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A. B. SEABORNE

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MEANS FOR QUENCHING, WASHING, AND SILENCING THE EXHAUST
EMISSION FROM INTERNAL-COMBUSTION ENGINES

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Fig. 1.

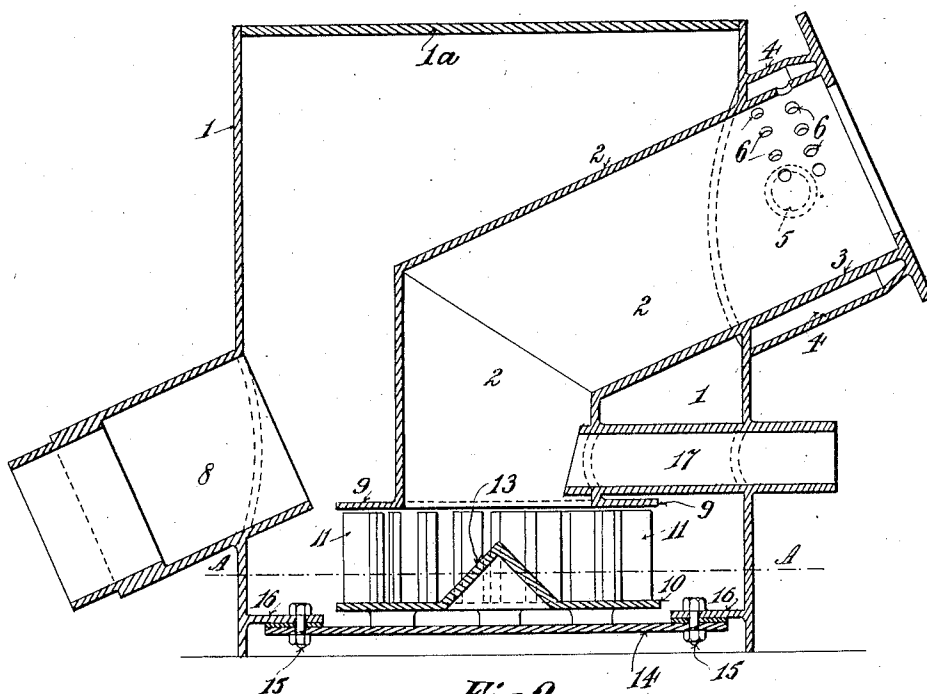
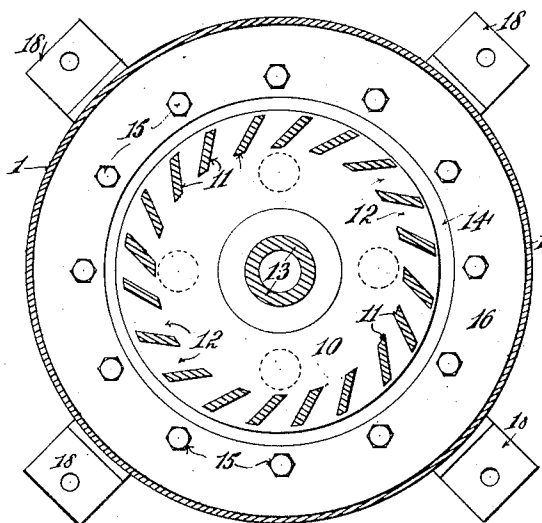


Fig. 2.



INVENTOR.

A. B. Seaborne.

Per

O. Millwood Hack.

Attorney.

UNITED STATES PATENT OFFICE

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MEANS FOR QUENCHING, WASHING, AND
SILENCING THE EXHAUST EMISSION
FROM INTERNAL-COMBUSTION ENGINES

Allever Burton Seaborne, Staines, England

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2 Claims. (Cl. 181—52)

This invention relates to an improved method of and means for quenching, washing and silencing the exhaust emission from internal combustion engines. The primary object of the present invention is to produce a simple apparatus which not only reduces back pressure to a greater degree than in silencers as at present constructed but also ensures complete silence in operation. Other objects of the invention are to effectually quench all flame or sparks from the engine exhaust and to extract sooty particles and water solvent deleterious components of exhaust gases. Moreover an apparatus embodying the present invention is inexpensive to manufacture and install, has no moving parts and will function with the minimum of attention.

