

(No Model.)

2 Sheets—Sheet 1.

W. A. EUDALY.

STEAM AND AIR BLOWER FOR FURNACES.

No. 551,927.

Patented Dec. 24, 1895.

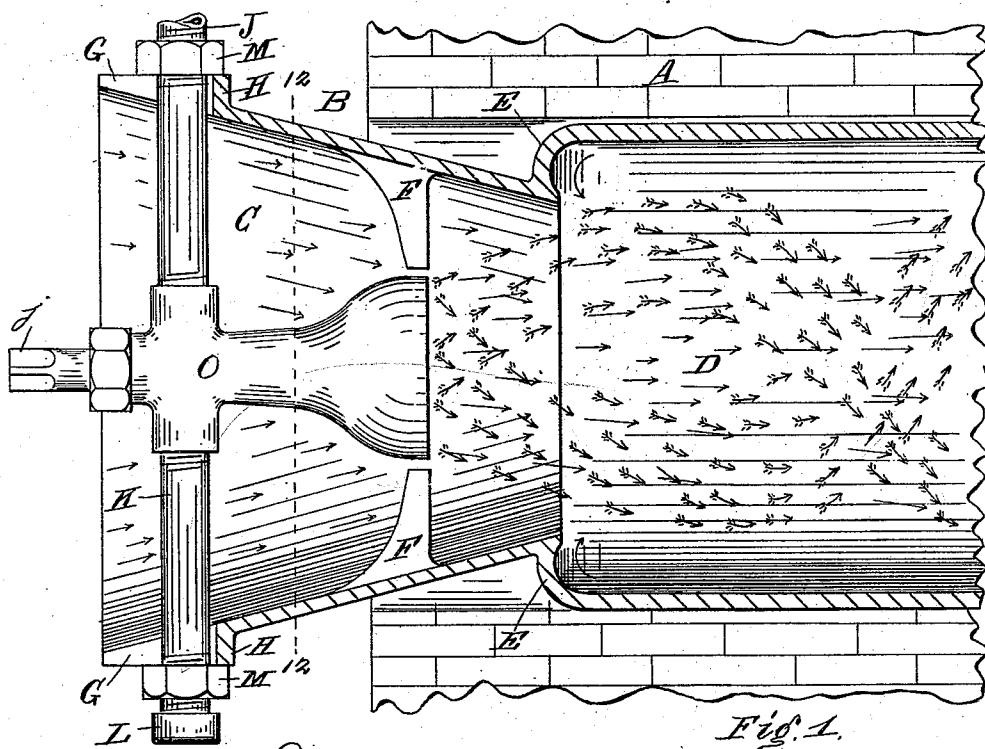


Fig. 1.

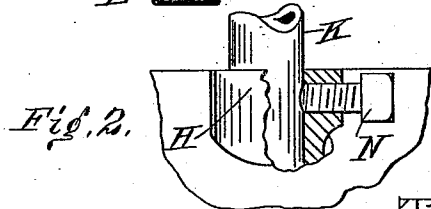


Fig. 2.

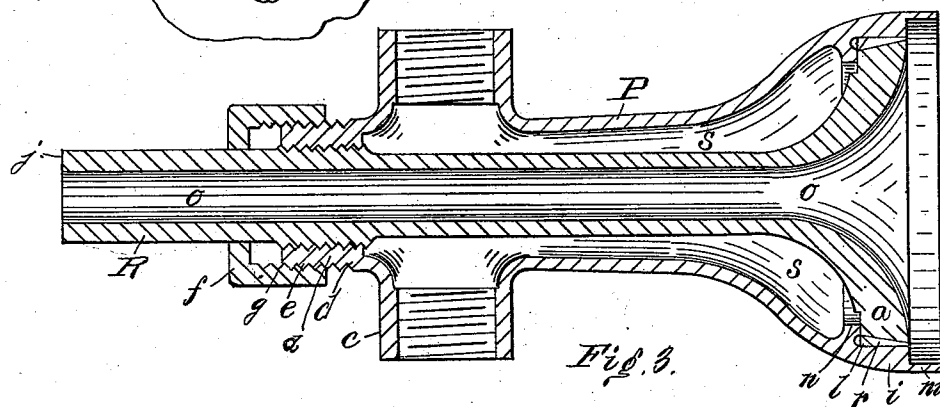


Fig. 3.

Witnesses:

E. B. Duffly
Chas. M. Worrell

Inventor.

