W. H. CUMMINGS.

VENTILATOR.

APPLICATION FILED DEC. 2, 1910.

985,148.

Patented Feb. 28, 1911.

6 SHEETS—SHEET 1.

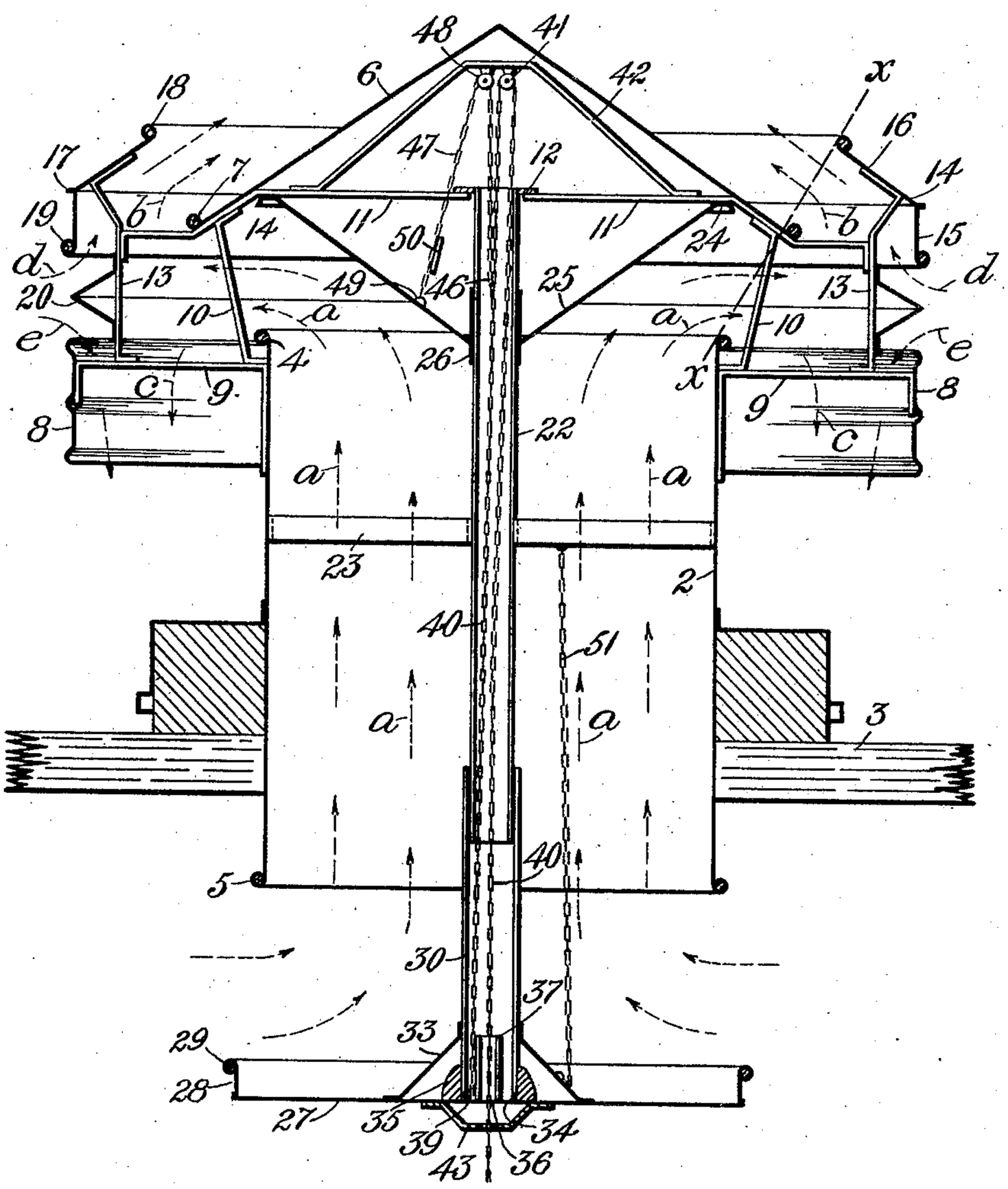

Fig. 1.

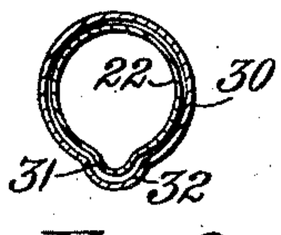

Fig. 2.

WITNESSES:

Geo. A. White Jr.

Grace N. Brown

INVENTOR:

