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METHOD OF AND MEANS FOR MOVING A GAS OR VAPOR BY THE DIRECT APPLICATION TO IT OF A SUITABLY EXPANDED MEDIUM.

APPLICATION FILED MAY 7, 1907.

FIG. 1.

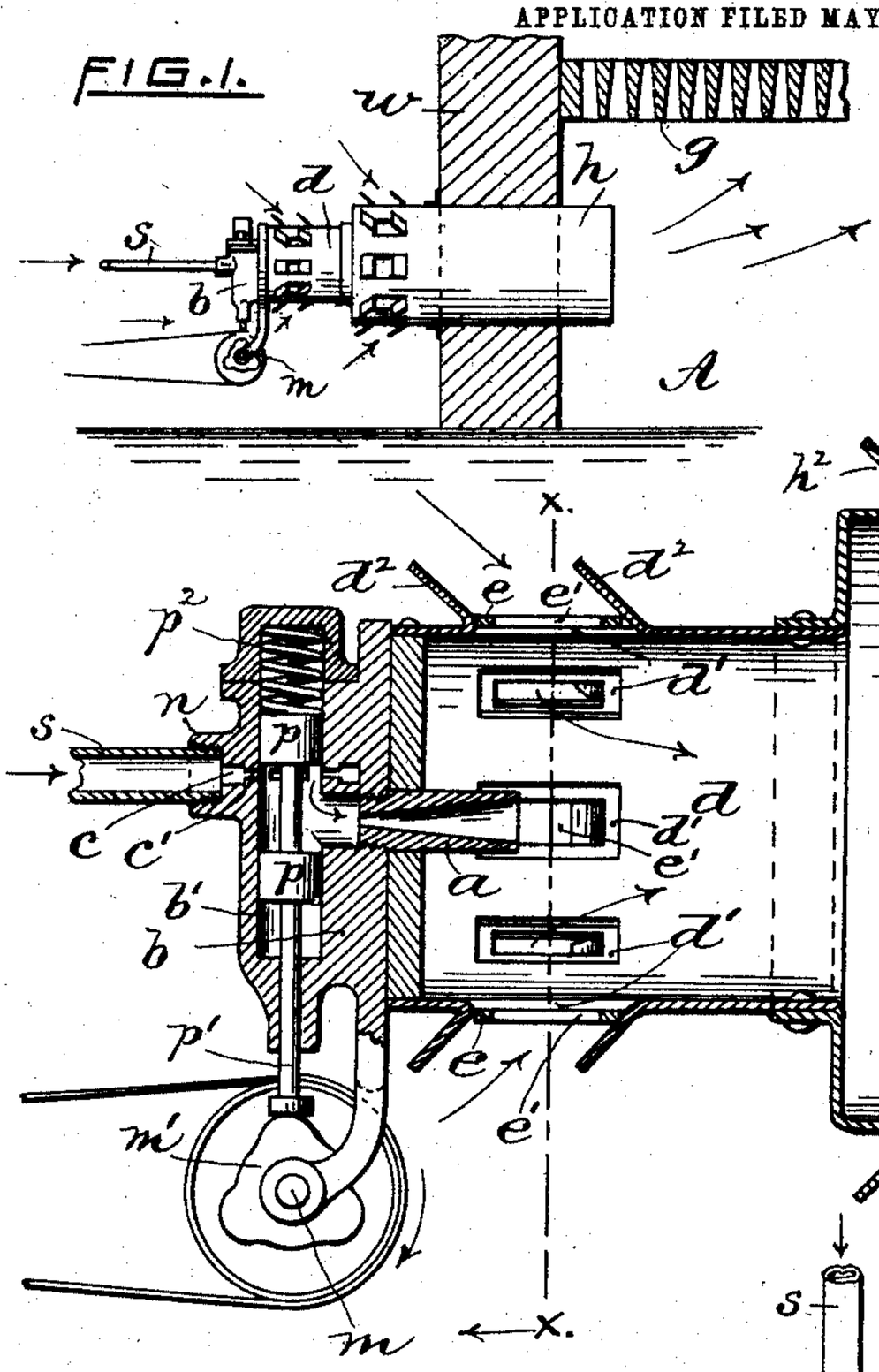

FIG. 2.

