

June 4, 1940.

W. C. UHRI, JR., ET AL

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EXHAUST GAS BURNER

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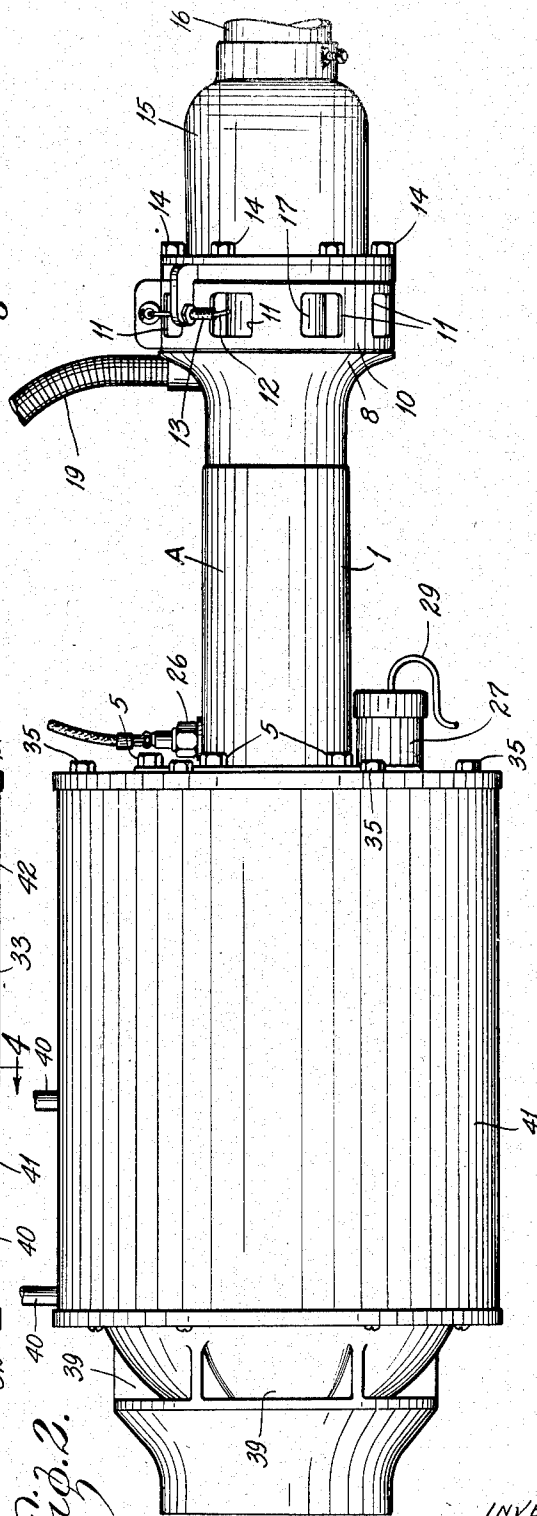
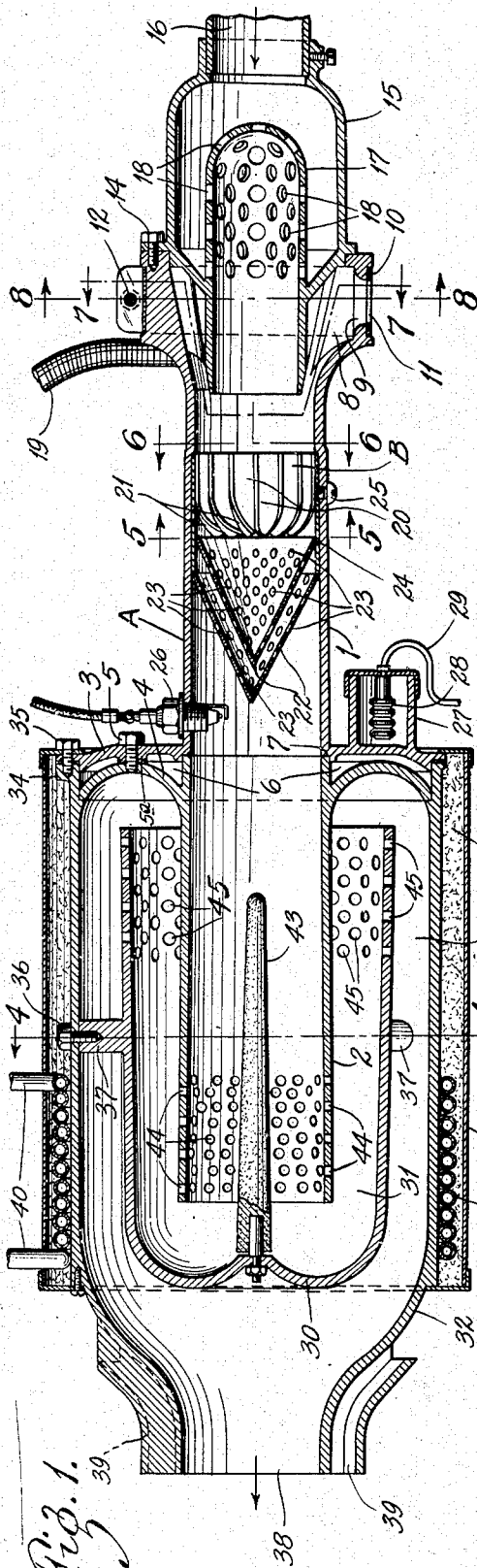