Willard H. Cummings

BY Arthur A. Arrington

ATTORNEY

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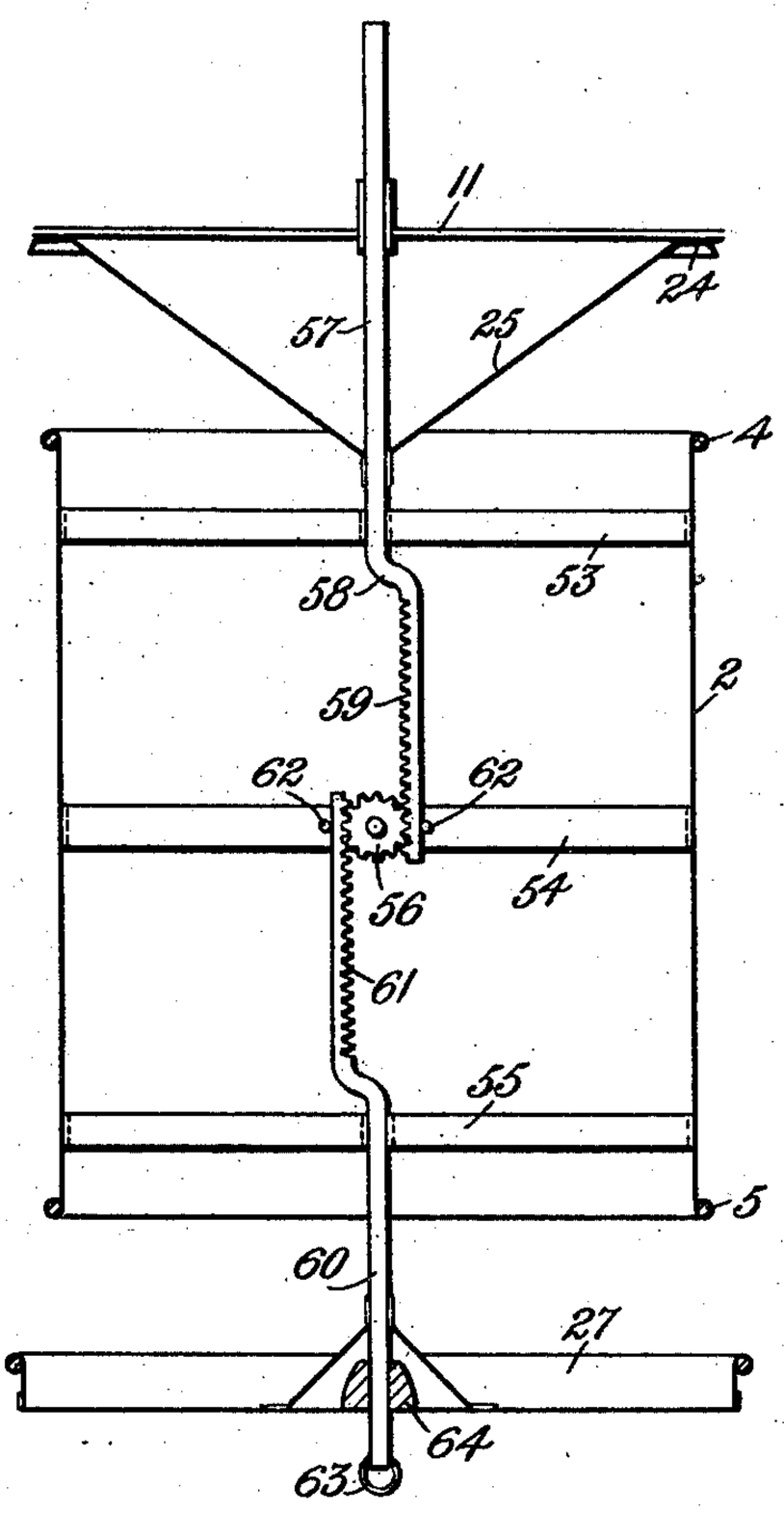

Fig. 3.

WITNESSES:

Geo. A. White Jr.

Grace N. Brown

INVENTOR:

Willard H. Cummings

BY

Arthur A. Arrington

ATTORNEY

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6 SHEETS—SHEET 3.

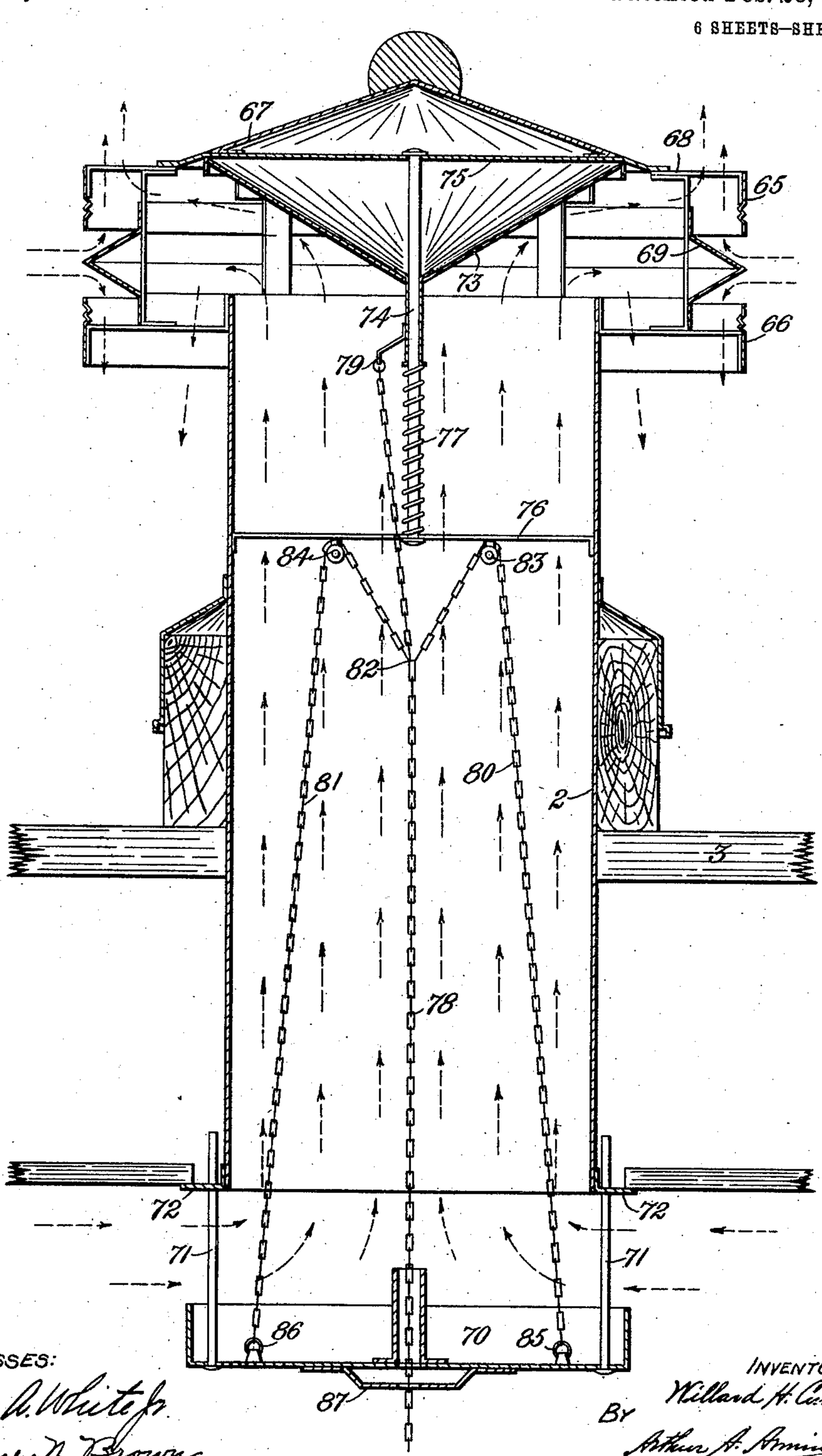

Fig. 4.

