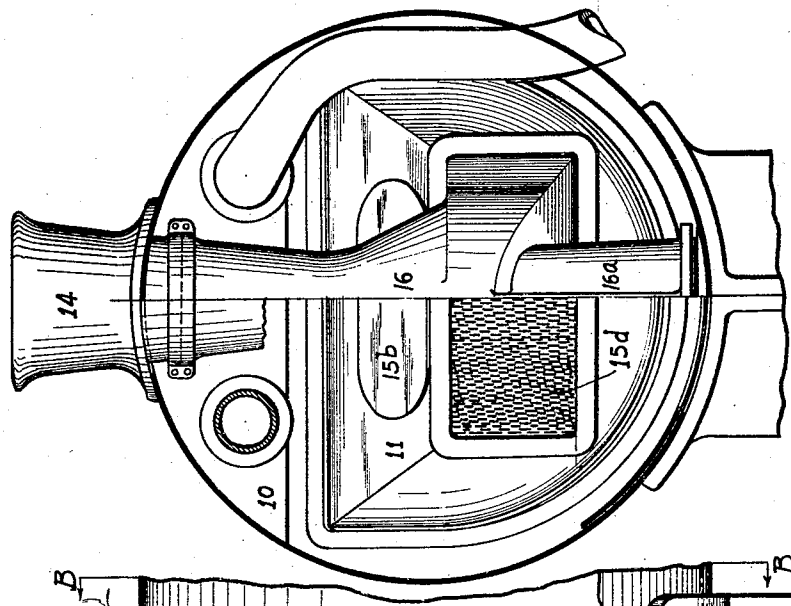
April 12, 1932. A. W. BRUCE 1,853,893

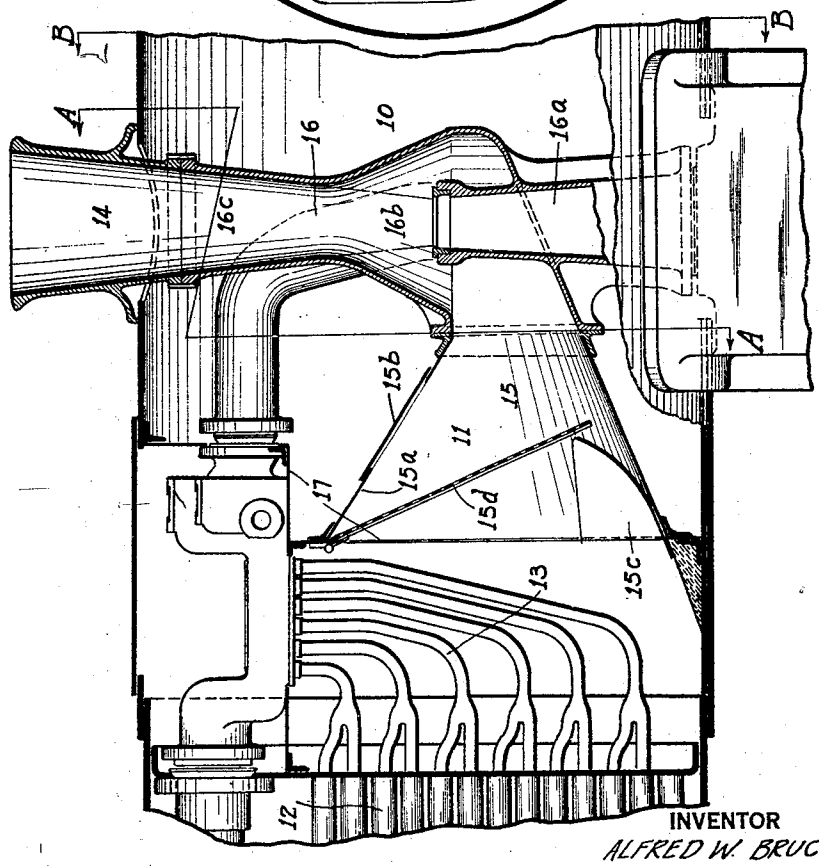
DRAFT APPLIANCE FOR LOCOMOTIVES

Filed March 21, 1929

-FIG.2.-



-FIG.1.-



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DRAFT APPLIANCE FOR LOCOMOTIVES

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The present invention relates to draft appliances for steam locomotives, and more particularly to improved means cooperating with the exhaust jet in the smoke box to induce an efficient forced draft through the flues of the boiler.

