L. H. SKEELS.

MUFFLER.

APPLICATION FILED AUG. 4, 1920.

1,432,797. Patented Oct. 24, 1922.

Fig. 1

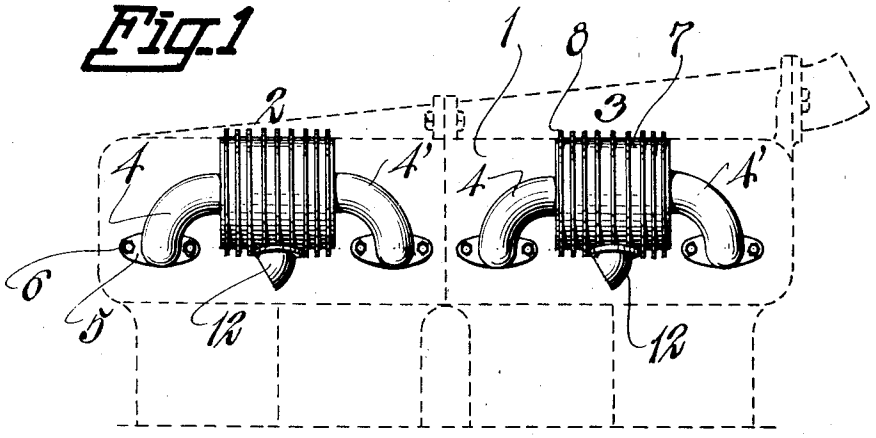


Fig. 2

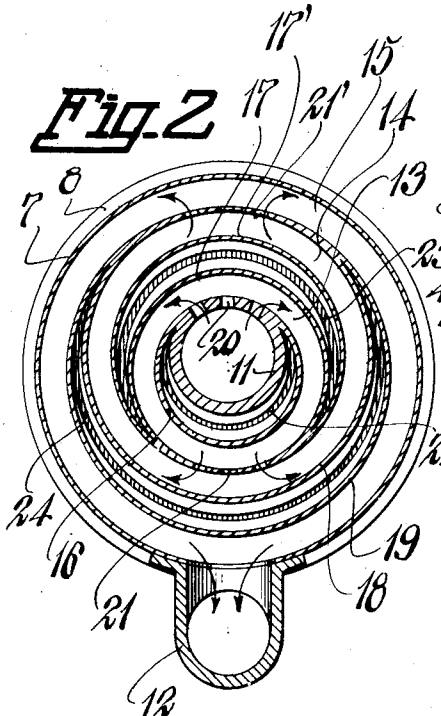


Fig. 3

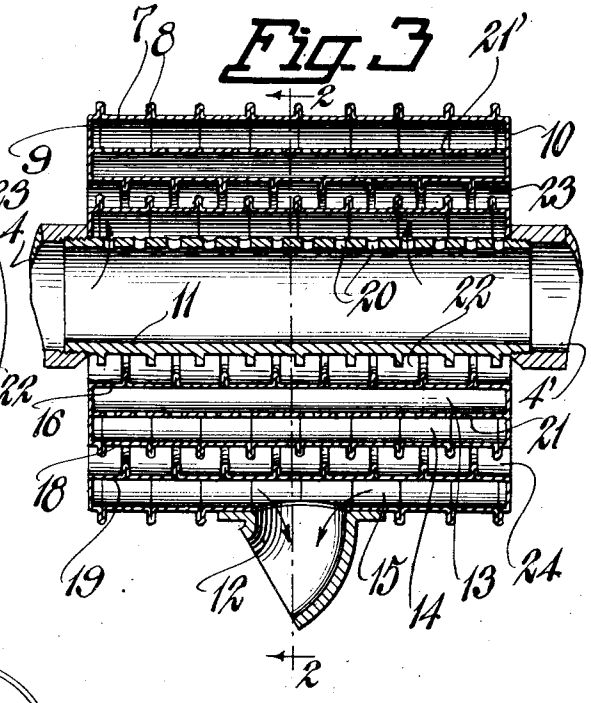
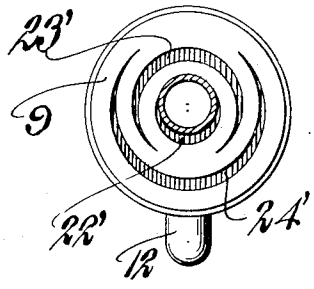


Fig. 4



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UNITED STATES PATENT OFFICE.

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MUFFLER.

Application filed August 4, 1920. Serial No. 401,219.

To all whom it may concern:

Be it known that I, LEE H. SKEELS, a citizen of the United States, residing at Portland, in Multnomah County, State of Oregon, have invented certain new and useful Improvements in Mufflers, of which the following is a specification.