WITNESSES:

Geo. A. White Jr.

Grace N. Brown

INVENTOR:

Willard H. Cummings.

By Arthur A. Arrington

ATTORNEY.

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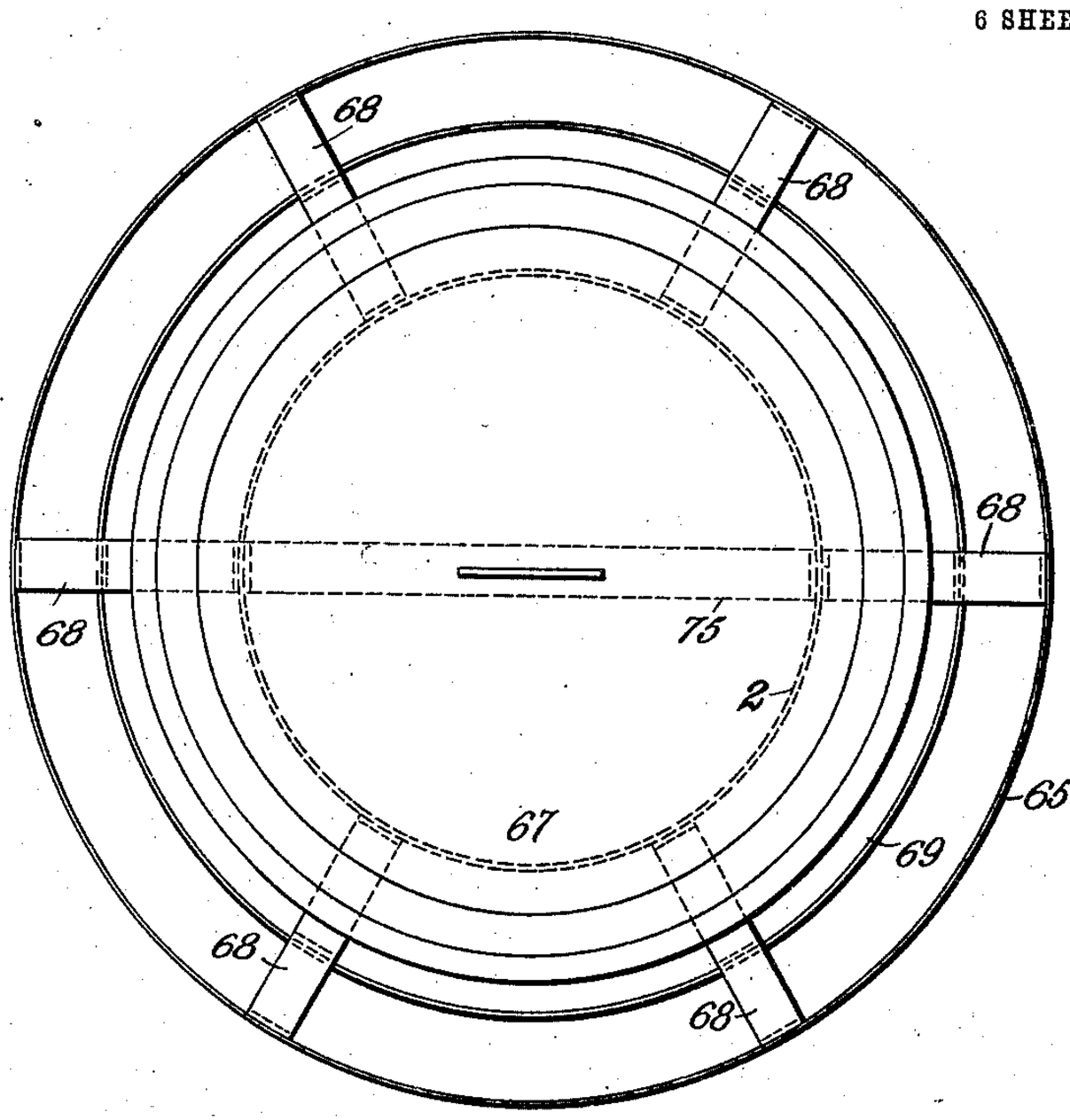

Fig. 5.

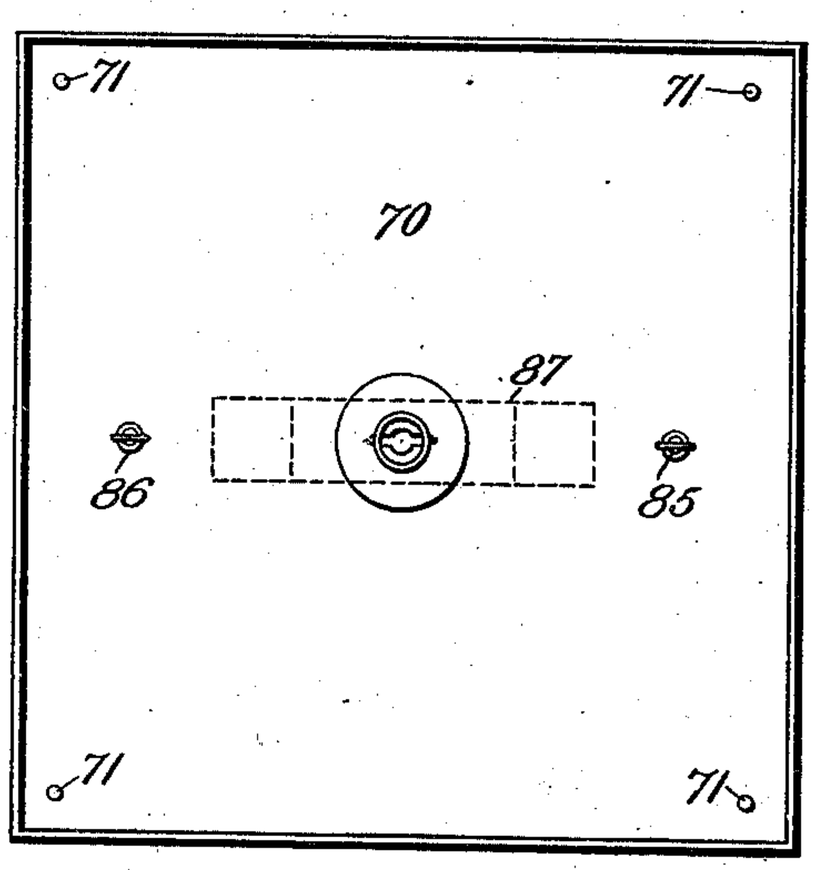

Fig. 6.

