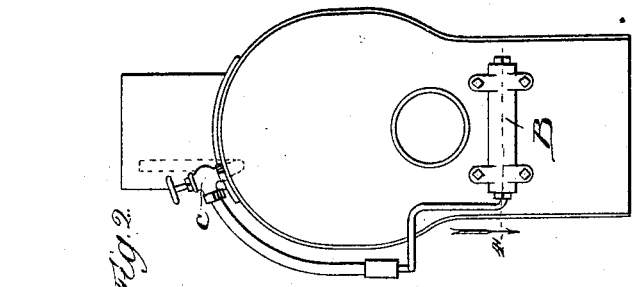
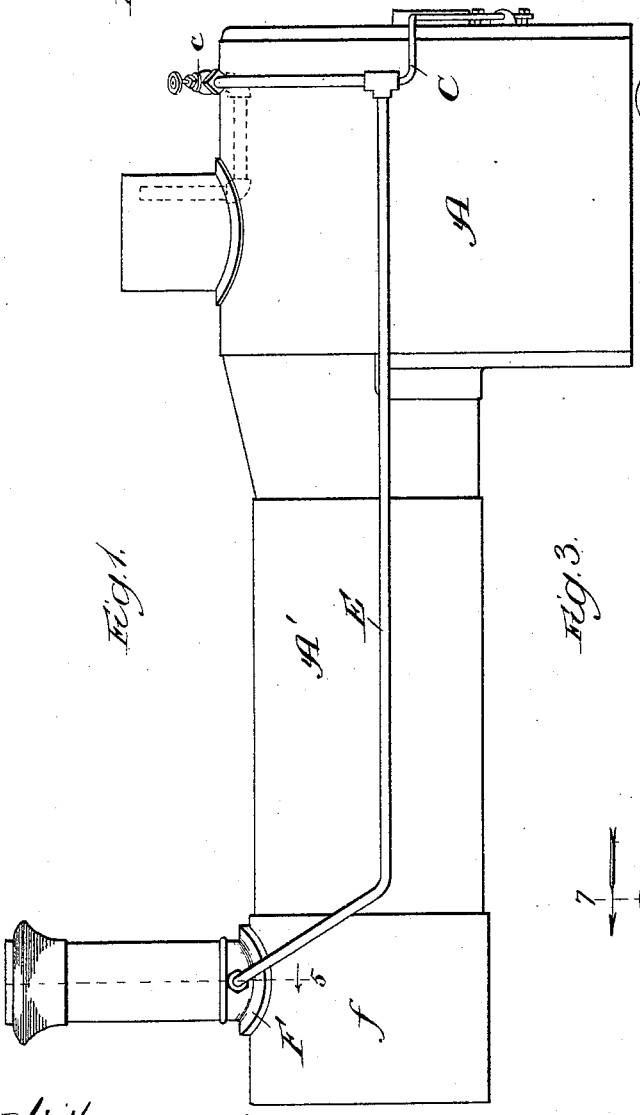
(No Model.) 2 Sheets—Sheet 1.

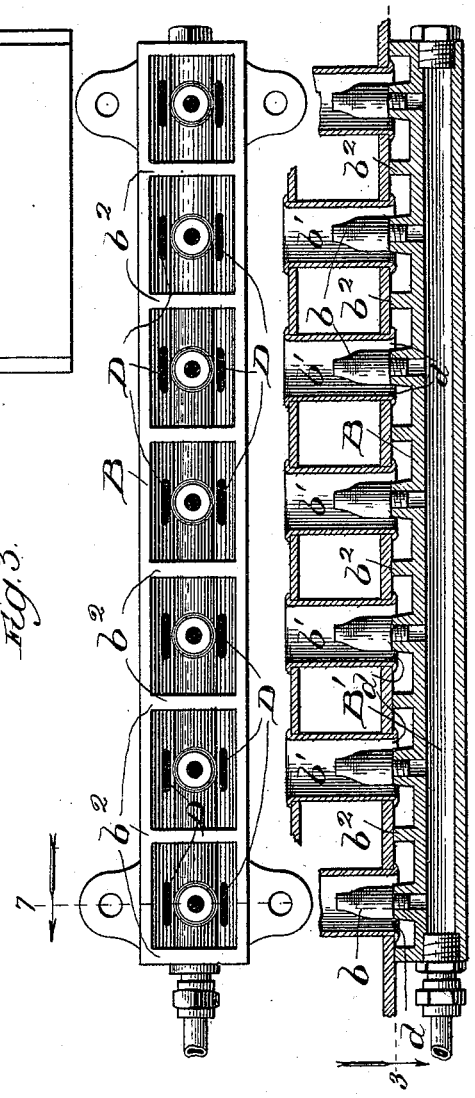
J. B. BARNES.

