H. B. MacFARLAND.

MUFFLER FOR LOCOMOTIVES AND THE LIKE.

APPLICATION FILED JULY 15, 1914.

1,173,447.

Patented Feb. 29, 1916.

3 SHEETS—SHEET 1.

Fig. 2.

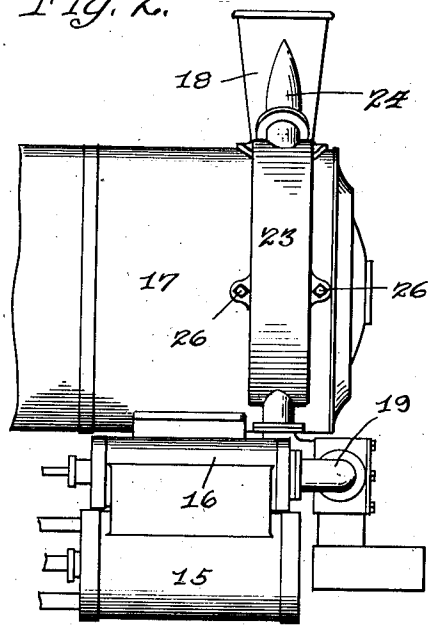


Fig. 1

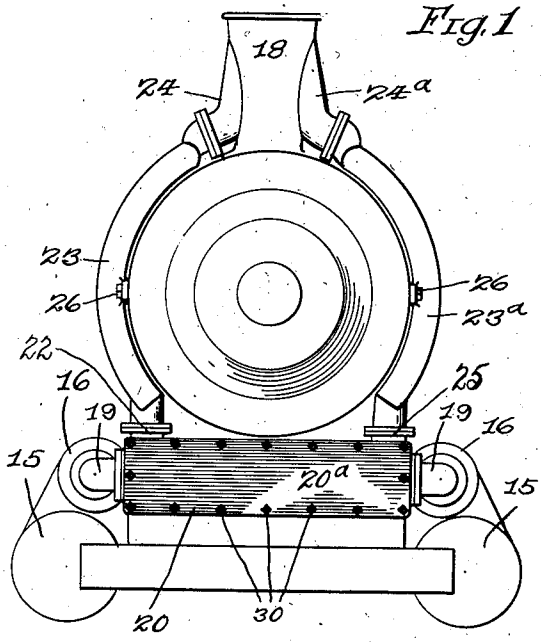


Fig. 3

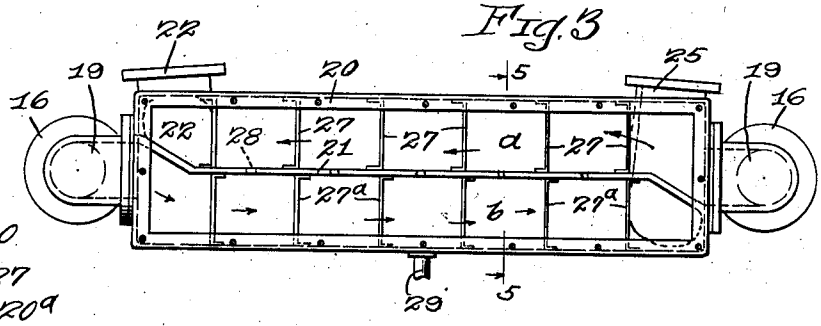


Fig. 5

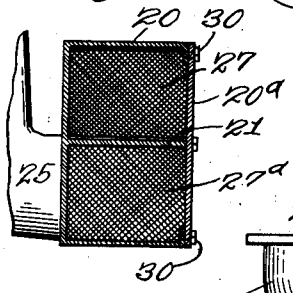
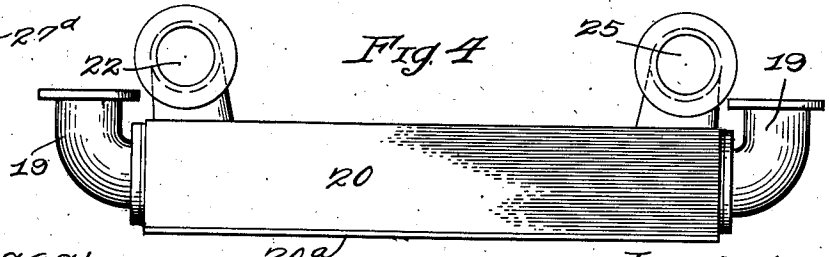


Fig. 4



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3 SHEETS—SHEET 2.

