(No Model.)

W. MATHEWS.

STEAM AND AIR INJECTOR FOR FURNACES.

No. 326,232. Patented Sept. 15, 1885.

Fig. 1.

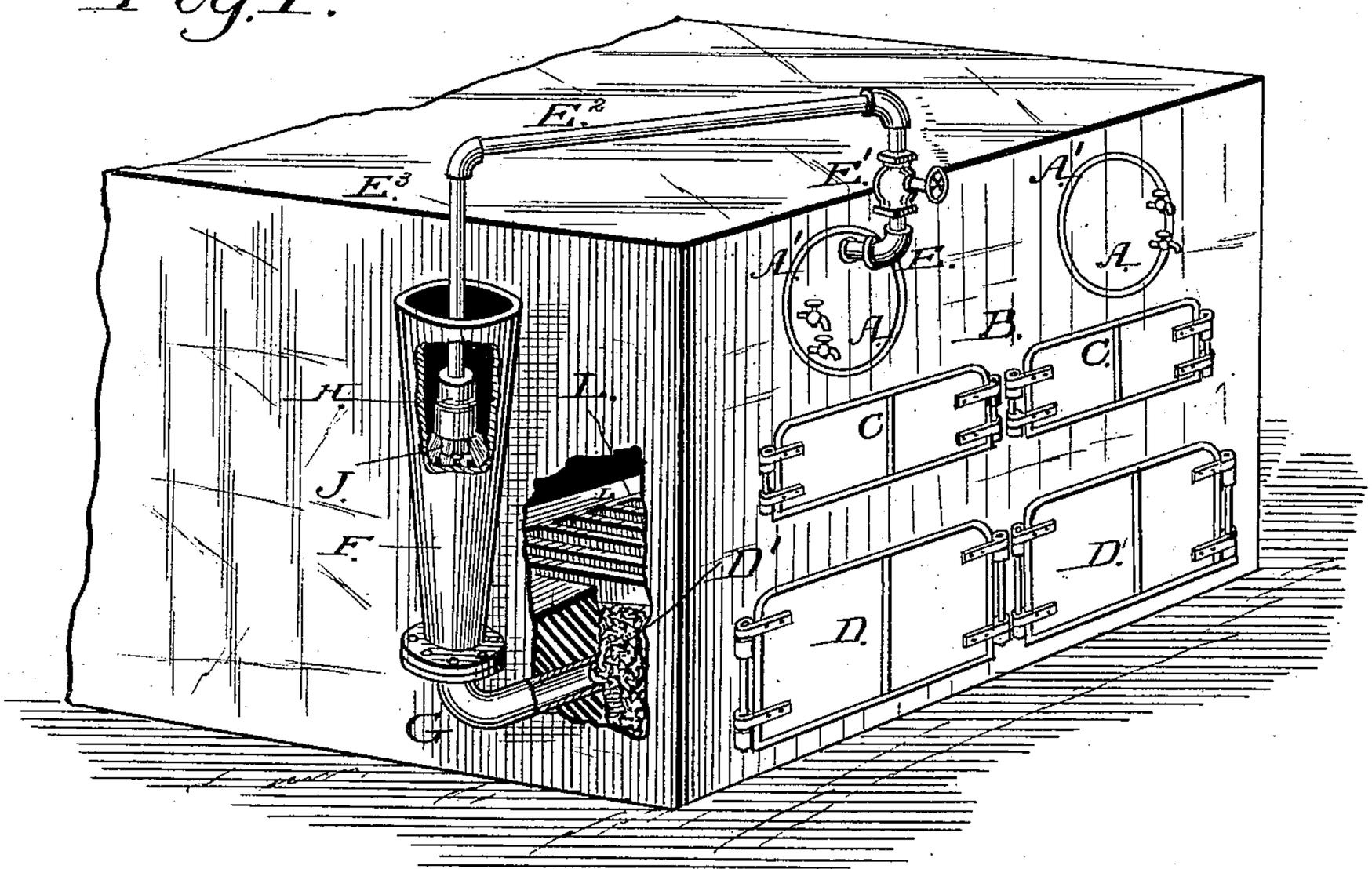


Fig. 2.

