April 16, 1935. H. S. POWELL 1,998,385

MUFFLER FOR INTERNAL COMBUSTION ENGINES

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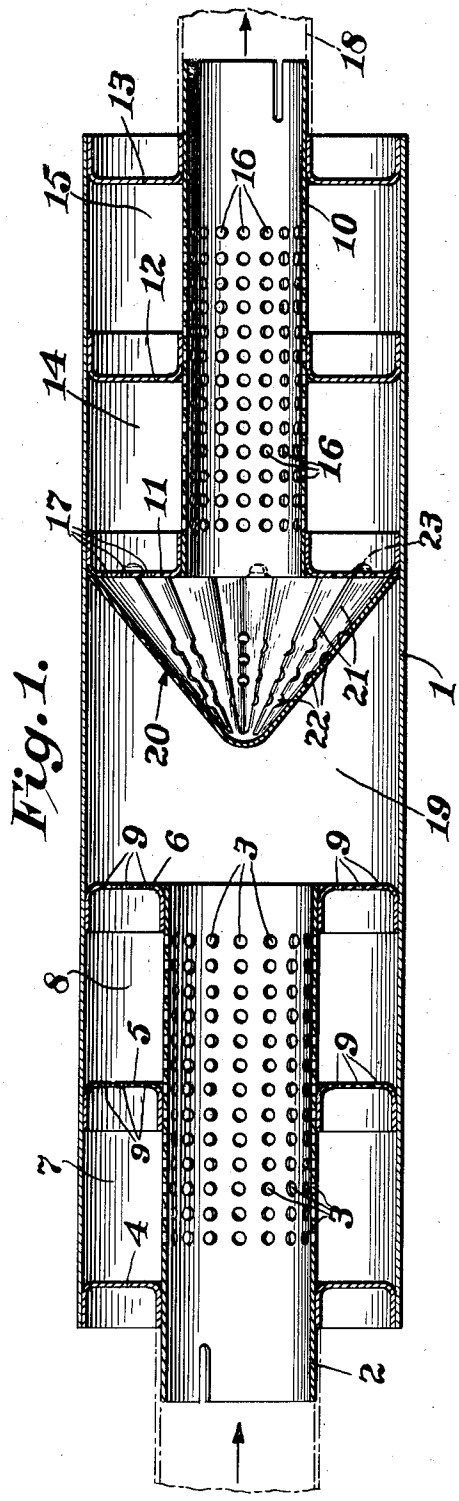


Fig. 1.

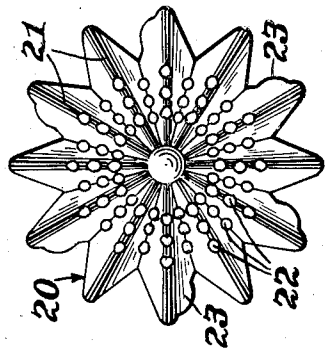


Fig. 3.

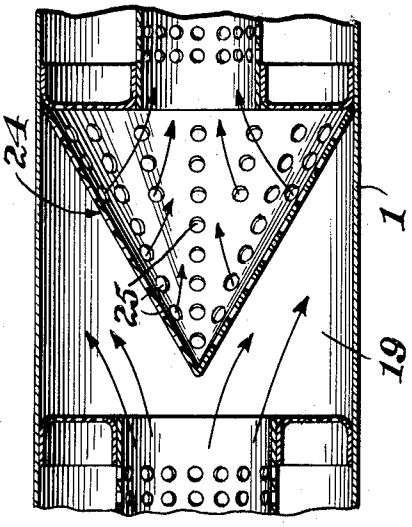


Fig. 4.

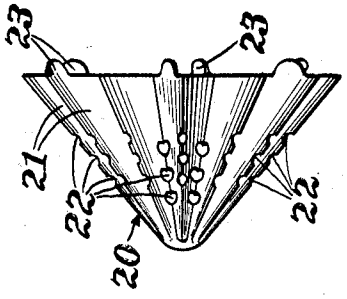


Fig. 2.

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MUFFLER FOR INTERNAL COMBUSTION ENGINES

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3 Claims. (Cl. 137—160)

The invention relates to new and useful improvements in a muffler for expanding gases, and more particularly to a muffler for an internal combustion engine.

An object of the invention is to provide a muffler which is light in construction and of few parts and which will reduce the noise incident to the release of the exhaust gases with a minimum resistance to the free flow of the exhaust gases through the muffler.

