W. HALSTED.

DEVICE FOR SUPPLYING AIR TO FURNACES.

No. 189,096. Patented April 3, 1877.

Fig 1

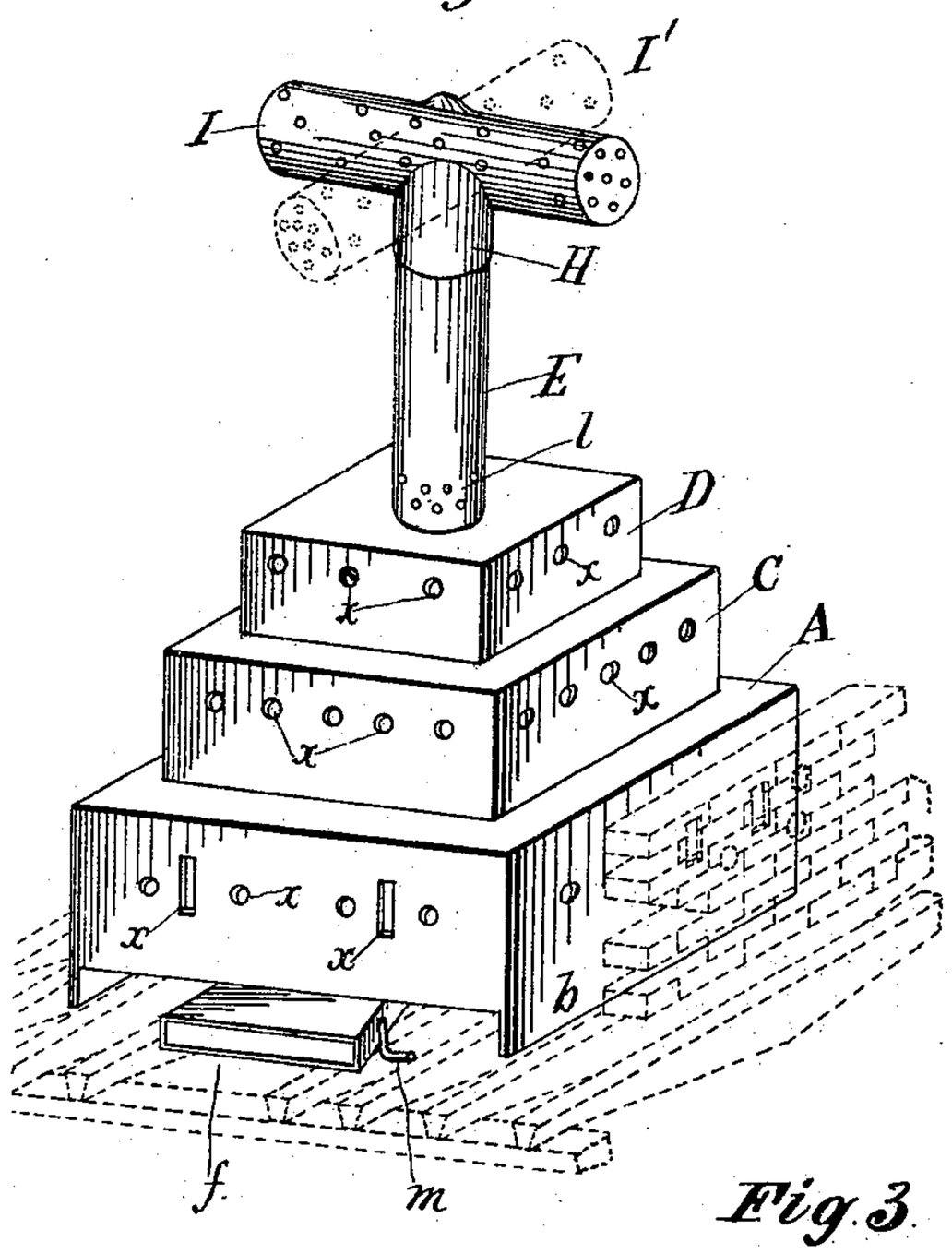


Fig 2

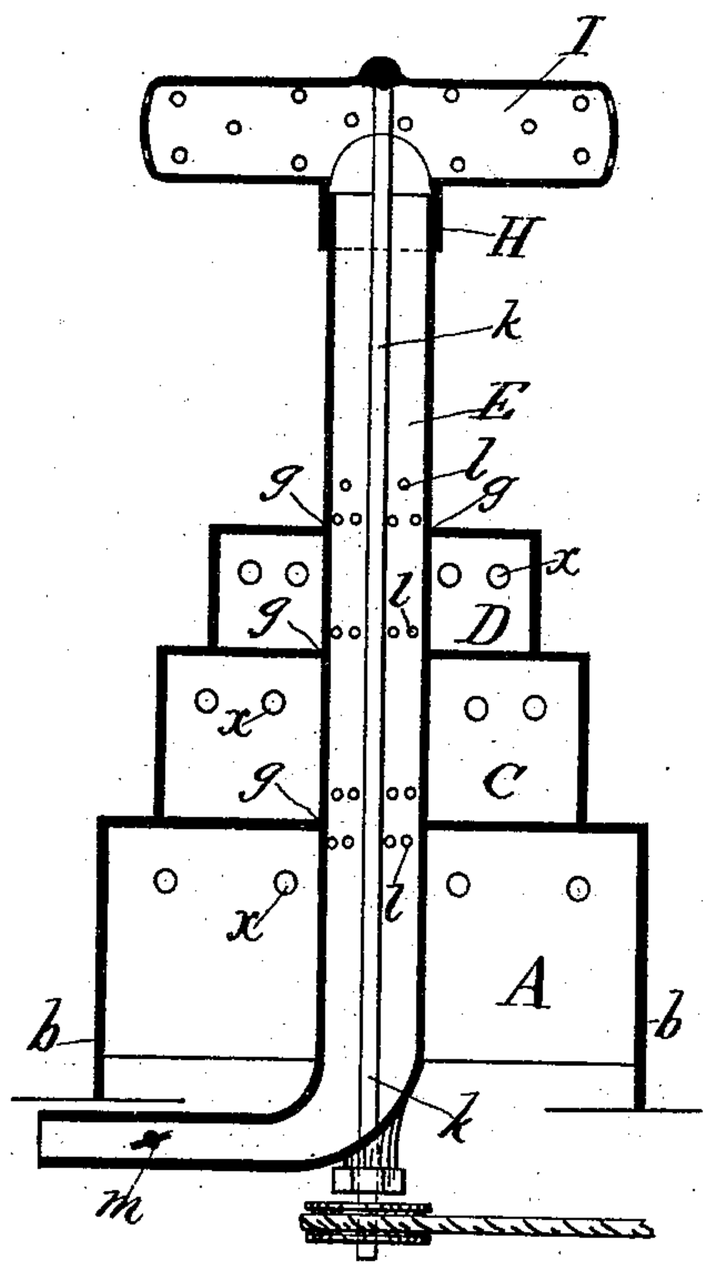
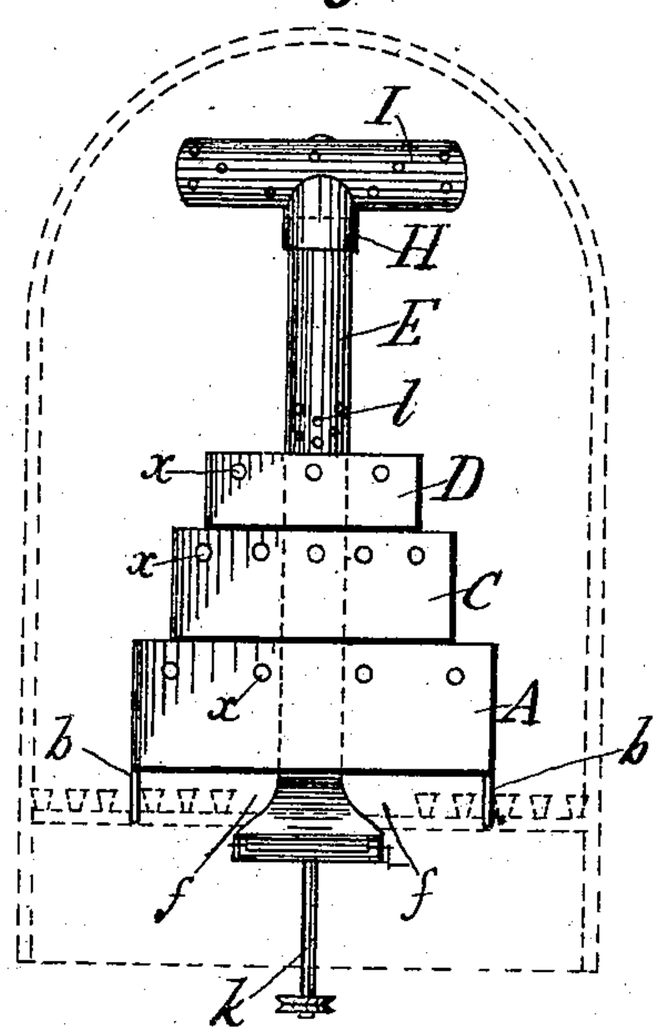