W. A. Eudaly
per E. B. Duffly
Attorney.

(No Model.)

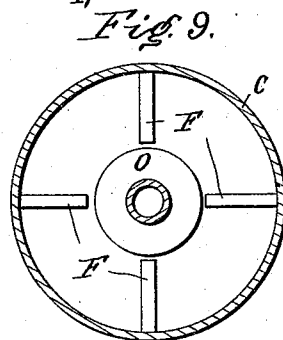
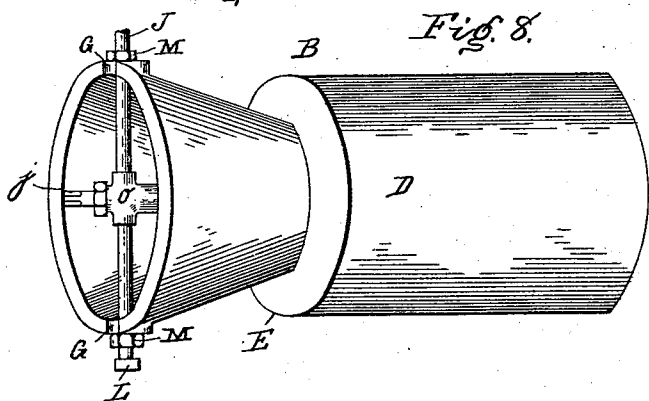
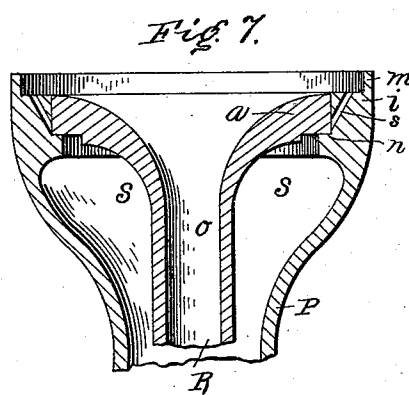
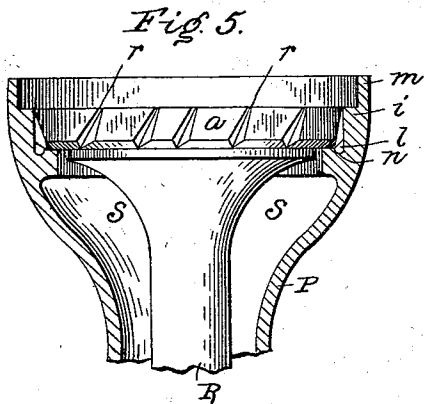
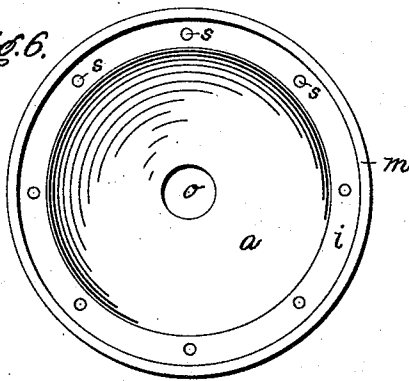
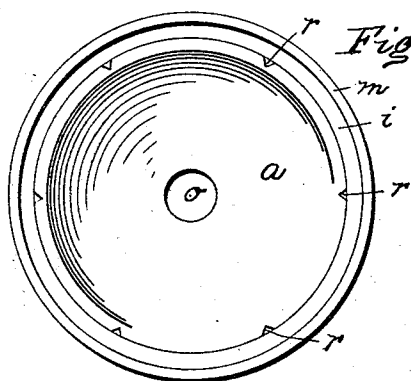
2 Sheets—Sheet 2.

W. A. EUDALY.

STEAM AND AIR BLOWER FOR FURNACES.

No. 551,927.

Patented Dec. 24, 1895.



Witnesses:
E. C. Duffy
Chas. M. Werle

Inventor
Wm. A. Eudaly
per E. C. Duffy
Attorney

UNITED STATES PATENT OFFICE.

WILLIAM A. EUDALY, OF CINCINNATI, OHIO.

STEAM AND AIR BLOWER FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 551,927, dated December 24, 1895.

Application filed September 6, 1895. Serial No. 561,647. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. EUDALY, of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Feeding Air to Furnaces and Steam and Air Blowers; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

My invention relates to certain new and useful improvements in steam and air blowers adapted to be applied to any kind of steam or heat producing furnaces.

