No. 843,252. PATENTED FEB. 5, 1907.

J. B. ALLFREE.

LOCOMOTIVE EXHAUST NOZZLE.

APPLICATION FILED JUNE 5, 1905.

Fig. 1.

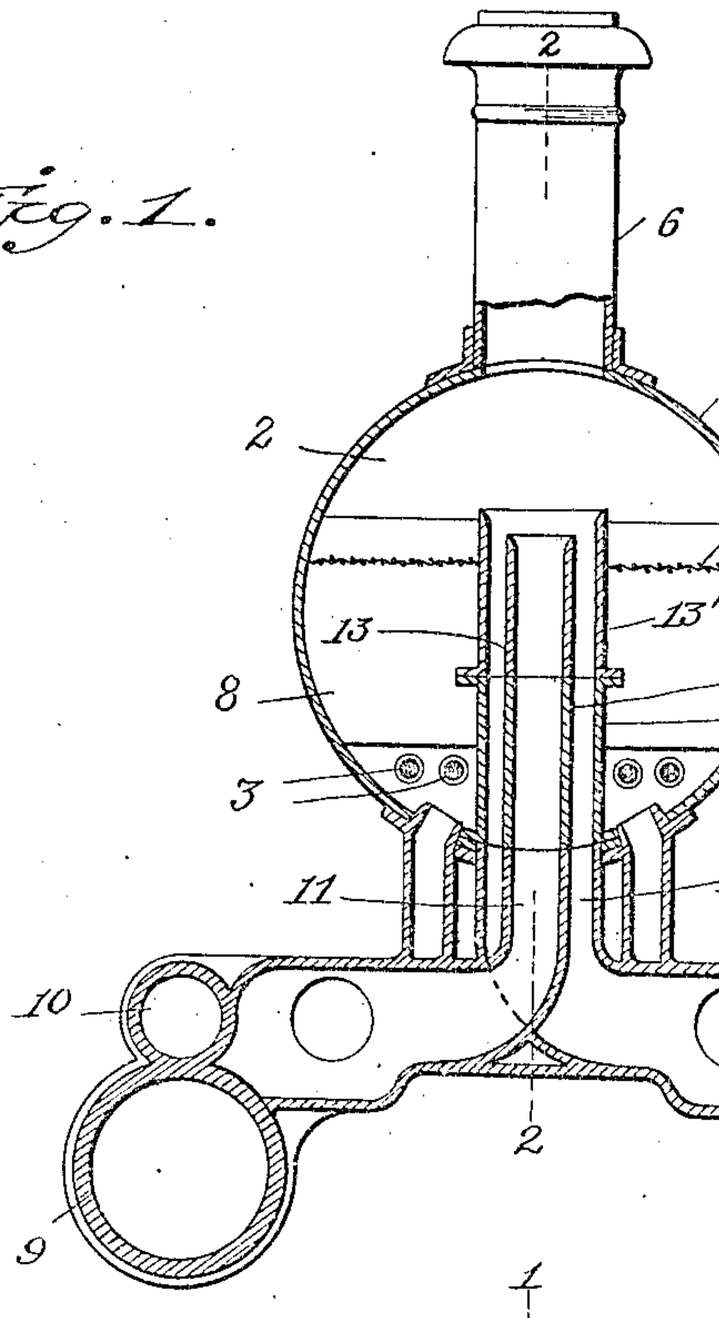


Fig. 4.

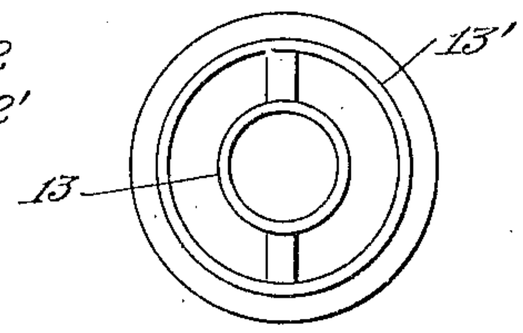


Fig. 3.