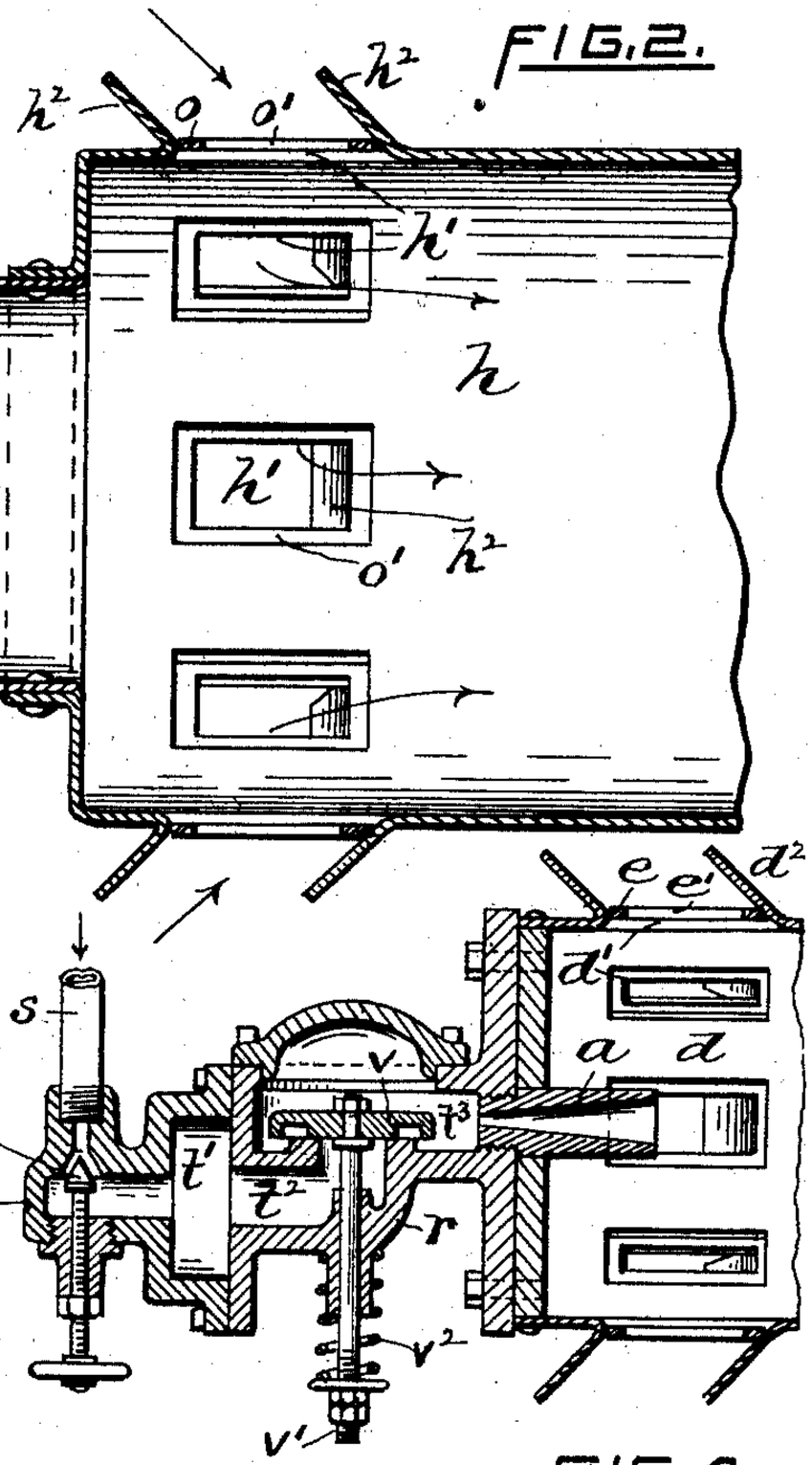

FIG. 4.