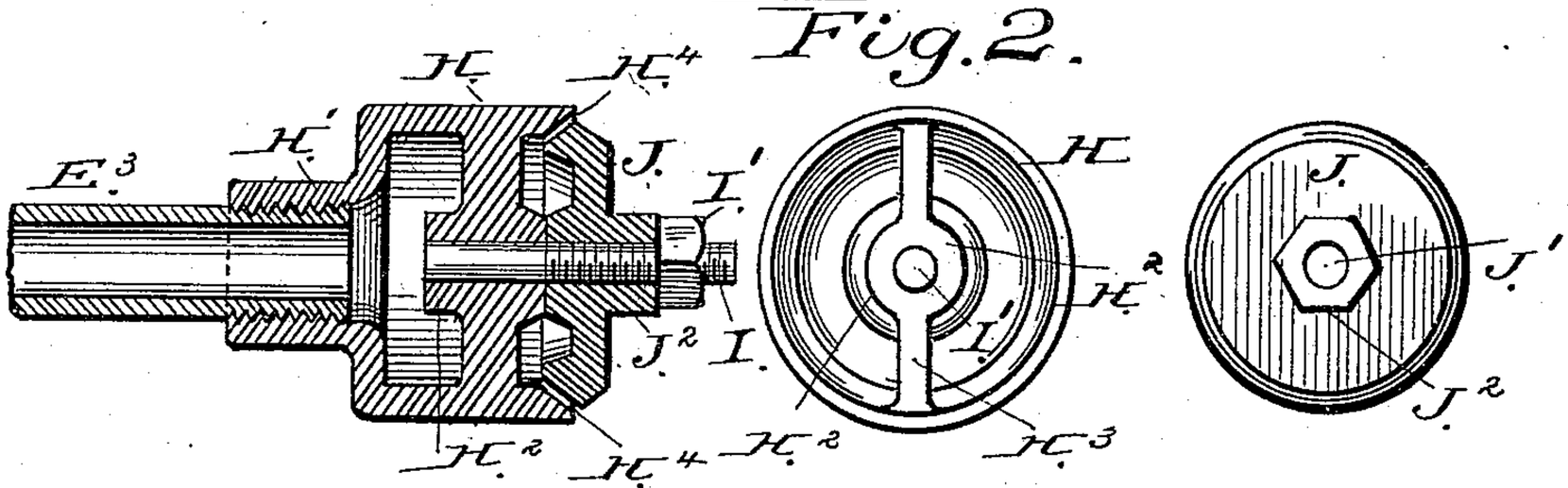
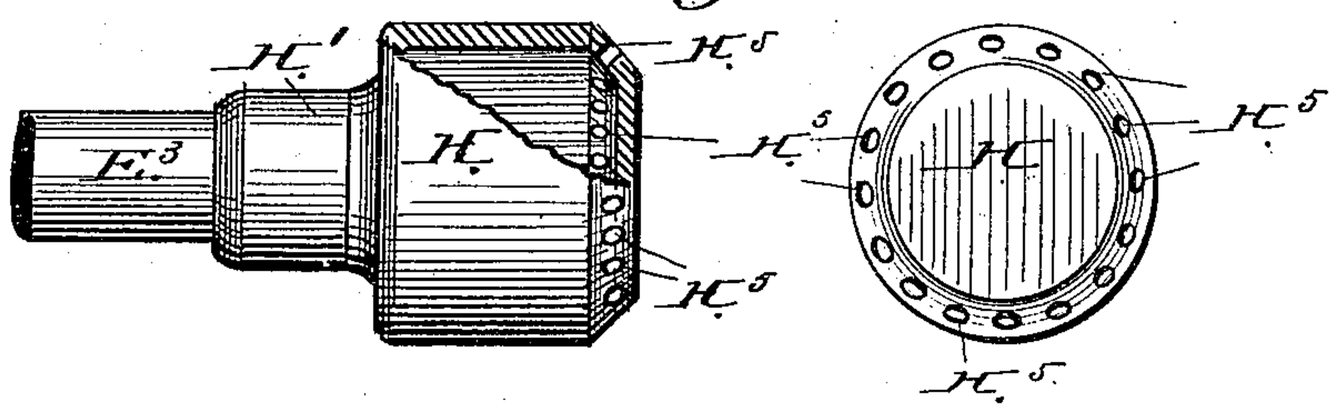


Fig. 3.



