Aug. 13, 1929. A. CHANARD 1,724,641

FORCED DRAFT DEVICE FOR LOCOMOTIVES

Filed Oct. 4, 1926

Fig.1.

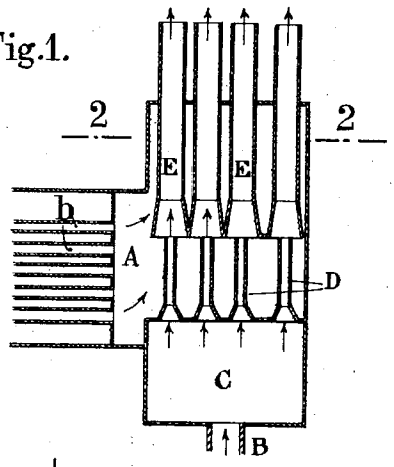


Fig.2.

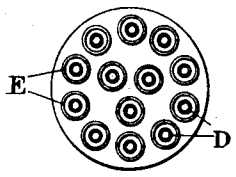


Fig.3.

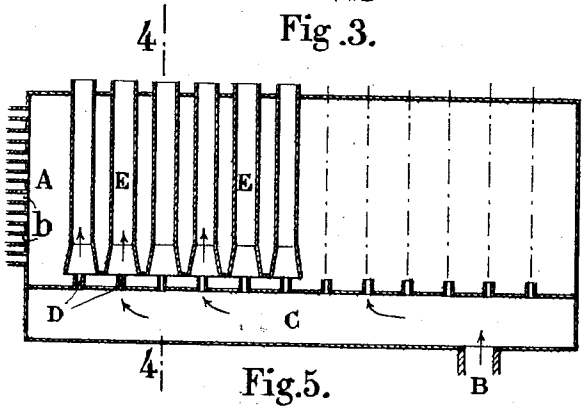


Fig.4.

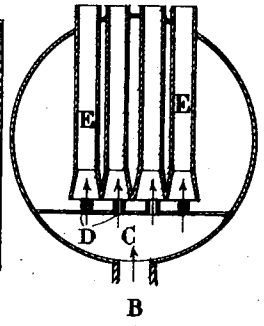


Fig.5.

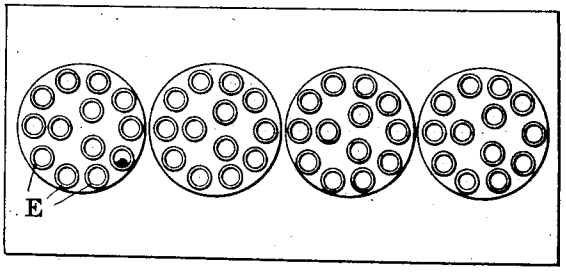


Fig.6.

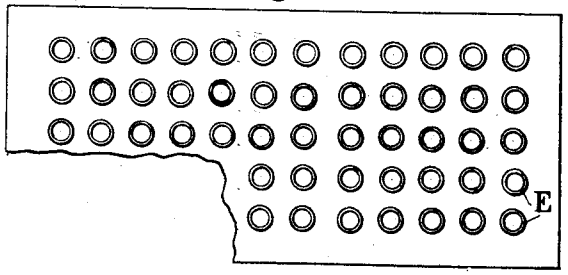
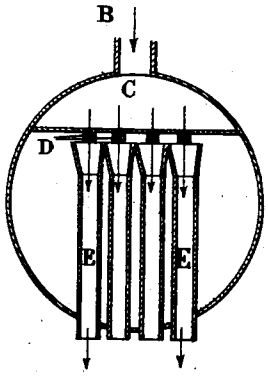


Fig.7.



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UNITED STATES PATENT OFFICE.

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FORCED-DRAFT DEVICE FOR LOCOMOTIVES.

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In actual locomotives, the escape of the steam is effected in a pulsatory manner and, consequently the carrying away of the smoke takes place by jerks, this being the cause of a considerable loss of energy.

Another cause of loss of energy is the excessive speed with which the fluids (steam and smoke) issue from the funnel. In fact, it can be noted that in a modern locomotive, burning 2000 kilograms of coal per hour, the gases (steam and smoke) issue from the funnel at the speed of about 178 meters per second, this representing a vis viva of about 286 horse power which is entirely lost. It would be simply necessary that the said gases (steam and smoke) should issue at a speed much lower than the above value for obtaining a considerable economy. If a speed of 36.50 meters per second (computed hereinafter) is chosen, the vis viva lost will then only be of 12 horse power.

On the other hand, in the existing arrangements, the outlet orifice of the funnel has a reduced diameter, in relation with this high speed of outflow, so that the suction action due to the displacement of the locomotive is not practically utilized. Calculation shows however, that in a locomotive having a funnel the cross section of which is of 0.18 square meter (usual dimension for the above mentioned locomotive), the suction action when running at a speed of 90 kilometers per hour is of 0.900 cubic meter per second, whilst if the cross section of the funnel was brought for instance to 0.62 square meter, the volume given off in these conditions would be approximately quadrupled.

Finally, the carrying away of the smoke by means of the steam is effected, in the existing arrangements, with bad efficiency, because the surfaces of contact between both fluids are not sufficient.