WITNESSES:

Geo. A. White Jr.

Grace N. Brown

INVENTOR:

Willard H. Cummings

By Arthur A. Arrington

ATTORNEY

W. H. CUMMINGS.

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6 SHEETS—SHEET 5.

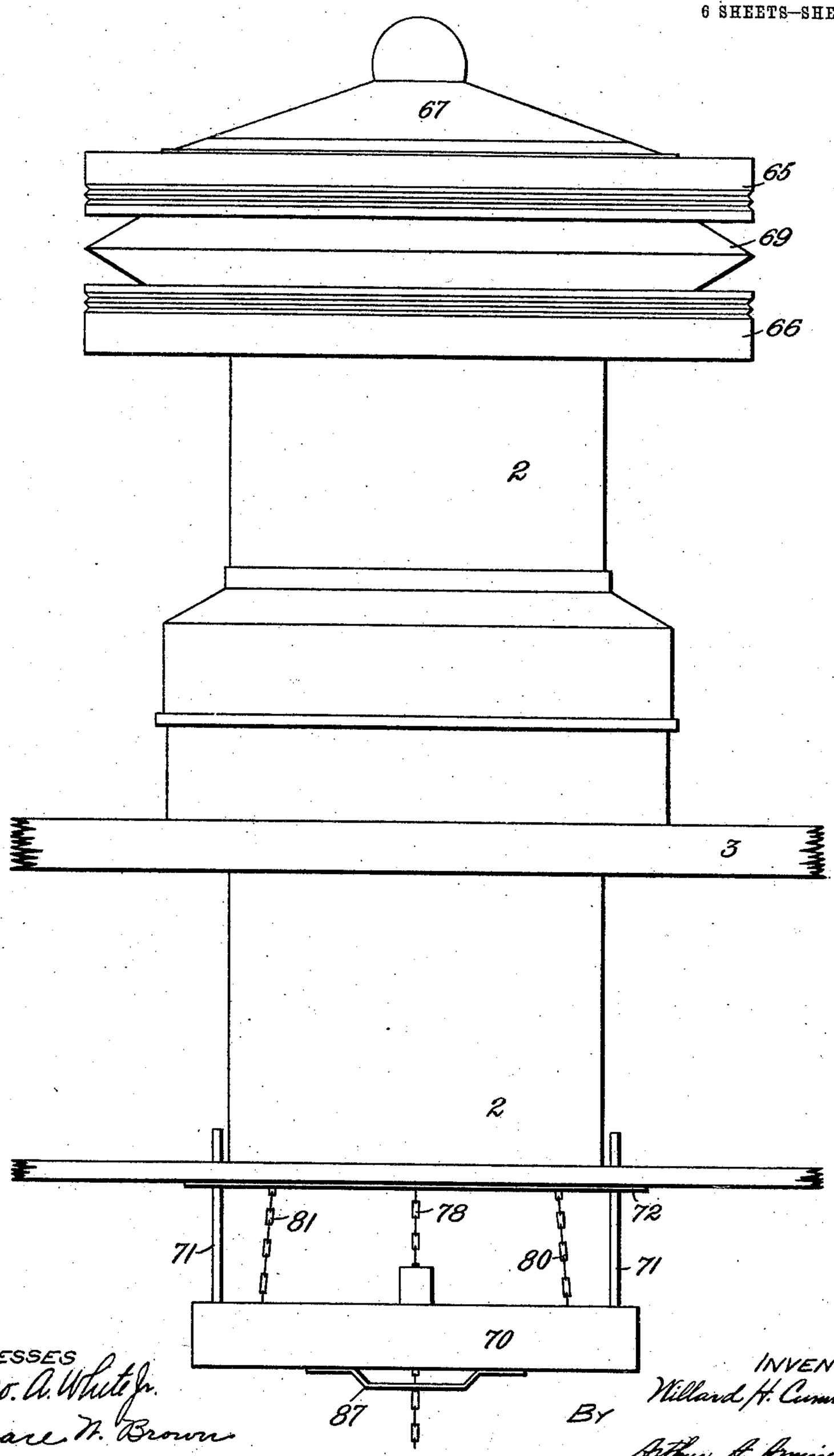

Fig. 7.

WITNESSES

Geo. A. White Jr.

Grace N. Brown

INVENTOR

Willard H. Cummings

BY

Arthur A. Armington

ATTORNEY

W. H. CUMMINGS.

VENTILATOR.

APPLICATION FILED DEC. 2, 1910.

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6 SHEETS—SHEET 6.

