

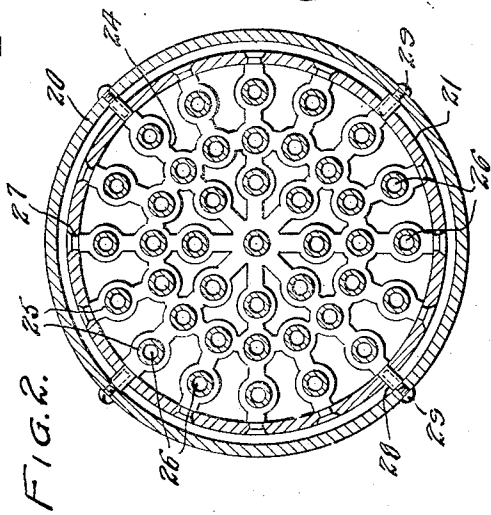
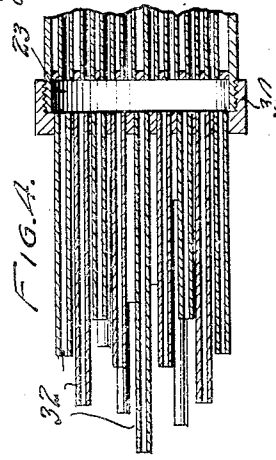
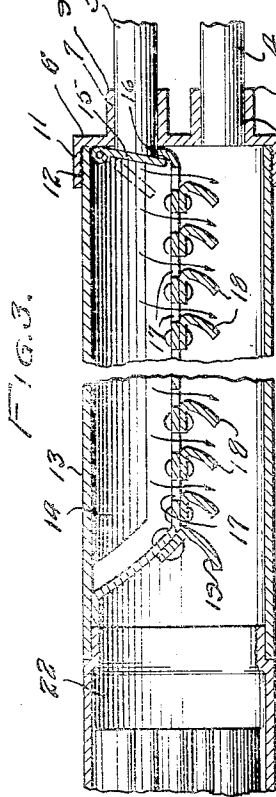
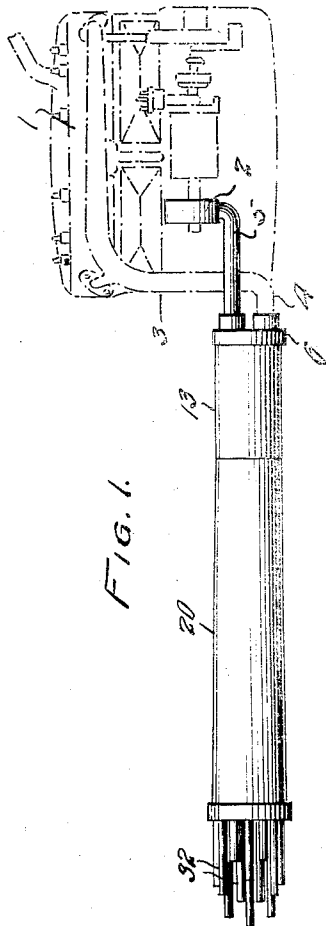
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APPARATUS AND PROCESS FOR MUFFLING AND PURIFYING EXHAUST GASES

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APPARATUS AND PROCESS FOR MUFFLING AND PURIFYING EXHAUST GASES

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(GRANTED UNDER THE ACT OF MARCH 3, 1883, AS AMENDED APRIL 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

5 This invention relates to an apparatus and process for muffling and purifying exhaust gases.

10 An object of the invention is to provide a new process for eliminating toxic gases in the exhaust of internal combustion engines.

Another object of the invention is to provide a catalyst to aid in rendering harmless the toxic gases of the exhaust of internal combustion engines.

15 An object of this invention is the production of an apparatus for the reduction of smoke and poisonous gas content of the exhaust gases from internal combustion engines.

20 Another object of this invention is the production of an apparatus for the reduction of smoke and the purification of poisonous gas content of the exhaust gases of an internal combustion engine by the introduction of air into the exhaust line of the engine.