The present invention is adapted to remedy all these inconveniences and has for object various improvements in the means used for carrying away gaseous fluids, and particularly combustion gases and smoke, by means of steam under pressure, and specially those applicable to locomotives for producing a forced draught by means of the exhaust steam.

The invention first consists in replacing in the draught conduit the pulsatory movement of the steam by a continuous flow of the latter, whilst appreciably reducing the speed of this fluid. For carrying this principle into practice, a tank of suitable capacity is interposed between the exhaust pipe of the cylinders and the inlet of the steam in the draught conduit.

The invention secondly consists in giving to the plane of issue of the gases (steam and smoke) a large cross section, so that whatever may be the nature and arrangement of the draught conduit or conduits causing the smoke-box to communicate with the atmosphere the speed of the steam and smoke should be limited to a maximum, much inferior to the actual values fixed for instance at 6.50 meters and that the suction action due to the displacement of the locomotive should, consequently, be proportionally increased.

The invention consists, moreover, in giving to the device adapted to connect the smoke-box to the plane of issue of the gases (steam and smoke) a profile, a cross section and a length such that the steam is braked therein in a real and effective manner, in order that in the plane of issue of this device the massive speed of the evacuated gases should be limited to that which has been predetermined, this device moreover having such a cross-section that the continuous flow from the intermediate tank is practically obtained.

The invention finally consists in dividing the steam the pulsations of which are deadened in the buffer tank indicated about, into numerous streams which help to obtain the continuous flow and come separately in contact with the smoke to be carried away.

In the form of construction preferably adopted, the usual funnel is replaced by a series of small funnels operating in parallel, at the entrance of each of which is arranged a steam injector tube. Owing to the division of the funnel into numerous elements, the surface of contact between the steam and the smoke is considerably increased and the efficiency is consequently improved.

In order that the invention may be clearly understood, a form of carrying into practice the principle of the said invention is illustrated, by way of example only, in the accompanying diagrammatic drawing in which:

Fig. 1 is a general diagram.

Fig. 2 is a horizontal section made according to line 2—2 of Fig. 1.

Fig. 3 is a vertical section of a smoke box constructed in accordance with the invention.

Fig. 4 is a cross section.

Fig. 5 is a horizontal section.

Fig. 6 is a modification.

Fig. 7 is a view similar to Fig. 4, showing another modification.

As shown in the drawing, Fig. 1, considering any gases, entering a chamber A and to be evacuated by means of steam admitted in a conduit pipe B, the latter is caused to open in an intermediate tank C. This tank carries a series of injection tubes D arranged opposite the inlet orifice of funnels E which open in the chamber in which the gases enter.

The steam expands at C and flows in an approximately continuous manner through the tubes D. It is injected in each funnel E where it causes the carrying away the smoke.

Figs. 3, 4, 5, 6 illustrate the same arrangement applied to a locomotive; the tubes *b* of the smoke box lead to A. The funnels can be formed by a series of groups similar to that of Figs. 1 and 2, Fig. 5, or they can be arranged in regular rows, Fig. 6. The buffer-tank C is arranged, for instance, at the lower part of the tubular body.

For indicating the order of magnitude of the considerable modifications made in the existing arrangements, it is useful to give, by way of example, a few numerical data. Whilst the exhaust speed in an existing locomotive reaches 178 meters per second, this speed, in the new device, is limited to 36.50 meters per second. The single funnel is replaced by 65 tubes having a diameter of 111 millimeters and a length of 1.10 meters. The total outlet cross section is 0.65 square meter instead of 0.18 square meter; the tubes D have a diameter of 44 millimeters.

Owing to these arrangements, the movement of the steam in the funnels is rendered continuous; the division of the funnel into numerous elements and the multiplication of the surfaces of contact ensure the easy carrying away of the smoke. The quantity of energy consumed for evacuating the smoke can be considerably reduced by permitting to effect in the cylinder a greater expansion of the steam. The speed of the mixture of steam and smoke at the outlet orifice is diminished, this facilitating the evacuation in the atmosphere. Finally, the increase of the exhaust cross sections increases the suction due to the displacement of the locomotive.

The new device can be easily placed no longer at the upper part, as usual, where the cloud of smoke inconveniences the engineer and can be the cause of accidents, but at the lower part of the locomotive, as diagrammatically illustrated in Fig. 7.

It is to be understood that the invention is not limited to the forms of construction described and to the numerical values indicated. It can be carried out according to any constructional modification deriving from the principle above set forth and all details of construction, forms, dimensions and materials used can be varied according to circumstances without departing thereby from the principle of the invention.

Claims:—

1. In combination with a locomotive, means for exhausting the fumes comprising a plurality of discharge channels in connection with the fumes of the locomotive having outlet orifices of greater cross section than their inlet orifices, an expansion tank communicating with the exhaust steam of the locomotive, and a plurality of injection tubes communicating said exhaust steam from said expansion chamber to the interior of each of said discharge channels.

2. In combination with a locomotive, means for exhausting the fumes comprising a plurality of vertical discharge tubes having conical shaped inlets, said tubes being in communication with the fumes of the locomotive, an expansion tank communicating with the exhaust steam of the locomotive, and a plurality of injection tubes communicating said exhaust steam from said expansion chamber to the interior of each of said discharge tubes, the inlet orifices of said injection tubes being of greater cross section than the outlet orifices.

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