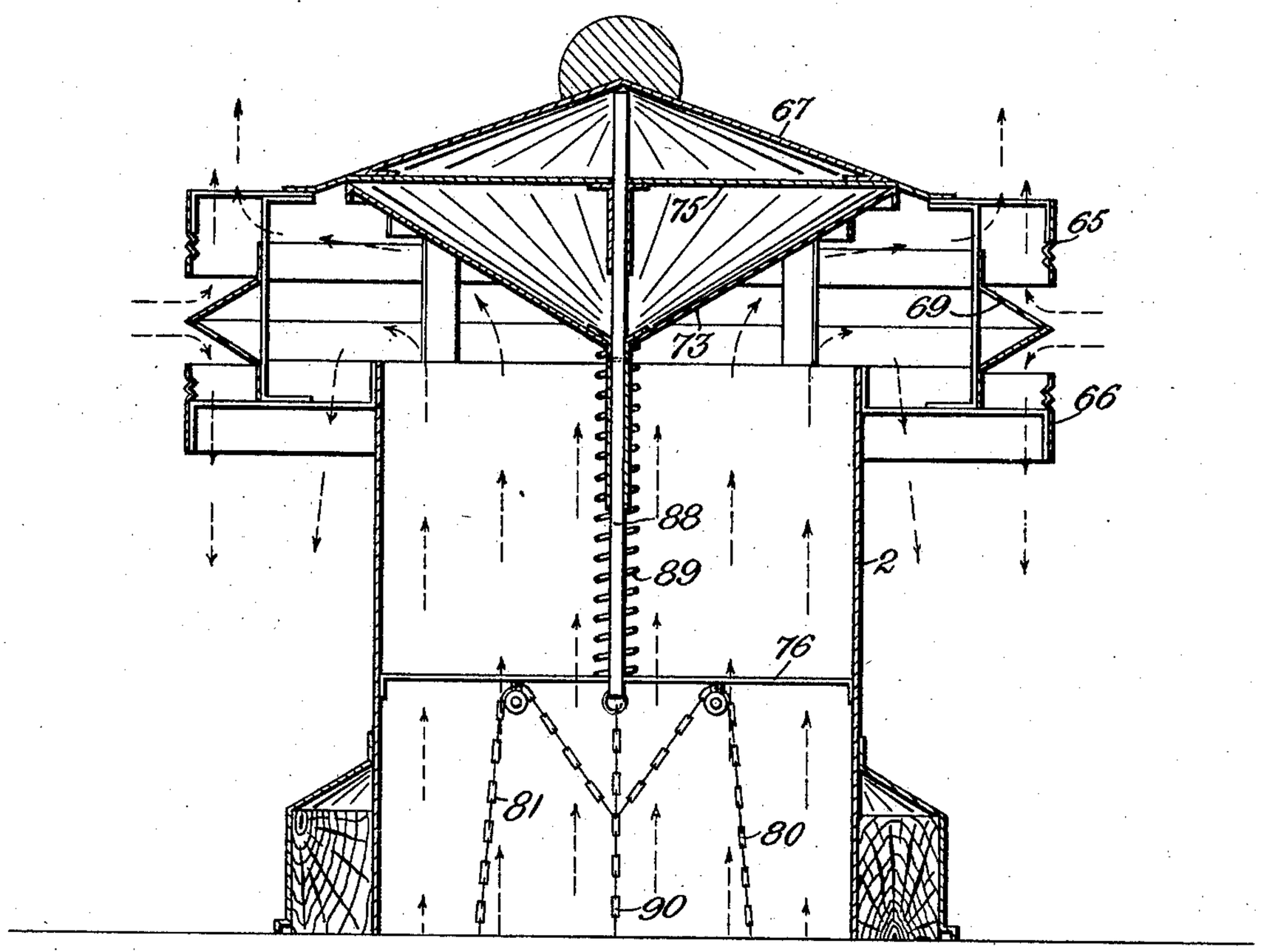

Fig. 8.

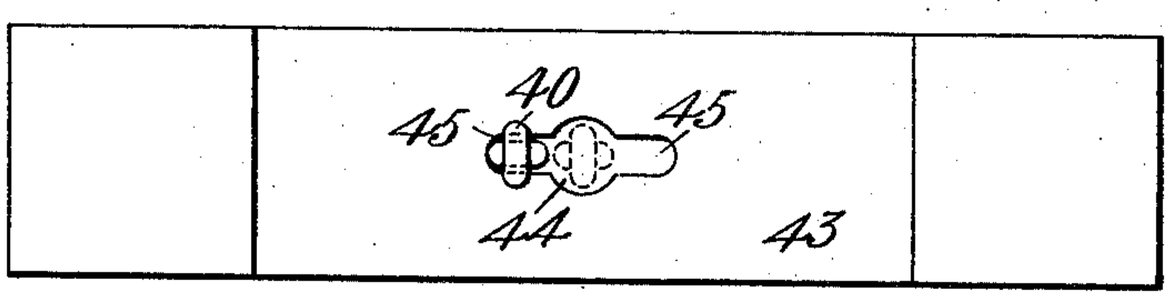

Fig. 9.

WITNESSES:

Geo. A. White Jr.

Grace M. Brown.

INVENTOR:

By Willard H. Cummings

Arthur A. Armington

ATTORNEY

UNITED STATES PATENT OFFICE.

WILLARD H. CUMMINGS, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE CLASON ARCHITECTURAL METAL WORKS, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

VENTILATOR.

985,148. Specification of Letters Patent. **Patented Feb. 28, 1911.**

Application filed December 2, 1910. Serial No. 595,241.

To all whom it may concern:

Be it known that I, WILLARD H. CUMMINGS, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Ventilators, of which the following is a specification.

My invention relates to ventilators for use on buildings, such as school-houses, theaters, public halls and factories, and consists of an improved arrangement for securing a maximum ventilation while at the same time preventing leakage or back drafts of air during stormy or windy weather.

My invention further contemplates improvements in the means for regulating the draft and closing the ventilator against the escape of air from the interior of the building, and also in the means for preventing dripping from condensation on the inside of the ventilator.

My invention is particularly adapted for use on weave-sheds or other textile manufacturing buildings in which it is necessary to maintain a high degree of temperature to provide the best results in various manufacturing processes. For such uses it is absolutely necessary that the ventilator be storm proof to prevent leakage in wet weather and also that it be susceptible of being rendered air tight to prevent the escape of the heated atmosphere in cold weather. Furthermore, it is highly important to prevent the condensation which forms on the air shaft from dripping down into the building as it would seriously damage the machinery and the goods in process of manufacture.

The invention is fully set forth in the following specification, illustrated by the accompanying drawings, in which:—

Figure 1 is a vertical sectional view of the preferred embodiment of my invention showing it applied to the roof of a building; Fig. 2, a detail view of the construction of the above; Fig. 3, a vertical sectional view of the air shaft of the ventilator showing a modification in the mechanism for closing the same; Fig. 4, a vertical sectional view of a modified form of my device; Fig. 5, a plan view of the same; Fig. 6, a plan view of the drip pan; Fig. 7, an exterior elevation of this form of the invention; Fig. 8, a sectional elevation of still another modification of my improved ventilator; Fig. 9, a detail view of the chain securing device.