Fig. 1.

Fig. 2.

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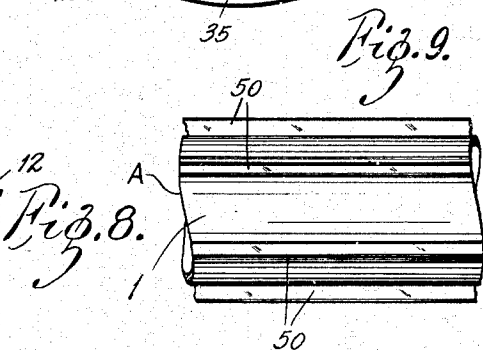
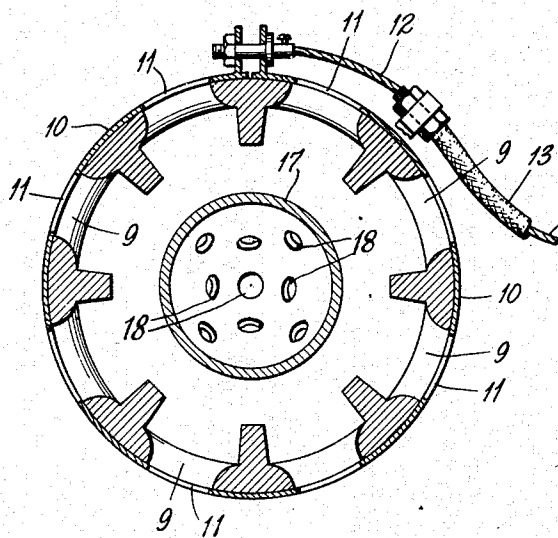
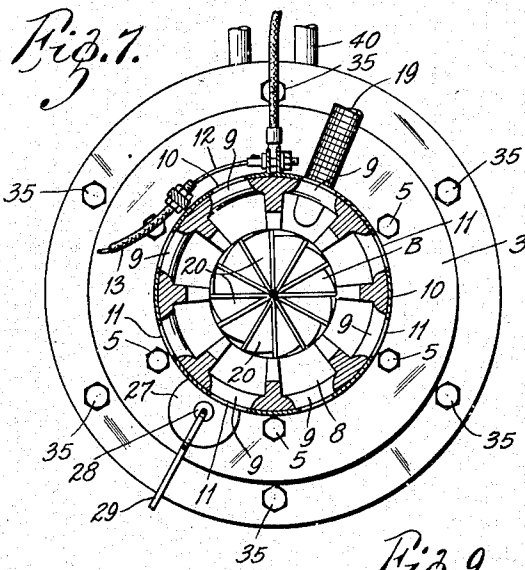
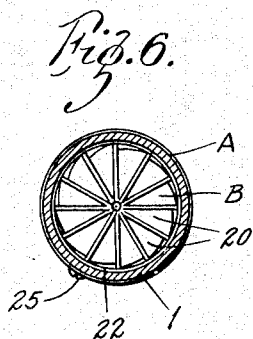
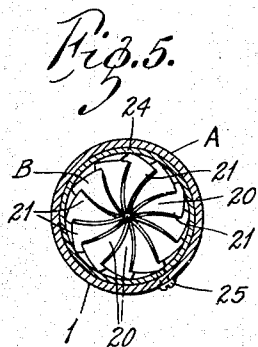
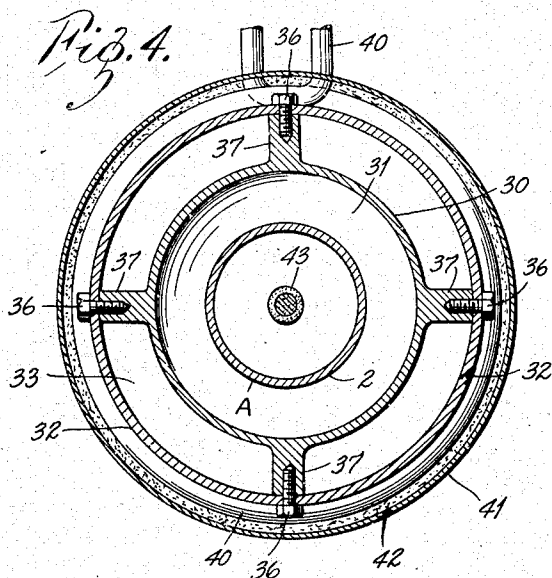
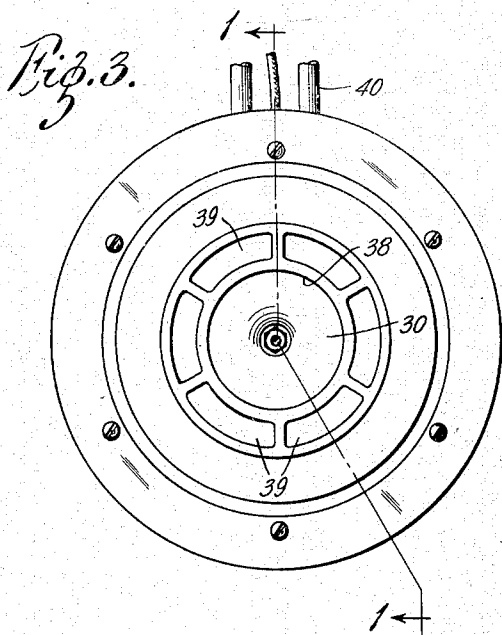
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EXHAUST GAS BURNER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,203,554

EXHAUST GAS BURNER

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St. Louis, Mo.

Application January 29, 1937, Serial No. 122,916

7 Claims. (Cl. 183-6)

This invention relates to devices for burning the exhaust gases of an internal combustion engine or the like. The invention has for its principal object to provide for the efficient burning of such exhaust gases so as to eliminate the harmful carbon monoxide content and other unburned matter therein. Other objects are to provide an exhaust gas burner of simple, economical and compact construction, which can be easily installed and repaired, which is quiet in operation, which reduces the exhaust noise without producing back pressure on the engine, and which can be adapted for use in heating a motor vehicle.

The invention consists in the exhaust gas heater and in the construction, combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings, which form part of this specification and wherein like symbols refer to like parts wherever they occur;

Fig. 1 is a central longitudinal sectional view of an exhaust gas burner embodying our invention,

Fig. 2 is a side elevation of said burner,

Fig. 3 is a view looking at the discharge end of said burner,

Figs. 4, 5, 6, 7 and 8 are transverse sections on the lines 4-4, 5-5, 6-6, 7-7 and 8-8, respectively, in Fig. 1; and

Fig. 9 is a partial side elevation of a modified inlet pipe construction.

