ventilating apparatus, the combination  
 of a conduit containing an inlet open to the  
 upper portion of the space to be ventilated, a  
 115 second inlet open to the lower portion of said space, and an outlet, and means operative, when actuated in one direction from a position in which the inlet from the upper portion of the space is substantially closed to said outlet, to  
 120 open said second inlet to said outlet to any desired degree and in its continued movement progressively open said outlet to said first-named inlet and simultaneously therewith progressively  
 close said second inlet to said outlet.

ROBERT G. FERRIS.

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