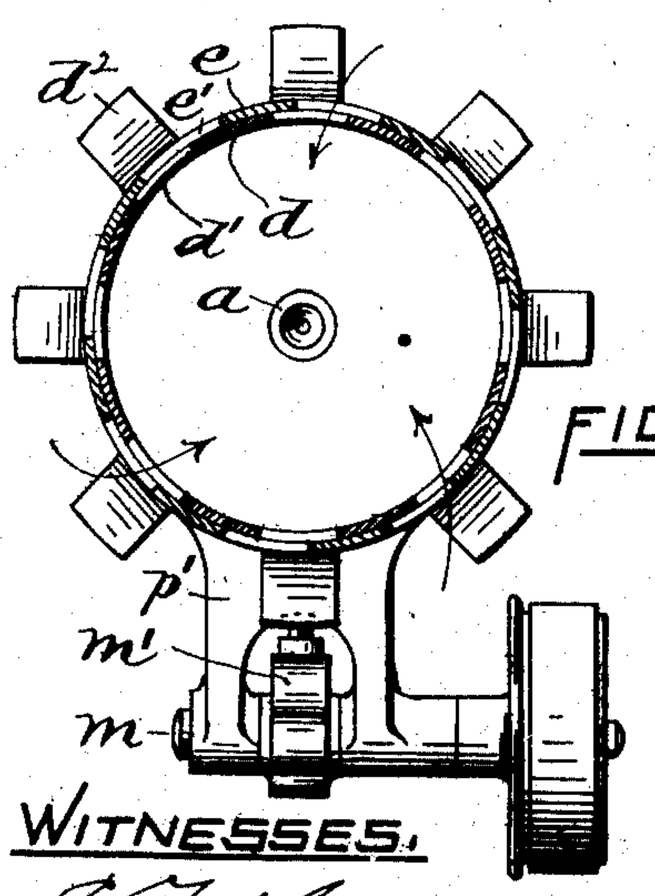

FIG. 3.

FIG. 5.

WITNESSES.

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METHOD OF AND MEANS FOR MOVING A GAS OR VAPOR BY THE DIRECT APPLICATION TO IT OF A SUITABLY-EXPANDED MEDIUM.

No. 864,969. Specification of Letters Patent. Patented Sept. 3, 1907.

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To all whom it may concern:

Be it known that we, WILLIAM H. KENERSON and ALBERT J. LOEPSINGER, citizens of the United States of America, and residents of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Methods of and Means for Moving a Gas or Vapor by the Direct Application to It of a Suitably-Expanded Medium, of which the following is a specification.

This invention relates to a new and improved method of and apparatus for moving air with any suitable expansible gas or vapor under pressure and discharging the mixture in any suitable manner for use, as for example under the grate of a steam-generating furnace to produce a forced draft for increasing the rate of combustion of the fuel used.

To be more specific, the invention consists in the employment of a fixed nozzle to which the steam, or other suitable medium under pressure, is admitted in short quick puffs, expanded therein, and discharged in corresponding puffs or impulses before the steam comes in contact with the inflowing atmospheric air, the thus combined mixture of expanded steam and air being conducted to the place of use.

The movements of the apparatus may be automatic or mechanical. In the former case the flow of the non-expanded or live steam may act to rapidly and intermittingly impinge upon and open a self-closing valve. The resulting charges or puffs of steam next enter and are expanded in a suitably shaped continuously open nozzle from which they exhaust into an apertured air receiver communicating with a flue or chamber, into which latter the charges of the thus mingled expanded steam and air are discharged and utilized. In the mechanically actuated system an arrangement substantially as just described may be employed, except that the self-closing valve for controlling the flow of live or unexpanded steam into the expansion nozzle is opened, say, by a rapidly revoluble cam or other analogous device.

By means of the improved system constituting the present invention each puff of admitted steam, before being utilized or mixed with the atmospheric air, is expanded in a suitably shaped nozzle, thereby converting a portion of its thermal energy into kinetic energy. Each of the thus intermittingly discharged rapidly moving expanded puffs act not only to mix with the air automatically drawn into the receiver following the last exhausted charge therefrom but to also discharge the combined steam and air puffs with an efficiency greatly in excess of that obtained in systems or steam-blowers in which the flow of steam into the air receiver or chamber is continuous, the steam in such cases expanding after coming in contact with the air.