The present exhaust gas burner has a central passageway therein formed by a pipe or tube A, made up of an inlet or front section 1 and a discharge or rear section 2 whose adjacent ends are provided with outstanding flanges 3 and 4, respectively, that are removably secured together by cap screws 5. These cap screws extend through a series of circumferentially spaced lugs 5a on one of said flanges, which lugs serve to space said flanges apart and thus provide a heat insulating air space 6 therebetween. As shown in the drawings, the forward or inlet section 1 of the central pipe or tube A is provided with an annular rib or shoulder 7 that cooperates with the adjacent end of the discharge section 2 to form a leak-proof joint therebetween.

The inlet end of the front section 1 of the central tube A of the burner is enlarged, as at 8, and provided with a series of circumferentially spaced air inlet openings or ports 9; and the passage of air through these ports is regulated by means of a valve comprising a sleeve 10 that is rotatably mounted on the outer periphery of said enlarged

portion 8 and is provided with openings 11 adapted to register with the openings 9. The sleeve 10 is operated by means of a suitable push-and-pull wire 12 enclosed within a flexible tube 13.

Secured to the enlarged inlet end 8 of the front or inlet section 1 of the tube A, as by screws 14, is an inlet housing 15 whose front or inlet end is adapted to be secured in any desired manner to the discharge end of the exhaust pipe 16 of an internal combustion engine so as to receive the exhaust gases thereof. Formed integral with the inlet housing 15 is an axial feed tube 17 that is disposed concentric with but spaced from said member. This feed tube is connected intermediate its ends with the side wall of the inlet housing 15 by means of a web at the rear end thereof and extends into but is spaced from the inlet or front end of the inlet section 1 of central tube A. The portion of the feed tube 17 located within the inlet housing 15 has a cupped front end portion and is provided with a multiplicity of perforations 18. This feed tube acts as a jet and a muffler for exhaust gases coming from the engine and in conjunction with the larger capacity of said inlet housing causes such gases to flow in a steady stream into the inlet end of the main or central tube of the burner. A flexible tube 19 leads from the crank case (not shown) of the engine to the inlet end of the central tube and acts to draw from said crank case vapors generated therein.

Mounted in the forward or inlet section 1 of the main tube A of the burner is a mixing device B comprising a series of radially disposed circumferentially spaced blades 20, whose rear end portions are curved or deflected laterally, as at 21, so as to deflect or spin the gas and air passing therebetween, and a plurality of longitudinally spaced interfitting conical shells 22 that are disposed with their large ends facing the curved ends of said blades and are each provided with a multiplicity of perforations 23. As shown in the drawings, the blades 20 are mounted in a sleeve 24 that has a snug fit in the tube and is held therein by means of a screw 25; and the cones 22 are welded at their large ends to said shell. Mounted in the tube A adjacent to the small ends of the perforated cones 22 is a spark plug 26 for igniting the combustible mixture of air and gas as it leaves said cones. Mounted in a cup or housing 27 provided therefor on the outstanding flange 3 of the inlet section 1 of the tube A is a heat responsive device 28 which operates through a tube 29, a suitable device (not

shown) for indicating the temperature of the burner.