The present invention relates to improvements in mufflers for use with internal combustion engines, adapted primarily for the purpose of rapidly cooling, and contracting, consequently reducing the noise, of the exhaust gases as they issue from the cylinders of the engine or motor.

To accomplish this purpose I provide a device of this character wherein all the heat contained in the exhaust gases is radiated, as rapidly as possible, through the several walls of the muffler, and the resulting cooled gases of combustion are thus allowed to pass to the atmosphere under low pressure, in comparative silence.

Due to the special construction of the muffler, the passage of the gases therethrough is comparatively free and only a slight impedance is caused in the flow of the cooled and contracted exhaust gases, thus eliminating back pressure and resulting in the delivery from the cylinders of approximately all of the burned gases, leaving the chamber free to admission of a full charge of fuel. The contraction of gases by cooling, and elimination of back pressure, thus insures more efficiency and economy in the combustion of the fuel gas, and consequently enhances the proficiency of the motor or engine.

The exhaust gases issue from the exhaust ports of the engine cylinders at an excessive temperature, and preferably the muffler for cooling said gases, by radiation of the contained heat, is or may be located in an exposed place, as for instance, under the bonnet of an automobile, where the muffler is subjected to a good circulation of air, as from an engine fan, for cooling the heat radiating walls of the muffler.

The invention consists essentially in certain novel combinations and arrangements of parts as hereinafter described, illustrated in the accompanying drawings, and set forth in the claims hereunto appended. It will be understood that various changes in the form, contour, mode of attachment and location, size, and minor details of construction of the muffler, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the details of my invention.

In the accompanying drawings I have illustrated one complete example of the physical embodiment of my invention, wherein two compactly arranged mufflers are each connected with a pair of exhaust-ports of a conventionalized engine, cast enblock, in which the parts are combined and arranged according to one of the preferred modes I have so far devised for the practical application of the principles of my invention.

Figure 1 is a view showing in dotted lines a portion of an internal combustion engine, with a pair of mufflers attached thereto, and embodying the principles of my invention.

Figure 2 is an enlarged transverse sectional view of the muffler at line 2—2 of Figure 3.

Figure 3 is a longitudinal vertical sectional view through the muffler.

Figure 4 is an end view of the muffler, showing an exhaust inlet pipe in section.

In order that the application of the muffler may be readily understood I have illustrated, in dotted lines, in Figure 1, an engine indicated by the numeral 1, to which a pair of mufflers 2 and 3, indicated as a whole, are applied, and communicating with the exhaust ports of the cylinders (four) of the engine or motor, by the exhaust gas inlet pipes 4 4′ to the mufflers. The mufflers are comparatively small, and compactly arranged, and are affixed to the engine by utilizing the attaching plates 5 on the exhaust pipes, and bolts or screws 6.

One or more of the mufflers may be employed, as required, with an engine, and one or two of the exhaust gas-inlet pipes 4, 4′ are used to meet varying circumstances. Inasmuch as the mufflers are of similar construction, a description of one will suffice for both of the devices illustrated.

The outer cylindrical casing 7 has externally spaced, annular radiating fins or ribs 8, fashioned by corrugating the stamped sheet metal. I have illustrated the device herein, and shall refer to it hereinafter as of cylindrical form for convenience of description, but it will be understood that various shapes may be used, and the parts may be riveted, bolted, or welded together for assembly, or cast metal parts may be used.

The ends or heads 9 and 10 of the casing have an open center to accommodate the gas pipe 11, arranged eccentrically with the walls of the casing and with its ends projecting beyond these heads, for attachment, as by screw threads, of the two inlet pipes 4 and 4′ at the opposite ends of the pipe. A short outlet pipe 12 is connected to the outer wall of the casing and located at the longitudinal center thereof, to receive the cooled gases, and shaped to direct the currents to the rear of the engine, or in direction of the moving air currents from the fan (not shown) at the front of the engine or motor 1.

In their travel from the central gas pipe to the outlet pipe 12, the gases of combustion are caused to take a tortuous course through successively enlarged annular chambers or channels 13, 14 and 15, formed with closed ends by the two heads 9 and 10 of the outer casing, and provided with spaced, concentric and eccentric cylindrical walls 16, 17, 17′, 18, 19. Perforations 20 are provided in the gas pipe 11, preferably arranged as indicated in the drawings in three parallel rows at the upper portion of the pipe and extending longitudinally thereof. These perforations open into the inner annular chamber 13, and at 21 perforations are fashioned in the wall 17 establishing communication between the inner chamber and the intermediate chamber 14, while at 21′ perforations are located in the wall 19 opening from the intermediate chamber to the outer chamber 15, and in turn this chamber opens to the outlet pipe 12. The openings 20, 21, 21′ and 12, it will be observed in Figure 2 are located at diametrically opposite points, causing the gas currents to take a course indicated by the arrows. Thus the gases issue through the perforations 20 into chamber 13 and pass around the wall 16 to the right and left, thence through openings 21 and pass to the right and left around wall 17′, thence through openings 21′ and as they impinge against the casing 7, are again divided and pass to the right and left around the wall 19 through the exterior or outer chamber 15 to the outlet pipe 12.

