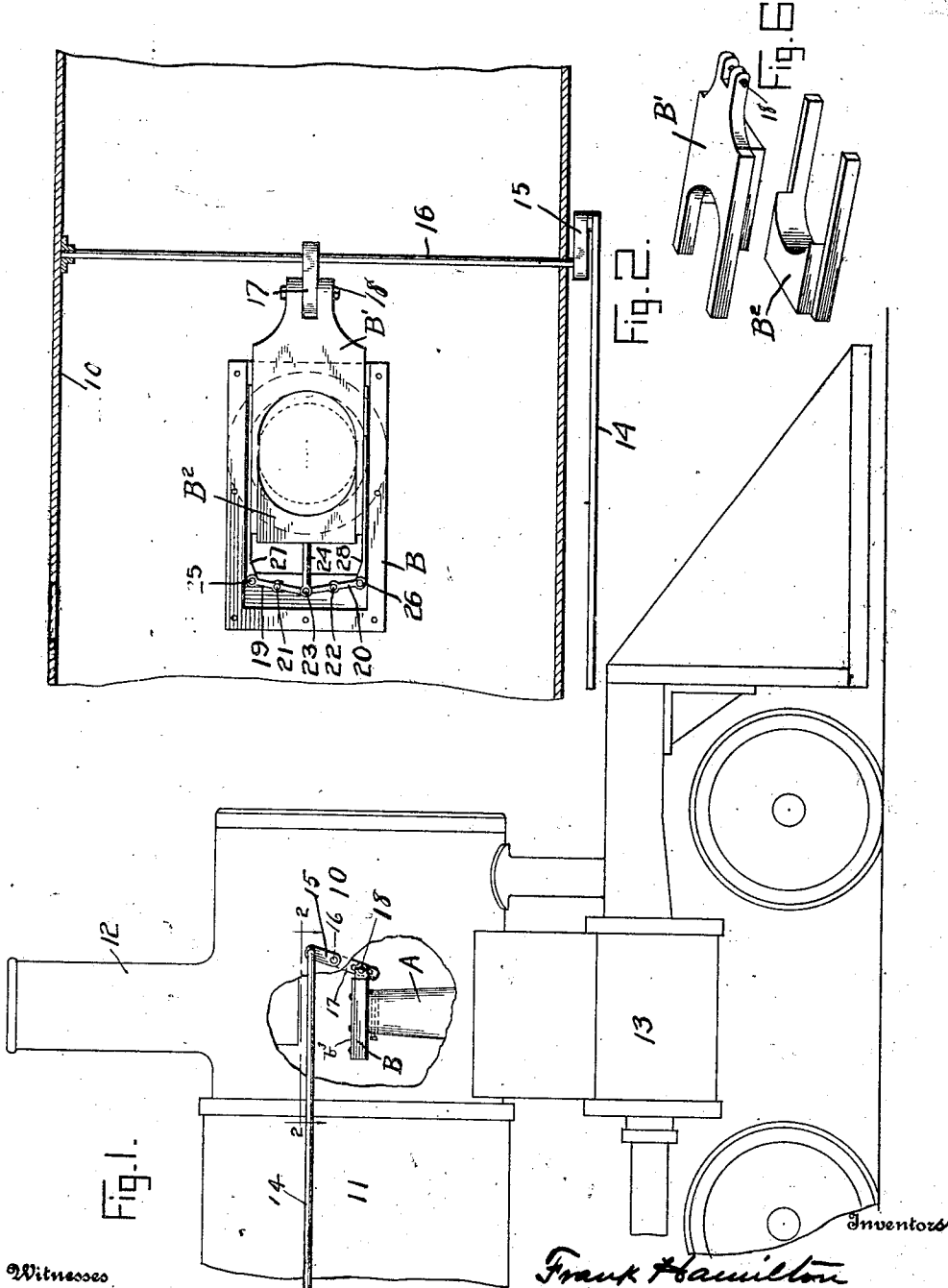


F. HAMILTON & C. R. TWYMAN:
VARIABLE EXHAUST NOZZLE FOR ENGINES.
APPLICATION FILED APR. 17, 1909.

977,301.

