3 Sheets—Sheet 1.

J. H. IRWIN.

Combined Atmospheric Injector and Ejector.

No. 205,650. Patented July 2, 1878.

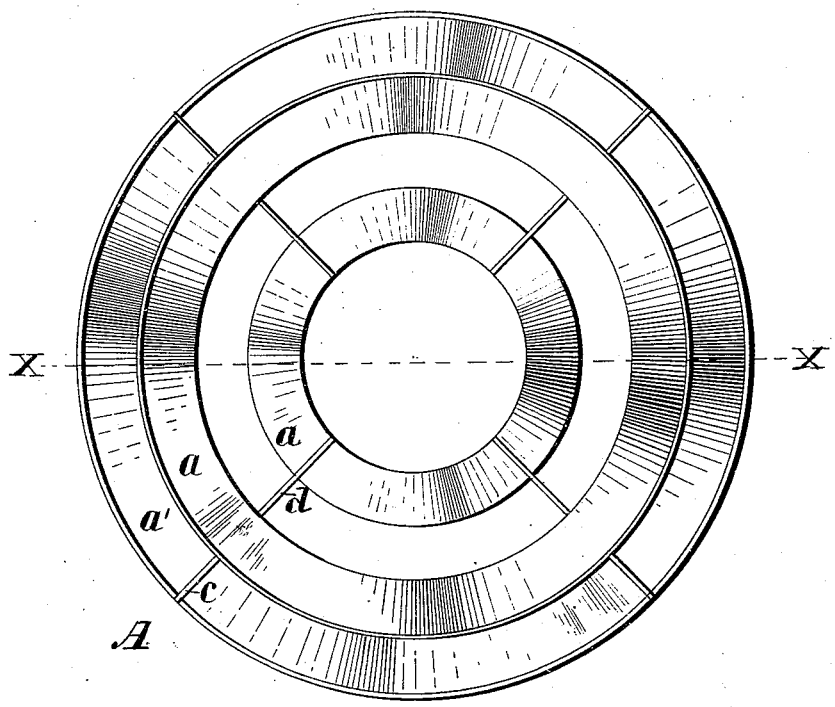

Fig 1

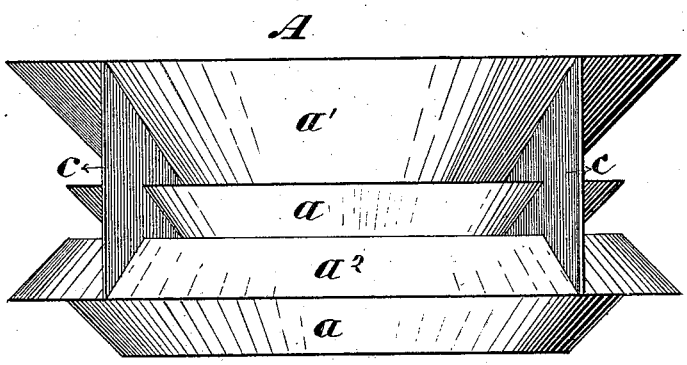

Fig 2

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3 Sheets—Sheet 2.

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Fig. 3.