In former methods and systems as usually employed for moving air by the direct application of unexpanded steam flowing continuously through an orifice or nozzle the efficiency of the steam used is materially restricted in that much of its thermal energy is not converted into kinetic energy before mingling with the air, much of its thermal energy being dissipated as sensible heat instead of being utilized to move the air. In the invention herewith the maximum amount of the thermal energy of the steam is converted into kinetic energy with a minimum degree of condensation so that the system when in use is capable of moving a much greater volume of air at each impulse. A puff of the pre-expanded steam issuing from the nozzle strikes the air filling the receiver or envelop, pushes it out of the receiver, and thus makes room therein for an inflow or charge of new air which enters through suitably disposed perforations. The puffs are so timed that each strikes the rear of a charge of new air before the latter comes to a state of rest; the cycle of operations being repeated at a rate, say, of some two thousand impulses per minute.

In the accompanying sheet of drawings illustrating mechanism or apparatus well adapted to be employed for carrying out the method and system forming the subject of this invention, Figure 1 represents a side elevation, in partial section, showing the application of the same to a steam-generating furnace. Fig. 2 represents a longitudinal central sectional view of the same in enlarged scale, the furnace wall and grate being omitted. Fig. 3 represents a transverse sectional view taken on line x x of Fig. 2. Fig. 4 is a sectional view similar to Fig. 2 showing a modified form of the apparatus, the latter being capable of automatic action, and Fig. 5 is a longitudinal sectional view, in enlarged scale, of a steam-expanding nozzle detached.

The following is a more detailed description of the apparatus, including the manner of its operation:—

d, Fig. 2, again referring to the drawings, designates an envelop or receiver, the same as drawn being cylindrical and provided with a series of suitably spaced peripheral air intake perforations d^1, each having exterior deflectors d^2. An annular damper or sleeve e may be movably mounted on the member d, the same having openings e^1 therein registering with said holes d^1 for controlling the volume of air passing there-

through. To the front end of the receiver a casting b is removably secured, having a valve-chamber b^1 therein, a boss n having a steam-inlet pipe s, an annular or main port c in continuous open communication with the steam-inlet, radial ports c^1 in direct communication with said chamber b^1 and port c, and depending brackets or arms forming bearings for the driven revoluble cam-carrying shaft m. Within the chamber b^1 is mounted a piston-valve p arranged with respect to said steam-ports; the stem p^1 extends through the casing and is adapted to bear upon the periphery of said cam, m^1. The rotary movement of the latter causes the cam-lugs to intermittingly elevate the valve to uncover the ports, while at the same time compressing the spring p^2; conversely, the reaction of the spring automatically depresses the valve and closes the ports concurrently with the passage of each cam-lug past the end of the valve-stem.

A suitable integral steam-expanding nozzle member a passes through the front end of the air-receiver d and is removably secured to the casting b. The nozzle has an open central hole having outwardly flaring or diverging sides extending longitudinally therethrough, its smaller end communicating directly with the valve-chamber; the arrangement being such that when the port is uncovered steam enters the nozzle and is expanded therein before it escapes from the larger end into the receiver d to push or force the air therefrom.

In lieu of the mechanical arrangement just described a casing or body r may be employed, the same being secured to the adjacent end of the receiver d as represented in Fig. 4. In this case the said steam-expanding nozzle is screwed into the casing and extends into the valve chamber t^3, the latter having a valve v of the self-opening or "pop" type seated therein; the valve-stem v^1 extends through the body member and is acted upon by a spring v^2 to insure the closing of the valve. To the front end of member r is secured a casing u having an expansion chamber or reservoir t^1 communicating with the smaller steam chamber t^2 leading to the underside of the valve v. Said member u has a steam-pipe s tapped therein and also a small steam-controlling valve t, the latter being located between the pipe and chamber t^1, all as clearly shown.

