

J. PLAYER.
EXHAUST NOZZLE.

APPLICATION FILED JUNE 17, 1908.

Patented Feb. 1, 1910.

2 SHEETS—SHEET 1.

948,019.

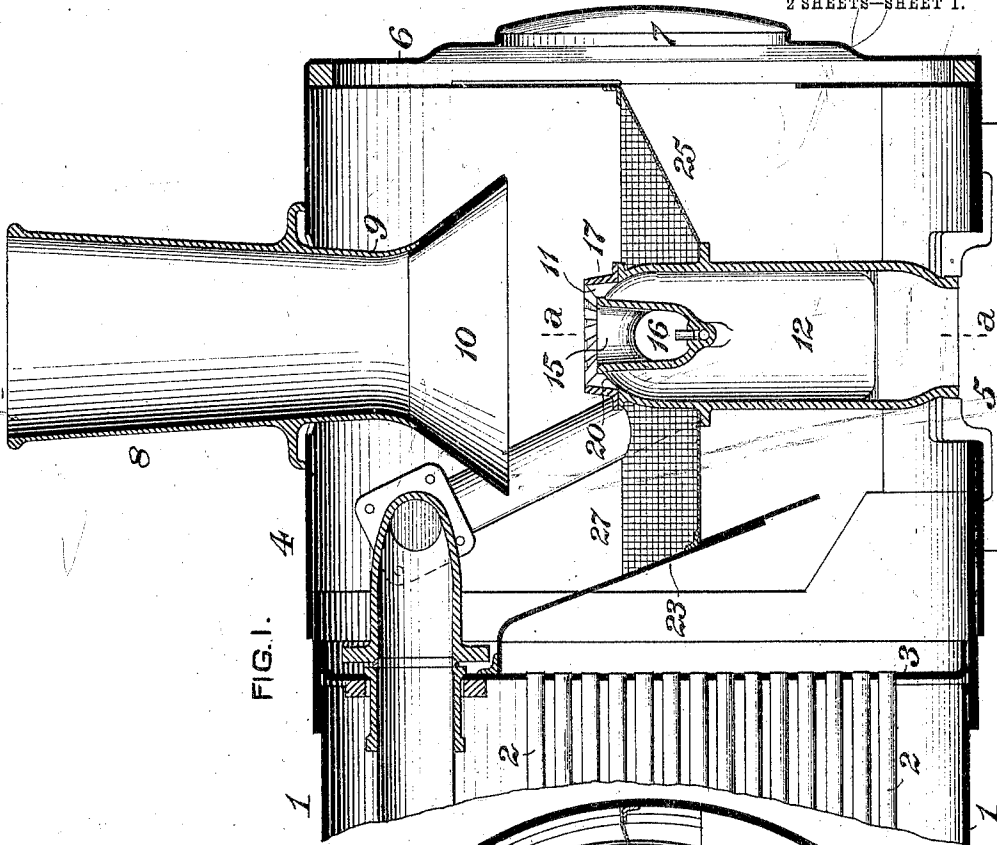


FIG. 1.

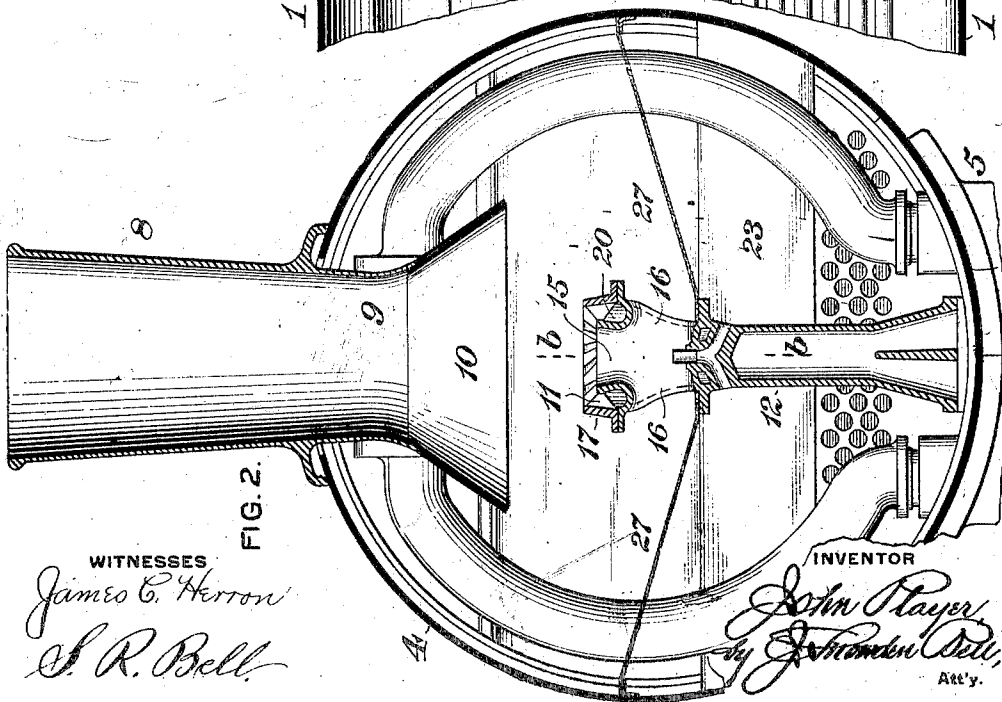


FIG. 2.

