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DEVICE FOR PRODUCING DRAFT IN ENGINES.

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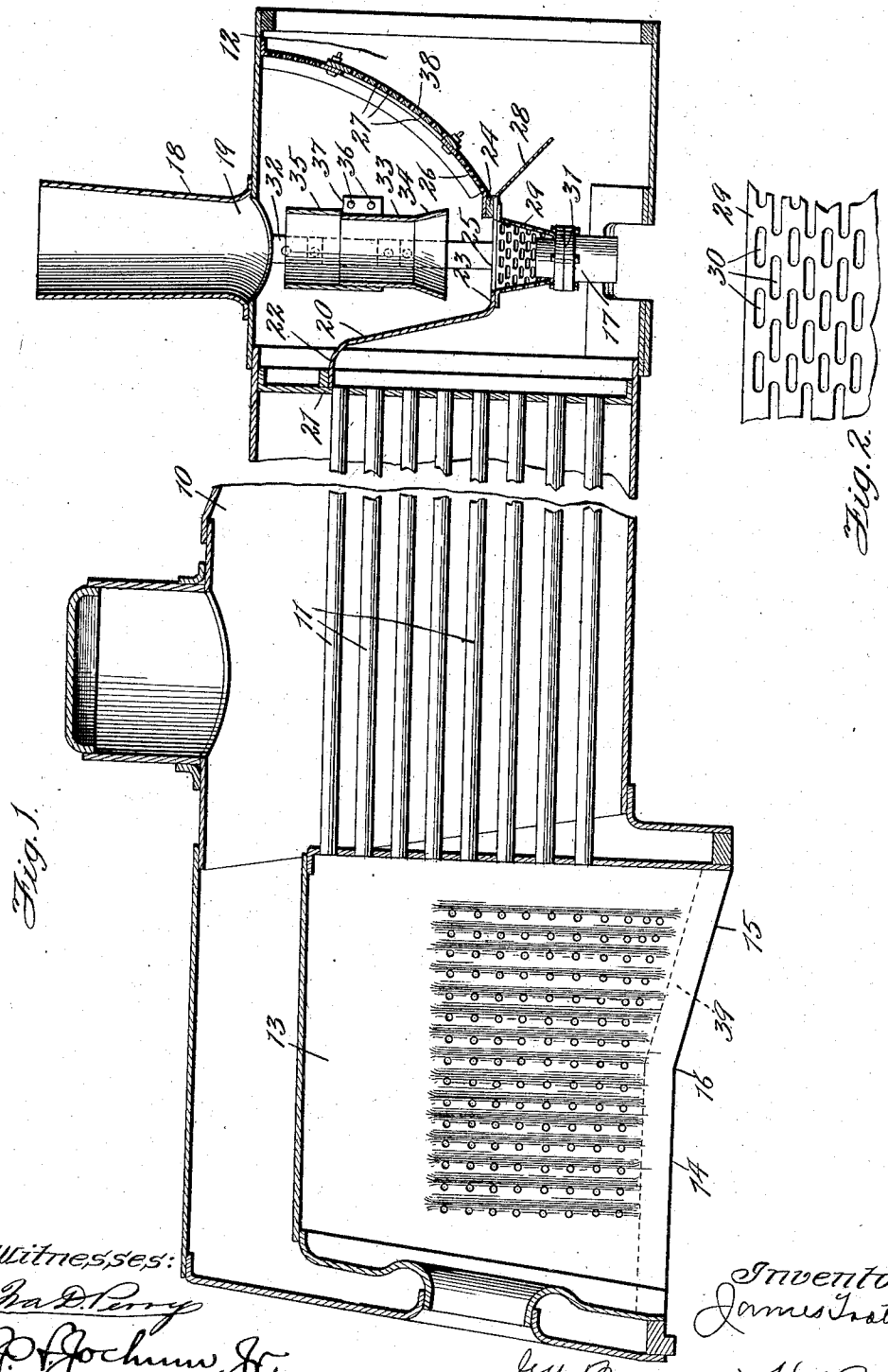
**1,015,460.**

Patented Jan. 23, 1912.

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# UNITED STATES PATENT OFFICE.

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## DEVICE FOR PRODUCING DRAFT IN ENGINES.

1,015,460. Specification of Letters Patent. Patented Jan. 23, 1912.

Application filed August 27, 1907. Serial No. 390,327.

*To all whom it may concern:*

Be it known that I, JAMES TROTTER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Devices for Producing Draft in Engines, of which the following is a specification.