Fig. 6

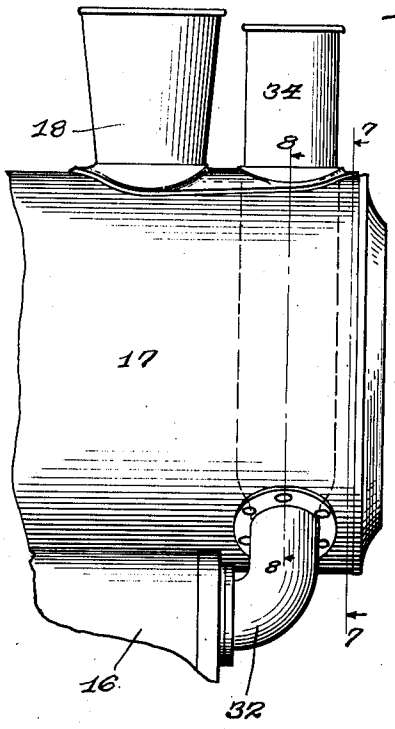


Fig. 7

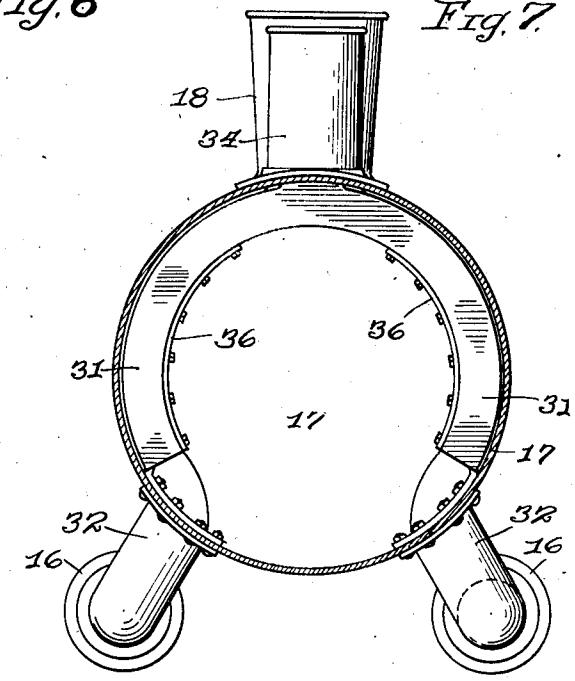


Fig. 9

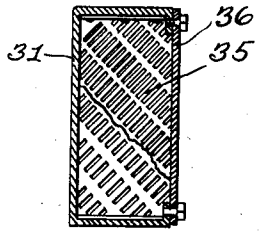
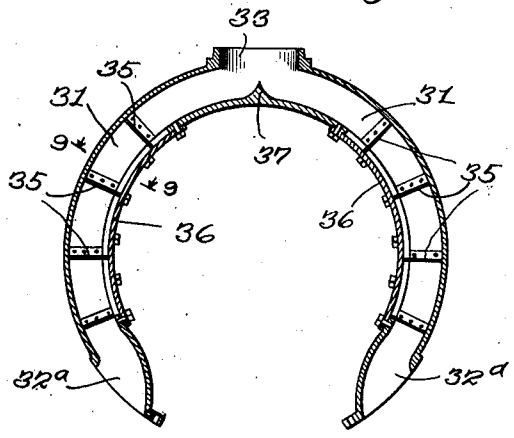


Fig. 8



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3 SHEETS—SHEET 3.

