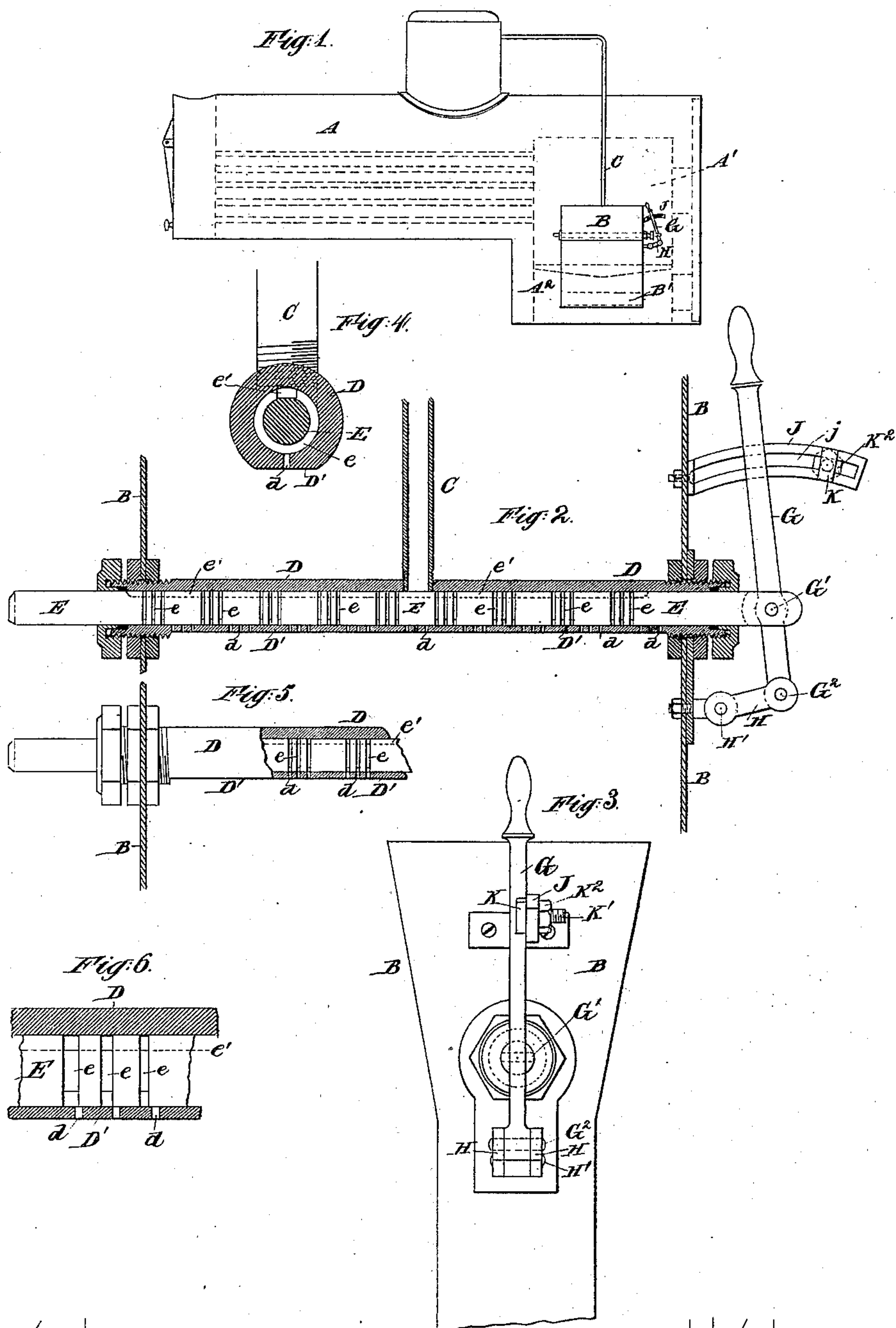


(No Model.)

G. W. F. BENNETT.
AIR INJECTOR FOR FURNACES.

No. 307,424.

Patented Nov. 4, 1884.



WITNESSES—
Charles R. Searle,
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INVENTOR—
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by his attorney
Thomas S. Peterson.

UNITED STATES PATENT OFFICE.

GEORGE W. F. BENNETT, OF CRANBURY, NEW JERSEY.

AIR-INJECTOR FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 307,424, dated November 4, 1884.

Application filed July 3, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. F. BENNETT, of Cranbury, Middlesex county, in the State of New Jersey, have invented certain new and useful Improvements in Air-Injectors for Furnaces, of which the following is a specification.

I will represent the invention as applied to inject air into the furnace of a stationary steam-boiler having a rectangular furnace; but it will be understood that the invention need not be confined to stationary boilers, but may apply to boilers of this or an analogous class used on steamers and for various purposes. The air is blown into the furnace by the discharge of high-pressure steam divided into a great number of small jets acting on air confined in the narrow passage. The construction allows the steam to act efficiently whether blowing with full force or in variously less efficient conditions.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a side elevation, showing the boiler with my apparatus attached. The remaining figures are on a larger scale. Fig. 2 is a vertical section through a portion. Fig. 3 is a front view of a portion. Fig. 4 is a transverse section through a portion on a still larger scale. Fig. 5 is a longitudinal section on the same scale as Fig. 2. It corresponds to Fig. 2, except that in Fig. 2 the apparatus is closed and in Fig. 5 it is open and in active use. Fig. 6 shows a modification. It is a longitudinal section.

Similar letters of reference indicate corresponding parts in all the figures.

A is a steam-boiler, and A' the internal fire-box or furnace.