Heretofore, the usual practice for inducing a forced draft through the flues of locomotive boilers has been to entrain the smoke and gases which enter the smoke box, in a jet of exhaust steam from the cylinders, by which jet they are carried out of the stack. The jet of exhaust steam flows from a nozzle disposed in the lower part of the smoke box, and enters the flaring lower end of a lift pipe spaced a considerable distance above the nozzle to permit the smoke and gases in the smoke box to become entrained with the jet. To develop with such mechanism, a draft of proper efficiency, it was necessary to employ a concentrated powerful jet of steam, and consequently undesirable back pressure on the pistons was present. Further objectionable features of the old mechanism, were the tortuous routes in the smoke box which the smoke and gases had to traverse before reaching the steam jet and the dead spaces that were present in the smoke box. Another objectionable feature was the liability of the nozzle to be disposed out of central alignment with the lift pipe, with consequent impairment of the efficiency of the jet. Another objectionable feature, was the leaks present at the places where the various fittings were attached.

An object of the present invention is to provide a forced draft appliance whereby the various disadvantages inherent in the described prior constructions are overcome.

Another object of the present invention is to combine the exhaust nozzle, and lift pipe in a single integral casting, whereby a substantial economy in manufacturing, installation, and maintenance costs is effected and centralization of the steam jet with the lift pipe is insured.

A further object of the invention is to provide a mechanism which will produce an efficient forced draft without the development of undesirable back pressure on the pistons.

Another object of the invention is to provide a mechanism whereby the leaks heretofore present in the smoke box are eliminated.

Other objects of the invention will hereinafter appear.

In the accompanying drawings, Figure 1 is a fragmental longitudinal vertical central section of the forward end of a locomotive embodying the invention; and Fig. 2, a transverse vertical section, the right hand half taken on the line B B and the left hand half on the line A A, of the mechanism shown in Figure 1.

In the practice of the invention, referring descriptively to the specific embodiment thereof, which is herein exemplified, there is provided in the smoke box, 10, of the locomotive, an independent passageway, 11, leading from a point forward of the boiler flues, 12, and superheater pipes, 13, out of the stack, 14. The passageway, 11, is formed of three main sections, viz: a draft pipe, 15, a lift pipe, 16, and the smoke stack 14.

The space within the smoke box is partitioned off forwardly of the superheater pipes by a diaphragm plate, 17, formed with a large central opening communicating with the draft pipe, 15. The walls of the draft pipe converge forwardly from the diaphragm plate, the top wall, 15*a*, being formed with a manhole which is closed by the cover plate, 15*b*. Within the draft pipe is a damper, 15*c*, and a sheet of wire netting, 15*d*. The damper is provided with a wall suitably inclined to project the cinders against the netting with sufficient velocity to make the mechanism self cleaning in the usual manner.

The lift pipe 16 comprises three main portions, viz: a lower portion, 16*a*, which contains the exhaust nozzle, and is joined to the draft pipe, an intermediate portion, 16*b*, having walls which converge upwardly above the nozzle, and a top portion, 16*c*, having walls which diverge upwardly from the intermediate portion. The construction is analogous to the well known Venturi tube.

It is to be particularly noted that by forming the draft pipe and the lift pipe as described, the passageway, 11, is of maximum cross sectional effective area, at the dia-

phragm plate, and is at a minimum cross sectional area at a point spaced above the exhaust nozzle. This construction enables the steam jet to play upon a relatively dense or concentrated body of smoke or gases, thus insuring the entrainment of a maximum quantity of smoke or gases, with the ensuing induction of a highly efficient forced draft through the flues of the boiler. Another advantage of playing the jet upon a concentrated body of gases, is that it enables a relatively large jet to be used, compared to that formerly required, thus practically eliminating back pressure on the pistons.

The lift pipe, and exhaust nozzle are preferably formed as a one-piece integral casting, whereby a substantial economy in manufacturing, installation, and maintenance costs is effected, and an accurate central alignment of the nozzle with the lift pipe is insured.