Fig. 11

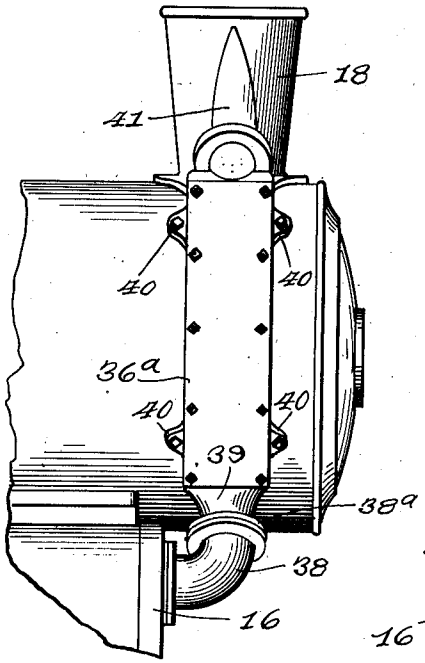


Fig. 10

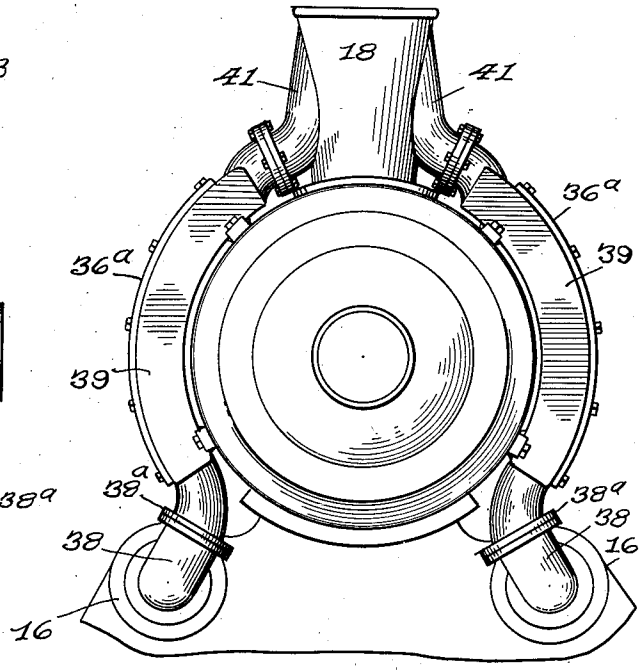


Fig. 13

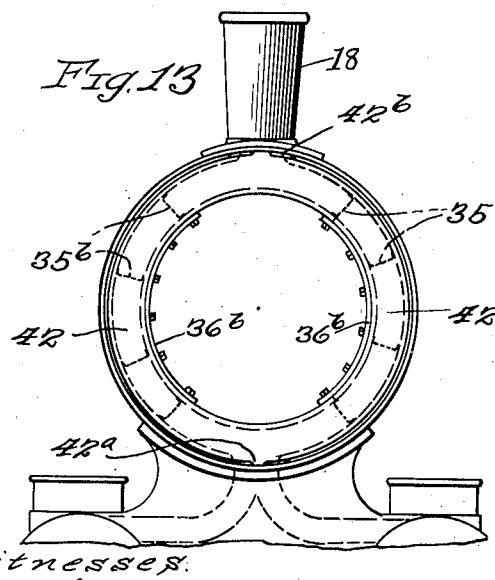
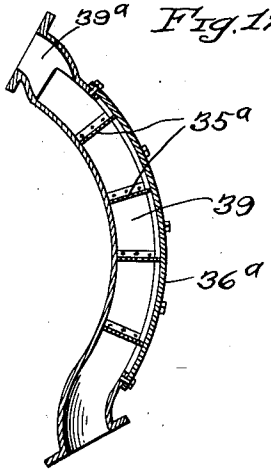


Fig. 12



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UNITED STATES PATENT OFFICE.

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MUFFLER FOR LOCOMOTIVES AND THE LIKE.

1,173,447. Specification of Letters Patent. Patented Feb. 29, 1916.

Application filed July 15, 1914. Serial No. 851,025.

To all whom it may concern:

Be it known that I, HELON B. MACFARLAND, a citizen of the United States, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Mufflers for Locomotives and the like, of which the following is a description, reference being had to the accompanying drawings, which form a part of my specification.

My invention relates more particularly to means for reducing or substantially eliminating the noise resulting from the exhaust steam of locomotive engines; and has for its object the provision of apparatus whereby the steam exhausting from the cylinders of a locomotive will be diffused and deflected in such a manner as to neutralize or affect the initial sound waves set up by the volume of steam liberated from the cylinders where it is under pressure.