The objects of my invention are to provide an adjustable steam and air blower suitable to be applied to any kind of a furnace, either below or above the grate-bars, or both at the same time, at the option of the operator, and for the purpose of supplying the requisite volume of air and steam to give the required amount of draft to the furnace, and at the same time aid in the combustion of the fuel, which fuel may be of the cheaper grades—such as hard or soft coal, screenings, slack, dust, or culm.

My invention has for a further object the providing of a furnace of any kind with an adjustable steam-jetting device, whereby the volume of steam and air permitted to enter the furnace can be increased or decreased while the blower is in operation and without altering the pressure in the steam-supply pipe or steam-nozzle.

My invention has for a further object the providing of a blower, the construction of which is such as to prevent any back-pressure in the air-conveyer.

My invention has for a further object the providing of a furnace with an adjustable steam-nozzle adapted to be cleaned while the blower is in operation, as will more fully hereinafter appear.

My invention consists in providing a steam and air blower with a steam and air conveyer of a peculiar construction, whereby the back-pressure usual in steam-blowers is en-

tirely overcome, as will more fully hereinafter appear.

My invention consists further in providing an air-conveyer of any shape with an adjustable steam-jetting device adapted to regulate the volume of steam and air flowing through the conveyer without altering the steam-pressure in the steam-supply pipes or steam-nozzle, as will more fully hereinafter appear.

My invention consists further in providing a steam and air blower with an annular adjustable steam-jetting device, whereby the steam-jetting openings are adapted to be increased or diminished in size while the blower is in operation and without altering the steam-pressure, as will more fully hereinafter appear.

My invention consists further in providing a steam and air blower with a steam-nozzle having a series of annular steam-jet openings, so constructed and arranged in reference to the other parts of the nozzle that the escaping jets of steam are made to pass into the air-conveyer in opposite directions with a whirling motion, as and for the purposes hereinafter set forth.

My invention consists further in providing a steam and air blower with a steam-jetting device adapted to be cleaned while in operation and without the aid of external means, as will more fully hereinafter appear.

My invention consists further in certain combinations and details in construction of the parts of an air-conveyer and steam-jetting device, as will be more fully hereinafter described and set forth in the claims.

In the accompanying drawings, Figure 1 represents a longitudinal mid-section of the air-conveyer with the steam-jetting device O and steam connections represented in perspective. Fig. 2 is a broken section showing the method of fastening the steam-jetting device O to the air-conveyer B by means of lugs H and set-screws N. Fig. 3 is a perpendicular longitudinal section of the steam-jetting device O as seen in Fig. 1. Fig. 4 is an end view of Fig. 3, showing the position of the semiconical steam-jet openings *r*, which may consist of any desired number. Fig. 5 is a longitudinal section of my steam-jetting device, showing the steam-jet openings *r* cut at an angle

across the periphery of the head *a*. Fig. 6 is an end view of Fig. 7. Fig. 7 is a longitudinal section of my steam-jetting device, showing another form of my steam-jet openings, as indicated by the letter *s*. Fig. 8 is a perspective view of my steam and air blower. Fig. 9 is a cross-section on the line *x x* of Fig. 8, showing the position of the guide-wings *F* and the end of the bell-mouthed arm *P* of the steam-nozzle *O*.

A represents the furnace-wall, which may be of brick when the blower is introduced at the side of the furnace, or an iron plate when the blower is attached to the front of a boiler-furnace. The ash-pit, grate-bars, and furnace above the grate-bars may be of any form best adapted to the purposes and fuel intended.

B is the air-conveyer as a whole, which is formed by the use of a frustum of a cone *C*, the small end of which is attached to an expansion-cylinder *D* by means of an annular curved flange *E*. The cylinder *D* being larger than the small end of cone *C* allows room for the steam and air to mix and expand at a point beyond the shoulder or flange *E*.

It has been found that the currents of steam and air forming the back-pressure in steam and air blowers always seek the sides of an air-conveyer when the steam-nozzle is located in the center, and that when the steam-nozzle is annular in form, admitting the air through a large central air-draft, the back-pressure will seek both the sides and center of the air-conveyer. With my construction of an air-conveyer having an annular steam-nozzle centrally located with a curved connecting flange or shoulder *E*, connecting the cone *C* to the cylinder *D*, which has a larger cross-sectional area than the frustum of the cone *C*, the counter-currents which in other forms seek the sides or center of the air-conveyer are deflected by the shoulder *E* and turned in the same direction of and made to unite with the currents of steam escaping from the steam-nozzle *O*.