WITNESSES

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2 SHEETS—SHEET 2.

FIG. 6.

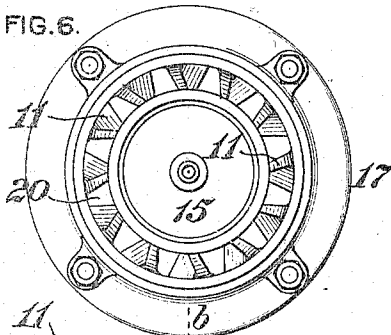


FIG. 9.

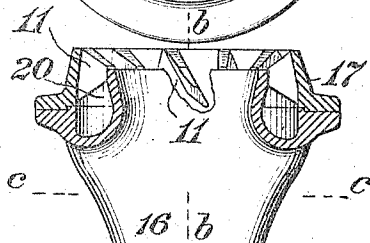
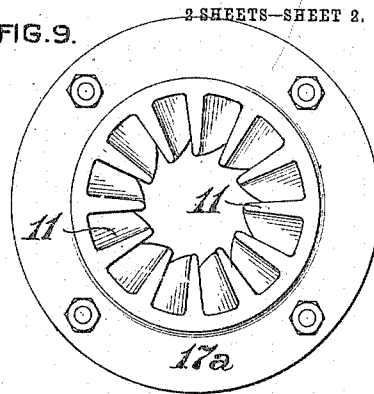


FIG. 4.

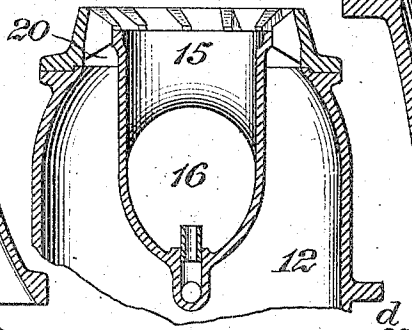


FIG. 7.

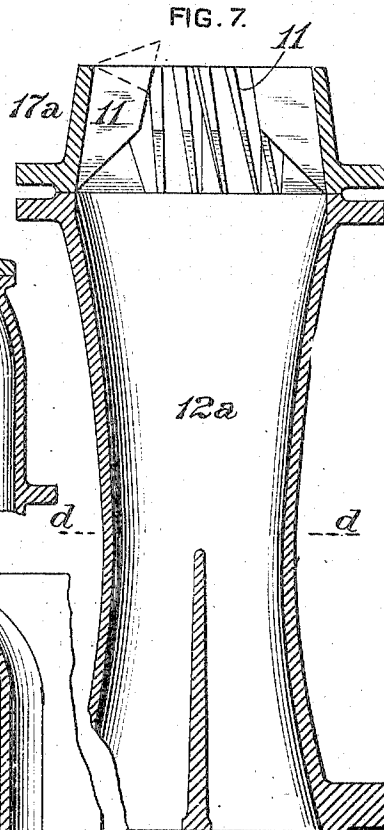


FIG. 3.

FIG. 5.

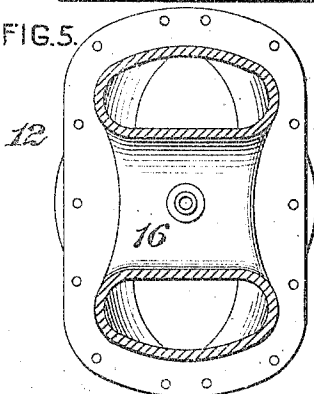
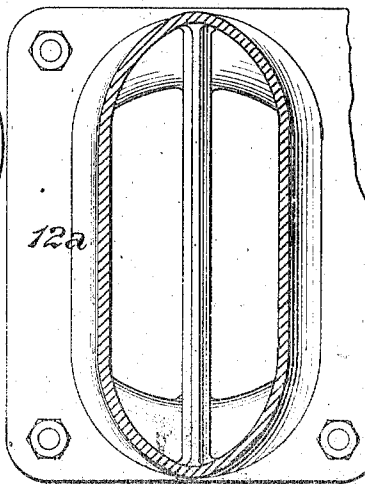


FIG. 8.