It is essential in the employment of such apparatus that the construction be of such nature as not to materially hamper or interfere with the comparatively free exhaust or escape of the steam, and thereby induce or cause undesirable back pressure.

It is evident that where a locomotive is provided with my improved means, it is necessary to employ some independent means for inducing draft in the locomotive boiler, as for example some such means as disclosed in my former Patent No. 1,059,378, of April 22nd, 1913, whereby the draft in the locomotive is mechanically induced; the exhaust steam being given a freer or less obstructed passage from the cylinders of the locomotive than has been the case in locomotives where the exhaust steam was discharged through an exhaust nozzle in the smoke-box of the locomotive for the purpose of inducing draft.

Another object of my invention is the provision of steam passages from the steam chests of the cylinders of the locomotive in a more direct manner than has heretofore been the case, so as to obviate the circuitous path through the saddle castings containing bends and restrictions in the steam passages.

In the employment of my invention, substantially all of the steam connections or passages leading from the cylinders of the locomotive are either arranged exterior of the boiler-shell or at a readily accessible point in the forward end of the smoke-box of the locomotive, thus permitting inspection and repair to be readily made without the necessity of dismantling the locomotive or boiler.

The invention may be readily applied to any type of locomotive without requiring or interfering with the general construction thereof, except for the manner of leading the exhaust steam from the cylinders; and the advantages of the invention will be more readily understood from the following detailed description of the constructions illustrated in the accompanying drawings, wherein:—

Figure 1 is a front elevation of an ordinary or switching type of locomotive shown provided with my invention; the features of the locomotive not affected by or connected with the invention being omitted. Fig. 2 is a side elevation of the construction shown in Fig. 1. Fig. 3 is an enlarged detail view of my invention with the front wall or cover plate removed so as to show the inner construction thereof. Fig. 4 is a top plan view of Fig. 3. Fig. 5 is a vertical sectional view taken on the line 5—5 of Fig. 3 and looking in the direction of the arrows. Fig. 6 is a side elevation of the front end of a locomotive illustrating a modified form, and its application, of my invention. Fig. 7 is a vertical sectional view taken on the line 7—7 of Fig. 6, looking in the direction of the arrows. Fig. 8 is a vertical sectional view taken on the line 8—8 of Fig. 6. Fig. 9 is a detail sectional view taken on the line 9—9 of Fig. 8, looking in the direction of the arrows. Fig. 10 is a front elevation of a portion of a locomotive illustrating another modified form of my invention and its application. Fig. 11 is a side elevation of the construction shown in Fig. 10. Fig. 12 is a vertical sectional view of one of the members or portions of the modification of my invention as illustrated in Figs. 10 and 11. Fig. 13 is a vertical sectional view of still another modified form of my invention, showing the application thereof to the ordinary type of locomotive, namely with the usual steam passages of the saddle casting communicating with my improved apparatus, which, in this instance, is located within the smoke-box of the locomotive.

In the particular exemplification of my invention as illustrated in the first five figures of the drawings, the well known and standard type of cylinders 15, 15, are illus-

trated, provided with the steam-chests or valve-chambers 16, 16, which may be provided with what are known as inside admission piston valves; my improved mechanism being shown applied to a well known type of switching or simple locomotive, the smoke-box end 17 whereof is illustrated and shown provided with the usual smoke-stack as at 18. Instead of having the steam exhaust from the cylinders through passages within the cylinder or saddle-casting, these passages are shut or blocked off so that the steam will exhaust through the front ends of the steam-chests 16, 16, and into the conduits or elbows 19, 19, which communicate with opposite ends of the housing or body portion 20 of my apparatus, as very clearly shown in Fig. 1; the exhaust-steam from the back or crank-ends of the cylinders may be carried through the bodies of the valves, in the well-known manner at present employed, and permitted to flow into the conduits or elbows 19, 19, as previously stated.

