Sept. 6, 1927. 1,641,394

W. H. MARTIN

EXHAUST AND LIKE SILENCER

Filed Nov. 21, 1925 2 Sheets-Sheet 1

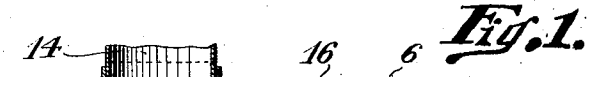


Fig. 1.

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Fig. 3.

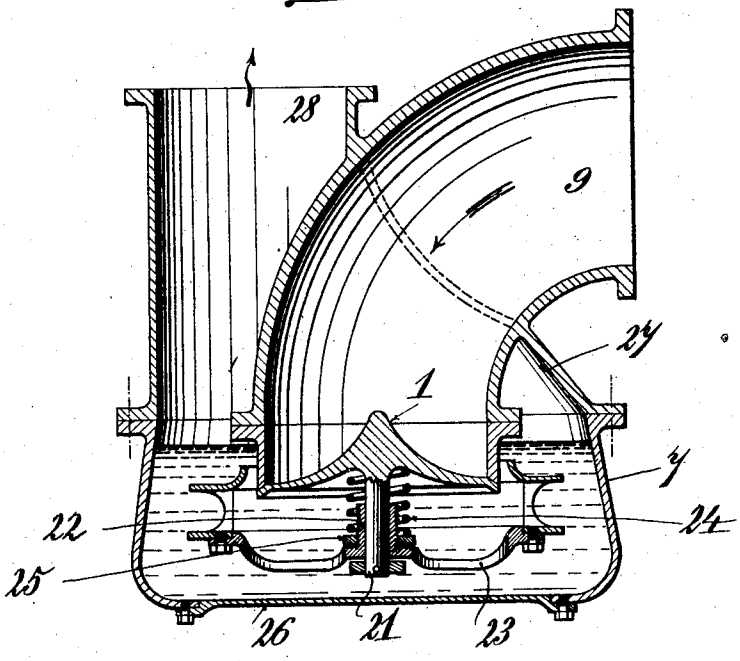
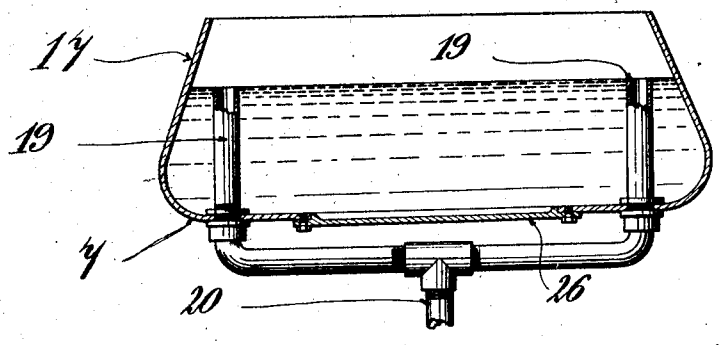


Fig. 4.



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UNITED STATES PATENT OFFICE.

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EXHAUST AND LIKE SILENCER.

Application filed November 21, 1925, Serial No. 70,624, and in Great Britain July 6, 1925.

This invention has reference to silencing means, more particularly for the exhaust of an internal combustion engine, wherein the exhaust gases act ejectorwise to put liquid in motion between guiding surfaces and the discharge orifice communicating with the guiding surfaces is automatically adjusted in size by a valve to suit the volume of the gases being exhausted and thereby maintain the velocity of the latter substantially constant. Such silencing means are described in the specification of British Letters Patent No. 8243 of 1911.

According to this invention, the valve, which diverts the flow of the gases leaving the discharge orifice so that they enter the space between annular plates forming the guiding surfaces and submerged in liquid, is spring controlled preferably in an adjustable manner so as to regulate the back pressure to a minimum approaching approximately to the head of liquid above the valve, it being understood that in all cases the spring means opposes the action of gravity on the valve which it exceeds, the exhaust elbow depends into an open water tank containing the annular plates, and the valve, which opens downwardly, has its spindle extending through the upper part of the exhaust elbow and is there provided with a spring tending to close the valve.

Three ways of carrying out the invention are exemplified in the accompanying drawings, Fig. 1 being a more or less diagrammatic view of a jacketed exhaust elbow having the improvements applied thereto and Fig. 2 being a similar view of a simpler non-jacketed arrangement. Fig. 1^a is a fragmentary section on the line 1^a 1^a Fig. 1. Fig. 3 is a view of the third arrangement. Fig. 4 illustrates a modification applicable to all of the foregoing arrangements.