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STEAM AND AIR INJECTOR FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 326,232, dated September 15, 1885.

Application filed May 9, 1885. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MATHEWS, a citizen of the United States, residing at St. Clair, county of Schuylkill, State of Pennsylvania, have invented a new and useful Improvement in Steam and Air Injectors for Furnaces, &c., of which the following is a specification.

This improvement relates more particularly to the form of the blower or nozzle passage for the steam, by which more air is entrained and carried in with the blast than can be done with the ordinary form of blower-nozzles.

The object of the improvement is to simplify the construction of steam air-blast nozzles, to make them positively adjustable, to increase their effectiveness, and to adapt them to all the purposes for which a steam air-blast is admissible. These objects are attained in the use of the nozzle shown in the accompanying drawings, in which similar letters indicate similar parts.

Figure 1 represents in perspective the application of the improvement to a nest of horizontal stationary boilers, the wall being partly broken away to show the ash-pit and fire-bars. Fig. 2 represents the blower in longitudinal section and an end view with the cap removed, a plan of the detached cap being shown below. Fig. 3 represents in partially longitudinal elevation and section, with a top end plan, an alternative mode of construction embodying the same principle of action as in Fig. 2.

I am aware that steam air-blast nozzles are not new. See Permanent Way, &c., of European Railways, by Colborn and Holly, 1858, Plate 40, in which a steam air-blast arrangement is shown applied to a locomotive-boiler fire-box. My construction of nozzle is different as to form, application, and functional effect.

Nozzles as usually adapted for air-blast purposes are of a conical form, and the steam discharging from the small end of the same will cross and form a reversed cone at a greater or less distance from the aperture of the nozzle. According to the angle of the interior of the same, this cross-intersection of the steam destroys to some extent the force of the current due to the pressure in the boiler, and is to that extent wasteful. Nozzles of the form described can only be used effectively within a reverse-cone blast-pipe, conforming more or less closely with the form assumed by the jet, and are wasteful of steam in proportion to the volume of air carried into the ash-pit, combustion-chamber, or stack.

My nozzle is cast of suitable metal for the purpose, having a body, H, neck H′, threaded for attachment to a steam-connection, and a center hub, H^2, supported by wings H^3, one or more in number, cast integral therewith, forming an annular space around the hub. The wings are dropped below the face of the hub, and the face of the hub is about one-fourth of an inch below the edge of the nozzle bell or body. The inner surface of the body from the wings to the edge is beveled at an angle of about fifteen degrees and the hub faced off.

The hub has cast integral with it, or has subsequently attached to it, a screwed top bolt, I, with a nut, I′. A disk-cap, J, of the general form shown, has a boss mating the hub of the nozzle, perforated, and threaded at J′ to fit the bolt I′; has a raised exterior boss, J^2, of a polygonal form for screwing it by a wrench to place, and its periphery beveled at the same angle as the inner edge of the body, and of such diameter that when resting upon the hub it shall leave an annular space for the escape of steam of about one sixty-fourth part of one inch. Should a stronger blast be required, the opening is positively adjusted by interposing washers of copper or suitable material between the cap and hub, and when the desired space has been secured the cap is tightened and the nut I′ screwed down, which will retain all in place.

In Fig. 3 I show another form of nozzle, simpler in its construction, but non-adjustable, as the apertures, once determined upon, remain fixed unless it were taken to the shop and the holes separately reamed out, which would of course preclude its subsequent use for a softer blast. It will be seen that the body and cap are cast integral with each

other, and that the outer edge is beveled at a suitable angle to enable the drill to be operated without breaking, and a series of holes are drilled close to each other, varying in diameter from one thirty-second to one-fourth of an inch, according to the strength of blast desired.

