Aug. 2, 1932. A. GIESL-GIESLINGEN 1,869,891

SELF CLEANING LOCOMOTIVE DRAFT APPLIANCE

Filed April 5, 1930

Fig. 1.

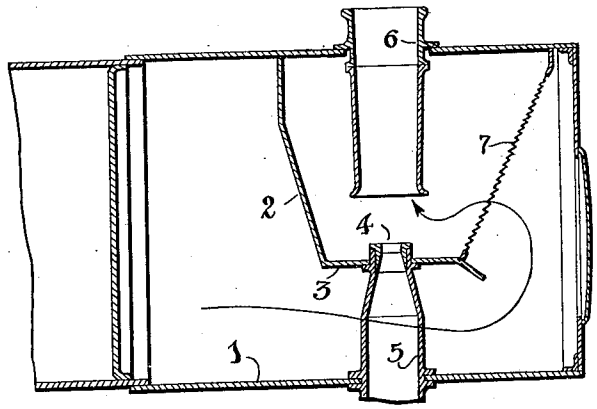


Fig. 2.

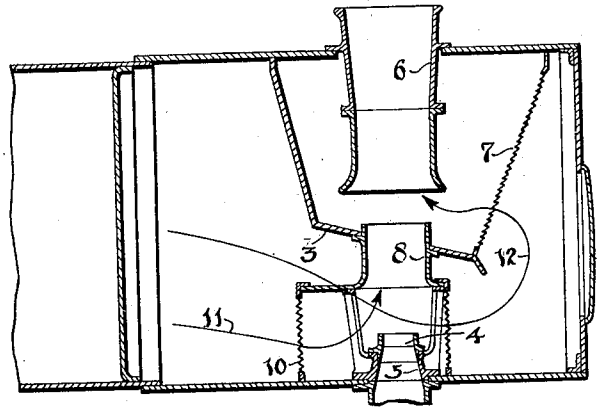
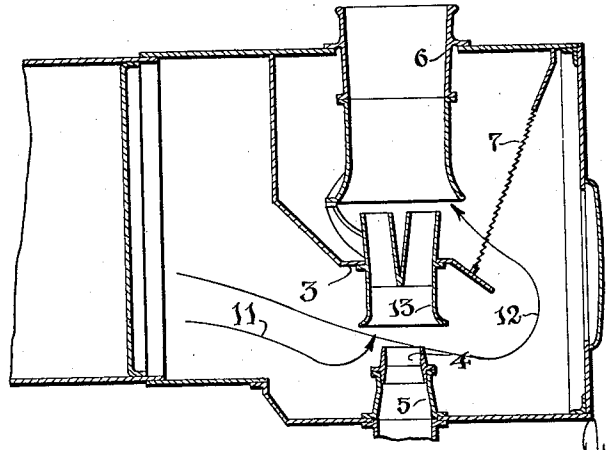


Fig. 3.



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UNITED STATES PATENT OFFICE

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SELF-CLEANING LOCOMOTIVE DRAFT APPLIANCE

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The invention relates to steam locomotives in which the draft required for the fire is created by suction obtained from the exhaust steam.

It is the object of draft appliances to create said draft with minimum back pressure on the locomotive engine and, usually, to discharge into the atmosphere the cinders entrained by the gas flow, thereby eliminating the necessity of cleaning the smokebox and eliminating the danger of getting clogged up during long runs. Furthermore, means must be provided to prevent the discharge of glowing particles of such heat capacity that they could start fires along the road. Fig. 1 is a longitudinal view of a generally accepted construction of locomotive front-end, as the combination of draft appliances and smokebox is often termed. Figures 2 and 3 are longitudinal views of locomotive front ends, showing preferred ways in which my invention can be put into practice as hereinafter more specifically set forth. Referring to Fig. 1: The draft appliance is housed in the smokebox 1. The combustion gases enter at the left and, by means of a partition, are forced to follow the direction indicated by the arrows, said partition consisting essentially of the so-called diaphragm 2 and the table plate 3. The exhaust steam, escaping from the nozzle 4 on top of the standpipe 5 and above the surrounding table plate 3, entrains the combustion gases and discharges them through the stack 6. A netting 7 serves to hold back larger coal particles. This arrangement constitutes a self-cleaning front-end, as the partition causes a rapid gas flow and allows substantially no dead corners to exist in the smokebox, whereby undue accumulation of cinders is avoided.