The housing or main portion of my improved muffler, is preferably provided with an intermediate longitudinally disposed wall or partition 21, whereby the housing or casing interior is divided into two compartments or chambers *a* and *b*, extending lengthwise of the member 20 as very clearly illustrated in Fig. 3; with the compartment *a* communicating at the right hand end with elbow or conduit 19 whereby the exhaust steam will be taken from the steam chest 16 and conveyed transversely of the locomotive to the outlet elbow or end 22 at the left hand side of the compartment. Connected to the outlet end 22, is an exhaust-conduit or pipe 23 secured adjacent the forward end of the smoke-box shell or ring, with the upper end provided with or terminating in a steam discharge portion 24 of the combination stack 18 very clearly illustrated in Figs. 1 and 2; the portion or steam-outlet 24 either being formed integral with the stack or secured thereto in any suitable manner so as to discharge the steam through the stack. The steam compartment *b* of the muffler as disclosed in Fig. 3, has its left hand end communicating with the elbow or conduit 19 whereby the exhaust steam is taken from the steam-chest 16 and led transversely of the muffler, and therefore of the locomotive, to the opposite or right hand end of the chamber where it is provided with the outlet or elbow 25 to which is connected the steam-conduit or pipe 23^a, similar in construction to the conduit 23, and similarly secured to the smoke-box shell or ring of the locomotive, as for example shown at 26, with the upper end of the conduit of pipe 23^a terminating in or being secured to a steam discharge end or portion 24^a of the smoke-stack 18.

The two compartments *a* and *b* of the muffler 20 are each provided with a series of any suitable number of vertically disposed foraminated partitions or stages as shown at 27 and 27^a in Fig. 3, composed either of wire netting of suitable mesh or perforated plates adapted to permit the passage of the steam but tending to neutralize or break up and affect the sound waves caused by the escaping steam in its passage through the muffler.

The partition 21 is preferably provided with a suitable number of perforations, for example, one in each compartment, as indicated at 28, whereby the water of condensation in the upper chamber may be allowed to drop into the lower compartment *b*, from whence it may be drained by means of a suitable drain-spout or outlet 29 provided in the bottom of the housing 20, as very clearly shown in Fig. 3.

By reason of the particular arrangement and construction of my invention, whereby the exhaust steam is carried from the left side of the locomotive, through the muffler and up around the smoke-box of the locomotive, through suitable conduits and exhausted into the right side of the combination stack, while the steam from the right side of the locomotive is passed through the muffler and up through suitable conduits about the front end of the smoke-box and exhausted into the left side of the combination stack, the main or body portion of the muffler, and, therefore, the bulky part thereof, may be placed in that space usually left unoccupied forward of the saddle-casting and beneath the front end of the smoke-box of the locomotive. With this construction, I am enabled to place the main or body portion of the construction where it will not offer undue obstruction to the vision of the engine crew.

In order that access may be had to the main or body portion of the muffler for the purpose of repair or renewal of the netting stages or perforated plates 27 and 27^a, the front wall 20^a of the housing 20 is preferably removably secured in place by means of the bolts 30, as very clearly shown in Figs. 1 and 5; removal of the wall 20^a enabling access being had to all compartments or portions of the housing 20 of my improved apparatus as exemplified in these first five figures of the drawings.

In Figs. 6 to 9, inclusive, I illustrate a modified form of my invention wherein the main housing or body portion of the muffler is in the nature of a circumferential member or substantially U-shaped housing arranged within the forward end of the smoke-box 17 of the locomotive. The main or body portion 31 of the muffler is curved to conform to the curvature of the boiler-shell or smoke-box ring, being of a diameter or size which will permit its insertion within the

smoke-box as very clearly shown in Figs. 6 and 7, so as to extend about the upper part of the smoke-box and between the points where the exhaust-steam conduits or elbows 32, 32, pass through the boiler-shell or wall of the smoke-box. At a point intermediate of its ends, namely at the uppermost point of the housing 31, it is provided with a discharge outlet 33, preferably flanged as shown in Fig. 8, and establishes communication with a discharge-stack 34, shown arranged forward of the usual smoke-stack 18. At points intermediate of the inlet openings 32^a, 32^a, with which elbows 32 connect, and the outlet-port or discharge 33, the main or body portion of the housing is provided with a series of stages or partitions 35, preferably radially disposed as very clearly shown in Fig. 8. These partitions, like partitions or stages 27, 27^a, are composed either of wire netting, or perforated plates, as for example illustrated in Fig. 9, whereby the sound waves, set up by the liberation of a volume of steam under pressure, will be interrupted or neutralized in the passage through the muffler.