I have found, practically, that for a nest of three boilers, with an aggregate grate-surface of fifty-four superficial square feet, an air-pipe of about ten inches diameter at the top or outer end, and of six inches diameter where it passes direct through the wall, or where it rests in a vertical position upon the flanges of a quarter-turn, to pass through the wall, is of sufficient size. In the latter case, to reduce the friction occasioned by the change in direction of the current, I make the quarter-turn and its connection through the wall of an increased diameter—say about ten to twelve inches. The cone-blast or air-pipe I prefer to have about three feet in length, with the above proportion of air-pipe to a blowing-nozzle of about two and one-half inches diameter of body. Culm or the smallest pea anthracite is burned without difficulty, the combustion being free and the heat intense. The air-pipe F may be constructed of a uniform diameter; but I give the preference to the conical or trumpet form described.

I generally arrange the blower as shown in Fig. 1, taking the steam by pipe E from the front head, A, of the boiler in the steam-space A′, interposing a globe-valve, E′, and carrying the pipe E^2 over the corner of the boiler-wall to the center of the air-pipe F. From this point, with an elbow and straight length of pipe, E^3, I drop the blower-nozzle H central to F, and with its annular blowing or jet edge about six or eight inches below the top edge of the air-pipe F, the pipe E and connections being three-quarter-inch pipe. Steam being turned on, and the supply being regulated by the globe-valve E′, it passes through the beveled annular edge H^4, or through the beveled series of holes or jets H^5, and, striking or impinging upon the interior surface of the air-pipe F, closes up its entire area with a stratum or disk of steam, and, as it is driven forward into the ash-pit, combustion-chamber, or stack, creates a partial vacuum of more or less strength, dependent upon the boiler-pressure and the throttling of the globe-valve, and the surrounding air, rushing into the pipe to balance the same, is intermixed and entrained with the steam, and carried into, say, the ash-pit D′, and, permeating through the bars L and fuel upon the same, provides the necessary quantity of atmospheric air to keep up a lively state of combustion.

This construction of blowing-nozzle is adapted to be used not alone for stationary boilers, as shown, but for locomotive and portable boilers also, and to increase the draft of stacks, or wherever it is desirable to secure a steady and effective draft with a small expenditure of steam. For ventilating purposes it is a desirable appliance.

A thin broad stratum of steam so adjusted as to entirely cover the area of the air-injecting pipe, whether round or rectangular in cross-section, will entrain and carry with it a larger proportion of atmospheric air than a cone-nozzle provided for the same purpose using the same quantity of steam, as the latter loses, as previously stated, a portion of its vital force in the cross-currents induced in forming the reverse cone that is to sweep down or through the delivery air-pipe; whereas my improved nozzle delivers the steam at once as a reversed cone, and its action as an air-blower is coincident with the opening of the globe-valve, whether the nozzle is within the air-pipe, as shown and described, or placed at such distance therefrom as to throw the base of the steam-cone within the air-pipe. B represents the fire-front, C the fire-doors, and D the ash-pit doors.

Having described my invention, shown its use and mode of application, and detailed its advantages, I desire to secure the following claims thereon:

1. In a combined steam and air injector, the combination of the trumpet-shaped air-pipe F, provided with a delivery-pipe connected to its smaller end, the steam-nozzle body placed within the said pipe F and provided with a steam-connection pipe, the central hub, H^2, and wings H^3, the screwed stud I, projecting from the hub H^2, the adjustable disk J, adapted to slide loosely upon the stud I, and the nut I′, for securing the disk to the nozzle-body, substantially as described and shown, and for the purpose set forth.

2. In a combined steam and air injector, the combination of the steam-nozzle body adapted to screw on a steam-pipe, and provided with the central hub, H^2, and the wings H^3, cast integral with it, the screwed stud I, securely fastened into the hub H^2, the adjustable disk J, adapted to slide loosely upon the stud I, and the nut I′, for securing the disk to the nozzle-body, substantially as described and shown, and for the purpose set forth.

WILLIAM MATHEWS.

Witnesses:
W. FRED TAYLOR,
JNO. DAWSON.