While this customary arrangement as described proved satisfactory on small steam locomotives, great trouble is being experienced on powerful locomotives due to the fact that exhaust nozzles have to be made very small in order to secure the required draft, resulting in power losses of 15 to 20 per cent and more of the total engine performance. Excessive restrictions to the gas flow are the source of these power losses and are unavoidable with this customary arrangement for the following reasons: Steam production and corresponding quantity of combustion gas rise much quicker with boiler size than the cross sectional area of the smokebox through which the gases have to pass. Furthermore, the area of the smokestack is governed by the necessity of having it at all times filled by the exhaust steam jet, in order to secure good suction power; it is clear, therefore, that the area of the smokestack in a given drafting arrangement cannot be increased beyond a certain point. Owing to the natural character of the steam jet, a larger area will be filled by the same if the height of the smokestack, or the distance from the exhaust nozzle to the top of the stack, is being increased; likewise, a smaller area of stack will be necessary if said distance is being decreased, which is generally the case with larger locomotives, the boilers of which have to be placed higher while the total height to the top of the smokestack is governed by the loading gauge.

It is a primary object of my invention to eliminate the excessive restrictions encountered by the gas flow in smokebox and smokestack as above described, thereby eliminating the principal cause of excessive back pressure, and to accomplish this without creating any other drawbacks to efficient blast action.

Another object of my invention is to permit of an especially effective use of an intermediate nozzle between exhaust tip and smokestack, thereby increasing the efficiency of the blast action and further decreasing back pressure. The intermediate nozzle further permits of restricting and pre-determining the amount of gas that is allowed to mix with the exhaust steam under the table plate.

It is another object of my invention to give the designer full freedom in choosing the position of the so-called table plate or partition in the smokebox, thereby obtaining just the gas velocity which is required to secure proper self-cleaning action of the front-end.

It appears from either one of the Figures 1, 2, or 3 that the usual partition 2, 3 divides the smokebox into what may be termed a lower and an upper chamber in such a way that the combustion gases enter the lower

chamber as they come from the boiler tubes, whereupon they are forced to flow rapidly along the bottom of the smokebox in order to sweep out cinders and other particles that would otherwise accumulate on said bottom. To the above ends my invention provides for the mixing of the exhaust steam with a part of the combustion gases under the table plate and before the gases pass around the front edge of said table plate, while the remaining part mixes with the steam above the table plate in the usual manner, and I prefer to place between exhaust nozzle and stack an intermediate nozzle, located within an opening of the table plate or otherwise so located that that part of the combustion gases which is being entrained by the exhaust jet before said exhaust jet enters said intermediate nozzle, flows from said lower into said upper chamber through said intermediate nozzle.

Fig. 2 is a longitudinal view of a locomotive front-end, showing one of the preferred ways in which this invention can be put into practice: On the standpipe 5, the exhaust nozzle 4 is placed as low as desired in order to obtain sufficient distance to the top of the smokebox with the object of using a properly sized stack. A part of the gases, the amount of which can be predetermined by calculation to obtain best conditions, follows the arrow 11, through the netting 10 and comes into contact with the entraining steam, whereupon it passes up through the intermediate nozzle 8 and the surrounding table plate 3 into the upper smokebox chamber and hence into the stack. The remaining part of the gases passes through the netting 7, following the arrow 12 and mixing with the steam above the table plate 3. Said table plate may be inclined, for example, and adjustable in such a way as to give the free gas passage desired. It appears that the intermediate nozzle 8, as it is located according to this invention, may be regarded as being a primary smokestack discharging from the lower smokebox chamber into the upper, while the main smokestack discharges from the upper chamber into the atmosphere. As shown, the intermediate nozzle is preferably smaller in cross-sectional area than the stack, whereby a sufficient gas flow around the front edge of the table plate is maintained, and proper self-cleaning action is secured.