The exhaust-steam from the steam-chests 16 is permitted to pass by means of the elbows or conduits 32 into the inlet ends 32^a, 32^a, at the lower part of the muffler 31, and compelled to pass upward on both sides of the smoke-box to be discharged through the opening 33 into the auxiliary stack or discharge 34.

In order that access may be had to the housing, especially at the points where it is provided with the partitions or sound wave interrupting means, I prefer to provide the inner sides of the housing with removable portions or cover-plates 36, 36, held in place by bolts, or other suitable means, which will permit of the ready removal of the cover plates, to enable inspection or repair of the stages or interior of the housing.

If desired, the inner wall of the housing at a point centrally beneath the discharge-opening 33, may be provided with an upwardly projecting lug or portion 37 whereby the steam will be given an upward course so as not to rush against the steam flowing upward through the opposite side of the housing.

It is apparent from the construction shown in these figures, that the boiler-shell or smoke-box ring may, if desired, constitute one wall of the housing, but I prefer to form the muffler as a separate unit which may be readily replaced without in any way interfering with the usual construction of the smoke-box.

In Figs. 10 to 12, inclusive, I illustrate another modified form of my invention wherein the muffler for the exhaust steam from the steam-chests on opposite sides of the locomotive is formed in two parts and arranged along the outside of the smoke-box ring or shell adjacent the forward end of the locomotive, as clearly shown in Fig. 11, so that the exhaust steam may be taken from the forward ends of the steam-chests 16, 16, by means of elbows or conduits 38, 38. These elbows or conduits 38, 38, are bolted or otherwise secured, as indicated at 38^a, to the lower or inlet ends of the housings or mufflers 39, 39, which latter are preferably curved to conform to the curvature of the smoke-box ring or shell so as to fit snugly against the outside of the smoke-box ring; being secured thereto in any suitable manner, as for example, by means of the flanges, formed integral with the housings of the muffler, and bolts as clearly shown at 40 in Fig. 11.

The upper ends of each of the housings 39, 39, terminate in a discharge opening 39^a, see Fig. 12, and preferably provided with a securing flange, as shown in Fig. 12, to which is bolted or otherwise secured the steam-discharge portion 41 of the combination stack 18, as very clearly shown in Fig. 10. The portions 41 project into the sides of the stack 18 and are either formed integral therewith or suitably secured thereto as may be desired. In the preferred form of the invention as shown in these figures, the housing or body portion of the muffler 39, like the housing in the construction previously described, is preferably made rectangular in cross-section as more clearly illustrated in Fig. 11, so as to offer as little obstruction as possible to the vision of the engine crew. Each housing 39, like the constructions previously described, is provided with a series of transversely arranged partitions or stages 35^a composed of wire netting or perforated plates properly secured to the walls of the housings so as to compel the steam to pass therethrough and thus effect or neutralize the sound waves. Any suitable number of these partitions or stages may be employed and suitably spaced apart as very clearly shown in Fig. 12; and in order that access to the netting stages or perforated plates may be had, for the purpose of repair, etc., each housing 39 may be provided with a removable side or cover plate 36^a as clearly shown, held in place by bolts or any suitable means. With this construction, the steam exhausting from the steam-chests 16, 16, is led up on the same side of the locomotive as the steam chest from which it is exhausted and discharged into the combination smoke-stack 18 as previously described in connection with the construction shown in the first figures of the drawings.

In Fig. 13, I illustrate still another modified form and application of my invention, wherein the muffler is shown applied to a well known type of locomotive, with the steam exhausting through the usual steam