In Fig. 1, the valve 1 is secured to the lower end of a vertical stem 2 which passes through a stuffing box 3 and has a head 4 acted upon by a compressor spring 5. The force of this spring can be adjusted, as for example by means of the nut 6, so as to do no more than seat the valve so that the back pressure i. e. the total pressure tending to seat the valve can therefore be regulated to a minimum which in the present case would approach approximately the height x of the water column between the level of the valve mouth and the level of the overflow in tank 7.

The water tank 7 and the annular plates 8 associated with the valve, which plates are connected together by radial webs 8^a, may be carried by the exhaust elbow 9 so as to move with the latter as it expands and contracts. The tank 7 may be fed with water from the cooling jacket 10 of the exhaust elbow which is provided with ports or slits 11 for this purpose, the overflow from the tank controlling the level of water therein; the tank may be fed from a separate supply pipe 12 or from both sources. The exhaust elbow 9 and the parts carried by it are usually arranged within a chamber 13 having an exhaust gas outlet 14 to atmosphere at the top and a water outlet 15 at the bottom which may lead to waste, unless it be desired to employ the water or its contained heat units for some auxiliary purpose and such chamber 13 may be provided with a door 16 to enable the valve or spring 5 to be got at. Or the upper part of the valve spindle 2 may extend through the wall of the chamber 13 so that the spring 5 will be external to the exhaust gas chamber and always within reach.

When used aboardship, the water tank 7 may have raised sides 17 and the upper edges 18 of its ends may slope upwardly athwartships from central overflow points, towards the tops of the sides 17; the fore and aft dimension of this tank being moreover greater than its athwartship dimension, if desired. With such an arrangement rolling will not materially affect the head of water above the valve. When this tank can be placed inside the base of the ship's funnel an open-topped chamber is only required for collecting the overflow water and no further lead-off pipes are necessary for the gases which simply rise up the funnel. If placed lower down nearer the engine cylinders an exhaust outlet pipe is only required to base of funnel. It follows that the gases are cleaned and cooled, their volume greatly contracted and all sparks arrested by the water.

Although the silencing of exhaust gases from an internal combustion engine has been more particularly referred to, it is to be understood that the invention is applicable generally, that is to say for the silencing of steam or other gases wherever this is liable to cause noise. Thus the means may be employed to effectually silence the suction of scavenge-air pumps or compressors. It will

thus be apparent that the means may be associated with the intake or exhaust outlet of any desired engine or machine or with both the intake and outlet thereof. Fig. 2 illustrates another arrangement and its construction will be self evident from the description given of Fig. 1. The flooding of the plates employed in the apparatus may be effected with either hot or cold water or other liquid as required.

Another arrangement is to have the valve with its stem attached below it and the spring surrounding the latter, everything thus being completely immersed.

Thus in Fig. 3 the depending valve stem 21 is received by a guide 22 carried by spider arms 23. 24 is the spring acted upon by an adjusting nut 25 and 26 is an inspection plate. The gases may be collected in a housing 27 surrounding the exhaust elbow 9 and fitted to top of tank 7, having an outlet 28 on top.

As will be obvious many modifications may be employed, it being possible for instance to effect the overflow in other ways than as shown in Fig. 1. Thus as indicated in Fig. 4 the tank 7 may be fitted with one or more stand-pipes 19, exemplified as branches from a common outlet pipe 20, through which stand-pipes the water may overflow.

What I claim is:—

1. A device of the kind described comprising a liquid container, means for supplying liquid thereto and means whereby the level of the liquid is maintained substantially constant, a gas duct depending into said container and having an orifice submerged in the liquid, spaced annular and stationary plates adjacent the duct orifice and likewise submerged, such plates constituting an annular ejector nozzle to which liquid has access from opposite sides, a valve adapted in one position to close the duct orifice aforesaid and in another position to direct the flow of gas from the duct into the space between the submerged plates constituting the annular ejector nozzle and a spring means opposing the action of gravity in the valve and tending to close the valve.

2. A device according to claim 1 in which the liquid container has two opposed, inwardly-inclined walls and means whereby liquid can overflow from the container intermediate of said walls.

3. The combination with a downwardly-discharging gas nozzle, of a liquid container having two opposed, inwardly-inclining walls and two additional walls connected to the ends of said inwardly-inclined walls, the upper edges of these two additional walls being approximately V-shaped, the inclined edges forming this V-shape extending from a point at which overflow takes place to the tops of said inclined walls.

Signed at London this ninth day of November, 1925.

WILLIAM HAMILTON MARTIN.