The currents of gas are thus successively divided and broken into minute jets to react upon themselves, causing a decrease in their progress, and as the currents impinge against and travel in contact with the cooled walls bounding the gas chambers the heat is extracted from the gases by radiation, and the walls of the chambers are continuously subjected to a cooling medium, for the purpose of attaining the exchange of heat.

Various means may be employed for the purpose of cooling the walls of the gas channels, and as an example of one such means I have provided a series of longitudinally extending air passages indicated as 22, 23, 24, having their respective open ends formed with slots or openings 22′ 23′ 24′ in the heads 9 and 10 of the casing.

These longitudinally extending passages are located at alternate, diametrically opposite, sides of the gas pipe, and are crescent-shape in cross section. They are formed by the eccentric and concentric walls within the casing, and surround a major portion of the wall of the gas pipe 11 and the respective gas channels 13 and 14. Air currents from an air-fan on the engine, or air currents induced by the movement of the automobile equipped with the mufflers, are forced through these passages for cooling the walls of the gas chambers or channels, and the exchanged heat from the gases is thus carried off by the currents of air through the rear head of the casing.

In order that the heat radiating surface may be increased I may utilize external annular fins or ribs 25 and internal fins 26 on the sheet metal walls of the air passages, and similar heat radiating fins 27 may be utilized on the exterior of the gas pipe 11 within the space or longitudinal passage 22.

From the above description taken in connection with my drawings, it will be apparent that the gases of combustion enter through either or both ends of the gas pipe, and pass circumferentially through the gas chambers or channels in the tortuous path described, and issue from the radially extending outlet of the casing and thence through the outlet pipe 12. The passage of air currents assist in the movement of the gas currents by providing a draft or suction at the open end of the outlet pipe, and the cooled gases issue freely, with the heat withdrawn therefrom, from the outlet pipe.

The air currents as a cooling medium, are forced, either by the air-fan, or by natural draft induced by the movement of the automobile, or launch, in through the front end of the air passages 22, 23, 24, and then longitudinally through these passages and out at the rear head of the casing, thus exchanging the radiated heat from the walls of the gas channels and carrying the heat units from the muffler. The exchanged heat, if desired, may be utilized with proper equipment, for heating the interior of the automobile or boat, or in some instances the fuel gases may be heated preparatory to introduction to the cylinders of the engine.

While I have illustrated heat radiating fins on the walls of the gas channels, I may modify the construction and use these fins also on the walls of the air passages, if desired, to increase the surface area of radiating media. Water, circulated through the air passages, may be substituted for the air currents in cooling the walls of the gas channels. Other changes are contemplated, within the scope of my claims, as previously set

forth, without departing from the spirit of my invention.

What I claim is—

1. The combination with a cylindrical casing and its eccentrically disposed, longitudinal perforated gas pipe, of a pair of perforated walls concentric with the casing and forming an annular gas channel communicating with said pipe, an intermediate pair of walls concentric with the pipe forming an annular air channel, an outer wall within and concentric with the casing forming an outer annular air channel open to the atmosphere, and said intermediate channel communicating with said inner and outer channels, and additional walls within the casing co-acting with said walls and pipe to form open end air passages, for the purpose described.

2. The combination with a casing and its inner gas pipe of an outer spaced wall within the casing forming therewith a concentric gas channel with its walls in contact with the atmosphere, an inner wall eccentric to this outer wall and forming a crescent shaped air passage through the casing, a third wall of smaller diameter co-acting with the inner wall to form an annular gas channel, a second eccentric wall co-acting with the third wall to form a crescent shaped air passage and an inner wall eccentric to the gas pipe forming a crescent shaped air passage thereabout and an annular gas channel communicating with said pipe, and said gas channels affording passage of gas from the gas pipe to the atmosphere, for the purpose described.

3. The combination with a casing and its inclosed perforated gas pipe, and a plurality of gas channels having perforated walls spaced about the pipe, of a series of longitudinally disposed walls formed with heat radiating fins forming open end passages through said casing, for the purpose described.

In testimony whereof I affix my signature.

LEE H. SKEELS.