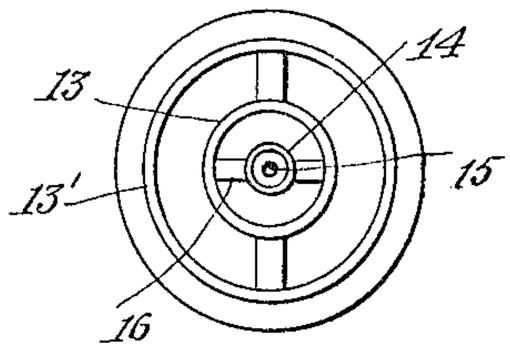
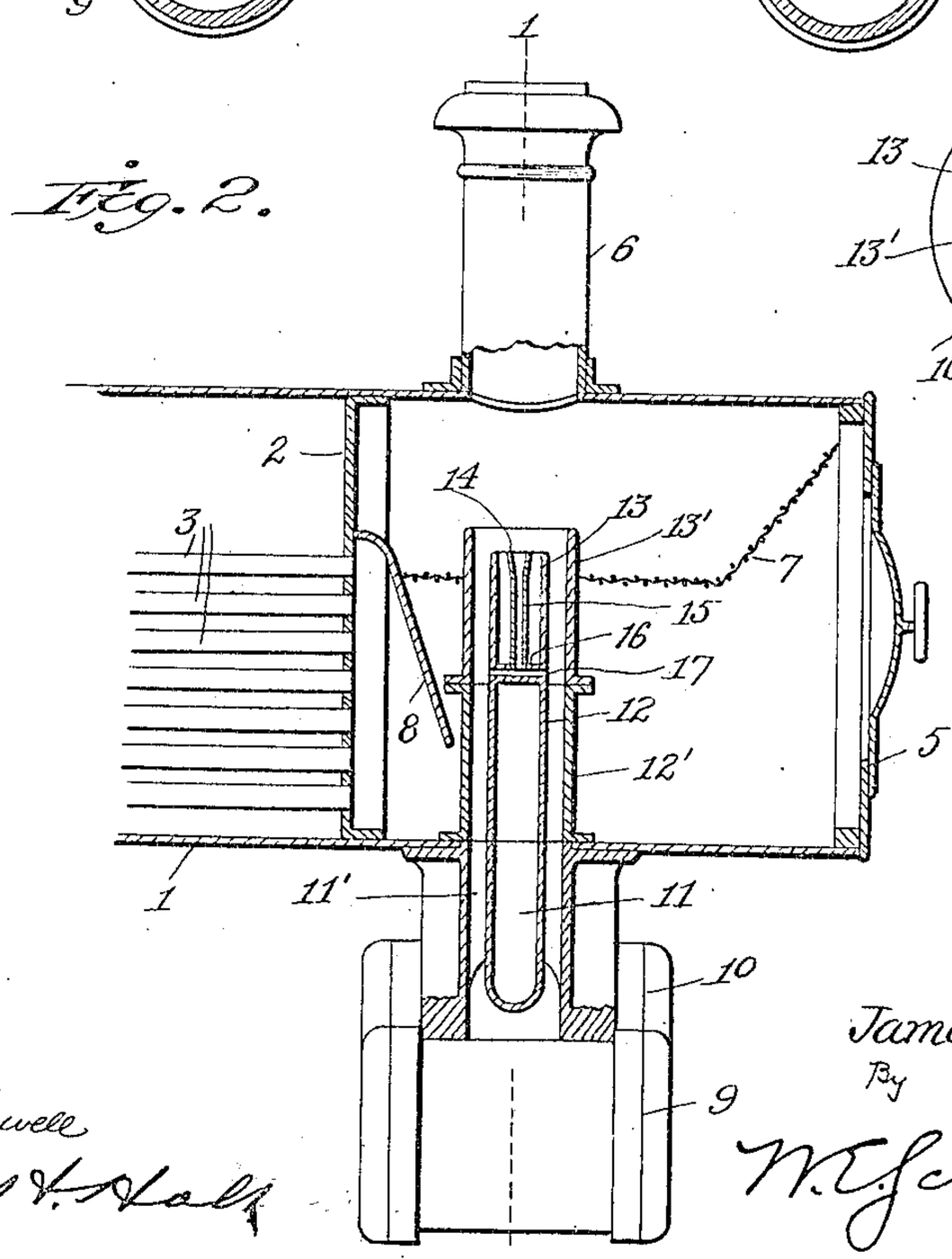


Fig. 2.



