J. E. & A. A. FISHER.

VENTILATOR.

APPLICATION FILED FEB. 15, 1909.

960,873.

Patented June 7, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

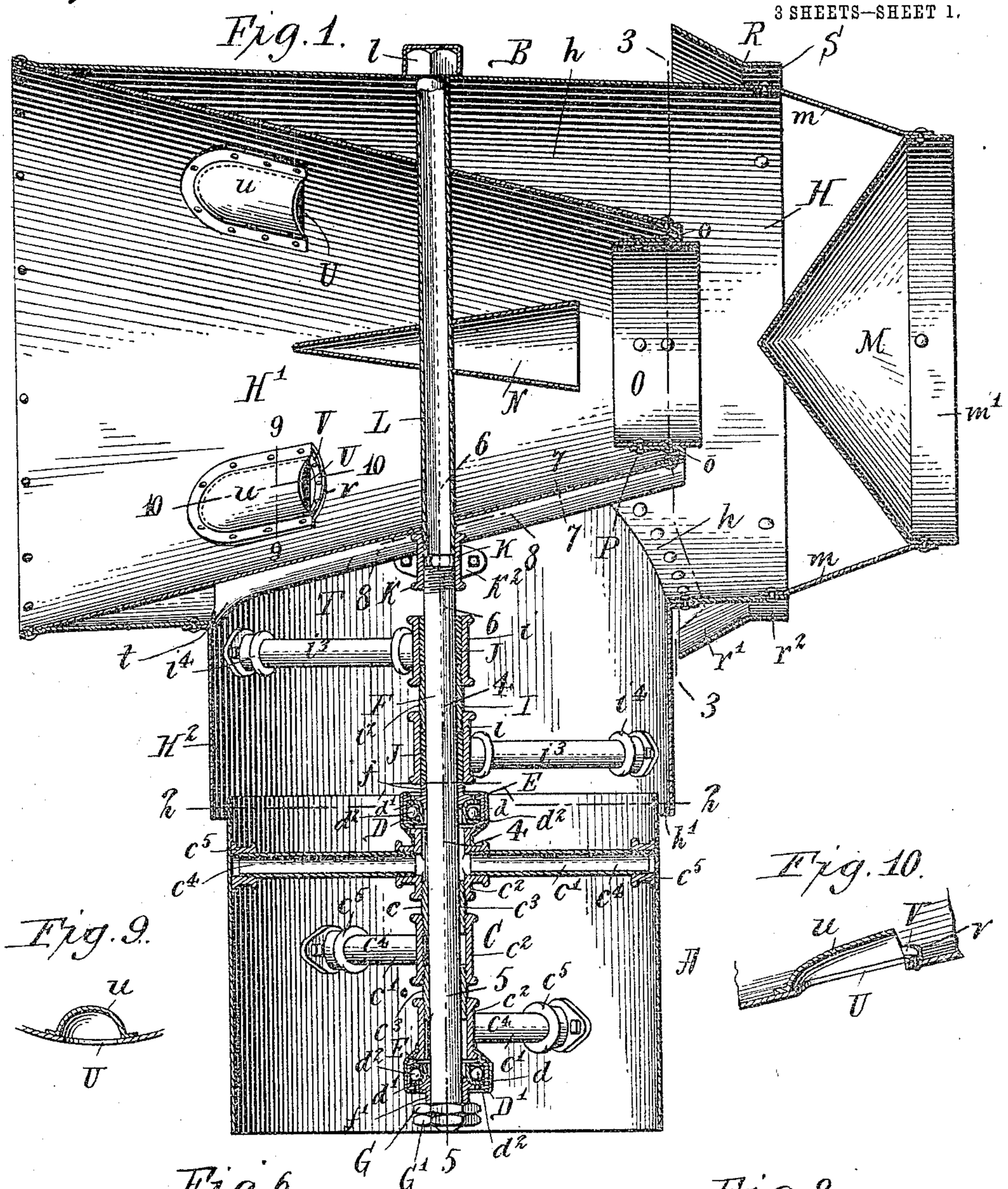


Fig. 9.

Fig. 10.

Fig. 6.

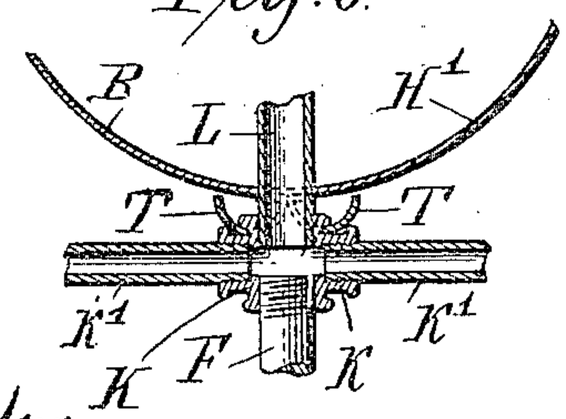


Fig. 7.