SMOKE BURNER.

No. 491,975. Patented Feb. 21, 1893.







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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

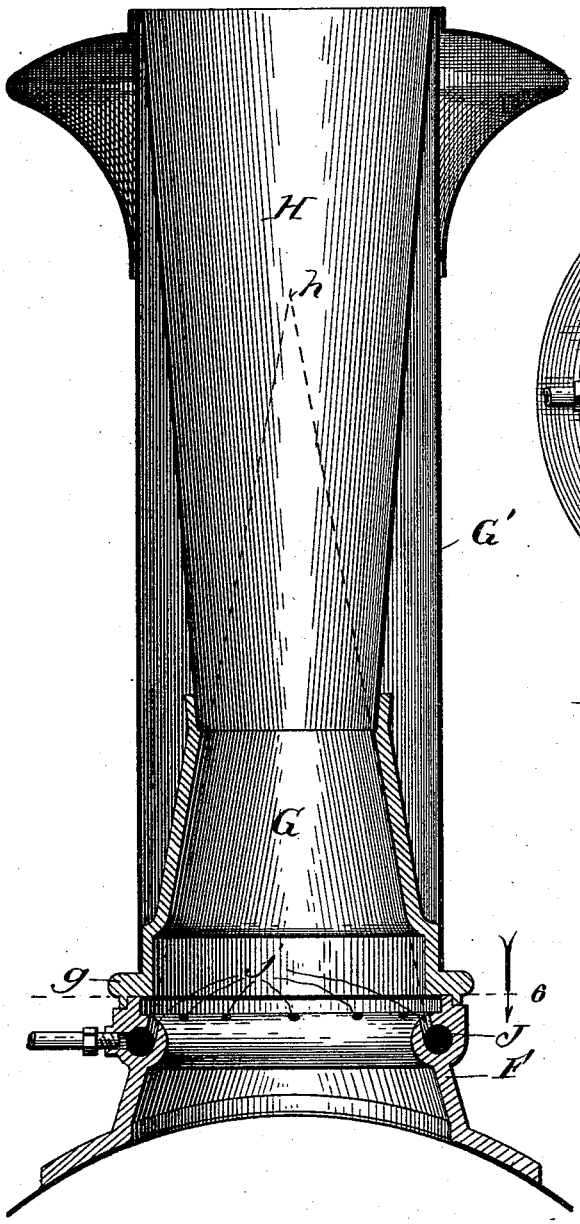


Fig. 6.

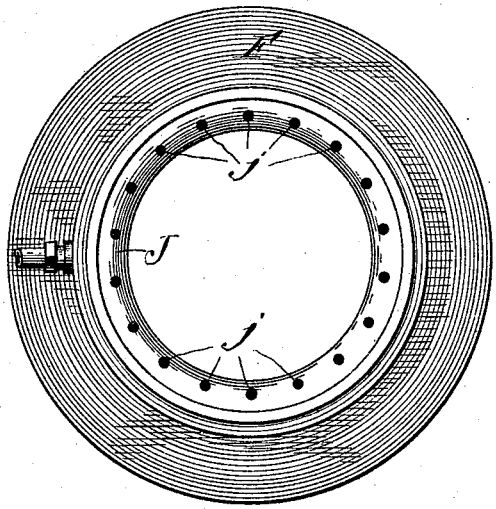
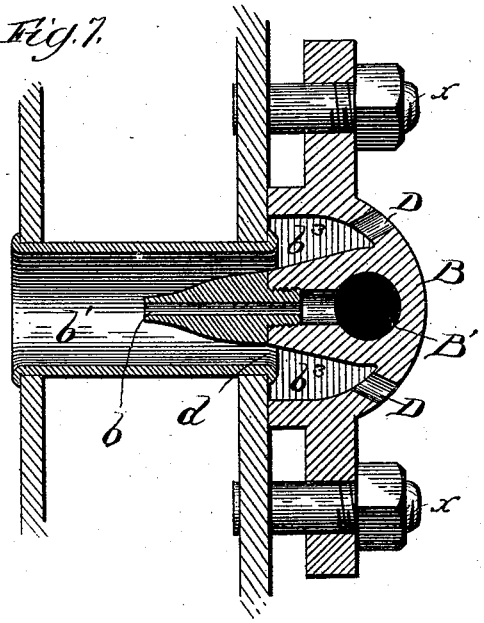