Fig. 1 shows the preferred construction of my device in which 2 is the cylindrical flue or air-shaft projecting through the roof of the building designated 3. The air-shaft, as well as the other principal parts of the ventilator, is preferably constructed of sheet metal and its upper and lower edges are here shown as curled over wire hoops 4 and 5 to reinforce and stiffen the structure. Surmounting the top of the air-shaft is a conical hood or cap 6 formed of sheet metal with its rim stiffened by the wire hoop 7, and supported on suitable braces as hereafter more particularly described. The cap 6 is held in a raised position above the top of the air-shaft so as to provide a port for the egress of air and its rim overhangs the edge of the shaft to prevent wind-swept rain or snow from beating into the opening of the latter. Encircling the air-shaft just below its upper end is a cylindrical rim or shield 8 supported on angle-shaped brackets 9. The shield 8 is spaced some distance away from the circumference of the air-shaft and as here shown is formed with a beading at its center and on the edges to give greater stiffness and prevent buckling. Secured to the brackets 9 and extending upward therefrom are braces 10 which support cross-pieces 11. The cross-pieces 11 radiate from a central hub or collar 12 and there may be four, six, eight, or any suitable number of them, to form a spider for supporting the cap 6. The outer ends of the pieces 11 are bent downwardly to conform to the shape of the cap and the braces 10 are riveted or otherwise fastened to their under sides. Extending upwardly from the brackets 9, some distance out from the braces 10, is another set of braces 13, equal in number to the pieces 11 and secured to the outer ends of the latter. The braces 13 support an annular shield 14 which is formed with a cylindrical flange 15 arranged in line with the shield 8 and positioned with an opening between their adjacent edges. The upper portion of the shield 14 is formed inwardly in the shape of a truncated cone 16 having the same inclination as that of the

cap 6. Preferably the metal of the shield 14 is folded on itself at 17 to form a stiffening rib and the upper and lower edges are curled over the reinforcing hoops 18 and 19. Supported on the vertical portions of the upright braces 13 is a dividing ring 20 which I term the deflector. The deflector 20 is V-shaped in section and is arranged with its apex equidistant between the edges of the shields 8 and 14.

Extending axially of the air-shaft 2 is a hollow shaft or tube 22 supported with its upper end secured in the collar 12. Midway of its ends the tube is braced by a spider 23 secured on the interior of the air-shaft 2. Preferably the spider is constructed of two pieces of relatively thin metal clamped together to surround the tube and bent to form four radial arms having their ends bent at right-angles and riveted to the air-shaft. Arranged to slide on the tube 22 is a damper 25 adapted to close down over the top of the air-shaft. The damper 25 is in the form of an inverted cone, and secured in its apex is a sleeve 26 which provides an extended bearing on the tube 22. The upper rim 24 of the damper is flared out and rolled over to overlap the edge of the air-shaft and provide a snug fit when the damper is in its closed position. Supported below the bottom of the air-shaft is a drip-pan 27 which can also be operated as a closure for the inlet of the ventilator. Preferably, the pan 27 is circular in shape with a rim 28 reinforced by the wire hoop 29 and adapted to inclose the lower end of the air-shaft. Extending upwardly from its center is a tubular sleeve 30 adapted to slide on the tube 22. Referring to Fig. 2, the lower end of the tube 22 is formed with a longitudinally extending protuberance 31 which fits a correspondingly formed channel 32 in the sleeve 30 and acts as a spline to prevent the pan 27 from turning. To strengthen the joint between the pan 27 and sleeve 30 I provide the conical reinforcing piece 33. The lower end of the sleeve 30 where it joins the pan is provided with openings 34 to allow the condensation which runs down on the interior of the sleeve to drain out into the pan. I also provide a weight in the pan 27 in the form of a collar 35, preferably of lead or some other relatively heavy metal, surrounding the sleeve 30. This weight is simply slipped loosely over the sleeve 30 before the reinforcement 33 is applied and acts as a counterbalance for the damper 25 which is attached to the drip-pan as later described. The weight 35 being loose on the sleeve 30, any moisture that works out through the openings 34 will leach under the weight and run along on the inside of the pan. A hole 36 is pierced in the center of the pan 27 for the operating chain or cord to pass through and this is protected by a small, upwardly extending tube 37 to prevent leakage through the bottom of the pan.

The damper 25 and pan 27 are raised and lowered by means of chains or cords as now described: Fastened to the pan 27 at 39 is the main operating chain 40 which runs up through the sleeve 30 and tube 22 and over a pulley 41. The pulley 41 is fastened on an arch-piece 42 supported on the cross-pieces 11. From the pulley 41 the chain 40 leads down again through the tube 22 and sleeve 30 and passes through the tube 37 and hole 36. Secured on the bottom of the pan 27 is a U-shaped piece 43 provided with a contracted opening for the chain 40. Referring to Fig. 9, this opening is preferably formed with an enlarged portion 44 at the center, giving ample clearance for the passage of the chain, and two oppositely extending slots 45. The slots 45 are wide enough to allow the entrance of a link of the chain sidewise but will not pass a cross link extending in the opposite direction. Normally the chain is drawn down through the enlarged portion 44 of the opening and by pulling it either to one side or the other one of its links may be locked in the slot 45 and the chain is then secured against further movement. Fastened to the chain 40 at 46 is a shorter chain 47 extending up over a second pulley 48 on the arch 42 with its opposite end fastened at 49 to the damper 25. A small weight 50 is secured to the chain 47 at a point near its fastening on the damper 25 for a purpose as later described. I also provide a safety chain 51 extending between the brace 23 and pan 27 as a precaution against the falling of the pan should the main chain 40 be broken through carelessness or abuse in operating the ventilator. The operation of the whole device is as follows:

The ventilator is shown in Fig. 1 as open, and it will be seen that the air from the interior of the building has an unrestricted ingress into the mouth of the air-shaft 2. As indicated by the arrows *a*, *a*, etc., the heated air passes up through the shaft or flue 2 and, striking the conical damper 25, is deflected radially outward to pass through the opening or port between the top of the flue and the rim of the cap 6. From this opening the escaping air either passes up between the cap 6 and shield 14 as indicated by arrows *b*, or draws down between the outside of the flue and the shield 8 as shown by arrows *c*. The deflector 20, positioned centrally of the opening between the edges of the shields 14 and 8, acts to divert the outside wind currents up across the top of the cap 6 as shown by arrows *d*, and down through the shield 8 as indicated by arrows *e*. This action sets up a strong draft which sucks the air out of the port at the

top of the flue and gives a maximum ventilation for the interior of the building. In other words, the force of the wind blowing against the side of the ventilator is utilized with utmost effect by dividing it into two currents and deflecting it both up through the shield 14 and down through the shield 8. In this way the suction or draft on the inside of the air-shaft is greatly increased over what it would be if only the current blowing across the top of the ventilator were utilized. That is to say, my improved device operates with a double draft and therefore provides the greatest possible ventilating effect.