25 Another object of this invention is the production of an apparatus for the reduction of smoke and the purification of the poisonous gas content of the exhaust gases of an internal combustion engine by the introduction of air into the exhaust line of the engine in the presence of a suitable catalyst.

30 Another object of the invention is to provide an apparatus for eliminating smoke and purifying gases from the exhaust of internal combustion engines and to effectively muffle and release the gases into the atmosphere without undue noise.

35 Yet another object of the invention is to provide an apparatus for effectively eliminating smoke and poisonous gas from the exhaust of an internal combustion engine by the injection of air under low linear velocity into the exhaust line of the engine, to mix
45 with the exhaust gases which are under high pressure and high velocity.

50 With these and other objects in view which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed,

with the understanding that the several necessary elements comprising my invention, may be varied in construction, proportions and arrangement, without departing from the spirit and scope of the appended claims.

In order to make my invention more clearly understood, I have shown in the accompanying drawings means for carrying the same into practical effect, without limiting the improvements in their useful applications to the particular constructions, which for the purpose of explanation, have been made the subject of illustration.

In the drawings forming a part of this specification:—

Fig. 1 is a side elevation illustrating my device as applied to an internal combustion engine,

Fig. 2 is a cross sectional view.

Fig. 3 is a longitudinal sectional view partly broken away and

Fig. 4 is an enlarged sectional view of the muffler, the expansion chamber and a fragment of the combustion catalytic chamber and tubes.

Referring by numerals to the drawings, 1 represents an internal combustion engine which may be of any type. Geared to the engine in any suitable manner is an air blower 2, which may also be of any type. The engine is provided with the usual exhaust line 3, preferably jacketed to retain the heat of the exhaust gases. The exhaust line 3, terminates in a lateral position as indicated at 4. Secured to and extending from the air blower 2 is an air line 5, the end of which is adjacent to and parallel with the end 4 of the exhaust line. This structure may be modified or varied according to the type of engine and air blower employed.

Mounted upon the exhaust and air lines is a cap 6, having inlet ports 7 and 8 provided with elongated sleeves 9 and 10 and a flange 11 provided with internal threads 12. The sleeves 9 and 10 receive the ends of the exhaust and air lines in a slip joint connection. It may be found desirable to otherwise connect the air line to insure against leakage.

A nozzle 13 is threaded or otherwise se-

cured to the cap 6. This nozzle comprises a cylindrical section or housing having arranged therein an elongated chamber 14 communicating with the air inlet port 7. The air inlet port 7 is provided with a check valve 15 hinged upon the cap 6 and normally bearing against an inclined seat 16. The elongated chamber 14 is provided with a plurality of ports 17 opening into the nozzle. The ports 17 are arranged in spaced relation to each other throughout the length of the chamber. Mounted upon the chamber adjacent to each port is a baffle plate 18. The baffle plates 18 are curved or bent toward the discharge end of the nozzle. An additional baffle plate 19 is mounted upon the forward end of the chamber 14 near the discharge end of the nozzle. The baffle plate 19 is likewise curved or bent toward the discharge end of the nozzle. The baffle plates 18 and 19 serve a twofold function in that they cause the discharged gases from the exhaust line to create a suction, when passing through the nozzle under high velocity, to draw a necessary quantity of air from the air chamber 14. These baffle plates also function as back pressure stops to prevent the exhaust gases from entering the air chamber. The pressure of air in the air chamber is maintained under low linear velocity. The valve 15 prevents back pressure.

There may be instances wherein it would be found desirable or where conditions may warrant a greater supply of air than would be drawn from the air chamber, in which air is admitted through the valve 15 normally under low linear velocity. In such cases, the air pressure may be increased through the medium of the air blower, which may be regulated for any pressure desired. Thus the supply of air may be increased or decreased at will and regulated or set to supply the desired or required quantity.