A² are the walls of the ash-pit. There may be any ordinary or suitable doors (not represented) for inducting air and removing ashes; but it is important that such openings be provided with means for tightly closing them, so that air at a gentle pressure blown inward by my apparatus shall be compelled to pass upward through the fire and quicken it, while the small proportion of steam mingled therewith produces its ordinary effect in maintain-

ing a clean condition of the fire, and thus promoting the combustion.

B is an air-inducting funnel, having its lower portion long and narrow, and terminating in a corresponding curved duct, B', communicating with the ash-pit.

D is a stationary tube, having a nicely-finished interior, and receiving steam through a pipe, C, from a convenient point at the top of the boiler, as will be understood. The lower face of the tube D is thinned, as indicated at D', and pierced by a series of small apertures, *d*.

E is a smoothly-finished cylindrical rod making a steam-tight contact with the interior of the tube D, and peculiarly grooved and operated. A groove, *e'*, extends longitudinally on the upper side, and is arranged to be in constant connection with the pipe C, which brings steam at full pressure from the boiler. There are circumferential grooves *e*, each in communication with the grooves *e'*. It follows that the grooves *e* are constantly filled with steam at full pressure, and that the steam will be discharged through the small apertures *d* whenever the grooves *e* are brought to coincide in position with the apertures *d*. The rod E extends out through a stuffing-box at each end of the tube D. One end is forked, and receives a lever, G, which is engaged therewith by a cross-pin, G'. The lower end of G engages by a cross-pin, G², with a pair of links, H, which engage by a cross-pin, H', with a fixed fulcrum, as shown.

J is a fixed arm standing alongside of the lever G, and having a curved slot, *j*.

K is an adjustable stop, having a stud, K', fitted in the slot *j*, and secured in the required position therein by a nut, K².

Operation: The stop K is secured in the required position on the arm J by tightening the nut K². When the lever G is thrust over close to the funnel B, the steam-filled grooves *e* are moved out of contact with the orifices *d*, and there is no action. When the lever G is moved into contact with the stop K, the grooves *e* coincide in whole or in part with the orifices *d*. The jets act forcibly on the air in the long and narrow funnel B, and induce a strong movement of the air in the direction of the jets, which is downward and laterally, into the ash-pit, thence blowing the fire. The

stop K may be adjusted to allow the orifices d to receive their full measure of steam when the lever is brought into contact with the stop, or to receive only half their full capacity, or any other given quantity, according as experience shall determine to be desirable, so as to blow with the greatest efficiency, if required, under any conditions, without unnecessary consumption of steam. When, as will often or usually be the case, the attendant desires to use the apparatus with less than its full efficiency, he moves the lever G toward, but not quite into contact with, the stop K. He can at will shift the lever into various positions, giving more or less efficiency, the stop K in such case serving no function, except as a guide to enable him by his eye to determine how nearly he has shifted the lever into its position of fullest efficiency. The extended passage formed by the funnel B is of service in holding the current of air subject to the influence of the jets of steam for a sufficient period to enable the jets to expend their full force thereon.

I have shown the several apertures d as spaced exactly coincident with the several grooves e . They will therefore all close and open simultaneously when the lever G, and consequently the rod E, is moved; but I can arrange these a little out of coincidence, and such may be preferred in some cases. Such arrangement is shown in Fig. 6. When thus arranged, a gradual movement of the lever G in the direction to set the apparatus at work will first discharge steam through a portion only of the orifices d , as indicated in Fig. 6, and only when the lever G is moved farther will all the orifices d commence to discharge. It may be well in such case to make the grooves e , which commence first to discharge, a little wider than the other grooves, as shown in Fig. 6.

A limited number of jets blowing strongly from considerable orifices may act more efficiently than a greater number of jets blowing from very minute orifices; but my experiments indicate that the latter condition, when realized, with the tube cut away along the portion where the orifices are presented, acts very efficiently, and I prefer, for most purposes, the arrangement and proportions shown in Figs. 1 to 5, inclusive.

Further modifications may be made by any good mechanic without departing from the principle or sacrificing the advantages of the invention.

The number of the grooves e and of the coincident or nearly coincident apertures d may be varied within wide limits.

I can apply an ordinary stud and pinching-nut to secure the lever G in any required position on the curved arm J. Such may be necessary or desirable on locomotives or engines, where there is much jarring of the machinery.

I can with stationary apparatus connect to the upper end of the funnel a flue leading from any room which it may be desired to ventilate.

I claim as my invention—

1. A steam-boiler furnace, A', and connecting-duct B', the funnel B presenting a long and narrow interior, in combination with the tube D, having apertures d , movable grooved rod E, and steam-connection C, arranged to discharge a great number of fine jets of steam, as herein specified.

2. The rod E, grooved, as indicated by $e e'$, with suitable operating means, as G, in combination with the close-fitting tube D, having orifices d and steam-connection C, and with steam-boiler A, furnace A', and narrow funnel or passage B, as herein specified.

3. The tube D, having perforations d , and cut away on the perforated side, as indicated by D', in combination with the grooved rod or movable part E $e e'$ and a funnel or passage, B, as herein specified.

4. The adjustable stop K, arm J, lever G, link H, and rod E, with its grooves $e e'$, in combination with each other, and with the steam-tight inclosing-tube D, having perforations d and connection C, bringing steam from the boiler, arranged for joint operation as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, N. Y., this 30th day of June, 1884, in the presence of two subscribing witnesses.

GEORGE W. F. BENNETT.

Witnesses:

CHARLES R. SEARLE,
M. F. BOYLE.