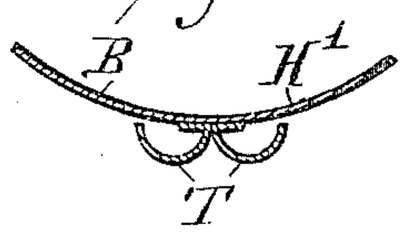
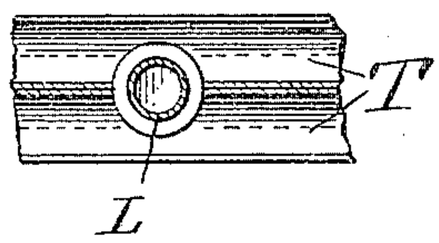


Fig. 8.



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3 SHEETS—SHEET 2.

Fig. 2.

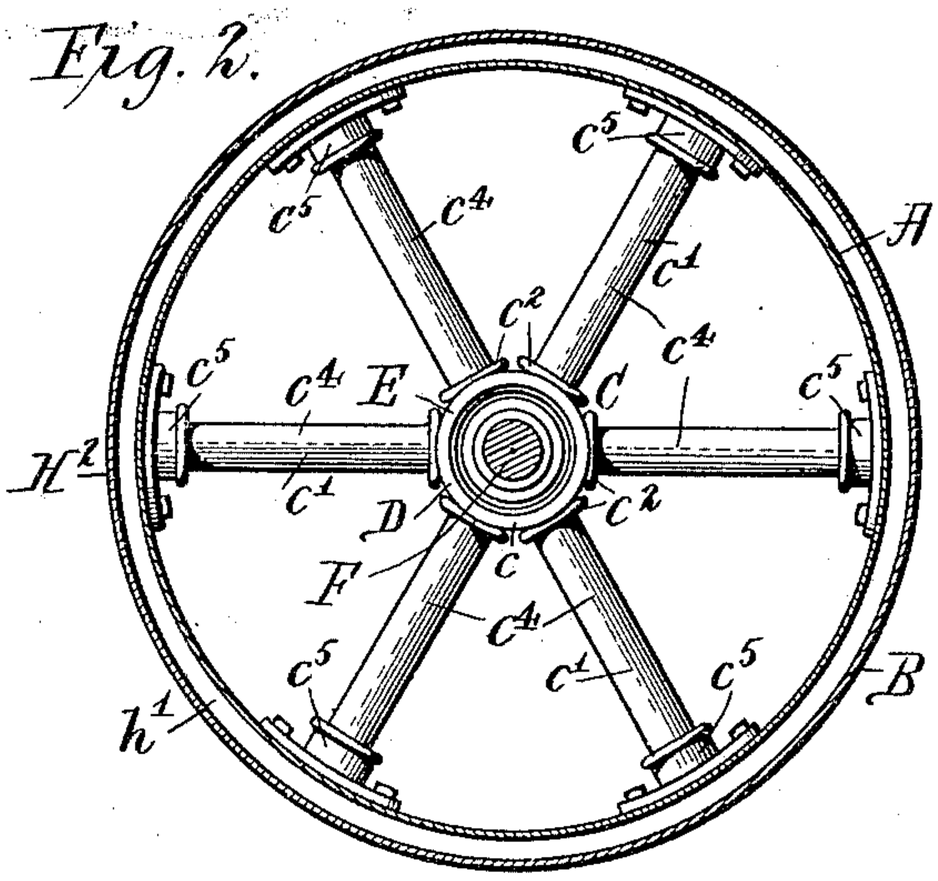


Fig. 3.