Patented Nov. 29, 1910.

2 SHEETS—SHEET 1.



Witnesses

L. K. Reichenbach
L. A. Price

Frank Hamilton
and Calvin R. Twyman
By E. W. Bedford —
Attorney

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Fig. 3.

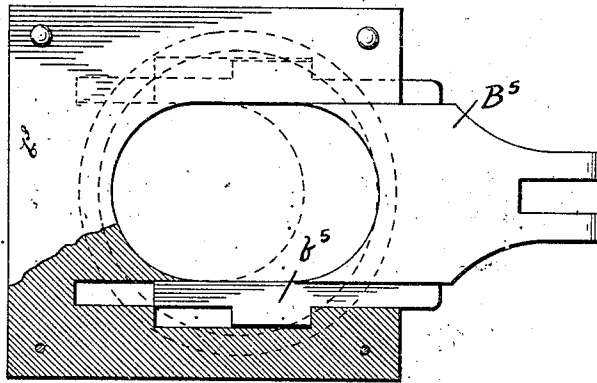


Fig. 4.

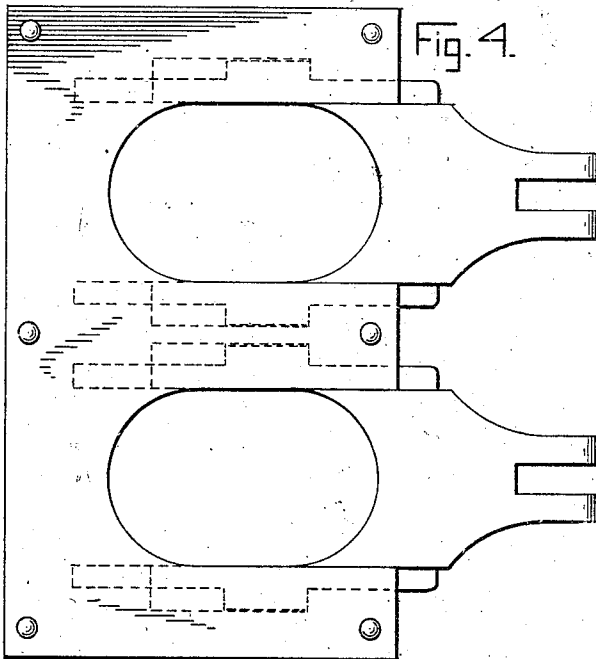
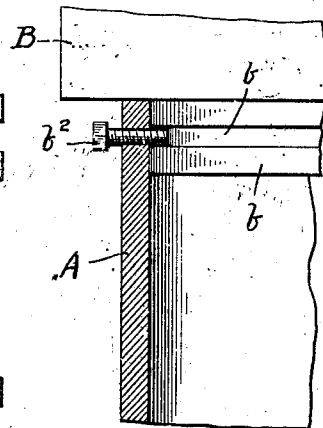


Fig. 5.



Witnesses

C. H. Reichenbach
L. A. Price

Inventors
Frank Hamilton
and Calvin R. Twyman,
 By *Edw. T. Bradford*
 Attorney

UNITED STATES PATENT OFFICE.

FRANK HAMILTON, OF BEARDSTOWN, AND CALVIN R. TWYMAN, OF GALESBURG,
ILLINOIS.

VARIABLE-EXHAUST NOZZLE FOR ENGINES.

977,301.

Specification of Letters Patent. Patented Nov. 29, 1910.

Application filed April 17, 1909. Serial No. 490,605.