In the last described case,—assuming the valves t and v, nozzle a, and perforated receiver d, to have been constructed, positioned and adjusted with respect to the steam pressure and volume of air to be moved,—the pressure of the inflowing live steam after filling chambers t^1 and t^2 in excess of the holding down force upon the valve v quickly lifts the latter a short distance and escapes thereunder into the chamber t^3, the force of the spring, &c., together with the then reduced pressure in chambers t^1 and t^2 causing the valve to reseat itself. The charge or puff of steam thus discharged into chamber t^3 flows into the small end of the nozzle a and is expanded therein, after which it discharges into the receiver and produces the effect described above.

In some cases the air pushed or moved by the puffs of steam pre-expanded in the nozzle a may be discharged into a still larger receiver, as h, to engage with and move a volume of air just previously introduced through the registering openings, o^1, h^1, of the members o and h, respectively; the two thus combined charges of air being discharged as one puff or impulse from the rear end of said receiver h into the pit A below the grates g of a boiler-furnace, or other place of use as desired.

What we claim as our invention and desire to secure by United States Letters Patent, is:—

1. The improvement in the method or system of moving air or other analogous expansible medium to be utilized for increasing the degree of draft, ventilation, &c., which consists in discharging in the form of puffs or impulses steam or other elastic fluid under pressure against said air while the latter is temporarily contained in a suitable receiver.

2. The improvement in the method of moving air or other analogous medium, the same consisting in admitting a charge of steam into a suitable nozzle and expanding it therein, and then discharging the thus expanded steam from the nozzle against the air for pushing the latter to the place of use, the resulting inertia of the thus moving elements greatly exceeding that obtained when the steam is expanded after it mingles with the air.

3. The improvement in the method of moving air through and discharging it from a continuously open duct or receiver, the same consisting in automatically and rapidly introducing successive charges of steam into a suitable nozzle, expanding each charge while it is passing through the nozzle and discharging it therefrom in the form of a puff or impulse against a volume of air so as to move the latter before the next succeeding discharge from the nozzle takes place.

4. The improvement in the method or system of intermittingly moving air or other expansible medium, which consists in automatically introducing a puff or charge of steam or other elastic fluid under pressure into a continuously open nozzle, then expanding said charge of steam in the nozzle, and then discharging the steam against the air and at the same time conducting the latter to the place of use.

5. In a system of the character described, the combination of an apertured air receiver, a continuously open fixed steam-expanding nozzle having its enlarged or discharge end disposed at or near the intake end of said receiver, and means for successively admitting charges of steam into the smaller end of the nozzle, arranged so that each charge of steam is expanded during its passage through the nozzle and is discharged therefrom in the form of a puff to engage with and move the corresponding charge of air in the receiver.

6. In a system of the character described, the combination with a stationary steam-expanding nozzle, and means for intermittently admitting steam thereto, of an air receiver or casing arranged with respect to the nozzle having a series of openings through its wall, and means for directing the flow of air into said openings.

7. In a system of the character described, the combination with a steam-expanding nozzle, and means for admitting steam thereto in an intermittent manner, of an air receiver having a series of perforations disposed around its periphery so as to introduce the air into it in advance of the enlarged or discharge end of the nozzle, for the purpose hereinbefore set forth.

8. In a system of the character herein described, the combination with an air receiver provided with a series of intake openings, of a movable member provided with a plurality of apertures disposed with respect to and arranged to register with said openings for varying the net area of the latter, a suitably mounted expanding steam nozzle having its larger or discharge end located in substantially the same cross-sectional plane with the rear end of said intake openings, and means for admitting steam to the smaller end of the nozzle in an intermittent manner.

9. In a system of the character described, the combination of an initial casing or envelop having suitable air-intake openings, a similarly devised but materially larger casing into which the former discharges, a stationary steam-expanding open nozzle having its rear or enlarged end in continuous open communication with the chamber of the initial casing, and means for intermittingly admitting charges or impulses of steam into the nozzle to be expanded therein, whereby each charge of thus expanded steam is discharged from the nozzle in advance of the next succeeding charge and pushes the air from the smaller into the larger casing to mingle with and discharge therefrom the air then contained in it, for the purpose hereinbefore set forth.

Signed at Providence, R. I., this 6th day of May, 1907.

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Witnesses:
HENRY B. STONE,
GEO. H. REMINGTON.