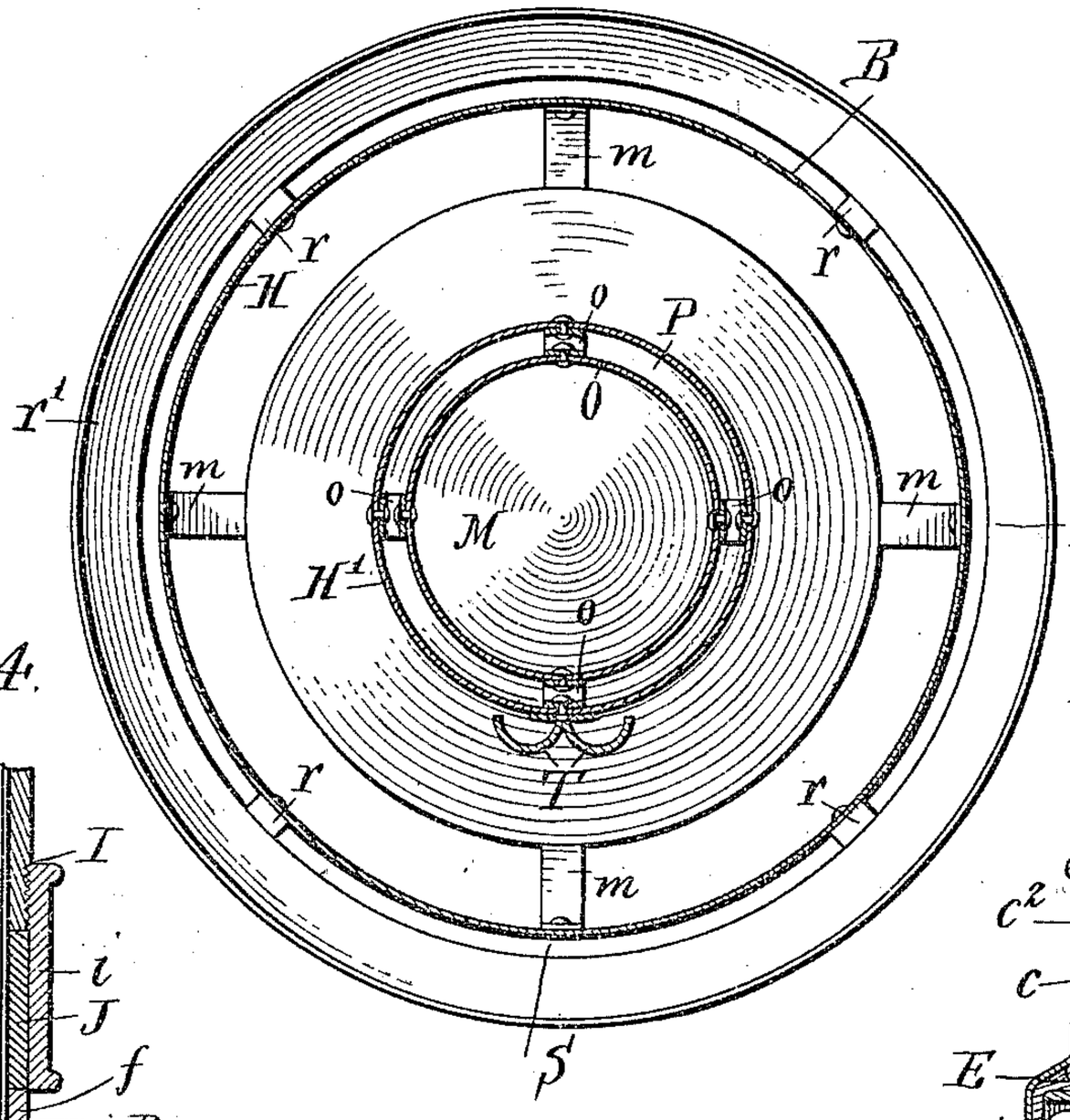


Fig. 4.

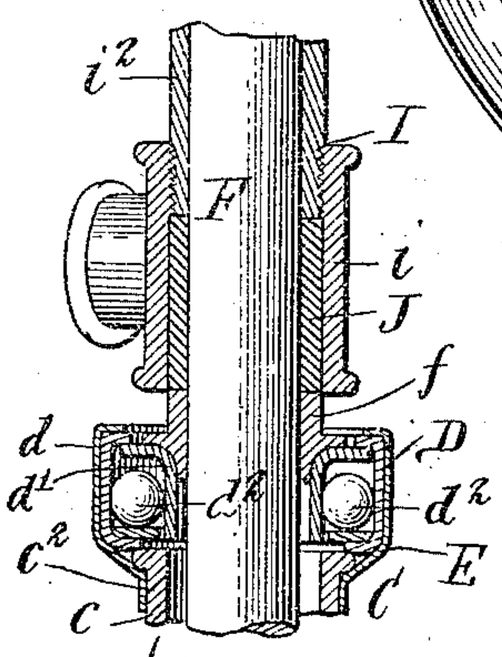
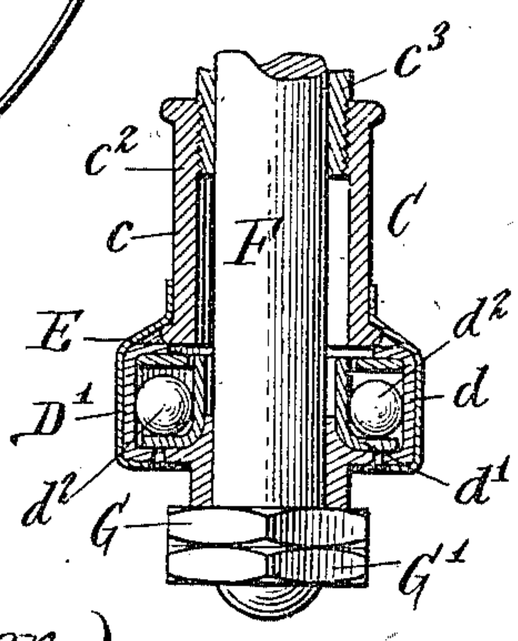


Fig. 5.