A cup-shaped casing 30 surrounds the discharge section 2 of the center tube A with its closed end disposed opposite the discharge end of said section and with its opened end terminating short of the outstanding flange 4 at the forward end thereof. This cup-shaped member is spaced from and cooperates with the discharge section 2 of the central tube to form an annular chamber 31 that surrounds said section and communicates with the discharge or outlet end thereof. A cylindrical casing 32 surrounds and is spaced from the cup-shaped member 30 and cooperates therewith to form a second annular chamber 33 around the annular chamber 31. The casing 32 is provided at its forward end with an outstanding flange 34 that is secured as by cap screws 35 to the outstanding flange 3 at the rear end of the inlet section 1 of the main tube. This outer shell or casing 32 is also secured to the cup-shaped member 30 by means of cap screws 36 that are threaded into radial projecting spacer lugs 37 on said member. The outer casing 32 extends rearwardly beyond the cup-shaped casing 30 where it terminates in a discharge end portion 38 having inwardly converging walls. This reduced discharge portion of the outer casing is provided with a series of exterior cooling passageways 39. If desired, the exhaust gas burner may be used to heat water circulating through a coil of tubing 40 placed around the casing and retained thereon by means of a shell 41 containing a suitable heat insulating material 42.

Projecting axially from the closed end of the cup-shaped member or casing 30 into the outlet section 2 of the main tube A of the burner is a pin 43 of suitable heat retaining material. As shown in the drawings, the discharge end portion of the discharge section 2 of the main tube A of the burner is provided with a multiplicity of perforations 44; and likewise, the portion of the cup 30 at the discharge end of the inner annular chamber 31 is also provided with a multiplicity of perforations 45. In order to reduce friction, the bottom of the cup 30, together with the outstanding flange 4 of the outlet section 2 of the main tube A are given a concave curvature. The central tube or pipe A and the annular chambers 31 and 33 increase uniformly in width to the discharge end of the device so that the capacity thereof increases constantly from the time the gases are ignited until they are discharged into the atmosphere.

The operation of the hereinbefore described exhaust gas burner is as follows: The exhaust gases of the internal combustion engine pass into the gas inlet housing 15 and thence pass into the perforated feed tube or muffler 17 thereof and are discharged from the discharge end of said tube into the inlet end of the main tube A of the burner where they are mixed with air drawn into said tube through the valve controlled air inlet openings 9 therein. Such gases and auxiliary air supply then pass through the mixing device B where they are thoroughly mixed by the curved blades 20 and perforated conical shells 22 thereof. This mixture is then ignited by the spark plug 26 as it leaves the mixing device. The products of combustion then pass from the discharge end of the main tube A into the inner annular chamber 31 and thence into the inner annular chamber 33 from which they are discharged into the atmosphere through the discharge opening into the discharge end 38 of the

outer casing 32. When the amount of gas passing through the device is suddenly increased, such excess gas will pass through the perforations 44 and 45 in the main tube A and in the cup-shaped casing 30, respectively, and then swept along with the gases passing through the annular chambers 31 and 33. These perforations also increase the surface exposed to the hot gases and thus shorten the time required to raise the temperature in the annular chambers to that required to thoroughly burn all of the undesirable gases passing therethrough.

As shown in Fig. 9, cooling fins 50 may be provided on the inlet pipe to prevent overheating thereof. The above burner construction efficiently and completely burns the exhaust gases of the internal combustion engine. The heated passageways insure complete combustion, the noise of the engine is muffled without causing any back pressure on the engine; and by reason of the substantial length of the inlet pipe and the efficiency of the mixing devices therein, the exhaust gases and air for combustion are thoroughly mixed without the necessity of any forced feed of air. Obviously, numerous changes may be made without departing from the invention. Therefore, we do not wish to be limited to the precise construction shown and described.

What we claim is:

1. An exhaust gas burner comprising a tube 30 having a central passageway having one end left open and provided at its other end with an inlet for exhaust gases and a valve controlled inlet for air and an annular chamber surrounding said passageway having a wall at one end extending across and in direct communication with the open discharge end thereof and with the other end in communication with the atmosphere, an ignition device in said passageway and a mixing device located in said passageway between said ignition device and said exhaust gas and air inlets.

2. An exhaust gas burner comprising a tube having a central passageway having one end left open and provided at its other end with an inlet for exhaust gases and a valve controlled inlet for air and a plurality of annular chambers surrounding said passageway concentric therewith with one end of a chamber in communication with the corresponding end of an adjacent chamber and with the innermost chamber having a wall extending across and in communication with the open discharge end of said passageway and with the outermost chamber in communication with the atmosphere at the end thereof remote from the end that is in communication with the next adjacent chamber, an ignition device in said passageway, and a mixing device in said passageway between said ignition device and said exhaust gas and air inlets.