Whereas the general known type of silencer consists of a box provided with an inlet and outlet and with baffles or restrictions and also expansion compartments through which gases from the engine are caused to pass, an embodiment of the present invention consists of a means of generating steam by means of the hot gases and intimately mixing that steam with the gases inside a suitable container or inside any known type of silencer in the following way; a jacket surrounds a part of the length of the exhaust inlet pipe to a container to which it may be welded or cast. Holes drilled in the inlet pipe or in the body of the container communicate with this jacket. Water introduced into the jacket passes through these holes and sprays upon the hot gases in the inlet pipe or on hot parts inside the container or silencer. Steam generated by this means and mixing intimately with the gases inside the silencer, leaves with them while water which has not evaporated may also leave with the gases or may be led away by a separate pipe.

The method underlying the present invention is to reduce the temperature, also the amplitude of both the pressure impulses and the sound waves, of the exhaust combustion gases by utilising the heat of said gases to generate steam or water vapour, and to intimately mix said steam or water vapour with the said hot gases before they are allowed to discharge into the atmosphere.

The object of generating steam or water vapour and mixing it with the exhaust gases is to reduce the amplitude of temperature and pressure waves between successive exhaust impulses by means of reducing the temperature by steam generation and augmenting the pressure in the periods occurring between successive exhaust impulses thus securing a more uniform and in consequence a silent final emission. The broad principle of mixing water with the exhaust gases for silencing the noise of internal combustion engines and washing or quenching the combustion gases is

not novel nor is any claim made to apparatus for carrying such a principle into practice.

According to the present invention water is introduced into the stream of hot exhaust gases as they pass through a duct to a suitable container, whereby steam or water vapour is generated and intimately mixes with said gases. The initial temperature and pressure of the gases is thereby reduced. The mixture of gases and water vapour is then partially condensed by leading it beneath water within the bottom of the container in such wise as to split up the mixture and set the water in evaporative frothy turbulence. The upwardly escaping mixture—at a still lower pressure and temperature, but saturated with water vapour—finally expands and condenses within the body of the container before passing through at outlet therein to the atmosphere together with any surplus unevaporated water.

An apparatus for carrying out the present invention comprises a suitable container, an inlet pipe therein for the heated combustion gases, an outlet from said container for the cooled and expanded gases, a submerged box within the lower part of the container and in communication with the lower end of the inlet pipe, the outlets from said box being so arranged that the gases escaping therefrom create a bubbling or frothy turbulence, one or more inlets in said container for water under pressure and means for generating steam or water vapour either by jacketing a portion of the inlet pipe and through which the water passes before discharging into the passage of the incoming gases through the inlet pipe or by directly discharging water into the path of the gases or by a combination of both methods.

This invention will be now more particularly described making reference to the accompanying drawing in which:

Fig. 1 is a view in sectional elevation of an apparatus embodying the present invention, and

Fig. 2 is a plan view of the apparatus in section on line A—A of Fig. 1.

A closed cylindrical container 1 is furnished with an inlet pipe 2 adapted to be coupled at its outer end 3 with the exhaust pipe or manifold of the engine. The inlet pipe 2, which may be a straight pipe centrally arranged within the container 1 and passing out through the closed end 1a thereof, is preferably made in two parts with its upper portion at an angle to its lower portion, said upper portion passing out through the side wall of the container as shown. The outer projecting end 3 of this pipe 2 before entering the container 1 is provided with a water jacket 4 adapted to be fed with water under pressure by one or more inlets 5. The top half of the end 3 of the inlet pipe 2 is furnished with a plurality of holes 6 placing the water jacket 4

in communication with the interior of the pipe 2.

An outlet pipe 8 from the container 1 in the lower part thereof may be angularly disposed in line with and opposite the angular portion of the inlet pipe 2 as shown or in other convenient position so long as the entrance to said pipe 8 is so far above the outlet from the pipe 2 as to ensure a bath of water always remaining within the bottom of the container 1 so that the gases from the inlet pipe 2 are discharged below the level of the water in the container.

The outlet from the pipe 2 terminates in a submerged apertured box, rose or other device in order to create a bubbling or frothy turbulence in the water by the gases discharging there-through.

One convenient arrangement is that shown in which a flange 9 on the lower end of the pipe 2 forms together with a bottom plate 10 which is provided with circumferentially upstanding vanes 11, a cylindrical box. The outlets from this box are the spaces 12 between the vanes 11 which are preferably angularly or tangentially arranged as shown.