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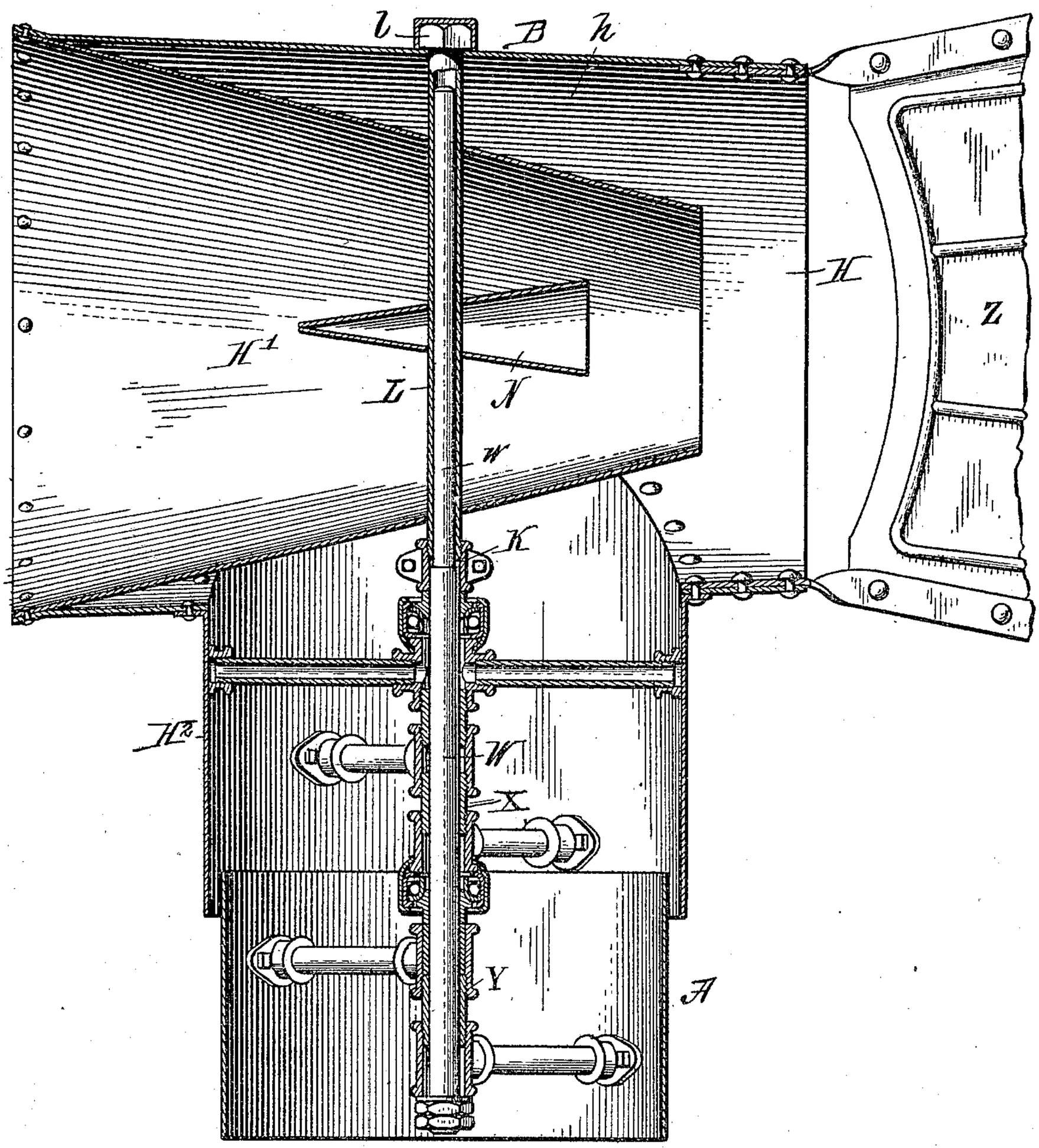
3 SHEETS—SHEET 3.

Fig. 11



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UNITED STATES PATENT OFFICE.

JOSEPH E. FISHER AND ALBERT A. FISHER, OF BUFFALO, NEW YORK, ASSIGNORS TO MARTIN FISHER AND SONS, OF BUFFALO, NEW YORK, A COPARTNERSHIP.

VENTILATOR.

960,873. Specification of Letters Patent. Patented June 7, 1910.

Application filed February 15, 1909. Serial No. 477,881.

To all whom it may concern:

Be it known that we, JOSEPH E. FISHER and ALBERT A. FISHER, both citizens of the United States, and residents of Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Ventilators, of which the following is a specification.

Our invention relates to ventilators and more particularly to that type of ventilators having a revolving portion or head mounted on an air-shaft extending through the roof of a building to the interior of the latter and adapted to revolve on or with said shaft and assume a position to conform to the direction of the wind.

We are aware that there are ventilators of this type now in use, but owing to the enormous strains to which they are at times subjected, their use is limited to the smaller sizes, due to the construction employed being too frail to withstand the effect of severe winds against the extended surface-areas of the larger sizes.

The primary object of our invention is the provision of a structure which will not be affected by the wind and which will permit the construction and the practical use of all sizes of ventilators of this type.

Another object is to so mount the revolving-head upon the air-shaft that deflection of said head from its true axis cannot occur, and to so construct the sustaining-shaft or spindle and support the same that it is almost entirely relieved of lateral strain.

A further object is the provision of a special form of support for the sustaining-shaft whereby great strength and rigidity is combined with cheapness of manufacture; said support having an extended bearing for said shaft and braces for bracing said support at different points in their length and from different directions.

Further objects are the provision of a brace-member to brace the said sustaining-shaft and connect the same to the lower or neck portion of said head or to the air-shaft by radial brace-arms arranged in different planes and disposed in different directions; to support the revolving head directly upon the support by means of the brace-member so as to reduce to the minimum the possibility of bending under the strain of the wind; and to provide means for preventing the water of condensation, created by the warm air drawn through the air-shaft and the cold air passing through the head, from dripping down into said air-shaft.