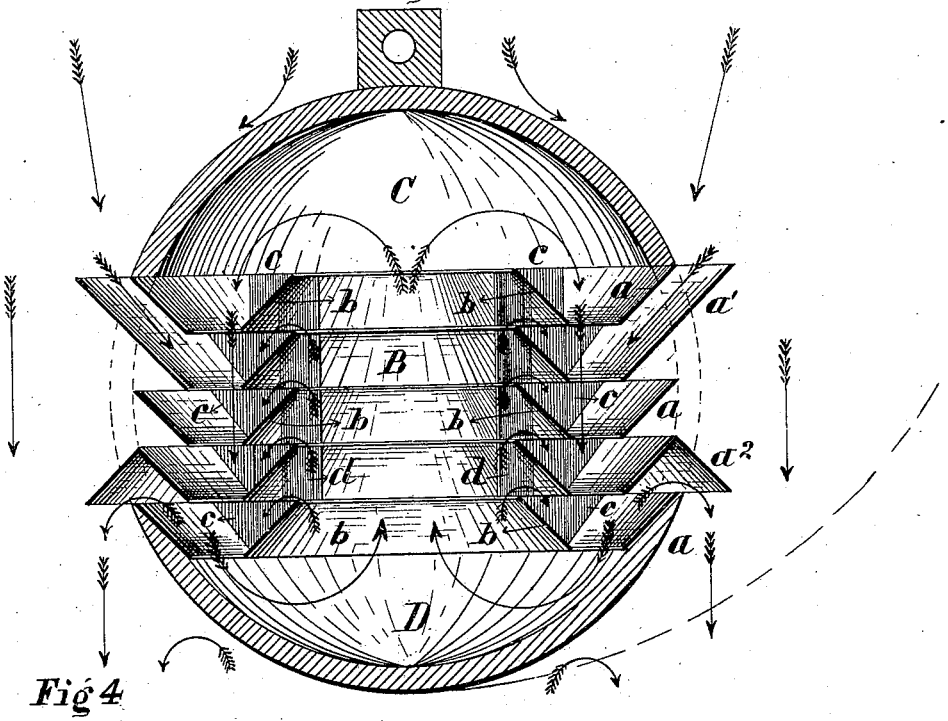


Fig 4

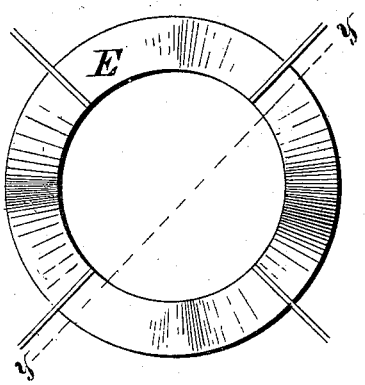
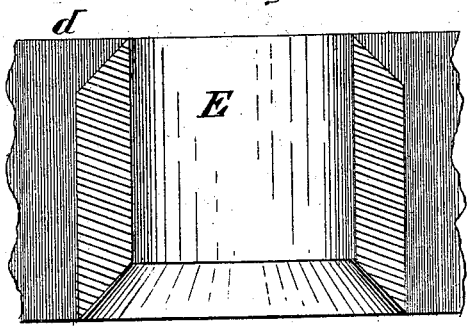


Fig 5



Witnesses

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3 Sheets—Sheet 3

J. H. IRWIN.

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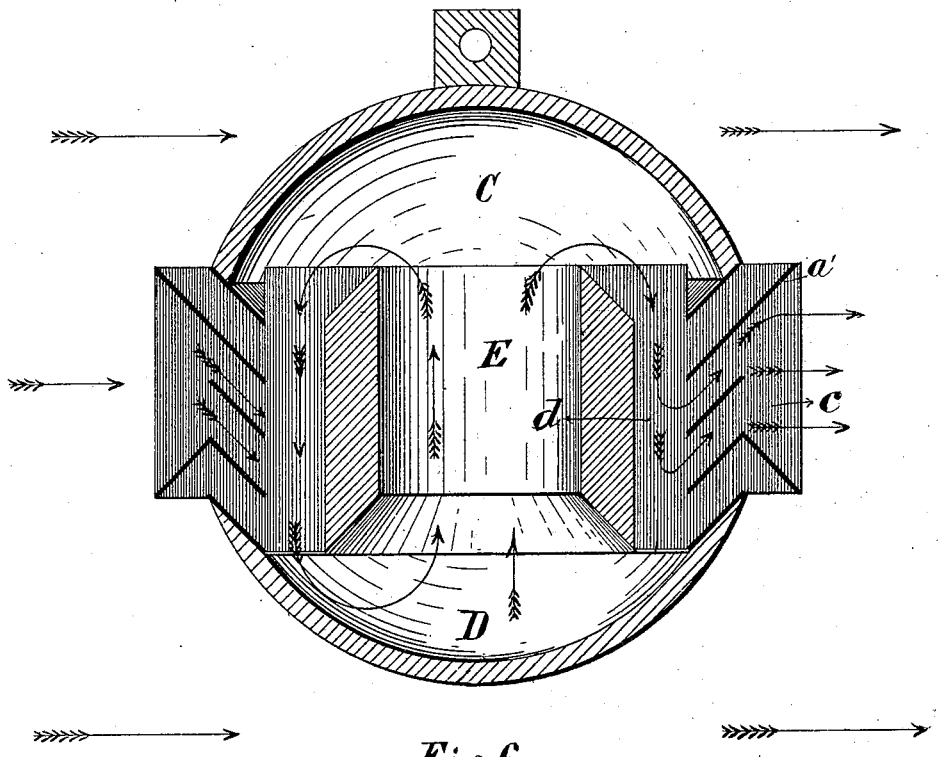

Fig 6

Witnesses

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UNITED STATES PATENT OFFICE.

