

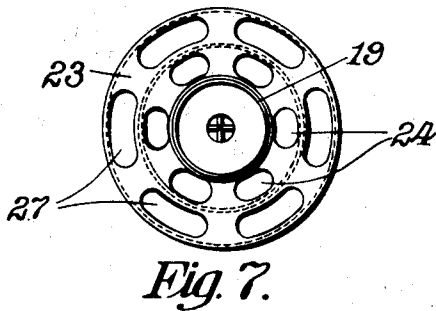
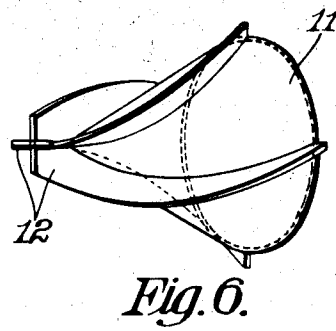
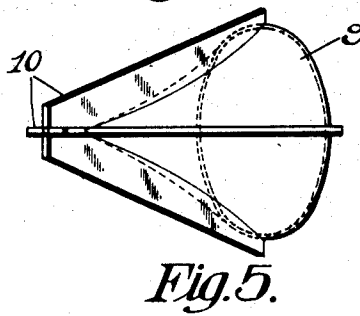
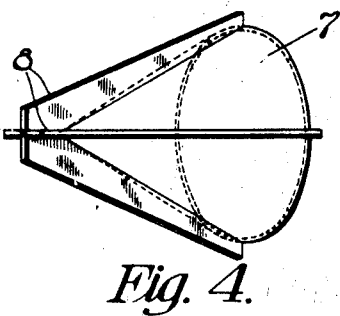
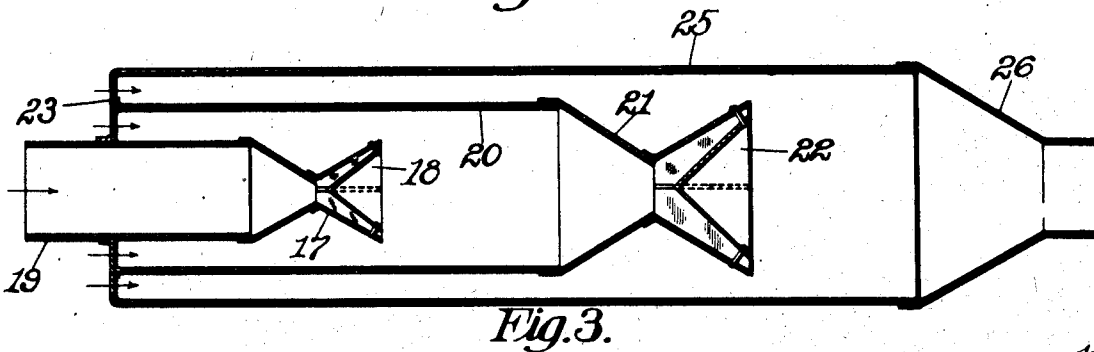
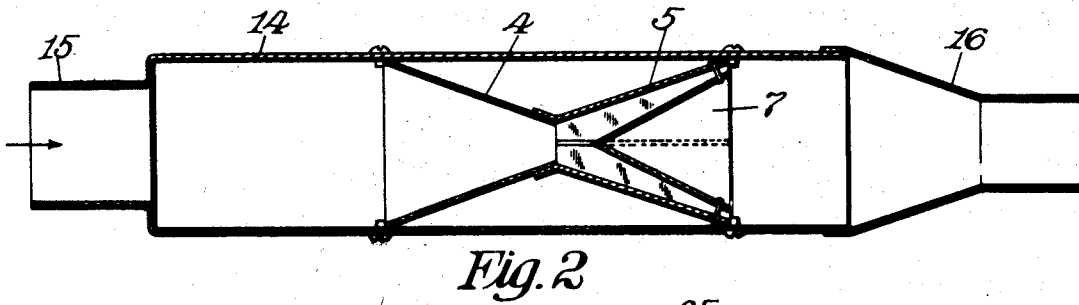
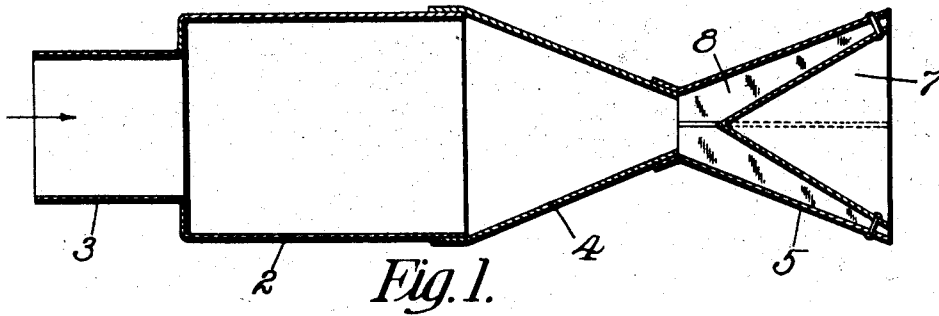
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F. A. NELSON