Witnesses
Edwin L. Jewell
John H. Hall

Inventor
James B. Allfree
By
W. J. Schoenborn
Attorney

UNITED STATES PATENT OFFICE.

JAMES B. ALLFREE, OF IRONTON, OHIO.

LOCOMOTIVE EXHAUST-NOZZLE.

No. 843,252. Specification of Letters Patent. Patented Feb. 5, 1907.

Application filed June 5, 1905. Serial No. 263,823.

To all whom it may concern:

Be it known that I, JAMES B. ALLFREE, a citizen of the United States, residing at Ironton, in the county of Lawrence and State of Ohio, have invented certain new and useful Improvements in Locomotive Exhaust-Nozzles, of which the following is a specification.

My invention relates to an exhaust-nozzle intended particularly for duplex engines where the exhaust-steam is used for creating a draft through the fire, and for example, as is to be found in ordinary locomotive practice, in which the exhaust-nozzle lies in the smoke-box of the locomotive.

The objects of my invention are, first, to provide an unbroken circle of exhaust-steam in the stack which will entirely fill the same, and thereby prevent leaking or return of the outside air, which tends to destroy the partial vacuum in the smoke-box; second, to so arrange the two pipes and their openings comprising the exhaust-nozzle as that each pipe will not be a hindrance to the other, but, on the contrary, an assistance in withdrawing the expanded steam from the exhaust-passages; third, to reduce the back pressure usually existing in locomotive-engines, and thereby increase their efficiency of operation; fourth, to increase the draft in the fire-box of a locomotive by the production of a greater and uniform vacuum in the smoke-box; fifth, other evident advantages which will hereinafter appear from the detailed description of the invention.

My invention consists of structural features and relative arrangements of elements which will be hereinafter more clearly described, and particularly pointed out in the appended claims.

Reference is to be had to the accompanying one sheet of drawings, forming part of this specification, in which similar characters of reference indicate corresponding parts in the several figures.

Figure 1 is a sectional elevation on the line 1 1 of Fig. 2, showing the locomotive-cylinders, exhaust-passages, and smoke-box with my improved exhaust-nozzle applied thereto without the spreader-cone attached. Fig. 2 is a longitudinal section of the smoke-box end of a locomotive, taken on the line 2 2 of Fig. 1, with spreader-cone attached. Fig. 3 is a top view of the exhaust-nozzle end shown in Fig. 2. Fig. 4 is a top view of the exhaust-nozzle shown in Fig. 1.

Referring to Fig. 2 of the drawings, 1 represents one end of the boiler-shell, provided with the flue-sheet 2, which is pierced by and supports the fire-tubes 3 3. The boiler-shell 1 is extended beyond the flue-sheet 2, which forms a cylindrical smoke-box 4. 5 is the removable door for readily offering access to the interior of the smoke-box. 6 is the stack communicating with the interior of the smoke-box. 7 is the screen for arresting the sparks when drawn through the tubes 3 by the blast of the exhaust-steam. 8 is a depending imperforate plate supported from the flue-sheet 2 and in front of the fire-tubes 3 3 for the purpose of increasing the blast in the lower series of the tubes and readily removing the ashes or soot deposited therein.

The foregoing-described structures and arrangements are the common and well-known type of locomotive construction and form no part of my present invention.

9 9′ (see Fig. 1) are the engine-cylinders, which are provided, respectively, with the usual steam-chests 10 10′.

11 and 11′ are the exhaust-passages leading, respectively, from the cylinders 9 and 9′ and are so arranged at their points of connection with the exhaust-nozzle, to be presently described, that the passage 11 is independent and centrally within the passage 11′.

12 and 12′ are concentric cylinders which form the base of the exhaust-nozzle and are suitably fastened to the casting containing the exhaust-passages 11 and 11′, so as to have the concentric annular passages formed therein register with the exhaust-passages 11 and 11′. The end of the nozzle comprises also two concentric cylinders 13 and 13′, fastened in any suitable manner respectively to the sections 12 and 12′, forming the base, and which, as will be seen in the drawings, form a continuation of the concentric passages in the base and passages 11 and 11′. The end of the outer cylindrical section 13′ of the nozzle extends above the end of the inner section 13 about three inches in the ordinary locomotive, and each of the sections have their ends slightly flaring, as indicated. The upper ends of the nozzle extend through the screen 7 and are directly under the opening of the stack 6.