WITNESSES

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UNITED STATES PATENT OFFICE.

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EXHAUST-NOZZLE.

948,019.

Specification of Letters Patent.

Patented Feb. 1, 1910.

Application filed June 17, 1908. Serial No. 438,912.

To all whom it may concern:

Be it known that I, JOHN PLAYER, of Schenectady, in the county of Schenectady and State of New York, have invented a certain new and useful Improvement in Exhaust-
5 Nozzles, of which improvement the following is a specification.

My present invention, while more particularly designed for application in connection
10 with annular exhaust nozzles for locomotive engines, of the type set forth in Letters Patent of the United States No. 673,726, granted and issued to the Brooks Locomotive Works, as my assignee, under date of May 7th, 1901,
15 is equally adaptable to those of the ordinary cylindrical form.

The object of my invention is to provide an exhaust nozzle for locomotive engines, which shall be of simple and inexpensive
20 construction and having ready adaptability in, and in connection with, smoke-boxes and spark arresting appliances of the constructions known and approved in present practice, and in the operation of which there
25 will be attained the advantages of freer steaming of locomotives, greater efficiency and economy in their performance by reason of reduction of back pressure on their pistons, and prevention of fire damages by the
30 practical elimination of the ejection of sparks from the smoke stack, particularly when burning low grade fuel and lignite coal.

The improvement claimed is hereinafter fully set forth.

35 In the accompanying drawings: Figure 1 is a vertical longitudinal central section through the smoke box, stack, and forward portion of the waist of a locomotive boiler, illustrating an application of my invention;
40 Fig. 2, a vertical transverse section, in the central plane of the stack and exhaust nozzle; Fig. 3, a vertical central section, on an enlarged scale, through the exhaust pipe and nozzle shown in Figs. 1 and 2, on the line
45 *a-a* of Fig. 1; Fig. 4, a similar section, on the line *b-b* of Figs. 2 and 3; Fig. 5, a horizontal section, on the line *c-c* of Fig. 3; Fig. 6, a plan or top view; Fig. 7, a vertical
50 central section through an exhaust pipe and nozzle of the ordinary plain or cylindrical form, showing the application of my invention thereto; Fig. 8, a horizontal section, on the line *d-d* of Fig. 7; and, Fig. 9, a plan
or top view.

55 My invention is herein exemplified as ap-

plied in connection with a locomotive boiler of the type now standard on railroads, and, in Figs. 1 to 6, inclusive, in connection with an exhaust nozzle of the type set forth in Letters Patent No. 673,726, aforesaid.

The shell or waist, 1, of the boiler, is provided with a plurality of fire tubes, 2, extending from the fire-box, which is not shown, to the front tube sheet, 3, through which tubes, the products of combustion pass
60 from the fire-box to the smoke-box, 4, which is secured, at its rear end, to the front ring of the shell, 1, and, at its bottom, to the cylinder saddles, 5. The forward end of the smoke-box is closed by a metal front, 6, having
70 a central door, 7, and it is provided, at its top, with a stack, 8, having a downward extension, 9, with a flaring or conical lower end, 10, within the smoke box.

Referring first to Figs. 1 to 6, inclusive,
75 my invention is shown in the drawings in connection with an exhaust pipe, 12, and an annular discharge cap, tip, or nozzle, 17, secured detachably to the top thereof, and constituting its exit section. The construction and relation of these members are substantially similar to those of the corresponding parts which are fully set forth in Letters Patent No. 673,726, and, as they are not, in
80 and of themselves, claimed as of my present invention, they will not be herein again at length described. The spark arresting appliance illustrated, which is one of sundry suitably adaptable designs, comprises inclined front and side sheets of wire netting
90 or perforated plates, 25 and 27, extending from an inclined transverse deflecting plate or diaphragm, 23, located in front of the tube sheet, 3, to the front and sides of the smoke box, below the lateral inlet passages,
95 16, through which the gases of combustion are entrained in their traverse to the central discharge passage, 15, of the nozzle 17.

In the practice of my invention, I form upon the outer wall of the annular exhaust
100 steam discharge passage, 20, of the exhaust tip or nozzle, 17, a plurality of inwardly extending discharge guide-vanes or ribs, 11, forming a plurality of openings, disposed around the nozzle relatively to any vertical
105 plane passing therethrough, and preferably set spirally to the axis thereof. Said vanes or ribs may be attached to either the outer or inner wall of the annular discharge passage, or may be made integral with both

walls thereof, and the shape and angle of the openings and plane of discharge formed thereby may be varied; also the number of vanes or ribs and resultant openings may be adapted to suit the requirements of construction and duty; said vanes or ribs extending from the outer wall of the discharge passage, 20, to or near the inner wall thereof, or equivalently, from the inner wall nearly to the outer wall. As shown in Figs. 3 and 6, the vanes or ribs, 11, are also inclined relatively to radii of the nozzle, but they may, if preferred, be set on lines coinciding with radial planes thereof, as shown in Figs. 7 and 9.