passages of the saddle-casting. In this construction, like the construction shown in Figs. 6 and 7, the muffler comprises the housing 42 made circumferential or circular in general contour and secured within the smoke-box ring or shell at a point coincident with the orifices of the steam passages leading into the smoke-box from the saddle-casting. The housing 42 is shown provided with an inlet at 42^a, which may be flanged as shown and arranged to receive a flange on the saddle casting surrounding the steam passages. It is, of course, understood that with my invention, the usual exhaust nozzle in the smoke-box is omitted. The steam exhausting into the housing 42 will pass upward on both sides and be discharged through the outlet opening 42^b provided at the uppermost point in the housing 42. With this construction, like the construction shown in Figs. 6 and 7, it is preferable to employ an auxiliary stack or exhaust-head as shown at 34 in Figs. 6 and 7 located forward of the smoke-stack so as to discharge the steam freely into the atmosphere at a point where it will not interfere with the vision of the engine crew. The housing 42 is provided at suitable intervals with stages or partitions 35^b, preferably radially arranged as illustrated; the partitions being formed of wire netting or perforated plates of such mesh or construction as to permit the steam to readily pass therethrough, and yet at the same time effectually break up or neutralize the sound waves induced by the exhausting steam discharged under pressure. For the purpose of permitting ready access to the interior of the housing, I provide the inner circumference thereof with the removable portions or cover-plates 36^b, 36^b, which may be secured in place in any suitable manner so as to effect a steam tight connection. The steam conveying means constituting my invention, are so constructed as to give the steam as free a passage as the use of such means will permit, so as to eliminate as much back pressure as possible; the use of my invention necessarily contemplating the employment of some independent draft inducing means.

In the constructions shown in Figs. 6 to 13, inclusive, the water of condensation may be allowed to flow back to the steam-chests and be discharged through the usual cocks or drains with which the steam-chests are provided.

I have shown and described some of the simplest and best forms of my invention, but certain modifications and re-arrangements may be made to acquire the same results without, however, departing from the spirit of my invention, and I do not wish to be understood, therefore, as limiting myself to the exact constructions shown and described.

What I claim is:—

1. In a locomotive provided with means for inducing draft and having steam-chests with enlarged exhaust ports, the combination of means having passages extending lengthwise thereof, the ends of said means being connected with the exhaust ports of oppositely disposed steam-chests, foraminated partitions arranged transversely of the passages at spaced intervals apart, and means connected with the outlet ends of said passages for discharging the exhaust steam at a point above the locomotive.

2. In a locomotive provided with means for inducing draft and having steam-chests with enlarged exhaust ports, the combination of means arranged transversely of the locomotive and having passages extending lengthwise thereof, means for effecting communication between the steam-chests and the adjacent ends of said passages whereby the steam will be conveyed to the opposite side of the locomotive from which it exhausts, foraminated partitions arranged at spaced intervals in said passages, the ends of the passages opposite to those receiving the exhaust steam being provided with discharge openings, and means for discharging the exhaust steam at a central point above the locomotive.

3. In combination with the steam-chests of a locomotive, means provided with elongated passages provided with foraminated partitions, one end of each passage being arranged in communication with the exhaust port of the adjacent steam chests while the other end of each passage is provided with a discharge opening, and means for conveying the steam from the discharge openings of said passages to a point located above the locomotive.

4. In combination with the steam-chests of a locomotive, means arranged transversely of the locomotive and provided with a pair of passages extending lengthwise thereof, one end of each passage being arranged in communication with the exhaust port of the adjacent steam-chest while the other end of each passage is provided with a discharge opening, foraminated partitions arranged at spaced intervals in each of said passages, and means connected with the discharge opening of each passage and extending upwardly so as to discharge the steam at a point above the locomotive.

5. In combination with the steam-chests of a locomotive, means having passages extending lengthwise thereof, means for effecting communication between the exhaust ports of the steam-chests and the adjacent end of said passages, foraminated partitions arranged transversely of the passages at spaced intervals apart, one wall of said means being removably secured in place so as to permit access throughout the length of said

passages, and means connected with the discharge ends of said passages for conveying the steam to a point above the locomotive.

6. In combination with the steam-chests of a locomotive, a housing arranged transversely of the locomotive and provided with a pair of passages extending longitudinally therethrough, one end of each passage being arranged in communication with the exhaust port of the adjacent steam-chest while the opposite ends of said passages are provided with discharge openings so that the steam will be led to opposite sides of the locomotive, both of said passages being provided with foraminated partitions, one wall of the housing being removably secured in place so as to permit access to both passages throughout the length thereof, and means connected with the discharge ends of said passages whereby the steam is conveyed to a point above the locomotive.

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