It is not essential to provide a netting 10 under the table plate, as experience shows that in this first part of the combustion gases which come into contact with a comparatively cool steam, glowing particles are being cooled sufficiently to prevent the danger of starting fires. Furthermore, any other construction of nettings can be used in place of the examples given, or suitably arranged deflector plates can be substituted for the nettings in well-known manner. In very restricted smokeboxes or on large locomotives it may also be desirable to use a perforated table plate.

It is also understood, of course, that this invention can be applied in connection with any desired construction or shape and cross-section of stack or intermediate nozzle, or a number of intermediate nozzles. Fig. 3, for example, shows a longitudinal view of a preferred front-end arrangement in which an intermediate nozzle 13 is used, with the object of dividing the exhaust jet and obtaining a still larger sectional area of the stack.

It is also sometimes of advantage to use two or more exhaust nozzles, discharging into one or more smokestacks. A further possibility is the use of a smokestack of other than circular section with a corresponding shape of exhaust nozzle.

The effect of this invention is so marked that a reduction in exhaust pressure to ½ or ⅓ is obtainable as compared to the customary arrangement shown in Fig. 1.

I claim:

1. In a locomotive using exhaust steam for obtaining draft, the combination with a smokebox, said smokebox being divided by a partition inside substantially in the described manner, means of discharging the combustion gases to the atmosphere by the action of the exhaust steam jet or jets, said exhaust steam passing through said partition and being discharged into the smokebox and coming in contact with a part of the combustion gases before passing through the partition, while coming in contact or entraining the remaining part of the combustion gases after having passed through said partition.

2. In a locomotive using exhaust steam for obtaining draft, the combination with a smokebox, said smokebox being divided by a partition inside substantially in the described manner, an exhaust nozzle discharging substantially the whole exhaust steam which is available for creating draft and a smokestack so arranged that the said exhaust steam passes through the partition on its way to the stack, and an intermediate nozzle between said first exhaust nozzle and stack, characterized by the fact that part of the combustion gases comes in contact with said exhaust steam before the exhaust jet passes through said partition, while the remaining part of the combustion gases comes in contact with the mixture of exhaust steam and said first part of the gases after the exhaust jet passed through said partition, it being understood that multiple nozzles and/or smokestacks can be incorporated in place of single ones.

3. In a locomotive using exhaust steam for obtaining draft, the combination with a smokebox, said smokebox being divided by a partition inside forming a lower and an upper chamber substantially in the described

manner, an exhaust nozzle discharging substantially the whole exhaust steam which is available for creating draft and a smokestack so arranged that the said exhaust steam passes through the partition on its way to the stack, and an intermediate nozzle between said first exhaust nozzle and stack, characterized by the fact that that part of the combustion gases which is being entrained by said exhaust steam before the exhaust jet enters said intermediate nozzle, flows from said lower into said upper chamber through said intermediate nozzle.

4. The combination claimed in claim 3, characterized by the further fact that the intermediate nozzle has a smaller minimum cross-sectional area than the stack.

5. In a locomotive using exhaust steam for obtaining draft, the combination with a smokebox, said smokebox being divided by a partition inside substantially in the described manner and for the purpose specified, an exhaust nozzle discharging substantially the whole exhaust steam which is available for creating draft and a smokestack so arranged that the said exhaust steam passes through the partition on its way to the stack, and an intermediate nozzle having a smaller minimum cross-sectional area than said stack, said intermediate nozzle being located between said first exhaust nozzle and stack and within an opening in the said partition.

In testimony whereof I affix my signature.

ADOLF GIESL-GIESLINGEN.