To all whom it may concern:

Be it known that we, FRANK HAMILTON, a citizen of the United States, residing at Beardstown, Cass county, Illinois, and CALVIN R. TWYMAN, a citizen of the United States, residing at Galesburg, in the county of Knox and State of Illinois, have invented certain new and useful Improvements in Variable-Exhaust Nozzles for Engines, of which the following is a specification.

Our said invention consists in certain improvements in the details of construction of variable exhaust nozzles for steam engines, whereby the forced draft through the smoke-stack may be regulated to suit conditions and secure the best results and back pressure avoided, all as will be hereinafter more fully described and claimed.

Referring to the accompanying drawings which are made a part hereof and on which similar reference characters indicate similar parts, Figure 1 is a side elevation of the front end of a locomotive having a portion of the side of the smoke-box broken out to show the exhaust nozzle embodying our said invention, Fig. 2 a horizontal section as seen when looking downwardly from the dotted line 2—2 in Fig. 1, the top plate of the nozzle frame being removed, Figs. 3 and 4 views showing modifications of the structure, Fig. 5 a sectional view through the top of the stand showing the means for securing the nozzle regulating device thereon, and Fig. 6 a detail perspective view showing the nozzle regulating slides separately.

In said drawings the portions marked A represent the nozzle stand and B the nozzle frame.

The stand A is, or may be, any appropriate stand arranged to receive the exhaust from the cylinder of a steam engine, such as shown in Fig. 1, or of any other form, or construction. It is mounted in the smoke-box 10 at the front end of the boiler 11 and immediately beneath the smoke-stack 12 of the engine and receives the exhaust from the cylinders 13 in the usual manner. The frame B comprises a base plate of suitable size and form and having a ring *b* on its under side (see Fig. 5) formed with a circumferential groove *b'* in which the points of set screws *b²*, extending through the side of the stand A, may engage and thus secure said frame B firmly to the top of said stand. Said frame is formed with an oblong shaped

opening of a length substantially equal to the diameter of ring *b* and is recessed longitudinally. Sliding plates *B'* and *B²* are mounted in said recess which is covered by a top plate *b³*. The form of plates *B'* and *B²* illustrated in Figs. 2 and 6, in which they are shown to have semi-circular recesses in their adjacent edges, forming a variable opening out of the nozzle. Plate *B'* is formed to slide in the ways formed in the frame B, while plate *B²* is formed to slide in ways formed between the sides of plate *B'*. Said plates are operated by means of a rod 14 one end of which runs to the cab of the locomotive, where it is connected to an operating lever (not shown), and its other end connects with a crank-arm 15 on the outer end of a rock-shaft 16 which extends across the smoke-box from side to side and is journaled in suitable bearings in said smoke-box. A crank-arm 17 extends downwardly from the central portion of said rock-shaft and connects with a pin 18 mounted in the front end of plate *B'*. Thus the rocking of shaft 16 operates to slide said plate *B'* in the frame B longitudinally.

Double ended levers 19 and 20 are centrally pivoted in the front end of recess in frame B on pivots 21 and 22 and are connected at their inner ends by a pivot 23 to the outer end of a connecting rod 24 which is connected to the central portion of the sliding plate *B²*. The outer ends of said levers are connected by pivots 25 and 26 to the ends of bars 27 and 28 which are secured to the outer edges of the sliding plate *B'*. It will thus be seen that as plate *B'* is slid back and forth, the levers 19 and 20 are rocked on their pivots and through the connection described operate said plate *B²* oppositely to said plate *B'* so that when shaft 16 is rocked in one direction said plates *B'* and *B²* are moved away from each other, to enlarge the opening through the exhaust nozzle, and when rocked in the other direction they move toward each other to contract said opening. The particular form of plates *B'* and *B²* is best shown in Fig. 6, by which it will be seen that each plate is formed with recessed edges which receive projecting side-pieces of the other plate, the side-pieces of one plate projecting from its top side and engaging recesses in the top corners of the opposite plate, and those of the other plate projecting from its

lower side and engaging recesses in the lower corners of the said first mentioned plate. By this arrangement the joints over-lap and leakage is guarded against.