Fig 3.



Witnesses.

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WILLIAM HALSTED, OF TRENTON, NEW JERSEY.

IMPROVEMENT IN DEVICES FOR SUPPLYING AIR TO FURNACES.

Specification forming part of Letters Patent No. **189,096**, dated April 3, 1877; application filed February 16, 1877.

To all whom it may concern:

Be it known that I, WILLIAM HALSTED, of Trenton, in the county of Mercer and State of New Jersey, have invented certain new and useful improvements in apparatus for improving the combustion and for consuming the gases generated in locomotive and other furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof, 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 letters of reference marked thereon, which form a part of this specification.

My improvements relate to a new and improved method of introducing air into locomotive-furnaces, for the purpose of giving a better draft, and for the burning of gases generated therein, and for saving fuel thereby; and they consist in the same, and in the devices hereinafter described for practicing the same.

In the drawings, Figure 1 is a perspective, and Fig. 2 a vertical central section, of an apparatus embodying my invention; and Fig. 3 shows the same, on a reduced scale, within an imaginary furnace. (Shown by dotted lines.)

I make a box, A—say, about twenty inches square—of sheet or cast iron, closed at its top and open at its bottom. Two sides of the box opposite to each other should be, say, fourteen or fifteen inches in depth; the other two sides opposite to each other should be about eight or nine inches in depth. These two deeper sides of this box should be so made that when the box is placed upon the grate within the furnace, they may pass through the spaces in the grate-bars, and may project through such spaces down below the grate-bars. Through the top of this box a hole should be made, round or square, as may be most desirable, of about twelve or fourteen inches in diameter. I now make another box, C, of lesser size—say, about seventeen inches square. The size of this box should be in height about eight or nine inches, and open at the bottom, and with a hole in its top of the same dimensions as in the larger box mentioned. I now make a third box, D, about fifteen inches square, also open at its bottom, and with a hole in its top of the same size as the two above mentioned. The height of this box should be, say, eight or nine inches. I now make a tube, E, either cylindrical or square, and of sheet-iron, of a dimension exactly of the size to pass through and to fill up the openings in the tops of the three boxes above mentioned, and let this tube be long enough to project, say, through and above the top of the upper box, and, say, from four to six inches below the grate of the furnace, the larger one A of the boxes (its open end downward) being set in the furnace over an opening or space, *f*, made in the grate-bars for the purpose of allowing the air freely to pass into it. This box forms the base or lower story of the structure. The second box, C, is laid similarly directly over the hole *g* in the first box, and this will form the second stage or story of the structure. The box D should be similarly placed directly over the hole *g* in the last-named box. Now, upon fitting the tube E into the openings *g* of these boxes, they will be held in their proper positions, and will form a structure having three different stages or stories, with the hollow tube passing through them, and projecting both above and below them. Around the four sides of each of these stories, at a distance, say, from four to five inches down each side thereof, perforations of holes *x*, of a size of one-fourth to three-fourths of an inch, should be made, through which air may be allowed to pass from within the structure into the burning fuel and through the furnace. This tube should project, say, from six to eight inches or more above the top story or platform of the structure, according to the height of the furnace, and the top of it, whatever form its other part may be, should be cylindrical, and should be so made that another cylindrical tube, H, having a hollow horizontal tube or tubes, I, connected with it, may be so fitted onto the vertical tube E that air may pass through this vertical tube into the horizontal tube or tubes I, and that the latter may be free to revolve upon the tube E. The tube or tubes I may be from two and one-half to three feet in length, or more, and of a diameter of from two to four inches, and if two be used, one should cross the other at

