Nov. 2, 1965 W. D. MARING 3,214,902

EXHAUST TREATING DEVICE

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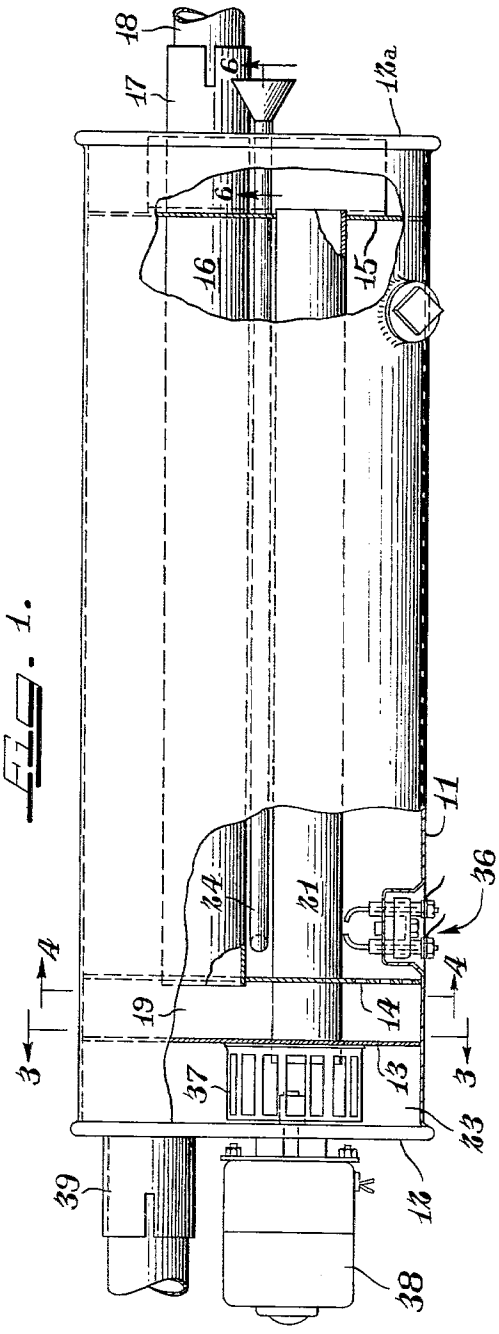

FIG. 1.

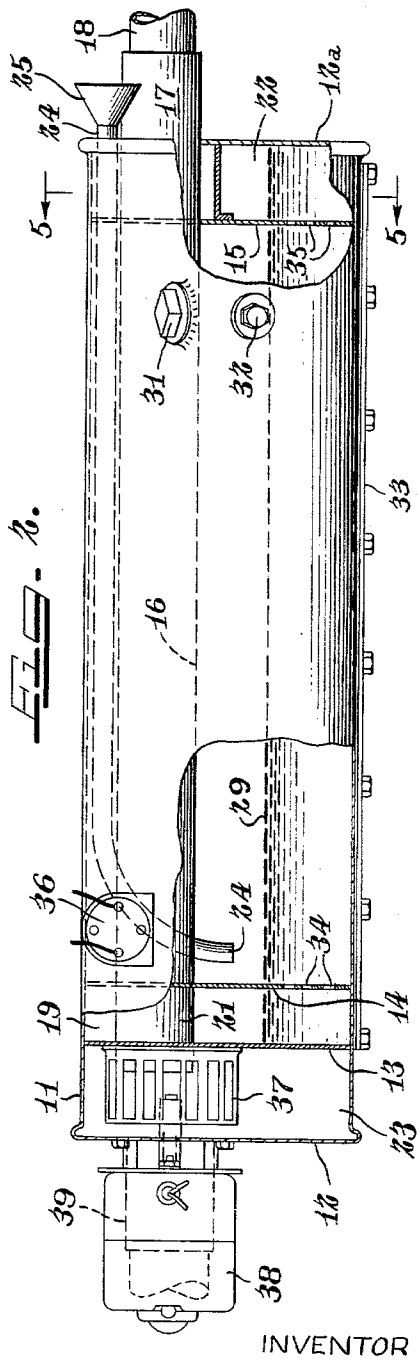

FIG. 2.