5 In Fig. 3 we have shown a single slide plate B^s, which is mounted and operated in the same manner as plate B'. It will be understood, of course, that in such a construction the plate B^s must move double
10 the distance to secure the same contraction and expansion of the opening through the exhaust nozzle as in the construction shown in Fig. 2. We have shown on the sides of plate B^s stop lugs b^s which engage with recesses in the sides of the ways in the frame
15 and serve to limit the longitudinal movement of said plate at the points desired.

In Fig. 4 we have shown a construction similar to that shown in Fig. 3 except that
20 two plates and two openings are shown instead of one. In such a construction it will be only necessary to have two crank-arms, similar to the crank-arm 17 on the rock-shaft 16, each of which will be appropriately
25 connected to the front end of one of said sliding plates. In such a construction the same result will be secured with the same degree of movement of the rock-shaft as in the construction shown in Fig. 2.

30 It is evident that other modifications in the details of construction may be employed without materially departing from the spirit of our invention.

By the construction shown in the several
35 views it will be noted that all openings for the sliding parts are toward the forward end of the smoke-box, the recess being closed on the rear side, thus preventing the leakage of steam toward the boiler flues and guard-
40 ing against the danger of back draft, or other interference with the draft through said flues, as the exhaust will be toward the front and away from the flues, thus aiding the draft instead of interfering with it.

45 Having thus fully described our said invention, what we claim as new and desire to secure by Letters Patent, is:—

1. A variable exhaust nozzle for engines comprising a stand connected with the ex-
50 haust of the cylinders and located in the smoke box beneath the smoke stack, a nozzle frame secured in the top of said stand formed with a closed rear end and an open front end, sliding plates partially covering
55 the opening in said nozzle and mounted to slide in said frame to enlarge or contract said opening the front plate being arranged to slide through the open front of said frame, operating means connected to the
60 outer end of said front plate adjacent to the

front of the smoke-box, and connections between the rear plate and the front plate for sliding said plates simultaneously, substantially as set forth.

2. A variable exhaust nozzle for engines 65 comprising a stand connected with the exhaust from the cylinders and located in the smoke-box, a nozzle frame formed with its front end open and its rear end closed secured in the top of said stand formed with
70 an opening and a longitudinal way, a sliding part in said way of a form to control the area of said opening as it is slid back and forth and projecting beyond the front end of said frame, an operating rock-shaft,
75 a connection between said rock-shaft and the front end of said sliding part through the open front end of said frame, and means for operating said rock-shaft, substantially as set forth. 80

3. In a variable exhaust nozzle construction for steam engines, the combination, of the stand connected with the exhaust of the cylinders, a nozzle frame formed closed at
85 its end toward the boiler flues and open at its end toward the front end of the smoke-box and with a ring on its under side adapted to fit into the top of said stand, said ring being formed with a groove in its side
90 to receive the points of securing devices extending horizontally through the wall of said stand, said securing devices, sliding parts mounted in ways in said nozzle frame with semi-circular adjacent edges, and
95 means for sliding said parts toward and from each other to vary the area of the opening between them, substantially as set forth.

4. A variable exhaust nozzle for engines comprising a stand with a top nozzle frame
100 formed with an opening and open at its front and closed at its rear, sliding parts for controlling the area of said opening mounted in a way around the same, said
105 sliding parts being formed with inter-engaging overlapping edges, and means for operating said sliding parts connected to the front end of the front part, whereby the rear end of said frame may be left closed, substantially as set forth. 110

In witness whereof, we have hereunto set our hands and seals at Galesburg, Ill., this 14 day of April, A. D. nineteen hundred and nine.

FRANK HAMILTON. [L. S.]
CALVIN R. TWYMAN. [L. S.]

Witnesses:

CHARLES L. BRANHAM,
WILLIAM JAMES ALDERMAN.