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOSHUA B. BARNES, OF SPRINGFIELD, ILLINOIS.

SMOKE-BURNER.

SPECIFICATION forming part of Letters Patent No. 491,975, dated February 21, 1893.

Application filed December 5, 1892. Serial No. 454,106. (No model.)

To all whom it may concern:

Be it known that I, JOSHUA B. BARNES, residing at Springfield, Sangamon county, Illinois, have invented a new and useful Improvement in Smoke-Burners, of which the following is a specification.

The object of my invention is to provide suitable, practicable and efficient means to increase the draft of locomotive boilers, and to supply the air requisite for the complete and perfect combustion of the fuel. The obvious advantages of such improvements are the prevention of smoke, the complete consumption of the products of combustion, and, consequently, the derivation of a greater efficiency from the amount of fuel used than has heretofore been accomplished.

To this end my invention consists, generally speaking, of a novel construction of injecting tuyeres and chambers attached to the fire box and receiving steam from the boiler, air being introduced thereby through apertures made of a peculiar form, for a purpose hereinafter specified. Furthermore, in order that the greatest draft may be obtained simultaneously with the employment of the injecting tuyeres, and through the manipulation of a single valve, I lead a supply of steam to the stack, independent of the exhaust, and arrange a steam chamber with discharge orifices in such manner that the greatest efficiency is obtained. By the simultaneous action of these two chambers, with their jets constructed as hereinafter described, I am enabled to obtain all of the advantages recited above; and my invention consists in the features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of a locomotive boiler and stack with my improvements attached; Fig. 2 an end elevation of said boiler; Fig. 3 a bottom plan view, taken on line 3 of Fig. 4, looking in the direction of the arrow; Fig. 4 an enlarged cross section, taken on line 4 of Fig. 2 looking in the direction of the arrow; Fig. 5 an enlarged vertical section of the stack and stack saddle, taken on line 5 of Fig. 1; Fig. 6 a plan view of the steam chamber adjacent to the stack saddle, the saddle being removed; and Fig. 7 an enlarged vertical section, taken through the line 7 of Fig. 3.

The fire box A, boiler A′, and other parts of the locomotive shown but not hereinafter specially described, are constructed in the usual and well known manner, and therefore require no detailed description.

Secured in any suitable manner, as by bolts *x x* upon the face of the fire box, and preferably beneath the furnace door, is a longitudinal chamber B, in which is located a steam passage B′, running along its entire length, and having at suitable points thereon injecting tuyeres *b*, which extend into openings *b′*, through the shell of the boiler, and through the usual water jacket thereof. Any suitable number of such tuyeres and corresponding openings may be provided, as desired, in order to secure the best results. Strengthening ribs b^2 are arranged between the tuyeres and abut against the face of the fire box when the device is secured thereon. There are thus formed a number of independent air chambers b^3, wherein the air is highly heated before its induction into the combustion chamber. Steam is supplied to the passage B′, through the supply pipe C, which takes dry steam from the top of the steam dome, as shown in the drawings, or at any other suitable point of the boiler as preferred. The steam supply is regulated by any suitable valve, as, for instance, the valve *c*. As shown particularly in Fig. 3, air inlets D permit the entrance of air into the spaces b^3, where it becomes heated to a suitably high temperature as stated. These inlets are of an elongated form, as shown more particularly in Fig. 3. The advantage of this peculiar form lies in the fact that the air passes or slips through such shaped openings more readily, and does not produce a roaring or whistling sound. The tuyeres extend into the openings in the face of the fire box, but leave an annular space or air passage *d* for the passage of the heated air induced by the steam blast into the fire box.