JOHN H. IRWIN, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN COMBINED ATMOSPHERIC INJECTOR AND EJECTOR.

Specification forming part of Letters Patent No. **205,650**, dated July 2, 1878; application filed January 30, 1878.

To all whom it may concern:

Be it known that I, JOHN H. IRWIN, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Combined Atmospheric Injector and Ejector, which is fully described in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a plan view of my combined injector and ejector; Fig. 2, an elevation of the same; Fig. 3, a sectional view of the same applied to a sphere, the section being taken on the line *x x*, Fig. 1; Fig. 4, a plan view of the ejector modified in construction; Fig. 5, a sectional view of the same, taken on the line *y y*, Fig. 4; and Fig. 6, a sectional view of the device thus modified applied to a sphere.

In Letters Patent No. 104,318, granted to me June 14, 1870, for an improvement in lanterns, there are shown and described an atmospheric injector and ejector operating in combination, but arranged at some little distance apart.

In Letters Patent No. 150,958, granted to me May 19, 1874, an injector and ejector are shown in combination with each other; but the one is superimposed upon the other, or arranged adjacent to each other in an endwise direction.

My present improvement relates to a device in which the injector and ejector are similar in general construction to those shown in the Letters Patent last named, but in which they are combined under a somewhat different arrangement, whereby desirable results are obtained.

The invention consists in arranging the ejector within the injector, or, in other words, combining an annular injector with a cylindrical ejector arranged within the former.

In the drawings, A represents the injector, which is composed of a series of annular plates, *a*, in the form of the frustum of a cone, the side of which is inclined at an angle of forty-five degrees. These plates are arranged one directly over another, as shown in Fig. 3 of the drawings, except the upper one, which is arranged at a distance from the next lower plate *a* equal to the vertical height of one of the sections, and a plate, a^1, of similar form, is interposed between the two upper plates *a*, which is considerably wider than the others, so that its outside or upper edge is even with the corresponding edge of the upper plate *a*. The smaller plates *a* are four in number, making, with the larger plate a^1, five deflectors, or, in other words, providing four openings for the diving currents. A plate, a^2, is attached to the upper or outer edge of the plate *a*, next to the bottom, which is inclined outward in the same way, at the same angle, as the plate *a* inclines inward, so that it will act as a deflector in an opposite direction to the latter.

These plates, being arranged as shown in the drawings, will operate upon currents of air coming in contact therewith in a manner similar to that described in my former patent of May 19, 1874, referred to above, and constitute an atmospheric injector very similar in construction to that described in the said patent.

It will be noticed that this injector is annular in form, leaving a large interior vacant space. In this space, within the annulars, I arrange an ejector, B, which is composed of plates *b*, of the same general form, and inclined at the same angle, as the plates *a*, but of smaller diameter, and arranged in an inverted position as compared with the plates of the injector—that is to say, the smaller diameter of a frustum of the ejector is in the same line with the larger diameter of the corresponding surrounding injector, as clearly shown in Fig. 3 of the drawings.

The plates *b* are all of the same size, and have the same perpendicular height as the plates *a*, and are five in number, thus corresponding with the injector-plates in providing four openings between them. These plates, arranged as described, constitute an air-ejector, which operates in connection with the injector A, which surrounds it, as will presently be described.

The plates of the injector are connected together by perpendicular stay-plates *c*, and the corresponding plates of the ejector by similar stay-plates, *d*, which also serve to connect the ejector to the injector by which it is supported.

Any other device suitable for the purpose

may be employed, however, for connecting and supporting the plates. The outside plates *c* also act as deflectors to turn the air into the injector by preventing it from passing around on the outside of the device.

This device, constructed and arranged substantially as described above, is applicable wherever it is desired to maintain a continuous atmospheric circuit, whatever may be the changes in the currents of the surrounding atmosphere.

For the purpose of illustration, I have shown in Fig. 3 of the drawings this device applied to a sphere, having selected this form because with it the action of the injector and ejector is theoretically perfect. In this drawing, the hollow sphere is represented as having its central portion cut away, and the combined injector and ejector inserted into this space, so that there will be a circular chamber, C, above the apparatus, and a similar circular chamber below it, the two being connected by the central opening within the ejector B, which constitutes a flue.