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MUFFLER FOR INTERNAL COMBUSTION ENGINES

Filed April 7, 1922



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UNITED STATES PATENT OFFICE.

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MUFFLER FOR INTERNAL-COMBUSTION ENGINES.

Application filed April 7, 1922. Serial No. 550,271.

This invention relates to mufflers for internal combustion engines, and it has for its chief object to devise a muffler which can be manufactured very economically and which will effectually perform the muffling operation without creating the excessive back pressure which is produced in mufflers of the present commercial types.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

Referring now to the drawings,

Figure 1 is a longitudinal cross sectional view of one form of muffler embodying the present invention;

Fig. 2 is a longitudinal cross sectional view of another embodiment of the invention;

Fig. 3 is a view similar to Fig. 2 of a still further modification;

Figs. 4, 5 and 6 are perspective views of different forms of mutes that may be used in the muffler; and

Fig. 7 is an elevation of the left-hand end of the muffler shown in Fig. 3.

Referring first to Fig. 1, the form of the invention there shown consists of a tube 2 of circular cross section having a reduced nipple 3 projecting from the left-hand end thereof. Telescoped on the right-hand end of the tube 2 is a tapered tubular member 4 and a similarly shaped member 5 is joined to the member 4. The smaller ends of the two tubular sections 4 and 5 are united, as clearly shown, the union between these parts, and also between the parts 2 and 4, being made by brazing, welding, riveting, or in any other convenient manner. The parts 4 and 5 form a Venturi tube. The nipple 3 is connected to the exhaust pipe of the engine so that the gases flow through the muffler in the direction indicated by the arrow.

The gases are compressed somewhat as they flow into the constricted part of the Venturi tube 4 and expand rapidly as they emerge from said constricted portion and flow outwardly through the part 5. I have found by actual use that this arrangement results in effectually muffling the explosions of the engine. I have also found that the back

pressure created in a muffler of this type is substantially less than in mufflers of the common commercial types. The difference at low engine speeds is not great, but there is a very substantial difference at high engine speeds. The back pressure builds up very rapidly in the common types of mufflers as the engine speed increases, but in a muffler of the character illustrated, while the back pressure does increase somewhat as the speed of the engine increases, nevertheless the increase is very much slower than in the more common types of mufflers, and it never rises as high in this muffler as in other types of mufflers with which I have been able to make comparative tests.

For the purpose of further increasing the muffling effect without substantially increasing the back pressure, I prefer to use a mute in the outlet end of the Venturi tube. This mute may take several different forms but in the construction shown in Figs. 1 and 4 it consists of a hollow cone 7 held in the outlet 5 of the tube by bolts or rivets, and provided with a plurality of flanges 8 which hold the mute spaced from the inner wall of the part 5. It should be noted that the apex of the cone is located close to the constricted portion of the Venturi tube, and that the mute tapers more sharply than the outlet 5, so that the space between the wall of the outlet and the mute gradually grows narrower toward the discharge end of the muffler. This construction is of advantage in silencing the exhaust and in smoothing out the flow of gases through the muffler.

Figs. 5 and 6 show other forms of mutes that may be substituted for that shown in Figs. 1 and 4, the mute shown in Fig. 5 having a body 9 in the general form of a cone, but in this case the elements of the surface of the cone are curves instead of being straight lines. This mute also is provided with straight flanges 10 similar to the flanges 8 of the mute 7. The mute 11, Fig. 6, consists of a hollow conical body provided with a series of spiral flanges 12. These mutes serve to smooth out the flow of gases through the muffler and break up the intermittent or puffy character of this flow. This is particularly true when the surface of the mute is slightly concaved, or when spiral flanges are used, such flanges

being particularly effective in deflecting the gases and producing a rotary motion of them as they flow through the outlet.