When it is not required to have the full draft through the ventilator the latter may be partly closed by a simple operation. The chain 40 depends from the ventilator to a point within reach from the floor and by pulling on the chain the damper 25 is lowered and the drip-pan 27 raised as required to regulate the size of the openings at the top and bottom of the air-shaft. It will be seen that by pulling down on the free end of the chain the pan 27 is raised toward the lower end of the air-shaft 2, the sleeve 30 sliding on the tube 22. As the pan 27 is raised the chain 47 is paid out over the pulley 48 and the damper 25 is lowered toward the top of the air-shaft. When it is desired to close the ventilator completely the drip-pan 27 is drawn up into close contact with the bottom of the air-shaft and the damper 25 will then be dropped down to fit closely over the top of the flue. This gives a practically airtight closure and prevents the escape of the heated air from the building.

In order to provide abundant space for the ingress of air at the mouth of the ventilator the pan 27 is placed at a greater distance from the bottom of the air-shaft than the distance between the top of the shaft and the damper 25. In closing the ventilator the damper 25 will therefore engage the top of the flue 2 before the pan 27 comes up against the bottom and the chain 47 simply slacks away to provide for this inequality of movement of the two closures. To prevent the chain 47 from falling slack within the tube 22, which would result in crowding and possibly binding the other chain 40, I attach the weight 50 to the chain 47 outside of the tube 22. The weight 50 causes the slack of the chain 47 to fall on the outside of the tube 22 and therefore the movement of the chain 40 is not interfered with or hampered. It will be understood that to retain the damper 25 and pan 27 in their closed, or partly closed, positions it is only necessary to draw a link of the chain 40 into the slot 45 of the bottom piece 43, as previously described, and the chain will be secured against movement. When the chain is released the weight of the pan 27 will cause the latter to drop down from the bottom of the shaft and the damper 25, which is of less weight, will be drawn up against the pieces 11. The range of movement of the damper 25 limits the movement of the pan 27 and prevents the sleeve 30 from sliding off the end of tube 22.

The improved arrangement of the wind shields 8 and 14 and deflector 20 on my new ventilator, besides increasing the effect of the wind currents in the atmosphere in setting up a draught through the flue, also serves as a precaution against back draughts and prevents rain or snow being forced into the air-shaft. It will be noted that a line x—x drawn across the top edge of the shield 14 tangent with the top of the air-shaft 2 passes through the rim of the cap 6. It will therefore be plain that slanting rain or snow cannot find entrance to the top of the air-shaft in this direction and the space between the cap and top of the flue is further protected by the surrounding rings 14, 8 and 20 which overlap one another. In other words, the outlet of the air-shaft is completely protected from storm and shielded from back drafts.

The drip-pan 27 serves to catch any moisture from condensation on the interior of the air-shaft and condensation running down the tube 22 and sleeve 30 will also be caught in the pan as previously described. The pan 27 also acts in conjunction with the damper 25 to close the ventilator without the necessity of a secondary damper at its bottom. By closing the bottom of the ventilator and preventing the warm air in the interior of the building from entering the air-shaft and coming against its walls, which will be of a different temperature on account of the colder atmosphere on the outside of the ventilator, the amount of condensation will be reduced to a minimum. It will also be noted that the arrangement of my new ventilator provides for an absolutely free and unrestricted entrance of the air when the drip-pan is lowered as there is a generous opening all around the lower end of the air-shaft without obstructions to the the air in any direction.

In Fig. 3 I have illustrated another method of operating the damper 25 and pan 27. Inside the air-shaft 2 are three diametrically arranged braces 53, 54 and 55 and on the central brace 54 is rotatably mounted a sprocket or gear-wheel 56. The damper 25 is secured to a rod 57 which slides in bearings in the brace 53 and cross-piece 11. The lower end of the rod 57 is offset at 58 and formed as a rack 59 having teeth adapted to engage the teeth of the gear 56. The drip-pan 27 is also secured to a similarly shaped rod 60 which slides in a bearing in the brace 55 and has a rack 61 with teeth engaging the gear 56 on the opposite side from the rack 59. Suitable pins

or rolls 62 mounted on the brace 54 act as guides to hold the racks in engagement with the gear. The rod 60 has a ring 63 at its lower end to which can be connected a cord or chain for operating the ventilator, or the rod 60 can be moved by a staff having a hook at its end adapted to hook into the ring 63. Preferably the pan 27 has a weight 64 which exactly counterbalances the damper 25 with the pan. By pushing the rod 60 upward the pan 27 is carried up against the bottom of the air-shaft 2 and the rack 61 rotates the gear 56 and draws the rod 57 down to lower the damper against the top of the flue. As the pan 27 and damper 25 counterbalance each other they will remain in position as set and, furthermore, the friction between the racks and gear acts to prevent accidental displacement through shock or jar.

In Fig. 4 I have illustrated another modification of my ventilator showing a still different method of operating the damper and drip-pan. The construction of the main elements of my device are also somewhat different in this embodiment as now pointed out. The wind-shields 65 and 66 here shown are both of the same form consisting merely of cylindrical flanges without the conical rim on the top of the upper shield. By making the cap 67 of generous diameter the top of the flue can be protected from storm without the use of the conical rim 16 shown in Fig. 1, but the latter arrangement is preferable since the protection afforded is absolutely complete, as before described.

Fig. 5 is a plan view illustrating the arrangement of the braces 68, etc., which support the wind-shields 65 and 66 and deflector 69, and Fig. 6, a plan view of the drip-pan. In this modification the drip-pan 70 is shown as being square in form, such construction being somewhat cheaper. As illustrated in Fig. 4, the pan is supported on vertical rods 71 which slide in bearings in the flange 72 fastened at the bottom of the flue 2. The damper 73 slides on a rod 74 held between the braces 75 and 76 and is normally held in its raised position by a coiled spring 77. The main chain 78, leading up through the pan 70, is secured to the damper 73 at 79, and two auxiliary chains 80 and 81 are spliced to it at 82. These lead over the pulleys 83 and 84 and are fastened to the drip-pan 70 at 85 and 86. By pulling down on the chain 78 the damper 73 is drawn down against the top of the air-shaft and the pan 70 is simultaneously raised against the bottom of the shaft to seal both ends of the ventilator. The chain 78 is secured in the piece 87, as previously descibed, to maintain the damper closed and when it is released the spring 77 acts to carry the damper 73 up against the brace 75. As the chain 78 is drawn up by the movement of the damper 73 the chains 80 and 81 automatically lower the pan 70. Fig. 7 illustrates the outside appearance of this form of my invention.