G represents slots cut out on opposite sides of the large end of cone *C*. At each side of these slots are raised lugs *H*. The outer edge of each lug is parallel with the outer edge of the lug on the opposite side of the cone. Each of these slots and lugs is adapted to receive steam-pipes *J* and *K*, which steam-pipes are held in place by jam-nuts *M* or set-screws *N*. The object of the slots *G*, lugs *H*, jam-nuts *M*, or set-screws *N* is to provide a means by which the steam-nozzle *O* may be centrally adjusted to the proper distance from the neck or small end of the frustum *C*. On the inner side of the frustum *C* are a number of flanges or guides *F*, which also aid in setting the steam-nozzle *O* in its proper position. It is also found that a proper setting of the steam-nozzle *O* with reference to the conical frustum *C*, cylinder *D*, and connecting-flange *E* causes the steam-jets escaping from the steam-nozzle to strike the

sides of the cylinder *D* at a point some distance beyond the flange *E* obliquely with a whirling motion, in such manner as to produce very little noise, and at the same time create a greater flow of air through the air-cylinder *D* than is possible with other forms of construction.

The steam-pipe *J*, attached by a union or other suitable means, (not shown,) to a steam-supply pipe, (not shown,) in which supply-pipe is placed a globe or other suitable valve, by which the steam can be supplied to or shut off from the steam-nozzle *O*. The pipes *K* should extend beyond the lug *H* far enough to allow room for the cap *L* and jam-nut *M*. It is not necessary to use a steam-pipe *K*, as a bolt of same size will answer the same purpose.

The steam-jetting device *O* is composed of a body or casing, which is preferably in the form of a cross, having a long arm *P*, bell-shaped at the inner or nozzle end and straight at the outer or opposite end *d*, and cross short arms *c c*. The short arms *c c* are threaded on the inside to receive the steam-pipes *J* and *K*, by which the jetting device is supplied with steam, and at the same time held in place. The arm *d* is threaded on the outside at *e* for the purpose of receiving the stuffing-box *f*. The arm *d* is also threaded on the inside at *g*, so as to receive the threads of the hollow stem *R*. The bell-shaped end of the long arm *P* is provided with a steam-space *S*, steam-seat *n*, inner flange *i*, and outer flange *m*, adapted to receive the hollow stem *R*. The stem *R* is provided with an enlarged annular end or head *a*, made to fit the flange *i* and steam-seat *n*. On the circumference of the head *a* are cut a number of semiconical or *V*-shaped grooves *r*. The small ends of these grooves *r* face outward and form the steam-jet openings.

The corner of the inner edge of the periphery of the head *a*, next the steam-seat *n*, is beveled so that when taken in connection with a groove cut at the bottom of flange *i*, next the steam-seat *n*, forms an annular steam space or groove *l* at the inner or larger end of the semiconical steam-jet openings.

The stem *R* is cut square at the small end *j*, adapted to be turned with a wrench or other means. Stem *R* is also provided with threads cut to work in the threads on the inner side of the arm *d*, as shown at *g*. By turning the stem *R* the head *a* may be released from the steam-seat *n*, when the steam from the steam-space *S* will rush into the steam space or groove *l*, thence through the jet-opening *r* into and through the cylinder *D* of the air-conveyer *B*. By means of the annular steam-space *l*, intervening between the steam-seat *n* and the jet-openings *r*, an equal pressure or volume of steam is uniformly supplied to each of the steam-jet openings *r* at the periphery of the head *a*, in this way insuring an equal draft to every part of the cylinder *D*.

In most furnaces and in many lines of manufacturing it is found necessary to vary the

temperature or amount of fuel consumed from time to time. Especially is this the case in the burning of all kinds of ceramics.

It has been found that steam passing through steam-jet openings into an air-conveyer at a high pressure has a much greater velocity than when at low pressure, and that the volume of air drawn into and delivered through the air-conveyer to the furnace increases or decreases in proportion as the velocity of steam-jets increase or decrease. Hence the importance of regulating the heat in the furnace by varying the volume of steam passing through the steam-jets without diminishing the velocity thereof. In order to maintain the greatest velocity in the steam-jets, the valve-opening in the steam-supply pipe must always have a larger sectional area than the combined sectional areas of the steam-jet openings. This result cannot be obtained where the pressure in the steam-nozzle is controlled by a steam-valve in the steam-supply pipe and where the sectional area of the steam-jet openings is a constant quantity, for the reason that in order to lessen the flow of steam without changing the size of the steam-jet openings the pressure in the steam-supply pipe must be reduced by partially closing the valve until the sectional area of the opening of the valve is less than the combined sectional area of the steam-jet openings, which instantly decreases the velocity of the steam-jets, and consequently the amount of air drawn into the air-conveyer and delivered to the furnace is very much reduced.