The bottom plate 10 is preferably formed with a centrally arranged cone shaped upstanding part 13 to assist in distributing the water and gases through the outlets 12. The bottom plate 10 to which the vanes 11 are attached is carried by a plate 14 forming the bottom closure of the container 1. This plate 14 is removably attached by bolts 15 to a flange 16 formed near the bottom edge of the container 1 and may be provided with a drain or sludge cock.

Water additional to that with steam entering the inlet pipe 2 through the holes 6 therein is preferably also introduced into the passage of the down-flowing mixture of gas and vapour through said pipe 2 by means of a pipe 17 passing through the walls of the container 1 and the pipe 2. The inner or outlet end of this pipe 17 may be furnished with a rose or other means to spray the entering water into the stream of gas mixture.

The container 1 may be furnished with supporting feet 18. The container together with other parts of the apparatus are preferably formed from sheet steel welded together and heavily galvanised to form an integral structure with the exception of the bottom plate and the box carried thereon.

In operation the exhaust gases entering through the pipe 2 are charged with steam, water vapour or water through the perforations 6 by which means the temperature and pressure of the hot gases are reduced and their specific gravity is changed by the addition of water vapour. This state is further enhanced by water entering through the pipe 17. The mixture of gases and water vapour now discharges through the submerged outlets in the box in communication with the end of the pipe 2, thus not only creating a frothy turbulence of the water in the bottom of the container but also causing evaporation of a portion of said water; the rising water-saturated mixture then expands in the body of the container causing a further change in specific gravity by condensation and finally escapes through the outlet pipe 8 together with any surplus unevaporated water.

It is thought that the gases carrying sound waves or with the power of setting up sound waves are prevented so doing in the manner above described and that an important part

played in this process is humidification condensation and re-evaporation in hundreds of cells (froth or bubbles) simultaneously, which has the effect of breaking down the power of sound propagation.

It will be appreciated that exhaust pressures temperatures and velocities of exhaust gases entering a silencing apparatus may vary very considerably owing to the position of the silencer relative to the engine and the type speed and horse power of the engine so that it will be necessary to proportion the various parts and methods of introducing the water to meet individual cases.

I claim:

1. An apparatus for quenching, washing and silencing the exhaust emission from internal combustion engines comprising a closed container, an inlet pipe therein for the heated combustion gases, a jacket surrounding a portion of said inlet pipe, a water inlet to said jacket and outlets therefrom discharging into said inlet pipe, a flange on the lower end of said inlet pipe, a plate contiguous to and parallel with said flange and supported by the bottom closure of the container, a plurality of angularly or tangentially disposed vertically arranged vanes carried on said plate and extending between it and the flange so that the flange, plate and vanes constitute a box terminating the lower end of the inlet pipe, outlets from said box constituted by the spaces between the vanes to allow the gases to escape with a swirling motion from the inlet pipe beneath accumulated water in the lower part of the container so as to create a bubbling or frothy turbulence in said water and a discharge outlet in the lower part of the container at the level above the outlets from the box for the cooled and expanded gases together with any surplus of unevaporated water in the bottom of said container, as set forth.

2. An apparatus for quenching, washing and silencing the exhaust emission from internal combustion engines, comprising a closed container, an inlet pipe therein for the heated combustion gases, a jacket surrounding a portion of said inlet pipe, a water inlet to said jacket and outlets therefrom discharging into said inlet pipe, a flange on the lower end of said inlet pipe, a plate contiguous to and parallel with said flange and supported by the bottom closure of the container, a plurality of angularly or tangentially disposed vertically arranged vanes carried on said plate and extending between it and the flange so that the flange, plate and vanes constitute a box terminating the lower end of the inlet pipe, outlets from said box constituted by the spaces between the vanes to allow the gases to escape with a swirling motion from the inlet pipe beneath accumulated water in the lower part of the container so as to create a bubbling or frothy turbulence in said water, auxiliary means for introducing additional water into the passage of the down flowing mixture of gas and vapour through the inlet pipe comprising a water pipe passing through the wall of the container and having its outlet end terminating in the inlet pipe above the box terminating its lower end, and a discharge outlet located in the lower part of the container at the level above the outlets from the box for the cooled and expanded gases together with any surplus of unevaporated water in the bottom of said container, as set forth.

ALLEVER BURTON SEABORNE.