In the construction shown in Fig. 2, the parts 4 and 5, which form the Venturi tube, are arranged as in Fig. 1, and a mute 7 is located in the outlet end of the tube. These parts are all enclosed in an outer tube 14 having a reduced nipple 15 for connection to the exhaust pipe, and also provided with a reduced outlet 16 on which a pipe can be connected, if desired, to conduct the exhaust gases to any desired point.

Referring to Fig. 3, the construction there shown comprises a Venturi tube 17 of the type shown in Fig. 1 with a mute 18 in the discharge end thereof, a tube 19 forming the inlet for the Venturi tube. This Venturi tube is enclosed in a second tube 20 which forms the inlet for another Venturi tube 21 of the same general character as, but somewhat larger than, the tube 17, this tube 21 also being provided with a mute 22. The tubes 19 and 20 are connected by a collar or base 23, Figs. 3 and 7, which is welded, brazed, or riveted to both tubes, the tube 19 projecting centrally through the collar 23. The collar is perforated, as indicated at 24, to admit air to the space between the tubes 19 and 20. Air is drawn through the perforations by the injector action of the current of exhaust gases.

This arrangement makes a more silent muffler than those above described, and it is also particularly valuable in locations where the muffler must be placed closely adjacent to wooden or other parts which might be damaged or possibly ignited by a very hot muffler. The exterior of the muffler may be made even cooler by enclosing the tubes 20 and 21 in an outer cylindrical tube 25 equipped with a tapered nozzle or outlet 26. This tube may conveniently be made integral with the base or collar 23, the perforations 27 in this member admitting air to the space between the tubes 20 and 25.

It will now be appreciated that this invention provides an exceedingly simple form of muffler, and that its very simplicity of construction enables it to be manufactured very economically. As above stated, the muffler is very efficient, it reduces the sound of the explosions fully as much as do the common commercial types of mufflers, and it creates substantially less back pressure than do the latter types of mufflers. The arrangement of Venturi tubes in series, as shown for instance in Fig. 3, is very effective in silencing the explosions of the engine without creating excessive back pressure.

While I have herein shown and described the best embodiment of my invention which I have so far devised, it will readily be appreciated that the invention is susceptible

of embodiment in many forms differing in details of construction from the form shown.

Having thus described my invention, what I desire to claim as new is:

1. A muffler for internal combustion engines, comprising a tube having a constriction therein with converging and diverging sections leading to and from said constriction, one of said sections serving as an inlet and the other as an outlet for exhaust gases, and a mute positioned in said outlet and tapered in the same direction as said outlet, said mute being spaced from the wall of said outlet and having parts cooperating with said outlet to deflect the gases flowing through the space between said mute and the wall of said outlet.

2. A muffler for internal combustion engines, comprising a tube having a constriction therein with converging and diverging sections leading to and from said constriction, one of said sections serving as an inlet and the other as an outlet for exhaust gases, and a mute positioned in said outlet and tapered in the same direction as but more sharply than the walls of the outlet, said mute having flanges on its outer surface bearing against the wall of said outlet.

3. A muffler for internal combustion engines, comprising a tube having a constriction therein with converging and diverging sections leading to and from said constriction, one of said sections serving as an inlet and the other as an outlet for exhaust gases, and a mute of approximately conical form positioned in said outlet with its apex close to said constriction and having its surface near its base located closer to the wall of the outlet than at its apex, said mute having parts cooperating with the wall of said outlet to exert a smoothing action on undulations in the flow of gases through said muffler.

4. A muffler for internal combustion engines comprising a Venturi tube with one end serving as the inlet and the other as the outlet for exhaust gases, a mute positioned in said outlet, and another Venturi tube in a portion of which the first Venturi tube is enclosed, whereby the exhaust gases flow through said tubes in series.

5. A muffler for internal combustion engines, comprising, in combination, a Venturi tube, an inlet tube connected with said Venturi tube to conduct exhaust gases thereto, a second tube encircling said tubes and spaced therefrom, means securing said second tube to the inlet tube and constructed to admit air around the inlet tube, a Venturi tube at the discharge end of said second tube, and an outer tube enclosing said second tube and secured thereto, said outer tube providing an air space around the second tube.

6. A muffler for internal combustion en-

gines, comprising a tube having a constriction therein with converging and diverging sections leading to and from said constriction, one of said sections serving as an inlet and the other as an outlet for exhaust gases, 5 a mute of approximately conical form positioned in said outlet with its apex close to said constriction, said mute having parts cooperating with the wall of said outlet to exert a smoothing action on variations in the flow of gases through said outlet, and 10 a discharge pipe for conducting gases away from said outlet, said pipe having a reduced orifice for the discharge of the gases.

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