14 is a hollow cone having openings 15 15, which is fastened, by means of a lug 16, centrally within the interior of the cylinder 13, so that its base is on a line with its upper flaring end, as shown in Figs. 2 and 3.

The operation of the invention is as fol-

lows: The cylinders 9 and 9′ alternately exhaust, respectively, in the passages 11 and 11′ by the arrangement, as heretofore described, in having the openings of the ends of the concentric cylinders one above the other. The exhaust-steam passing through the annular passage formed by 13′ acts as an ejector on the interior of the central passage formed by the central cylinder 13, and therefore reduces the back pressure in the exhaust-passage 11. Likewise when the exhaust-steam is passing out through the central cylinder 13 it acts as an ejector for the interior of the annular chamber formed by the cylinder 13′, and thereby reduces the back pressure in the exhaust-passage 11′.

The hollow cone 14, which is not absolutely essential in the above operation of my invention, is for the purpose of deflecting the exhaust-steam over the end of the outer annular exhaust. The openings 15 are for the purpose of permitting some of the exhaust to pass in the interior of the hollow cone and break the vacuum which might be formed and cause cross-currents of the exhaust, which would affect the efficiency of the operation.

It will be readily seen that owing to the shape of the ends of the blast-nozzle each blast as it passes out into the stack completely and uniformly fills the same with an unbroken volume of exhaust, thereby not insuring a constant and reduced pressure in the smoke-box for the proper combustion of the fuel, but, as above indicated, one nozzle assists the other in reducing the back pressure in the engines, and consequently the efficiency of the locomotive instead of a hindrance, as heretofore found in practice.

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

1. In a locomotive or the like, the combination of a smoke-box, an exhaust-nozzle in said smoke-box and comprising two concentric cylinders forming a uniform and unobstructed annular exhaust-passage throughout its entire length in the smoke-box, the upper edge of the inner cylinder being below the edge of the outer cylinder, and means for independently connecting the passages formed by the two concentric cylinders with the exhausts of the locomotive-engines.

2. In a locomotive or the like the combination of a smoke-box, an exhaust-nozzle in said smoke-box and comprising an inner cylinder, an outer annular and concentric cylinder surrounding the inner cylinder and forming therewith a uniform unobstructed annular exhaust-passage throughout its entire length in the smoke-box, the upper edge of the outer cylinder being above the edge of the inner cylinder, and means for independently connecting the passages formed by the inner and outer cylinders with the exhausts of the locomotive-engines.

3. In a locomotive or the like the combination of a smoke-box, an exhaust-nozzle extending its entire length in said smoke-box and comprising an inner nozzle connected with the exhausts of one of the engines of the locomotive, an outer nozzle surrounding the inner nozzle and whose sides are parallel throughout its length with the sides of the inner nozzle and forming therewith an unobstructed exhaust-passage, the upper edge of the outer nozzle being above the edge of the inner nozzle, and means for connecting the exhausts of the other engine of the locomotive with the outer nozzle.

4. An exhaust-nozzle for locomotives or the like comprising two concentric exhaust-cylinders, the upper edge of the inner exhaust-cylinder being below the edge of the outer cylinder, a spreader within the inner exhaust-cylinder and means for independently connecting the passages formed by the concentric cylinders with the exhausts of the locomotive-engines.

5. An exhaust-nozzle for locomotives or the like comprising an inner and circular exhaust-cylinder, an outer annular and concentric exhaust-cylinder surrounding the inner exhaust-cylinder, the upper edge of the outer cylinder being above the edge of the inner cylinder, a cone-shaped spreader within the inner cylinder and means for independently connecting the passages formed by the inner and outer cylinders with the exhausts of the locomotive-engines.

6. An exhaust-nozzle for locomotives or the like comprising an inner exhaust-nozzle connected with the exhausts of one of the engines of the locomotive, a spreader within the inner nozzle, an outer exhaust-nozzle surrounding the inner nozzle and whose sides are parallel with the sides of the inner nozzle and its upper edge above the upper edge of the inner nozzle and means for connecting the exhausts of the other engine of the locomotive with the outer nozzle.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES B. ALLFREE.

Witnesses:
GEO. H. DAVIES,
E. L. ALLFREE.