Still further objects are, to provide the outlet end of the head with a conical member lying almost entirely outside of said head and acting to prevent down or back-drafts and simultaneously serving as a vane; to provide the head exteriorly and at its outlet end with a suction-augmenter; to provide the inner end of the wind-receiving cone with a suction-augmenter which acts to more effectively produce a vacuum in the neck-portion of the ventilator; and to otherwise improve on ventilators of this type.

To these ends the invention consists in the construction, arrangement and combination of parts to be hereinafter described and more particularly pointed out in the appended claims.

In the accompanying drawings, consisting of three sheets, Figure 1 is a central vertical section of our improved ventilator. Fig. 2 is a horizontal section taken on line 2—2, Fig. 1. Fig. 3 is a vertical section taken on line 3—3, Fig. 1. Fig. 4 is an enlarged vertical section taken on line 4—4, Fig. 1. Fig. 5 is an enlarged vertical section taken on line 5—5, Fig. 1. Fig. 6 is a vertical section taken on line 6—6, Fig. 1. Fig. 7 is a vertical section taken on line 7—7, Fig. 1. Fig. 8 is a longitudinal section taken on line 8—8, Fig. 1. Fig. 9 is a vertical section taken on line 9—9, Fig. 1, looking toward the left. Fig. 10 is a longitudinal section taken on line 10—10, Fig. 1. Fig. 11 is a central vertical section, similar to Fig. 1, showing the location of the brace-member and the support reversed.

Referring now to the drawings in detail, like letters of reference refer to like parts in the several figures.

The reference letter A designates an air-shaft or fixed member which is connected with the main air-pipe that communicates with a room, rooms, or other inclosure or inclosures to be ventilated. Surmounting this air-shaft is a revoluble head or cowl B

which is adapted to assume a position to conform to the direction of the wind; said head or cowl being revolved by the wind.

Having reference now to the embodiment of my invention shown in Figs. 1 to 8, C designates a support within the air-shaft or fixed member of the ventilator and it comprises an axial extended bearing-member c and radial brace-arms c^1 arranged in pairs in different horizontal planes with the arms of each pair at a different angle than those of the remaining pair or pairs, thus tying the bearing-member c to the wall of said air-shaft in a rigid and secure manner and bracing the same in different directions.

While we do not wish to confine ourselves to any particular construction of support, we find the construction shown lends itself admirably for the purpose intended and as it can be easily constructed, owing to its being formed of common wrought iron or other suitable pipes and pipe-fittings, we now adopt it as the preferred construction. It is apparent, however, that any support embodying the principles of the support shown, whether constructed of pipes and pipe-fittings, or of cast, wrought or machined elements, falls within the scope of this invention.

In the support herein shown, the bearing-member c is constructed of a plurality of alined or four-way pipe-fittings c^2, the number of these fittings depending on the number of pairs of brace-arms employed in the support, and these fittings are connected by nipples or short lengths of pipes c^3 threaded into adjacent ends of the fittings. The brace-arms are constructed of pipes c^4 and sockets c^5; the latter being riveted, bolted, or otherwise suitably secured to the inner side of the air-shaft and having the outer ends of the brace-arms threaded into them while the inner ends of said brace-arms are threaded into the horizontal sockets of the fittings c^2.

Fastened to the upper end of the support C, or more particularly to the upper end of The upper pipe-fitting c^2, is an anti-friction bearing D and fastened to the lower end of the lower pipe-fitting c^2 is an anti-friction bearing D^1. Each anti-friction bearing comprises by preference, a stationary outer half-raceway d, a revoluble inner half-raceway d^1 and an annular series of anti-friction balls d^2 interposed between said half-raceways. We confine said anti-friction bearings within housing E which are secured to the upper and lower ends of the support, said housings being preferably made of sheet-metal clamped or otherwise fastened to the upper and lower pipe-fittings, as best shown in Figs. 4 and 5 and also made to grip the outer half-raceways to prevent their revolving.

Journaled to revolve in the support C is a sustaining-shaft or spindle F which supports the head or cowl of the ventilator and it also extends through the anti-friction bearings D and D^1 and has the inner half-raceways d^1 of said bearings arranged to revolve therewith. Surrounding said shaft or spindle above the support is a bearing-cone f which rests upon the inner half-raceway of the anti-friction bearing D and a similar bearing-cone f^1 surrounds said shaft or spindle below the support and is held against the inner half-raceway of the anti-friction bearing D^1 by a nut G threaded onto the lower end of the shaft or spindle; a jam-nut G^1 being provided to prevent unscrewing of the nut G.

The head or cowl B of the ventilator comprises essentially a horizontal main tube or shell H having a conical or tapering tube H^1 arranged centrally therein and forming the main draft passage, and a neck H^2 depending from said tube or shell and opening into the gradually increasing annular space h between the tapering tube H^1 and the main tube or shell H. Said neck is somewhat greater in diameter than the air-shaft A and slightly overlaps the upper end of the latter with an annular space h^1 between the two.

