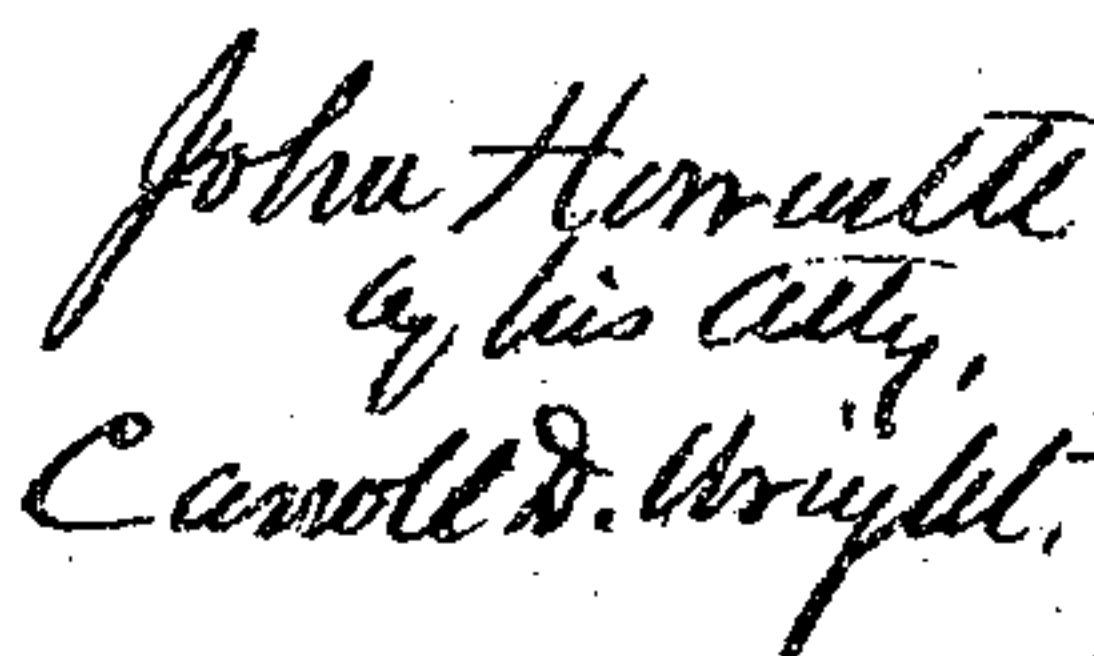


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# United States Patent Office.

JOHN HOWARTH, OF SALEM, MASSACHUSETTS.

Letters Patent No. 100,294, dated March 1, 1870.

## STEAM BLOWER AND EXHAUSTER.

The Schedule referred to in these Letters Patent and making part of the same.

### To whom it may concern:

Be it known that I, JOHN HOWARTH, of Salem, county of Essex, and State of Massachusetts, have invented a Combination Blower and Exhauster; and do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal section of my apparatus, and

Figure 2 is a cross section of same on line *xy* of fig. 1.

The object of my invention is to produce means by which I can utilize steam to its fullest extent in drawing into an apparatus the largest volume of air and gases, and discharging it with the degree of force requisite to the accomplishment of the particular result sought; that is, to produce an apparatus by which I can secure an increased blast power from a given weight of motor, or best create a vacuum in a given time and with the greatest economy of steam.

The nature of my invention consists in adjusting a series of tubes, regularly increasing in diameter, set in a line as to their axis, with a space between the one and the succeeding, so that in looking through the series from the least in size to the greatest, there appears to be but one tube, telescope form, in a frame, so that steam is admitted to the smallest tube by an induction-pipe from the boiler, and passing through the seemingly one tube, air and gases are admitted through the succeeding spaces between the tubes, where air or gases are united with and carried by the steam to the largest end of the tube and discharged, either as a blast or as an exhauster, when the induction end of the apparatus leads from a vessel; and

The nature of my invention consists, further, in uniting the volume of combined air and steam attained through a series of tubes with a still further quantity of air by means hereinafter described.

In the drawings—

A A is a pipe, which sustains and incloses the apparatus hereinafter described.