right angles, like the cross on top of a turnstile. (See dotted lines marked I′ in Fig. 1.) These hollow horizontal tubes are perforated with holes from one-fourth to three-fourths of an inch in diameter through their whole length, at a distance, say, one to two inches apart, and are also perforated at their ends.

In order to cause the tube or tubes I to revolve, a long iron rod, *k*, should be so attached to it or them, at or near its center, that the rod may be passed down through the center of the tube E. This rod, upheld in an appropriate bearing or support, should project a few inches below this tube, so that it may be connected with a cog-wheel or gearing or belting, or any other convenient mechanical device by which it can be turned while in its perpendicular position. It may also be operated by connecting it with the piston-rod of an engine, whether the same moves vertically or horizontally. The tube E, at portions opposite or just below the perforations *x* in boxes or stories A C D, above mentioned, should be perforated with appropriate openings *l* all around, at a distance, say, of one inch apart from each other, and extending up and down the tube, say, about eight inches, for the purpose of admitting free escape of air from the tube E into the three stories.

For the purpose of protecting the sheet-iron or material of which this structure is made, it should be covered externally with such material as fire-brick is made of, made of the same shape exactly as the exterior of the structure, only a little larger, so as to cover it completely from the action of the fire; or the structure may be protected by fire-brick, leaving openings in or between them to permit the air to pass through the perforations *x*.

The squares intended to cover each of the platforms may be one and one-half inch larger than the diameter, so as to allow the other edge of the platform to project an inch or more beyond the side, so as to shut down over the outside of the platform to the extent of a half inch or more, so as to hold each side in its place. These platforms, being thus placed on each of the upright sides, will be held in their place by the upright cylindrical tube which passes through the circular holes in their center, and the sheet-iron or cast-iron structure will thus be completely protected from the fire.

Instead of only three boxes or platforms, more may be used to complete structure.

The apertures *x x* in the sides of the boxes may be of any desired form—as, for instance, square, round, or parallelograms.

A damper or valve may be placed in the inlet end of tube E.

If desired, a small tube leading from the dome or other part of the boiler of a locomotive or engine may conduct steam into the lower end of a vertical tube within the tube E, or into the lower end of the rod or shaft *k*, which may be made hollow or tubular for this purpose, and whereby the steam may be let into or turned off from said tube at pleasure, and may be discharged into the revolving tube I, and thence into the upper part of the furnace.

With such an arrangement it will be seen that either air or steam may be used, as may be found best adapted to effect proper combustion of the fuel used in the furnace, and of the gases generated therein.

This invention is applicable not only to locomotives, but also to stationary and other engines, and to stoves and furnaces. For an ordinary-sized locomotive or furnace one of my described structures would be sufficient; but for very large ones two may be used.

The several boxes may, in some cases, have open communication with each other, or merge into a single chamber. In such case the air from without, entering such chamber, will tend the better to prevent so intense a heating of the metal composing the chamber, and to preserve it for a long time; but in whichever way it be constructed, the openings from the tube E into the chambers may be as many or as large as may best conduce to the result sought, or as may best accord with the openings in the sides of the box or boxes.

A fan, *m*, may be employed, and which may be operated by connecting it with the piston-rod of the engine.

I claim—

1. As a means for aiding and accelerating the combustion of fuel in furnaces, locomotives, &c., the series of graduated and perforated chambers within the fire-pot, in combination with the perforated air-tube E, extending through and supplying air to such chambers, substantially as shown and described.

2. The combination, with the perforated chamber or chambers, and with the central perforated tube E, of the horizontal perforated tube I, connected to a rod or support, *k*, and adapted to be revolved upon the tube E, substantially as and for the purposes set forth.

WILLIAM HALSTED.

Witnesses:
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