Fitted upon the discharge end of the nozzle is an elongated frusto-conical housing 20. The cross sectional diameter of the housing 20 is slightly increased from its slip joint connection with the nozzle throughout its length, the object of which is to prevent the building up of back pressure.

Mounted within the housing 20 is a combustion chamber 21. The combustion chamber 21 is frusto-conical in form so as to fit within the housing 20. This combustion chamber 21 is so positioned and mounted within the housing as to form between itself and the wall of the housing 20 an air space to more effectually retain the heat from the discharged gases in the chamber. The position of the combustion chamber is such within the housing as to provide a space between its end adjacent to the nozzle to form a mixing chamber 22. A similar space is provided at its discharge end for an expansion chamber 23.

The combustion chamber 21 is provided at each end with a plurality of radial supports 24, radiating from a common center. These supports are provided with aligned apertures 25 for the reception of catalytic tubes 26, which may be secured therein in any desirable manner. The ends of the radial supports project through apertures 27 in the wall of the combustion chamber. The apertures 27 have counter sunk portions in which heads are formed upon the supports for effectually securing the supports in a rigid position. The ends of a number of the supports are extended to function as spacers 28 and are provided with means 29 for retaining the chamber within the housing in spaced relation, though other means of mounting the chamber may be employed.

Threaded or otherwise secured to the exhaust end of the housing 20 is a cap 30 provided with a plurality of apertures 31 arranged in close assembly. Mounted in the apertures 31 are tubes 32. The tubes 32 vary in length as clearly shown in Figs. 1 and 4. These tubes 32 communicate directly with the expansion chamber and owing to their variation in length, interfere and divide the noise incident to the discharge to effectively function as a muffler.

The combustion chamber 21 formed of the catalytic tubes 26 is constructed of an alloy composed of 25 per cent manganese, 10 per cent lead and 65 per cent copper. It is to be understood, however, that these proportions may be varied. The chamber after having been completely assembled and preparatory to mounting the same with the housing, is placed in an oven and heated. Air is expelled from the oven and replaced by oxygen and the heating continued until a heavy coating of oxide is formed on all of the exposed surfaces.

The exhaust gases from an internal combustion engine contain carbon monoxide and smoke due to an insufficiency of oxygen in the air mixed with the petroleum or other vapor used as a fuel. A part of the fuel vapor also escapes in the exhaust. These exhaust gases enter the nozzle 13 under high pressure and high velocity causing, by their contact with the baffles 18, a suction action through the ports 17 upon the air in the chamber 14. The chamber 14 is supplied with air from the blower 2 and to insure against back pressure, a check valve 15 is employed.

The air supplied to the chamber is taken therefrom and mixed with the exhaust gases at atmospheric pressure and under low linear velocity. Back fires are eliminated by reason of the injection of the air in small quantities through a number of ports arranged in the line of travel of the exhaust gases. In some instances, it may be found desirable to inject the air with force. In such in-

stances, this may be accomplished by the adjustment of the blower.

The exhaust gases and the air mixed therewith pass from the nozzle 13 into the mixing chamber 22 from thence into the combustion chamber 21 where complete oxidation takes place, the same being promoted by the catalyst. Upon the exhaust gases mixed with air entering the combustion chamber and coming in contact with the catalyst, the various oxides would be reduced part of the time and at other times the oxide would be built up according to the amount of oxygen or carbon monoxide present. Thus the catalyst is regenerative and thereby preserved. Accordingly, under such conditions the carbon monoxide is completely oxidized at all times before leaving the combustion chamber. Upon being discharged from the combustion chamber, the discharge enters the expansion chamber 23 from whence it is released through tubes of varying length in the muffler. This arrangement of tubes effectively divides and deadens the noise incident to the discharge.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth, by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention, or exceeding the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A process for eliminating toxic gases from the exhaust of an internal combustion engine comprising, introducing exhaust gas into a mixing nozzle, forcing air therein at a predetermined rate to be mixed with the exhaust gases, admitting the mixture of air and exhaust gases to a combustion chamber, oxidizing the mixture within the combustion chamber in the presence of catalytic tubes, expanding the oxidized mixture and muffling the expanded mixture passing to the atmosphere.