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Fig. 3.

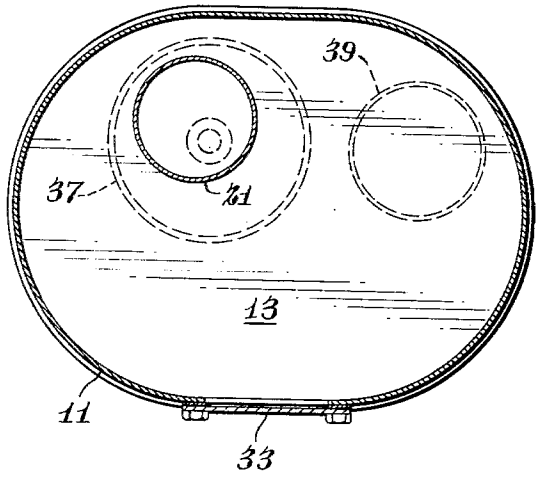
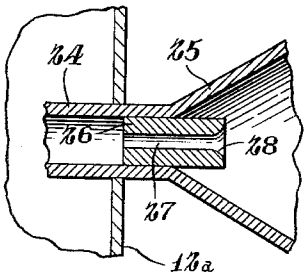


Fig. 6.



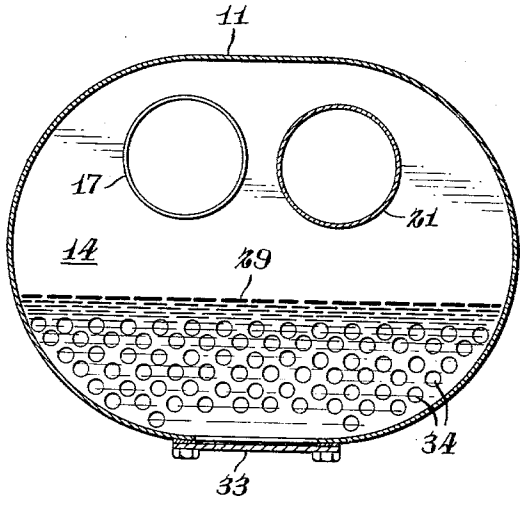


Fig. 5.

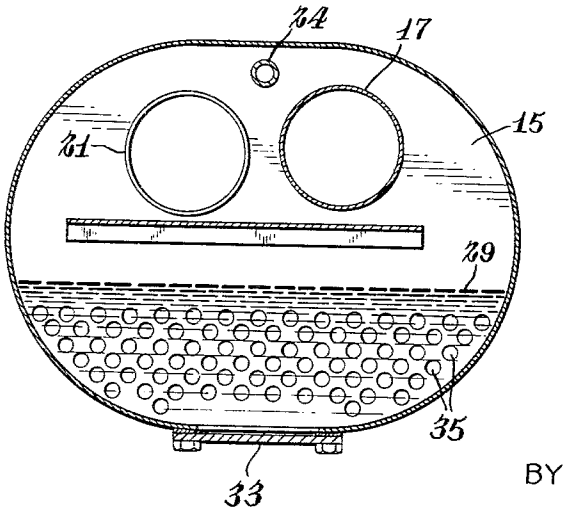


Fig. 4.

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EXHAUST TREATING DEVICE

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11 Claims. (Cl. 60—30)

The invention relates to improvements in exhaust treating devices or mufflers for internal combustion engines. More particularly, the invention relates to a muffler for an internal combustion engine which muffler embodies novel means to eliminate or greatly reduce the amount of carbon monoxide passing therefrom. The device includes means for silencing the noise of exhaust gases and further embodies novel means to admit atmospheric air into the interior of the device so that exhaust gases therein can be reburned by elements incorporated into its construction.

It is therefore an object of the invention to provide an exhaust treating device with novel means to burn the hydrocarbons in exhaust gases flowing therethrough.

Another object is to provide a device of the character described with fluid filtering means effective to change the exhaust gases into a highly volatile vapor.

Another object is to provide novel means to change the chemical properties of exhaust gases.

Another object is to provide a device of the character referred to which is not expensive to manufacture or use, is very efficient in its use and is easy to install on existing engines.