The sustaining-shaft or spindle F extends up into the neck of the cowl and is rigidly connected therewith by a brace-member I; which, like the support B, is also formed of pipes and pipe-fittings. Said brace-member comprises a hub formed of a plurality of alined + or cross-fittings i connected by a nipple or short length of pipe i^2, and radial arms i^3 threaded with their inner ends into the horizontal sockets of the fittings i and having their outer ends threaded into sockets i^4 bolted, riveted, or otherwise fastened to the inner side of said neck. In order to insure a secure binding of the shaft or spindle within the hub of the brace-member so that the cowl is compelled to rotate with said shaft or spindle, the fittings i are filled with Babbitt or other metal, as shown at J, Figs. 1 and 4. The brace-member may, however, be otherwise secured to said shaft or spindle, and in lieu of pipes and pipe-fittings, cast, wrought, or machined elements or parts may be used. The radial arms i^3 are arranged in pairs in different horizontal planes with the arms of each pair at a different angle than those of the remaining pair or pairs, as the case may be. In this manner the cowl is rigidly connected with the sustaining-shaft or spindle and braced from different directions.

In the drawings we have shown two pairs of radial arms employed in the construction of the brace-member, and while this is sufficient for ventilators of from ordinary to medium large sizes, it may be necessary in very large sizes to employ three or more pairs of

radial-arms, in which cases the arms would be set at such angles as to brace the neck of the cowl equidistantly around its circumferences. We have also shown a support with three pair of brace-arms, and this number can be diminished or increased in proportion as the sizes are reduced or enlarged.

It is to be noted that the brace-member I bears directly upon the upper cone *f* and consequently the entire weight of the head or cowl is carried by the upper anti-friction bearing, and as the sustaining-shaft is braced in different directions from the upper end of the brace-member to the lower end of the support, lateral deflection of the same is entirely avoided, particularly since the brace-member is in direct contact with the support. This is a very essential feature of our invention, since it obviates all possibility of the shaft bending or breaking between its points of connection to the head or cowl and those to the air-shaft.

While the support C sustains the weight of the head or cowl through the upper ball-bearing, it also receives all lateral or twisting strain the head or cowl is subjected to, through both the upper and lower ball-bearings. A lateral strain applied to the head or cowl tends to force the upper end of the support laterally in the same direction and simultaneously raise the shaft, in consequence of which the lower ball-bearing receives an upward strain which is imparted to the support; but as the latter is braced in different directions and in different horizontal planes, it will effectively prevent the deflection of the head or cowl B, and with the aid of our improved brace-member I supported directly upon the support C, said head or cowl will at all times be maintained in position for free revolving action.

The upper end of the sustaining-shaft or spindle F projects above the upper end of the brace member I and is connected to a brace K comprising a + or cross pipe-fitting *k* into the lower socket of which said shaft or spindle is threaded, radially-disposed pipes k^1 having their inner ends threaded into the horizontal sockets of said fitting, and sockets k^2 riveted, bolted, or otherwise secured to the wall of the neck of said head or cowl and having the outer ends of said pipes threaded thereinto. This brace is preferably arranged at a different angle than the radial arms i^3 of the brace-member, so that while forming no part of the brace-member, it acts in conjunction with the same and the support B to effectively brace the shaft.

The brace K serves as a connector to connect the shaft or spindle F with a tube L having its axis coincident with that of the shaft and extending upward from said brace, through the tapering draft-tube H^1 and through the main tube or shell H, the projecting upper end thereof having a nut *l* applied thereto. This tube serves to firmly steady the upper end of the head or cowl and also serves as a means to support the inner end of the draft-tube H^1. It is apparent that the same effect would be obtained by extending the sustaining-shaft or spindle F so as to reach through the top of the head or cowl, but such a construction would be more expensive.

The main tube or shell H of the head or cowl is tapered slightly rearward, and while the flaring wind-entrance formed by the conical inner or draft-tube and the increased surface area at the entrance end of the head or cowl would cause the latter, under heavy winds, to be directed with the inlet end facing the wind, we provide an improved vane M which enables the head to be revolved readily by light winds. This improved vane is situated at the rear or outlet end of the head or cowl and serves also to prevent back-drafts, thus preventing the admission of cold air into the room or inclosure. The vane is in the form of a cone having its apex directed inward and it is secured to the main tube or shell of the head or cowl by braces *m*, its rear end being cylindrical, as at m^1. The wind striking against the outer surface of this vane causes the head or cowl to revolve, and if at any time the rear end of the latter faces the wind or is at a slight angle to the direction in which the wind is blowing, the entrance of the wind into the rear end of the head or cowl is, to a considerable extent, shut-off by the vane and the tapered inner surface of the latter receiving the force of the wind causes the head or cowl to be rotated so that the entrance end of the latter is swung into the wind.

Secured to the tube L is a conical spreader N arranged axially within the draft tube H^1 and having the apex at its front. This spreader acts to direct the air-currents toward the wall of the draft-tube. or in other words, away from the axial line, and as the air-currents passing along the tapering wall of said draft-tube are directed toward the axial line, the diverging currents thus created pass out through the rear end of the draft-tube and out the main tube H with accelerated speed. In passing out the small or rear end of the draft-tube H^1, the air within the neck of the head or cowl is drawn out of the latter and is discharged through the rear or outlet end thereof, thereby causing a vacuum within said neck so that the foul and heated air from the room or inclosure rises uninterruptedly into said neck and is drawn therefrom and discharged through the outlet of the head or cowl with the outrushing air-currents.