A branch E of the supply pipe from the boiler leads to the stack, which is constructed as follows: The usual stack saddle F is arranged upon and secured to the smoke box *f* in the ordinary manner, and supports an inverted funnel G, upon whose lower flange *g* rests the stack body G′. This funnel is adapted to receive another upright funnel H,

as shown in cross section in Fig. 5. An annular steam chamber J is formed in the upper portion of the saddle, and is provided with a number of steam outlets *j*, which are each of such an angle that the jets of steam emitted therefrom will pass parallel to the sides of the funnel G, and will focus at a point thereabove, as at *h*.

The operation of my devices are as follows: By operating the valve *c* steam is admitted through both supply pipes C and E, supplying respectively chambers B′ and J with steam. Steam from chamber B′ passes through the tuyeres *b* into the combustion chamber, and thereby induces air through the elongated air holes B into the independent air chambers or compartments b^3, where it becomes heated. It is thence drawn through the annular openings *d* into the fire chamber, thus supplying a sufficient quantity of oxygen for the complete combustion of the fuel, and thereby preventing the formation of smoke. The accomplishment of this object is further attained and assisted by the conjoint and simultaneous action of the steam jets in the stack saddle, which increases the draft simultaneously with the employment of the tuyeres which discharge steam into the combustion chamber and induce heated air therein. As before stated, when the valve *c* is open steam flows into the branch pipe E′ as well as into the pipe C. Steam is conducted through the pipe E to the annular steam chamber J, from whence it escapes through the apertures *j*, which have such an angle that they focus at the point *h*. Thus a powerfully induced current is set up, and the draft increased simultaneously and conjointly with the operation of the injecting tuyeres on the fire box.

Although I have entered into a minute and detailed description of my invention, I do not wish to be understood as unduly limiting myself thereto; but desire to deviate therefrom as circumstances may suggest or render expedient.

I claim—

1. A locomotive smoke burner, comprising a boiler having openings in the face of its fire box, a chamber secured thereto, a steam passage in such chamber, injecting tuyeres arranged along such passage and projecting into the openings in the fire box, air passages adjacent to said tuyeres and communicating with such openings, air passages in the shell of said chamber, a steam supply pipe from said boiler provided with a valve leading to said steam passage, a smoke box, a stack saddle supported thereon, an annular chamber in said saddle, openings in said annular chamber at such angle that steam jets focus thereabove, a branch pipe of said steam supply pipe leading to said annular chamber, whereby as steam is admitted to said supply pipes, the two sets of steam jets will act simultaneously and conjointly, substantially as described.

2. A locomotive smoke burner, comprising a boiler, a chamber B secured thereto, a steam passage B′ therein, tuyeres *b* arranged along such passage, openings *b′* through the face of the fire box, ribs b^2 abutting against the fire box and dividing the interior of the chamber into independent compartments b^3, elongated air passages D leading into said compartments, holes *d* adjacent to the tuyeres and entering into the openings *b′*, whereby as steam is admitted in the steam passage it will be injected into the fire box through the tuyeres and air thereby induced will pass through the openings and through the air compartments where it becomes heated, substantially as described.

3. In a locomotive smoke burner, the combination of a boiler, openings in the fire box thereof, a chamber B secured to the face of said boiler and containing a steam passage B′, injecting tuyeres arranged along said passage and projecting into such openings, air apertures D opening into the interior of said chamber, annular air inlets *d* entering the fire box, a smoke box, a stack saddle mounted thereon, an annular chamber arranged therein, openings *j* in said annular chamber J′ at such angle as to focus at a point thereabove, an inverted channel G mounted on said saddle and supporting at its top an upright funnel H, the sides of said funnel G being parallel to the direction or slant of the openings *j*, a steam supply pipe operated by a valve and dividing into two branches, one of such branches feeding said passage B′ and the other feeding the annular chamber J, substantially as described.

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