An important advantage of the improved construction is that by conducting the smoke or gases through an independent passage in the smoke box, the necessity heretofore present, of maintaining air tight joints for all attachments in advance of the diaphragm plate, is eliminated.

Another advantage of the improved construction is that it is essentially comprised in two main parts, thus eliminating the chance of varying from the original installation in taking down and reassembling the apparatus.

While one of the preferred embodiments of the invention has been described, it is to be understood that various modifications in form, assembly, and details, may be resorted to without departing from the spirit and scope of the invention defined in the following claims.

The invention claimed, and desired to be secured by Letters Patent, is:—

1. In a locomotive, the combination of, a boiler having flues; a smoke box having a top wall, forward of the flues; an unbroken draft passageway comprising a portion leading from a point forward of the flues longitudinally through the smoke box toward the front thereof, and a portion above the longitudinal portion leading vertically upward from the longitudinal portion and out through the top wall of the smoke box, the said passageway having a bottom wall inclined upwardly toward the front of the smoke box; and an exhaust nozzle projecting through said bottom wall and extending upwardly through said longitudinal portion and opening within the vertical portion of the passageway.

2. In a locomotive, the combination of, a boiler having flues; a smoke box having a top wall, forward of the flues; an unbroken draft passageway comprising a portion leading from a point forward of the boiler flues longitudinally through the smoke box toward the front thereof, and a portion above the longitudinal portion joining said longitudinal portion and leading vertically upward therefrom through the top wall of the smoke box, the said vertical portion having the form of a Venturi passageway, the said draft passageway having a bottom wall inclined upwardly toward the front of the smoke box; and an exhaust nozzle projecting through said inclined bottom wall into the passageway and extending through said longitudinal portion and opening within said vertical portion of the passageway, the said nozzle being disposed in axial alignment with the vertical Venturi portion of the passageway.

3. In a locomotive, the combination of, a boiler having flues; a smoke box forward of the flues; a tubular unbroken passageway for conducting products of combustion forwardly of the smoke box and out through the top thereof, the said passageway comprising a vertical portion having the form of a Venturi tube and a longitudinal forwardly tapering portion leading from a point forward of the boiler flues and joined at its forward end, on its upper side, to the base of the Venturi portion; and an exhaust nozzle projecting into the passageway and extending upwardly through said longitudinal portion and opening within said Venturi portion, the said exhaust nozzle being in axial alignment with the Venturi portion thereof.

4. In a locomotive, the combination of, a boiler having flues; a smoke box forward of the flues; an unbroken passageway therein for leading products of combustion forwardly of the smoke box and out through the top thereof, comprising a longitudinal forwardly tapering portion leading from a point forward of the boiler flues toward the front of the smoke box, a vertical upwardly tapering portion joining the longitudinal portion at its forward end on the upper side thereof, and a vertical upwardly flaring portion joining the vertical upwardly tapering portion; and an exhaust nozzle projecting into the passageway and extending through said longitudinal portion of the passageway and opening within the vertical upwardly tapering portion of the passageway.

5. In a locomotive, the combination of a smoke box, a partition separating the front portion from the rear portion of the smoke box, said partition having an opening therein; a passageway for the products of combustion in the forward end of said smoke box comprising an intermediate portion having upwardly converging walls, an upper portion adjacent the intermediate portion having upwardly diverging walls thereby forming a throat at the juncture of the converging and diverging walls, a lower portion open at its rear adjacent the in intermediate portion, and forwardly converging walls connecting said openings whereby a passageway having enclosing side walls and open ends is provided for conveying the products of com-

bustion; and an exhaust nozzle extending upwardly through said lower portion having an outlet concentric with the said throat.

6. An integral casting for a locomotive smoke box, comprising a passageway including a lower portion having an opening at the rear for the admission of the products of combustion, an intermediate portion adjacent the lower portion having upwardly converging walls, an upper portion adjacent the intermediate portion having upwardly diverging walls thereby forming a throat at the juncture of the converging and diverging walls; and an exhaust nozzle, having a lower portion adapted for connection with a cylinder exhaust, extending into said passageway lower portion and having an outlet concentric with said throat.

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