Other objects and the advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

FIG. 1 is a top plan view of the exhaust treating device, showing parts of the outside casing broken away.

FIG. 2 is a side elevational view of the device, showing parts of the casing broken away.

FIG. 3 is a transverse sectional view, taken on line 3—3 of FIG. 1.

FIG. 4 is a transverse sectional view, taken on line 4—4 of FIG. 1.

FIG. 5 is a transverse sectional view taken on line 5—5 of FIG. 2.

FIG. 6 is an enlarged detail sectional view of the atmospheric air inlet, taken on line 6—6 of FIG. 1.

Referring to the exemplary disclosure in the accompanying drawings, the exhaust treating device includes an outer shell **11**, generally oval in section, having end walls **12** and **12***a* closing the ends thereof. Spaced from said end walls and spaced apart are three partitions **13**, **14** and **15**. A tubular conduit **16** extends inwardly through the shell from one end wall **12***a* and it is connected in flow communication with an inlet fitting **17** having connection with the exhaust pipe **18** of an internal combustion engine. This tubular conduit **16** passes through the partitions **15** and **14** and its inner end opens into an expansion chamber **19** between partitions **13** and **14**. A second tubular conduit **21** is arranged within the casing **11**, parallel to but spaced from conduit **16**, and extends from the partition **15** through partition **14**, expansion chamber **19** and partition **13**. One end of said conduit **21** is in flow communication with a chamber **22** defined by partition **15** and the related end wall **12***a*; whereas, the other end is in flow communication with an exhaust chamber **23** defined by partition **13** and its related end wall **12**.

Atmospheric air is admitted into shell **11** through a tube **24** that extends through end wall **12***a* and has, on its outside end, a flared mouth **25** adapted to scoop up air when the engine is in operation. The tube **24** has, at its juncture with the flared mouth **25**, a venturi fitting **26** (FIG. 6) provided with a restricted orifice **27**, the lead end of which is bevelled or rounded, as at **28**, to maintain a low level of sound of air passing therethrough.

The bottom region of shell **11**, between partition **13** and end wall **12***a* is filled with a fluid **29**. This fluid preferably comprises a mixture of benzyl benzoate and a high temperature lubricating oil. Such mixture have a boiling point of about 613° F. The upper unfilled region of the shell between partitions **14** and **15** constitutes a combustion chamber. The liquid level can be maintained through a filling opening normally closed by a plug **31** and a spill-out opening normally closed by a plug **32**. When required, the liquid, which accumulates waste material and residue, can be withdrawn for replacement by a clean liquid upon removal of a floor plate **33** provided in the bottom side of shell **11**.

As best shown in FIGS. 4 and 5, the partitions **14** and **15** are perforated, as at **34**, **35**, respectively, in their lower or submerged areas only for a purpose to be explained presently.

Insofar as the structure has been described, exhaust gases entering conduit **16** flow into expansion chamber **19** and down into the fluid **29** in said chamber. Said gases are drawn, by means described presently, through the apertures **34** in partition **14** and rise in the form of a monoxide gas into the upper region or combustion chamber of the shell where it is mixed with atmospheric air entering tube **24** and becomes highly volatile. Means in the form of a spark element **36** is mounted in the combustion chamber which is adapted to fire at predetermined close intervals through electrical connection with a spark coil (not shown) on the internal combustion engine. Firing of the spark element ignites the highly volatile gas-air mixture thus consuming same and carbonizing solids therein. These burnt gases and solids are drawn back into the liquid **29** in the bottom of the combustion chamber by means to be described presently, where the solids remain to be collected in the form of a sludge on the bottom of the shell. The burnt gases however, flow through the liquid and through the apertures **35** in partition **15** into chamber **22** and out through the conduit **21**.

The flow of atmospheric air and gases through the device and the exhaust of burnt gases is accomplished by providing on the outlet end of conduit **21**, and in chamber **23**, a centrifugal blower **37** operated by a motor **38** which operates to direct the gases to and through an exhaust outlet **39**.

It should be apparent that the monoxide (CO) content of the gases flowing through exhaust outlet **39** has been converted to carbon dioxide (CO_2).