In order to increase the draft in the air-

shaft, an annulus O is secured to the outlet end of the draft-tube H^1 so that part thereof extends into said tube and part projects beyond the rear edge of the same. Said annulus is preferably in the form of a short cylindrical tube separated from the wall of draft-tube H^1 by an annular intervening space P gradually restricted rearwardly. This annulus may well be termed a draft-augmenter and it is secured to the wall of the draft-tube H^1 by arms *o*. The air-currents passing rearward along the tapering wall of the draft-tube is compressed as it is forced along through the intervening space P and is thereby accelerated, and under this increased speed, it escapes from the draft-tube in direct contact with the rear edge thereof, thus creating increased suction on the air within the neck of the head or cowl and producing an effective draft under all conditions. We have also applied to the rear end of the main tube or shell B, a suction-augmenter, whereby the air passing along the outer surface of the head or cowl is utilized to cause suction within the rear end of said main tube or shell. Said suction-augmenter, so called, because it increases the suction action of the wind passing over the rear end of the head or cowl, is in the form of an annulus R surrounding the rear end of the tube or shell and separated therefrom by an intervening space S. Said annulus is secured to said tube or shell by brackets or arms, *r*. By preference, we make said annulus with a flaring front portion r^1 and a cylindrical rear portion r^2 so that the air-currents are compressed and increased as they pass through the intervening space S. This device causes the air-currents to pass over the rear edge of the main tube at an increased speed, and thus act, by suction, to hasten the escape of the air-currents from within the head or cowl.

The cold-air passing through the draft-tube H^1 and coming in contact with the inner surface thereof causes sweating of the tube on the outer side thereof, owing to the warm air rising from the room or inclosure coming in contact with said outer side and being condensed by the cold condition of the tube. This water of condensation, would under ordinary conditions drip down through the air or ventilating pipe and be returned to the room or inclosure. To prevent this, we have arranged lengthwise and centrally underneath said draft-tube, troughs T into which the water of condensation flows from the curved wall of said tube. Said troughs are provided at their lower ends with spouts *t* from which the water drips and passes out between the neck of the hood and the air-draft.

In ventilators of this type very little suction is created at the front end of the annular space *h* surrounding the draft-tube, and we therefore make provision to draw the air therefrom and direct it through the rear portion of said tube with the wind or air-currents passing entirely through the same. For this purpose we provide the draft-tube with openings U screened with hoods *u* open at their rear ends so that no portion of the wind and air-currents entering the front of the head or cowl can pass through said openings. The wind and air-currents passing over said hoods act to draw the air in the front end of the space *h* into the draft-tube to be carried rearward and out of the rear end of the head. This creates a partial vacuum in said space and permits the air from the air-shaft to rise thereinto to be drawn therefrom through the openings U. The hoods also serve to prevent rain, or other elements of the weather entering the air-shaft through said openings, and as a further preventative against this, we secure guards V to the inner surface of the draft-tube in rear of the openings situated beneath the horizontal center of said tube, said guards being preferably of angle-formation in cross-section and curved in the direction of length so that the inwardly or radially-disposed flange *v* thereof will be a distance from the rear ends of the openings, thus leaving a free passage for the escape of the air from the front end of the space *h*. Any other suitable guard may be used for this purpose, and guards may also be provided for the openings U above the horizontal center, but this we do not deem necessary. Owing, however, to the draft-tube tapering rearward, the elements of the weather entering said tube and reaching a point in rear of said openings would flow toward the entrance end of the tube and part thereof enter the air-shaft through the openings below the horizontal center, but this is effectively prevented by the use of the guards U, or equivalent means, in rear of said last mentioned openings.

In Fig. 11 of the drawings, we have shown the ventilator in slightly modified form, with the suction-augmenters O and R, the openings U and the troughs T omitted, and a common vane Z substituted for our improved conical vane. It is therefore, apparent that parts of the ventilator can be omitted or other parts substituted for some of those shown. In this particular modification, the supporting-shaft or spindle remains stationary and the head or cowl is revolubly mounted thereon. Said shaft or spindle, designated W differs from that shown in the figures previously described in that it has a reduced upper portion *w* which enters the tube L and the latter and the brace K rotate about said shaft. The brace-member, designated X is constructed

similar to the support C shown in Figs. 1, 2, 4 and 5, and the support, designated Y is constructed similar to the brace-member I, shown in said figures.

We have herein shown and described the construction embodying the principle of our invention now thought to be the best for the purpose intended, but we do not limit ourselves to such construction; on the contrary, we hold ourselves at liberty to make such changes in the construction as fairly fall within the scope of our invention, and therefore, we claim as our invention,—

1. A ventilator comprising an air-shaft, a support within said shaft comprising an axial extended hub and arms connecting said hub at different points in its length with the wall of said air-shaft, anti-friction bearings at the upper and lower ends of said hub, a rotatable sustaining-shaft passed through said hub and said anti-friction bearings and having its lower end threaded, a nut applied to said threaded end of the sustaining-shaft and acting to bear upward on the adjacent anti-friction bearing, and a cowl rotatable with said sustaining-shaft and supported by the anti-friction bearing at the upper end of said hub.