This pipe has flanges *a a* at each end, and is smaller in diameter from *b* to *c* than from *c* to *d*, thus forming a neck, *b c*.

B is a frame, in which are held the tubes 1 2 3 4 5 6 by means of projections or clamps E E. These tubes are held in a line, their axis being parallel with the axis of pipe A, and are bored through their horizontal centers, number 1 being the smallest of the series, and the others increasing in diameter regularly from 1 to 6.

C is an induction-pipe leading from a boiler to tube No. 1.

D is a set-screw holding the discharge end of the apparatus in its proper position within pipe A.

The projections E E are also clamps, and each has

set-screws *n n*; thus the tubes 1 2 3, &c., are compressed and firmly held in their position, which, by the means just set forth, can be adjusted as required.

Each tube of the series projects into the succeeding one, say, three thirty-seconds of an inch; the increase of size of bore is, say, one-eighth of an inch, which gives a space of one-sixteenth of an inch between each tube and the succeeding one. These dimensions, of course, are given for example, but I have found by experiment that they serve the purpose well.

Steam is represented by dotted arrows, and air or gases by full line arrows.

### Operation.

Steam from a boiler enters the apparatus through induction-pipe C, passing its tube 1 at *i* with a velocity comparative with the weight of steam; it passes into tube No. 2 with the same velocity. Thus is created about the space between tube 1 and 2 a vacuum, which is filled at once by air coming in at *k*, and the air is combined with the steam within tube No. 2, and partakes of the steam's velocity. This volume of combined steam and air or gases passes on to tube No. 3, where a fuller supply of air or gases is taken through space between No. 2 tube and No. 3, and so on through the whole series, until the volume of combined steam and air or gases is discharged from the outer tube at S into the neck *b c* of pipe A.

At the point *tt* the already acquired volume receives a fresh quantity of air or gases, which combines with the acquired volume, and this increased volume is discharged at mouth *h* of pipe A, thus securing the greatest volume of air and steam which can be attained from a given quantity and velocity of steam. This result is more plainly seen when it is understood that the blast from the combined action of all the tubes rarifies the air in pipe A about the mouth of tube No. 6, thus creating a vacuum which is at once filled with fresh air again through the main pipe A, which air, of necessity, combines with the volume discharged at S. The construction of pipe A at this point favors or secures this result, for it will be observed that by diminishing the diameter of pipe A from *c* to *b*, and allowing the discharge end of series of tubes to project into their diminished portion of pipe A, I have a continuance of the series of tubes, but on an enlarged scale.

The limit to which the number of tubes can be extended is the vacuum force to absorb air or gases, and the force required to expel them with the requisite velocity from the apparatus.

The number shown is used to illustrate my invention, for I use them extended to ten or twelve.

The vacuum force and blast force are diminished as the number is increased, or as their diameters are increased relatively to each other. I find it important



not to admit too much air or gases to combine with steam at once, lest the velocity of the steam should be reduced too suddenly, for it is my aim to combine and utilize the largest possible amount of air or gases and steam; and if the whole quantity of air and steam were permitted to come together at one point, the velocity of the steam would be arrested at once, and less air or gases would be moved by a given amount of steam.

I can apply this apparatus to a great variety of uses, and in many different forms, some of them requiring new combinations, which I leave for further patents; but as a blower or exhauster, wherever such may be used, its utility is beyond a doubt, for, having carried it through a series of actual experiments, I speak from experience and not theory.

I am aware that the specific arrangement of tubes described and shown, alone, is not new, nor do I claim such arrangement; but,

Having thus fully described my invention,

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

1. The tubes 1 2 3, &c., in combination with frame B, constructed substantially as set forth.

2. The tubes 1 2 3, &c., and frame B, in combination with pipe A, constructed as shown, substantially as described.

3. The combination of tubes 1 2 3, &c., frame B, pipe A, and induction-pipe C, all arranged and operating substantially as herein set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN HOWARTH.

Witnesses:

CARROLL D. WRIGHT,  
AUSTIN S. HOWARTH.