From the foregoing description it will be apparent that I have provided a novel exhaust treating device which is simple in construction and highly efficient in operation.

Having thus described my invention, I claim:

1. In an exhaust treating device, a tubular shell closed at its ends and having an exhaust gas inlet and an exhaust outlet, means in said shell to wash exhaust gases entering said shell, means to mix said washed exhaust gases with atmospheric air within said shell, means in said shell to ignite said gas-air mixture, and means in said shell to wash burnt gases and to convey them to the exhaust outlet.

2. The exhaust treating device recited in claim **1**, in which the means to exhaust said burnt gases comprises a blower.

3. In an exhaust treating device, a tubular shell closed at its ends, an inlet for exhaust gases in one end of said shell and an exhaust outlet in the other end of said shell, a conduit through which said gases pass, a chamber into which said gases are discharged from said conduit, a combustion chamber in said shell, means of communication between said chamber and said combustion chamber, a liquid filling a part of said chamber and combus-

tion chamber and covering said means of communication, said gases flowing through said liquid from the chamber into the combustion chamber, an inlet for atmospheric air in said combustion chamber, means to ignite the mixture of gases and atmospheric air in said combustion chamber, and means to convey burnt gases from the combustion chamber to the exhaust outlet.

4. The exhaust treating device recited in claim 3, in which a partition separates the chamber from the combustion chamber and the means of flow communication comprises at least one aperture in said partition.

5. The exhaust treating device recited in claim 3, in which a second conduit is provided in the shell to deliver burnt gases from the combustion chamber to the exhaust outlet.

6. The exhaust treating device recited in claim 3, in which a suction blower is provided to exhaust the burnt gases.

7. In an exhaust treating device, a shell, a combustion chamber in said shell, said combustion chamber containing a liquid, means to discharge exhaust gases through said liquid and into said combustion chamber, means to admit atmospheric air into said combustion chamber, means to ignite the atmospheric air and gas mixture, and means to withdraw burnt gases from the combustion chamber through said liquid and discharge it from the shell.

8. The exhaust treating device recited in claim 7, in which the means to ignite the mixture comprises a spark element.

9. In an exhaust treating device, a shell having end walls, first and second conduits in said shell, means connecting one end of said first conduit to the exhaust of an internal combustion engine, a first partition at one end of said shell defining with one end wall a chamber with which one end of the second conduit communicates, second and third partitions spaced apart and spaced from the other end wall defining separate chambers, a combustion chamber in said shell between the first and second partitions, one of said separate chambers being in flow communication with the other end of the first conduit and the other chamber being in flow communication with the other end of said second conduit, an exhaust outlet leading from said last named chamber, a fluid contained in said combustion chamber, perforations in the first and second partitions submerged in said fluid, means to force exhaust gases flowing through the first conduit to flow through said fluid and into the combustion chamber, means to admit atmospheric air into the combustion chamber above said fluid, and means to ignite the mixture of atmospheric air and gases in said combustion chamber, said force means withdrawing burnt gases through the fluid and into the said second conduit for delivery to the exhaust outlet.

10. In an exhaust treating device, a shell, first and second conduits in said shell, means connecting one end of said first conduit to the exhaust of an internal combustion engine, a first chamber at one end of said shell with which one end of the second conduit communicates, second and third chambers at the other end of said shell, a combustion chamber in said shell between the first and second chambers, said second chamber being in flow communication with the other end of the first conduit and the third chamber being in flow communication with the other end of said second conduit, an exhaust outlet leading from said third chamber, a fluid partially filling said combustion chamber, passageways connecting the first and second chambers with the combustion chamber, said passageway being submerged in said fluid, means to force exhaust gases flowing into the second chamber to flow through said fluid and into the combustion chamber, means to admit atmospheric air into the combustion chamber above said fluid, and means to ignite the mixture of atmospheric air and gases in said combustion chamber, said force means withdrawing the burnt gases through the fluid and into the said second conduit for delivery to the exhaust outlet.

11. The method of changing the chemical properties of exhaust gases, which comprises flowing said gases through a liquid and into a combustion chamber, mixing atmospheric air with said gases in said chamber, igniting said air-gas mixture, and withdrawing the burnt gases through the liquid and exhausting same.

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