2. A ventilator comprising an air-shaft, a support within said shaft formed of pipes and pipe-fittings and comprising an axial extended hub and arms connecting said hub at different points in its length with the wall of said air-shaft, anti-friction bearings at the upper and lower ends of said support, a rotatable sustaining shaft passed through said hub and bearings and rotatable with the moving parts of said bearings, and a cowl secured to said sustaining-shaft above said support and being supported by the latter.

3. A ventilator comprising an air-shaft, a support within said air-shaft, a sustaining-shaft rotatable in said support and extending upward therefrom, a cowl surmounting said air-shaft, and a brace-member within said cowl comprising an extended axial hub and radial arms connecting said hub at different points in its length with the wall of said cowl, said hub being secured to the sustaining-shaft and bearing with its lower end against the upper end of said support.

4. A ventilator comprising an air-shaft, a support within said air-shaft, a sustaining shaft rotatable in said support and extending upward therefrom, a cowl surmounting said air-shaft and having a depending neck, and a brace-member within said neck comprising an extended axial hub and a plurality of pairs of radial arms arranged in different horizontal planes and connecting said hub with the wall of said neck, each pair of said arms being disposed in different directions and the hub of said brace-member being supported by said support.

5. A ventilator comprising an air-shaft, a support within said shaft comprising an axial extended hub and radial arms connecting said hub with the wall of the air-shaft, said hub being formed of + pipe-fittings and nipples or pipes connecting said fittings and said radial arms being formed of pipes secured at their outer ends to the wall of the air-shaft and having their inner ends threaded into the horizontal sockets of said + pipe-fittings, a sustaining-shaft in said hub, and a cowl mounted on said sustaining-shaft and supported by said support.

6. A ventilator comprising an air-shaft, a support within said air-shaft, and a sustaining-shaft rotatable in said support, a cowl surmounting said air-shaft and having a depending neck, a brace-member within said neck comprising an axial extended hub formed of + pipe-fittings, nipples or pipes connecting said fittings and radial arms formed of pipes having their outer ends secured to the wall of said neck and their inner ends threaded into the horizontal sockets of said fittings, said sustaining-shaft being fastened into said hub and said hub being supported by said support.

7. A ventilator comprising an air-shaft, a cowl surmounting said air-shaft and comprising a main horizontal tube, a neck portion depending from said tube, and a draft-tube arranged lengthwise in said main-tube and extending over said neck-portion, a support within said air-shaft having an axial hub, a brace-member in said neck-portion having an axial hub alined with the hub of said support, a sustaining shaft journaled to revolve in said support and secured in the hub of the brace-member, a brace above said brace-member having an axial socket into which the upper end of said sustaining-shaft is threaded, and a tube extending vertically through said draft-tube and having its upper end secured in the wall of the main horizontal tube and its lower end threaded into the axial socket of said brace.

8. A ventilator comprising an air-shaft, a cowl surmounting said air-shaft and having a draft-tube subjected on its outer surface to the warm air rising through said air-shaft and on its inner surface to the cold air-currents, and means to prevent the water of condensation caused by the sweating of said draft-tube from dripping into said air-shaft.

9. A ventilator comprising an air-shaft, and a cowl rotatable on said air-shaft and comprising a horizontal main tube and surrounding the upper end of said air-shaft with a space between the two, a neck-portion depending from said main-tube and a ta-

pered draft-tube arranged lengthwise in said horizontal main tube and extending over the neck-portion, and a trough arranged centrally beneath said draft-tube and leading toward the wall of said neck-portion to direct the water of condensation out between said neck-portion and the air-shaft.

10. A ventilator comprising two members, one an air-shaft and the other a cowl surmounting said air-shaft, a support within one of said members and a brace-member within the other, said support and said brace-member each comprising a hub and radial arms connecting said hub with the wall of the member in which it is located, and a sustaining-shaft secured in one of said hubs and loose within the other.

11. A ventilator comprising a horizontal main tube, a neck-portion depending from said tube, and a draft-tube arranged lengthwise within said main-tube and separated from the latter by an intervening space, said draft-tube having openings between its ends, individual disconnected hoods screening said openings and open at their rear ends, and a guard in rear of at least one of said openings to prevent the elements of the weather entering said opening through the open rear end of the coöperating hood.

12. A ventilator comprising an air-shaft, a cowl surmounting said air-shaft, a support within said air-shaft comprising a hub and a plurality of pairs of radial arms connecting said hub with the wall of said air-shaft, the arms of each pair being at different angles than those of the remaining pair or pairs, and a sustaining-shaft supported by said support and sustaining said cowl.

In testimony whereof, we have affixed our signatures in the presence of two subscribing witnesses.

JOSEPH E. FISHER.
ALBERT A. FISHER.

Witnesses:
ELLA C. PLUECKHAHN,
MATILDA C. STICHT.