In the present type of locomotive engines, in which a fire grate is employed having a downwardly inclined rear portion adjacent the fire tubes, considerable difficulty has been experienced in that the strongest draft is created at the peak or angle formed by the depressed portion of the grate, due to the fact that uneven drafts are created through the fire tubes or flues which will cause the fuel to be consumed more rapidly at this point, thereby uncovering the same and causing the fuel to accumulate excessively on the grate in advance of the peak so that the fuel will not be consumed and thereby block or close the tubes.

To overcome this objection and serious difficulty, and to provide improved means for creating a uniform draft through all of the flues, which will maintain an even depth of fire bed whereby the grate will be evenly covered throughout its entire area is the primary object of this invention.

A further object is to provide an improved device of this character in which the exhaust nozzle discharging into the stack for creating the draft through the flues, is located at a comparatively low point in the smoke box, and in which the diameter of the choke of the stack is proportionately increased, so that the steam as it is discharged from the nozzle, will expand, and together with the gases and cinders entrained therein, substantially fill the stack.

A further object is to provide an improved device of this character for creating a uniform draft through all of the flues.

A further object is to provide an improved device of this character adapted to prevent the accumulation of cinders or ashes in the smoke box, and which will automatically clean the smoke box and also prevent the accumulation of smoke in the top thereof without producing back pressure on the engine.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawing illustrating an exemplification of the invention, and in which—

Figure 1 is a longitudinal sectional view of a locomotive engine boiler constructed in accordance with the principles of this invention. Fig. 2 is a detail plan view of a portion of the screen or shield for the discharge nozzle.

Referring more particularly to the drawing and in the present exemplification of the invention, the numeral 10 designates the boiler of a locomotive engine provided with fire tubes or flues 11 at the forward end of which is a smoke box 12 into which the tubes 11 discharge and at the rear with a fire box 13 with which the flues 11 also communicate. The fire box 13 is provided with a fire grate having a substantially horizontal portion 14 at the front thereof, and an inclined or depressed portion 15 at the rear thereof which forms a peak 16 substantially midway of the length of the grate.

Discharging into the smoke box 12 is a nozzle 17 which is located at a comparatively low point within the box and the said nozzle is also located in a direct line with the stack 18, which latter communicates with the smoke box in the usual manner. The exhaust steam from the engine cylinder is directed into the nozzle 17 in the ordinary and well known manner, not necessary to illustrate, and is discharged from the nozzle directly into the stack 18. The choke 19 of the stack is of a somewhat larger diameter than the diameter of the ordinary choke, and is increased proportionately with relation to the height of the nozzle 17 so that as the steam is discharged from the nozzle, it will expand and together with the gases and cinders entrained therein, substantially fill the stack.

An imperforate partition 20 is mounted within the smoke box in any suitable manner, preferably by securing it along one edge to the wall 21 just above the forward ends of the flues or tubes 11. This partition embodies a short forwardly projecting portion 22 and a downwardly and forwardly inclined portion from which projects a plate or table 23. Said table 23 may be made in a separate piece and secured to the inclined

portion, but is preferably made by deflecting the lower end of said inclined portion. As shown in Fig. 1, said partition extends across the forward ends of the upper series of tubes 11 so that gases therefrom are deflected downwardly. The free end of the plate or table 23 may be supported in any desired or suitable manner, preferably by means of a bracket 24 secured to the sides of the smoke box, and this plate or table 23 is provided with an aperture 25 which is located above the end of the nozzle 17 and is of a diameter somewhat larger than the said end. The free end of the plate or table 23 extends beyond the nozzle 17 and terminates short of the forward end of the smoke box 12.

The plates 20, 23, taken together, constitute a partition which crosses the line between the nozzle and the stack, and which is entirely imperforate, excepting for the opening 25 whereby direct communication between the flues and the stack will be concentrated around the nozzle through this opening and a very powerful draft will be produced under the plate or table 23 by the employment of a comparatively large nozzle whereby the cinders which do not pass directly through the conical screen 29 will be continued onward in a horizontal direction by their momentum thus obtained, and will be eventually dashed against the screen 38 and thereby broken up and carried therethrough by the draft induced above the table 23.