Figs. 7 to 9 inclusive, illustrate an exhaust pipe, 12^a, and exhaust nozzle, 17^a, of the ordinary form, that is to say; having an exhaust steam passage leading to, and terminating at, a circular exhaust steam discharge opening at the top of the nozzle. The guide vanes or ribs 11, similarly to those above described for the annular nozzle, form a plurality of openings, concentrically disposed around a central opening in the nozzle relatively to any vertical plane passing there-through, and preferably set spirally to the axis thereof. Said vanes or ribs are shown attached to the outer wall of the nozzle, but may be attached to a central annular or hollow hub, inserted therein or cast integral therewith, and the number, shape, and angle of the openings formed thereby, and plane of discharge therefrom, may be varied to suit structural conditions and requirements of capacity. The upper ends of the ribs forming the discharge openings may either be in the plane of the top of the nozzle, as shown in full lines in Fig. 7, or be upwardly or downwardly inclined relatively thereto, as indicated in dotted lines. A similar variation may be made in the angle of the upper ends of the guide vanes of the nozzle shown in Figs. 1 to 6. The function of the guide vanes or ribs and openings formed thereby is to disintegrate the otherwise solid or annular jet or column of steam emanating from the nozzle, thereby increasing its diameter and volume, reducing its total velocity, causing a more perfect commingling with, and entrainment of, the gases of combustion, and, when set spirally, of giving a rotating motion thereto, thereby more uniformly filling the smoke stack and producing a higher and more perfect vacuum in the smoke box.

The greater effectiveness of the improved exhaust nozzle in producing a higher and more perfect vacuum in the smoke box, resulting from the disintegration of the jet, consequent reduction in velocity, and increase in diameter and volume and more perfect commingling with, and entrainment of, the gases of combustion, especially in a nozzle of the annular type, permits a very material increase in the area of the exhaust

opening in the nozzle, (which in actual practice has been demonstrated to be as high as 70 to 80 per cent.), thereby reducing the back pressure upon the engine pistons and largely increasing its efficiency. At the same time, the more steady and less intermittent vacuum obtained in the smoke box has a tendency to minimize the discharge of sparks from the stack, especially when a rotating motion is given, and in consequence, the well recognized difficulty in burning lignite fuel without the emission of large quantities of sparks, has, with these improvements, in practice, been found to be virtually overcome. Incidentally, owing to the steadier vacuum, a higher rate of, and a more perfect combustion of fuel is obtained, thereby increasing the evaporation in the boiler and adding further to the efficiency and capacity of the engine by its better steam producing ability.

Variations in the number, form, angle and position of the guide vanes or ribs, and openings produced thereby, may be made without departure from the spirit or operative principle of my invention, and therefore I do not consider it confined to, or limited by, the specific structural details herein described and shown.

I claim as my invention and desire to secure by Letters Patent:

1. A locomotive exhaust pipe discharge nozzle having a plurality of separated internal spiral vanes, integral with its periphery.

2. A locomotive exhaust pipe having a central discharge passage for the entrained gases, a concentric annular steam discharge orifice, and a plurality of vanes or bridges subdividing said concentric annular steam discharge orifice.

3. A locomotive exhaust pipe having a central discharge passage for the entrained gases and a concentric annular steam discharge orifice having a plurality of separated circumferential openings surrounding the central gas discharge passage.

4. A locomotive exhaust pipe having a central discharge passage for the entrained gases, a concentric annular steam discharge orifice, and a plurality of spirally disposed vanes or bridges subdividing said concentric annular steam discharge orifice.

5. A locomotive exhaust pipe having a central discharge passage for the entrained gases, and a concentric annular steam discharge orifice having a plurality of separated spirally disposed circumferential passages surrounding the central gas discharge passage.

6. In a locomotive or other engine using forced draft, the combination of a smoke box, a smoke stack, and an exhaust pipe having a central discharge passage for the entrained gases and a steam discharge orifice having a plurality of separated circumfer-

ential openings disposed concentrically with the gas discharge passage.

7. In a locomotive or other engine using forced draft, the combination of a smoke box, a smoke stack, and an exhaust pipe having a central discharge passage for the entrained gases and a steam discharge orifice

having a plurality of separated circumferential passages disposed spirally and concentrically with the gas discharge passage. 10
JOHN PLAYER.

Witnesses:

C. B. HOLMES,
JOCELYN CONE.