3. An exhaust gas burner comprising a tube having a central passageway flaring towards an open discharge end thereof and provided at its opposite end with an inlet for exhaust gases and a valve controlled inlet for air, and two annular chambers surrounding said passageway with a wall at one end of the innermost chamber extending cross and in communication with the discharge end of said passageway and with one end of the outermost chamber in communication with the atmosphere, the other ends of said chambers communicating with each other, said innermost chamber flaring towards its point of communication with said outermost chamber and said outermost chamber flaring from said point, an igni-

tion device in said passageway, and a mixing device in said passageway between said ignition device and said exhaust gas and air inlets.

4. An exhaust gas burner comprising a tube 5 having a central passageway flaring towards an open discharge end thereof and provided at its opposite end with an inlet for exhaust gases and a valve controlled inlet for air, and two annular chambers surrounding said passageway with one 10 end of the innermost chamber extending across and in communication with the discharge end of said passageway and with one end of the outermost chamber in communication with the atmosphere, the other ends of said chambers communicating with each other, said innermost 15 chamber flaring towards its point of communication with said outermost chamber and said outermost chamber flaring from said point, an ignition device in said passageway, a mixing device 20 in said passageway between said ignition device and said exhaust gas and air inlet, and a tapering pin of heat retaining material extending into the open discharge end of said passageway.

5. An exhaust gas burner comprising a central 25 tube having one end left open and provided at its other end with an inlet for exhaust gases and a valve controlled inlet for air located adjacent to said exhaust gas inlet, an ignition device disposed in said tube, a mixing device located in 30 said tube between said ignition device and said exhaust gas and air inlets, a cup-shaped inner casing surrounding and spaced from the side and discharge end of said tube, and an outer casing 35 surrounding and spaced from said inner casing and provided beyond the discharge end of said central tube with a discharge opening, said tube having an outstanding flange thereon closing the annular space between said tube and said outer casing and spaced from the open end of said cup-shaped inner casing.

6. An exhaust gas burner comprising a central 40 tube having one end left open and provided at its other end with an inlet for exhaust gases and a valve controlled inlet for air located adjacent to said exhaust gas inlet, an ignition device 45

disposed in said tube, a mixing device located 5 in said tube between said ignition device and said exhaust gas and air inlets, a cup-shaped inner casing surrounding and spaced from the side and discharge end of said tube, and an outer casing 10 surrounding and spaced from said inner casing and provided beyond the discharge end of said central tube with a discharge opening, said tube having an outstanding flange thereon closing the annular space between said tube and said outer 15 casing and spaced from the open end of said cup-shaped inner casing, said cup-shaped inner casing being provided opposite the discharge end of said tube with a concave surface and said flange being provided opposite the open end of said cup-shaped casing with a concave surface.

7. An exhaust gas burner comprising a central 20 tube made up of axially aligned inlet and discharge sections provided at their adjacent ends with outstanding flanges, members for securing said flanges together, said inlet tube section being provided with an inlet for exhaust gases and a valve controlled inlet for air located adjacent 25 to said exhaust gas inlet, an ignition device disposed in said inlet tube section, a mixing device located in said inlet tube section between said ignition device and said air and exhaust gas inlets, a cup-shaped casing surrounding and spaced 30 from the discharge end and side of said discharge tube section, and an outer casing surrounding and spaced from said inner casing and provided beyond the discharge end of said discharge tube section with a discharge opening, the flange on 35 the discharge tube section closing the annular space between said section and said outer casing section at the end of the latter remote from the discharge opening therein, said flange being spaced from the open end of said cup-shaped inner casing, said cup-shaped inner casing being provided opposite the discharge end of said discharge tube section and said flange being provided opposite the open end of said cup-shaped casing with concave surfaces.

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