A suitable screen 26, preferably in the form of a foraminous plate whose perforations are shown as elongated openings 27 formed therein extends across the smoke box with one end thereof secured to the free edge of the plate or table 23, and the other edge preferably secured to the top of the smoke box 12 adjacent the forward edge thereof. The partition plate 20, the plate or table 23 and the perforated screen 26 are preferably so arranged as to divide the smoke box 12 into two compartments, one preferably above the other, and secured adjacent the plate or table 23 in advance of the nozzle 17 is a downwardly extending inclined baffle plate 28 which extends in a direction away from the nozzle 17 and terminates preferably at a point below the discharge end of the nozzle.

A suitable screen or shield 29, preferably constructed of a piece of metal provided with elongated openings 30, surrounds the discharge end of the nozzle 17, and is of an inverted frusto conical shape, the smaller end thereof resting upon a suitable coupling 31 on the nozzle 17 adjacent the end thereof and the larger end being secured to the plate or table 23 in any desired or suitable manner so as to communicate with the aperture or opening 25 therein, and this screen or shield serves as a means for preventing the cinders or sparks from being drawn through the flues or pipes 11 and being carried directly into the stack 18 by the steam or vapor which is discharged through the nozzle 17.

Arranged within the upper chamber of the smoke box 12 which is formed by the partition 20 and screen 26 is a suitable support 32 which is preferably located adjacent the stack opening and is held in position in any desired or suitable manner.

A petticoat pipe 33 having a flanged lower extremity 34 is adjustably secured to the support 32 in any desired or suitable manner and is located intermediate the nozzle 17 and the stack 18, and in a direct line with the discharge end of the nozzle so that the steam passing from the nozzle 17 will also pass through the pipe 33 before entering the stack 18. If desired, the pipe 33 may be provided with an adjustable section 35 arranged adjacent the upper end thereof and said section preferably surrounds the upper extremity of the pipe 33 and is clamped in position by means of suitable bolts 36 which pass through suitable ears or flanges 37 on the said section.

If desired, and in order to gain access to the upper chamber in the smoke box, the perforated plate or screen 26 may be provided with a removable section 38 which may be held in position in any desired or suitable manner.

In use, as the steam from the cylinder discharges into the stack 18 through the pipes 33, 35, the air in the smoke box will become rarefied and will be drawn up through the stack, thereby producing a draft through the pipes or flues 11.

It will be noted that if the partition 20 were not present, a stronger draft would be created through the series of flues adjacent the discharge end of the nozzle, but by the use of the partition and by locating the nozzle at a comparatively low point within the smoke box and below the free extremity of the partition, a uniform draft will be created through the flues and the cinders which would ordinarily accumulate on the fire bed at the lowest point of the grate will be raised through the flues and discharged through the stack after they have become ground up in the smoke box, due to the fact that they are forced against the partition 20, screen 29, baffle plate 28 and screen 26. In the ordinary construction of engines of this type, and where an uneven draft is created through the tubes or flues, the peak 16 of the grate becomes uncovered, due to the fact that the strongest draft is created at this point of the fire bed, but with this improved construction of engine, and by locating the discharge end of the nozzle 17 at a comparatively low point within the smoke box and

proportionately increasing the choke of the stack 18, the draft through the flues will become uniform and the fire bed, indicated by the reference numerals 39, will remain of a uniform depth throughout its entire area and the peak 16 will be covered and protected to the same extent that the remaining portion of the grate is covered.

With this improved construction of engine it has also been practically demonstrated that the amount of fuel consumption has been reduced from 240 pounds to a thousand mile ton, to 108 pounds to a thousand mile ton, thereby maintaining the efficiency of the engine at a very material reduction of expense.

The screen or shield 29 serves as a means for assisting in breaking up the cinders as they are drawn through the fire tubes, and coöperates with the baffle plate 28, and also prevents the cinders from being forced directly through the stack 18.

If desired, the baffle plate or shield 28 may be dispensed with without materially altering the efficiency of the engine.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a device for the purpose described, the combination of a furnace embodying substantially horizontal smoke flues, a smoke box into which said flues discharge, a stack rising from said smoke box, an exhaust nozzle arranged below and in line with said stack, and a partition extending substantially entirely across the smoke box from side to side and inclined downwardly and forwardly from a point above the flues between the back of the smoke box and the stack and crossing a line between the stack and the nozzle at an elevation substantially above the nozzle and having an enlarged passage arranged in direct line with the nozzle and stack whereby the flues will have direct communication therethrough with the stack.