In my invention when the blower is in operation the valve in the steam-supply pipe is kept wide open, the volume of steam passing through the jet-openings being controlled solely by the stem R and jet-openings in the head *a*.

It will be observed that each turn of the stem R outward exposes a greater sectional area of the semiconical steam-jet openings *r* at the outer edge of the flange *i*. In this way by pushing the head *a* outward or drawing it inward the volume of the steam passing through the openings *r* may be increased or decreased without altering the pressure in the steam-nozzle, or when desired the flow of steam can be entirely stopped by drawing the head *a* inward until it rests tightly on the steam-seat.

On account of this novel construction and operation peculiar only to my steam-jetting device described, I am able to produce a stronger current of air and steam in the air-conveyer than can be produced by any other means, thus making it possible to carry any degree of heat in the furnace without loss of steam or steam-pressure in the blower. The stem R is also preferably provided with an air-space *o*, flaring at the inner end, which is adapted to admit a small stream of air through the front end of the head *a*, in this way preventing a vacuum which would otherwise form at the center and outer surface of the

head *a*. This vacuum if allowed to form has a tendency to draw one or more of the annular steam-jets from the periphery of the head *a* to the center thereof, which necessarily causes an unequal flow of steam and air through the air-cylinder D. In my invention herein described, by means of the air-space *o*, this vacuum and the bad results thereon are entirely prevented. The outer deflecting-flange *m* should be somewhat longer than the thickness of the head *a* or the length of the jet-openings *r*, so that when the head *a* is pushed out to the extreme length of the jet-opening *r* it is still within the deflecting-flange *m*. I have found that the steam passing through the jet-opening *r* under a high pressure of steam is forced against the inside of the annular flange *m* in such a way as to cause the jets of steam to be divided, each portion flying off in opposite directions at a tangent to the inside circle of the annular flange *m*, thus causing the steam escaping from the steam-jet openings to pass through the cylinder D in a double whirl or spirals, as indicated by the feathered arrows in Fig. 1. In other words, a series of annular steam-jets are made to pass out of the steam-nozzle P and curve to the right in the form of a spiral, while an equal number of jets are made to turn to the left in like manner. By this means the air is more readily drawn into the frustum C, and delivered to the expansion-cylinder D, where on account of this peculiar whirling motion of the steam-jets it becomes thoroughly mixed with the steam before entering the furnace or ash-pit proper.

I have found that in other blowers the steam-jet openings pass through a solid piece of metal, or pieces of metal firmly fastened together, which is connected to the steam-supply pipe in such a way that when any of the jet-openings become stopped on account of scales from the steam-supply pipe, or other foreign substances, it is necessary to stop the operation of the blower, detach the parts, and with some suitable instrument remove any obstruction found in the steam-space or jet-holes.

With my invention when it becomes necessary to clean the steam-jet openings *r*, or steam-space *l* or S, the operator has but to turn the stem R with a wrench or other suitable means until the inner edge of the head *a* passes beyond the outer edge of the flange *i*, at which point the steam-jet openings become disengaged from the flange *i*, and at the same time the volume of steam passing through the steam-nozzle becomes sufficiently increased to dislodge and remove any obstruction from the steam-spaces S and *l* or jet-openings, when as soon as the obstruction is removed by a reversed turn of the stem R the head *a* is drawn back to its proper position without stopping the operation of the blower.

In Figs. 6 and 7 the steam-jet openings *s* are cylindrical in form and are bored on an angle through the flange *i*, so that the inner ends of the jet-openings pierce the inner or

lower side of the flange *i* at a point just above the steam-seat *n*. With this arrangement, by moving the head *a* out or in, the amount of steam flowing through the jet-holes *s* can be increased or decreased in proportion as the periphery of the head *a* is raised or lowered.

In Fig. 5 the conical steam-jet openings *r* are cut at an angle on the periphery of the head *a*, so as to produce a whirl of steam and air in the same direction in the air-cylinder D.