Suppose, now, there is a fire or heating apparatus of some kind in the central portion of the lower part of the lower chamber D, which of course naturally produces a current of rarefied air and gases up through the flue in the center of the apparatus. Suppose, too, an outside atmospheric current proceeding in a downward direction, as indicated by the arrows. That portion of the air coming inside of the outer injector-plate a^1 will be deflected downward, as indicated by the arrows, until finally it enters the lower chamber, where, becoming rarefied, it will rise through the central shaft or flue into the upper chamber; but the action of the injected current will be such as to turn the current, after it enters the upper chamber, back within the upper injector deflecting-plate *a*, as shown by the arrows, and also to take a portion of the air ascending through the flue out of the openings between the ejector deflecting-plates, as indicated by the small arrows, in accordance with well-known laws. This air, mixing with the incoming air from the outside, will be carried down with it into the lower chamber again, and so on continuously, a steady current being kept up, as described. A portion of the air injected into the lower chamber will be deflected by the walls of said chamber upward and outward through the lower opening, and, escaping, will be deflected by the double plates $a\ a^2$, so that it will pass out and be turned down below the injector.

I have referred to the sphere as presenting one of the most favorable forms for the operation of the device. This must be evident from the fact that the inclosing circular wall will have the same deflecting effect upon the atmospheric currents in all directions, and the operation of the device will be more or less nearly perfect, according to the shape of the structure to which it is applied.

I have shown in the drawing an illustration by arrows of the operation with the wind or atmospheric current coming from one direction only. It will be readily understood, however, that the effect is similar whatever the direction of the current. Suppose, for instance, the wind is blowing from one side directly against the injector, a portion will be caught by the deflecting-plates *a*, turned downward and across to the deflecting-plates *b* of the ejector, and turned upward by them into the flue-shaft, which it will cross to the openings in the ejector on the opposite side, where it will be deflected downward by the plates *b*, and, caught by the plates *a* on the same side of the apparatus, will be deflected upward again, and escape into the open air, a portion, of course, being deflected into the lower chamber, where the operation is substantially as already described.

It is evident also that the effect will be the same, whether the apparatus is stationary and acting upon currents in the surrounding atmosphere, or the atmosphere be quiet and the apparatus oscillated, as indicated by dotted lines in Fig. 3, or moved in any direction whatever. The air will always enter the injector, from whatever direction blowing or whatever may be the motion of the apparatus, and the balancing effect of the ejector will remain under all circumstances so that the continuity of the circulation cannot be interrupted.

In Figs. 4 and 5 I have shown a modification of the ejector, in which it is made in the form of a cylinder, E, having the same thickness as that of the ejector described above, so that when placed within the injector, as shown in Fig. 6 of the drawings, it will occupy the same space as the former.

In Fig. 6 the operation of the device thus constructed is illustrated, the application also being made to a sphere.

Suppose the wind to be blowing directly against the apparatus from the left, as indicated by the arrows. It will be caught by the injector and deflected downward, as heretofore described, into the lower chamber D; thence will pass up through the central flue into the upper chamber C, where it will be drawn down into the injector on the opposite side of the apparatus, and be deflected upward and outward, so as to escape therefrom, as indicated by the arrows, a small portion being also turned down in a similar way on the other side of the apparatus and directed into the lower chamber again, as described.

This device is practically applicable in a great number of places for the purpose of securing the ventilation of buildings, ships, mines, &c., for supplying a continuous current of air to furnaces, lamps, or lanterns, and heating and illuminating apparatus generally, and many other like applications which it is not necessary to describe particularly here, as they will be made the subject-matter of other applications for Letters Patent.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An annular atmospheric injector, in combination with an atmospheric ejector arranged within the former, and operating in connection therewith, substantially as described.

2. An annular atmospheric injector, in combination with an ejector arranged within the former and chambers or receiving-compartments arranged above and below the injector, whereby a balancing effect is secured and a continuous circulation produced, substantially as described.

3. The injector deflecting-plates *a* and *a*^{1}, in combination with the ejector deflecting-plates *b*, constructed, arranged, and operating substantially as described.

4. The deflecting-plates *a* *a*^{1} of the injector, in combination with the supporting and deflecting plates *c*, substantially as described.

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