In Fig. 8 the damper 73 is shown as fixedly mounted on a rod 88 which slides in bearings in the braces 75 and 76. A coiled spring 89 maintains the damper in its raised position and to close it against the top of the air-shaft 2 the rod 88 is pulled bodily downward by means of the chain 90 attached to its lower end.

It will be evident that still further modifications might be made in the form and arrangement of my device without departing from the spirit and scope of the invention.

Therefore, without limiting myself to the exact construction shown, what I claim is:—

1. In a ventilator, the combination with a vertical air-shaft, of a cap surmounting the top of said shaft and spaced above the edge thereof to provide an exit for the air, an annular wind-shield surrounding the upper end of the shaft, and spaced some distance therefrom, a second, annular wind-shield arranged above the first shield with a space between their adjacent edges, and a V-shaped deflector arranged in the opening between the shields and adapted to divert the wind currents up through the upper shield and down through the lower one to cause a draft through the air-shaft.

2. In a ventilator, the combination with the air-shaft, of a cap spaced above and apart from the top of the shaft to provide a port for the exit of air, two annular wind-shields surrounding the upper end of the air-shaft and arranged with an opening between their adjacent edges, and an annular, V-shaped deflector arranged in said opening with its apex equidistant between the edges of the shields.

3. In a ventilator, the combination with a vertical air-shaft provided with an air-port at its upper end, of two annular wind-shields spaced apart from the air-shaft and surrounding the air-port with an opening between their adjacent edges, and an annular, V-shaped deflector arranged in the opening between the wind-shields.

4. In a ventilator, the combination with a vertical air-shaft, of a cap spaced above and apart from the top of said shaft to provide a port for the exit of air, an annular wind-shield surrounding the upper end of the air-shaft radially outward therefrom, a second annular wind-shield arranged above the first with an opening between their adjacent edges and having its upper portion bent inwardly to bring its top edge in a plane extending from the edge of the air-shaft through the rim of the cap, and an annular, V-shaped deflector arranged in the opening between the wind-shields.

5. In a ventilator, the combination of a

vertical air-shaft 2, angle-shaped brackets 9 extending radially from its upper end, an annular wind-shield 8 supported on said brackets, two sets of upright braces 10 and 13 mounted on the brackets 9, a spider formed of radial pieces 11 having their ends secured to the braces 10 and 13, a cap 6 supported on said spider, an annular wind-shield 14 supported on the braces 13 and arranged with an opening between it and the shield 8, and a V-shaped deflector 20 supported on the braces 13 in the opening between the wind-shields.

6. In a ventilator, the combination with a vertical air-shaft, of a damper arranged to close down over the top of the air-shaft, a drip-pan suspended below the bottom of the air-shaft entirely away from its lower edge to provide a free space for the entrance of air, and means to move the damper and drip-pan toward each other to close both ends of the air-shaft.

7. In a ventilator, the combination with the air-shaft, of a vertical tube supported centrally thereof, a damper arranged to slide on the tube to close the upper end of the air-shaft, a drip-pan arranged to slide on the tube to close the lower end of the shaft and means to operate the damper and pan substantially as described.

8. In a ventilator, the combination with the air-shaft, of a cap arranged above the top of the air-shaft with an opening for the exit of air, a tube arranged axially of the air-shaft, a conical damper arranged to slide on the tube to close down over the top of the air-shaft, a drip-pan adapted to slide on the tube to close against the lower end of the air-shaft, and means connecting the damper and drip-pan to adapt them to be moved toward each other to close both ends of the ventilator.

9. In a ventilator, the combination with the air-shaft, of a tube extending axially thereof, a damper arranged to slide on the tube to close the top of the ventilator, a drip-pan suspended below the shaft with a free space between their circumferences, a sleeve extending upwardly from the pan to slide on the tube, and means to slide the damper and pan on the tube to close both ends of the ventilator.

10. In a ventilator, the combination with the air-shaft, of a damper adapted to close the upper end of the shaft, a drip-pan suspended below the air-shaft and adapted to close its lower end, means extending axially of the shaft on which the damper and pan are arranged to slide, and means connecting the damper and pan to operate them simultaneously to close both ends of the ventilator.

11. In a ventilator, the combination with the air-shaft, of a tube supported axially thereof, a damper arranged to slide on the tube to close the upper end of the shaft, a drip-pan arranged to slide on the tube to close the lower end of the shaft, a pulley arranged above the tube, a chain extending from the pan up through the tube over the pulley and down through the pan, and means connecting said chain to the damper to operate the latter simultaneously with the movement of the drip-pan.

12. In a ventilator, the combination with the air-shaft, of a tube supported axially thereof, pulleys supported above said tube, a damper arranged to slide on the tube to close down on the top of the air-shaft, a drip-pan arranged to slide on the tube to close up against the bottom of the air-shaft, a chain extending up from the pan through the tube over a pulley and down through the bottom of the pan, and a second chain attached to the first and extending up over a pulley with its end secured to the damper.

13. In a ventilator, the combination with the air-shaft, of a tube supported axially thereof, a drip-pan suspended below the air-shaft and arranged to slide on the tube to close the bottom of the shaft, a pulley above the tube, a chain extending up from the pan through the tube and over the pulley, then down again through an opening in the pan, and means on the pan for securing the chain against movement through the opening.

14. In a ventilator, the combination with the air-shaft, of a tube 22 supported axially of the air-shaft, a drip-pan 27 arranged below the bottom of the air-shaft and formed with a rim 28 adapted to surround the latter, a sleeve 30 extending upwardly from the pan and adapted to slide on the sleeve 22, a tube 37 within the sleeve 30 protecting an opening in the bottom of the pan, and a chain extending up from the pan 27 through the tube 22 and down again through the tube 37, substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLARD H. CUMMINGS.

Witnesses:
GEORGE W. BLACKBURN,
GRACE W. BROWN.