Having sufficiently described my invention to enable others skilled in the art to make and operate the same, I do not wish to confine myself to the particular method of constructing my steam and air blower herein described, as I am aware that many forms may be adopted with good results without departing from the spirit of my invention.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a steam and air blower having an annular steam nozzle provided with both an outer and an inner flange, the latter having a smaller diameter and centrally fitted therein, a movable head with steam jet openings on the periphery thereof as and for the purposes set forth.

2. In a steam and air blower having a steam nozzle provided with an annular steam valve seat and movable head, an annular series of steam jet openings connected with an annular steam space located between the steam seat and jet openings whereby the contents of the jetting device is equally distributed to the jet openings as and for the purposes set forth.

3. In a steam and air blower, a steam nozzle with an external flange joined to the outer edge of an internal flange of less diameter to which is adjusted a movable head having on the periphery thereof a number of semiconical jet openings, and means for controlling the area thereof while the steam nozzle is in operation as and for the purposes set forth.

4. A steam and air blower comprising an annular steam jetting device, having an adjustable head and jet openings located centrally to an air conveyer composed of a cylindrical expansion chamber joined by an annular curved flange to the small end of the frustum of a cone, and slotted at the large end and having suitable means such as lugs H and set screws N for fastening the steam nozzle in its proper position, as and for the purposes set forth.

5. In a steam and air blower having an annular nozzle, an adjustable hollow stem adapted to admit air to the center and front end of the steam nozzle, in combination with an adjustable head provided with semiconical jet openings, fitted to an annular steam valve seat and flange whereby the steam seat head and flange control the steam passing through the jet openings, as and for the purposes set forth.

6. In a steam and air blower, an air con-

veyer composed of a frustum of a cone joined to an enlarged expansion cylinder by an annular curved flange, in combination with a steam nozzle centrally located therein having an adjustable stem and head fitted to an annular steam valve seat with an annular flange adapted to regulate the flow of steam passing through the jet openings while the blower is in operation, as and for the purposes set forth.

7. The combination in a steam and air blower, of a steam nozzle having an outer casing provided with an inner annular flange, a series of jet openings, a steam valve seat, and movable head whereby the volume of steam passing through the jet openings is controlled substantially as set forth.

8. In a steam and air blower, an air conveyer comprising a frustum of a cone having on its inner side a number of guide wings, and a central steam nozzle within the wings, the frustum being joined at its small end by an annular curved flange to an expansion cylinder, substantially as set forth.

9. In a steam and air blower, an annular steam jetting device having an annular steam nozzle provided with an internal annular valve seat and flange having an annular intervening steam space *l*, and an adjustable steam valve head centrally located as and for the purposes set forth.

10. In a steam and air blower, a steam nozzle having the cross arms *c c*, short arm *d*, stuffing box *f*, long arm P, in combination with an adjustable stem R, and head *a*, steam jet openings *r*, steam space *l*, flange *i*, outer flange *m*, and steam seat *n*, as and for the purpose set forth.

11. As an article of manufacture the central steam nozzle having deflecting flanges and provided with a head having suitable apertures near its periphery and centrally supported substantially as described.

12. In a steam and air blower having an adjustable head, a steam valve seat *n*, steam space *l*, flange *i*, and outer flange *m*, as set forth.

13. The combination in a steam and air blower, of a steam nozzle consisting of a casing having inner and outer flanges, a movable head provided with openings formed at an angle to the periphery of the head and adapted to communicate with the steam space substantially as described.

14. In a steam and air blower, a steam nozzle provided with a steam valve seat and flange fitted with a removable head, having on the circumference thereof steam jet openings cut at an angle to the plane of its axis, whereby the escaping steam is given a whirling motion as and for the purposes set forth.

15. In a steam and air blower, a steam nozzle provided with an outer casing having an outer flange joined to an inner flange of smaller diameter, and a steam valve seat, in combination with a central adjustable head having on its periphery a number of conical steam jet openings cut at an angle to the plane

of its axis, whereby the escaping steam is given a whirling motion as set forth.

16. The combination in a steam blower having a central nozzle casing carrying a steam
5 nozzle head provided with jet openings, the casing having a flange and steam seat *n*, and the head beveled above and adjoining the steam seat to form an enlarged steam space, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

WILLIAM A. EUDALY.

Witnesses:

O. E. DUFFY,
C. M. WERLE.