2. An exhaust device comprising a nozzle, an elongated chamber in the nozzle, the chamber having a plurality of ports communicating with the nozzle, the ports being spaced apart and arranged within a line, baffle plates mounted upon the chamber within the nozzle adjacent to the ports, a baffle plate upon the forward end of the chamber, an inlet port for the chamber, a check valve for the inlet port, and an inlet for the nozzle.

3. An exhaust device comprising a nozzle, an elongated chamber within the nozzle, the chamber having a plurality of ports opening into the nozzle, baffle plates mounted on the chamber within the nozzle, the baffle plates

being curved toward the discharge end of the nozzle, an intake port for the chamber, a valve for the intake port of the chamber and an intake port for the nozzle.

4. An exhaust device comprising a frusto-conical housing, a frusto-conical chamber mounted in the housing, radial supports in each end of the chamber, catalytic tubular sections having individual contact surfaces mounted in the radial supports and means for mounting the chamber in the housing in spaced relation to the wall thereof.

5. An exhaust device comprising an elongated frusto-conical housing, a frusto-conical chamber mounted in the housing, radial supports mounted in each end of the chamber, a bank of catalytic tubular sections having individual contact surfaces mounted in the radial supports, and means carried by the radial supports for mounting the chamber in the housing in spaced relation to the wall thereof.

6. An exhaust device comprising an elongated frusto-conical housing, a frusto-conical chamber mounted in the housing, radial supports mounted in the ends of the chamber, a bank of catalytic tubular sections having individual contact surfaces mounted in the radial supports, the radial supports extending through apertures in the chamber, shoulders on the radial supports bearing against the wall of the chamber, a number of the radial supports extending through and beyond the housing to form spacers for supporting and securing the chamber within the housing in spaced relation to the wall thereof.

7. An exhaust device comprising a frusto-conical housing, a mixing nozzle connected to one end of the housing, a plurality of exhaust ports of varying length connected to the other end of the housing, a mixing chamber adjacent to and communicating with the nozzle, an expansion chamber adjacent to and communicating with the exhaust ports, a combustion chamber intermediate the mixing chamber and the expansion chamber and a catalyst in the combustion chamber.

8. An exhaust device comprising an elongated frusto-conical housing, a mixing nozzle connected to the smaller end of the housing, a plurality of exhaust ports varying in length connected to the larger end of the housing, a mixing chamber in the housing adjacent to and communicating with the nozzle, an expansion chamber in the housing adjacent to and communicating with the exhaust ports, a combustion chamber in the housing intermediate and communicating with the mixing chamber and the expansion chamber and a catalyst in the combustion chamber comprising a plurality of catalytic tubes.

9. An exhaust device comprising an elongated frusto-conical housing, a mixing nozzle

connected to the smaller end of the housing,
a plurality of exhaust ports of varying
length connected to the other end of the
housing, a combustion chamber mounted in
5 the housing intermediate the mixing nozzle
and exhaust ports, the chamber being in
spaced relation to the wall of the housing
and in spaced relation to the mixing nozzle
and exhaust ports and a bank of catalytic
10 tubes mounted within the chamber.

10. An exhaust device comprising an
elongated frusto-conical housing, a mixing
nozzle connected to the smaller end of the
housing, a cap upon the larger end of the
15 housing, a plurality of exhaust ports of vary-
ing length in the cap, a chamber mounted in
the housing in spaced relation to the wall of
the housing, the respective ends of the cham-
ber being in spaced relation to the mixing
20 nozzle and the exhaust ports, and a catalyst
comprising a bank of catalytic tubes mount-
ed in the chamber.

In testimony whereof I affix my signature.

MAURICE EUGENE BARKER.

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