2. The combination of a smoke box provided with a stack, flues discharging into the box, a nozzle within the bottom portion of the box, a partition adjacent the ends of the flues and extending from a point above the flues downwardly in an inclined direction and having at its lower end a forwardly extending portion above the upper end of said nozzle, said forwardly extending portion being provided with an aperture coaxially disposed with the nozzle, and a tubular screen secured at one end around the edge of said aperture and having its other end extending around the upper end of the nozzle.

3. The combination of a smoke box provided with a stack, flues discharging into the box, a nozzle within the bottom portion of the box, a partition adjacent the ends of the flues and extending from a point above the flues downwardly in an inclined direction, said partition having its lower end deflected to extend above the upper end of said nozzle, said lower end being provided with an aperture coaxially disposed with reference to the nozzle, a screen extending transversely across the box and having one edge supported adjacent the apertured portion of the partition, and a tubular screen secured at one end to said lower end of the partition about the edge of said aperture therein and having its other end extending around the upper end of the nozzle.

4. The combination of a smoke box provided with a stack, flues discharging into the box, a nozzle within the bottom portion of the box, a partition adjacent the ends of the flues and extending from a point above the flues downwardly in an inclined direction, said partition having its lower end deflected forwardly to provide a portion extending above the upper end of said nozzle, said portion being provided with an aperture coaxial with the nozzle, an adjustable petticoat pipe coaxially mounted with said stack and nozzle, and a tubular screen secured at one end to the forwardly extending portion of the partition around the edge of said aperture and having its other end secured to said nozzle about the upper end thereof.

5. In a device for the purpose described, the combination of a furnace embodying substantially horizontal smoke flues, a smoke box into which said flues discharge, a stack rising from said smoke box, an exhaust nozzle arranged below and in line with said stack, a partition extending from a point above the flues between the back of the smoke box and the stack and crossing a line between the stack and the nozzle at an elevation substantially above the nozzle and having an enlarged passage in direct line with the nozzle and stack whereby the flues will have direct communication therethrough with the stack, said partition being otherwise imperforate, and a screen extending from the forward side of the smoke box rearwardly to a point forward of said opening.

6. In a device for the purpose described, the combination of a furnace embodying substantially horizontal smoke flues, a smoke box into which said flues discharge, a stack rising from said smoke box, an exhaust nozzle arranged below and in line with said stack, a downwardly and forwardly inclined partition extending substantially entirely across the smoke box from a point above the flues between the back of the smoke box and the stack and crossing a line between the stack and the nozzle at an elevation substantially above the nozzle and having an enlarged passage arranged in direct line with the nozzle and stack whereby the

flues will have direct communication therethrough with the stack, and a foraminous screen extending from the forward side of the smoke box rearwardly to a point forward of said passage.

7. The combination of a smoke box provided with a stack, flues discharging into the box, a partition arranged in the upper portion of the box across the ends of some of the flues, said section being imperforate except for an opening in line with the stack, a nozzle discharging into the stack through said opening, the discharge end of the nozzle being located relatively low in the smoke box and terminating short of the end of said partition, an inverted frusto-conical screen surrounding the orifice of said nozzle and extending upwardly to the lower end of said partition, and a baffle in advance of the nozzle, said baffle being arranged to project forwardly and downwardly from the upper edge of said screen.

8. The combination with a boiler shell provided with a transverse wall for forming a smoke box at one end thereof, a stack opening from said smoke box, flues discharging into the box through said wall, an imperforate partition rigidly mounted upon said wall above the uppermost flues and projecting downwardly at an inclination over some of said flues, said imperforate partition being provided with a forwardly extending portion with an opening coaxial with the stack, a nozzle disposed at a low point in the smoke box and terminating below said opening, said nozzle being thereby adapted to discharge through the opening into the stack, a screen extending from said forwardly extending portion to said nozzle, and a baffle projecting forwardly at an inclination from the forward end of said forwardly projecting portion.

9. In a device for the purpose described, the combination of a furnace embodying substantially horizontal smoke flues, a smoke box into which said flues discharge, a stack rising from said smoke box, an exhaust nozzle arranged below and in line with said stack, a partition extending from a point above the flues between the back of the smoke box and the stack and crossing a line between the stack and the nozzle at an elevation substantially above the nozzle and having an enlarged passage in direct line with the nozzle and stack whereby the flues will have direct communication therethrough with the stack, said partition being otherwise imperforate.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 23rd day of August A. D. 1907.

JAMES TROTTER.

Witnesses:

J. H. JOCHUM, JR.,

CHARLES H. SEEM.