A further object of the invention is to provide a muffler of the above type wherein there is a cushioned expansion chamber at the receiving and at the delivery end of the muffler, and an expansion chamber intermediate the same through which the gases pass.

A further object of the invention is to provide a muffler in the form of a casing through which the exhaust gases pass, which casing in turn is provided with inlet and outlet tubular members spaced from each other to provide an expansion chamber and surrounded by closed cushioning expansion compartments.

These and other objects will in part be obvious and will in part be hereinafter more fully disclosed.

In the drawing:

Figure 1 is a longitudinal sectional view through a muffler embodying the improvements, and showing the preferred form of construction.

Figure 2 is a side view of the detached baffle plate which may be used in the muffler.

Figure 3 is an end view of the same.

Figure 4 is a longitudinal sectional view through a portion of the muffler, showing a slightly modified form of baffle plate.

In carrying out the invention, a muffler casing is provided which is preferably cylindrical. Extending into the receiving end of the casing is a tubular member having the walls thereof within the casing perforated. This tubular member is spaced from the casing, and there are partitions extending from the casing through the tubular member. These partitions may be provided with small holes or may be in some cases imperforate. They form substantially closed compartments into which the exhaust gases have a cushioned expansion as they flow through the perforations into and out of the compartments, or from one compartment to another. There is a similar tubular member at the discharge end of the muffler casing which is preferably of smaller diameter than the first-named tubular member. This member is also perforated and there are partitions between the tubular member and the casing forming closed cushioning compartments similar to those first referred to at the receiving end of the muffler. These tubular members are spaced from each other, thus forming an expansion chamber into which the gases expand as they leave the receiving tubular member before they pass into the discharge tubular member. As shown in the drawings, there is a baffle plate for retarding the movement of the gases, but this baffle plate may be omitted if desired.

Referring more in detail to the drawing, the improved muffler consists of a casing 1 preferably of sheet metal which forms the outer shell. The exhaust gases pass through this casing. Extending into the receiving end of the casing is a tubular member 2 which is of considerably smaller diameter than the casing 1. This tubular member is provided with perforations 3. Between the tubular member and the casing are partitions 4, 5 and 6 which form chambers 7 and 8. The partitions 5 and 6 are provided with small perforations 9 as shown in the drawing. These partitions, however, may be imperforate. Even with the small perforations in the partitions, the chambers 7 and 8 are substantially closed and serve as cushioning compartments into which the gases expand.

The tubular member 2 projects beyond the partition plate 4 and is adapted to enter the inlet pipe leading from the engine. At the delivery end of the muffler casing there is a tubular member 10 which is of slightly smaller diameter than the tubular member 2. Between this tubular member 10 and the casing 1 are partitions 11, 12 and 13 forming chambers 14 and 15. The tubular member 10 is perforated, as indicated at 16. The chamber 15 is completely closed except for the perforations 16. The chamber 14 is completely closed except for the perforations 16 and the perforations 17 in the partition 11. This tubular member 10 projects beyond the partition 13 and is adapted to receive the discharge pipe indicated in broken lines at 18.

The tubular member 2 at its inner end is spaced from the inner end of the tubular member 10 so as to provide a chamber 19 which is larger in diameter than the tubular member 2. As shown in the drawing, a baffle plate 20 is provided for retarding movement of the gases from this expansion chamber 19 into the tubular member 10. This baffle plate is preferably cone shaped and may be made from a sheet of metal which is bent so as to provide corrugations 21 extending along the surface of the cone-shaped

baffle plate. There are perforations 22 in the baffle plate and holding lugs 23 which aid in the clamping of the baffle plate betwen the flange of the partition 11 and the casing 1. In Figure 4 of the drawing, a baffle plate 24 is shown which is cone shaped and perforated as indicated at 25. The wall of this baffle plate is smooth and not corrugated.

The operation of the muffler is thought to be obvious from the structure described. The exhaust gases passing through the tubular member 2 which have positive and negative impulses given thereto will expand and pass through the opening into the compartment 7 where the expansion of the gases is cushioned by reason of the fact that the compartment is closed. This reduces the impulses and the vibrations resulting therefrom and will in part reduce the noise incident to the expansion of the passing gases. The gases will again expand into the chamber 8 and here they will be partly cushioned and partly retarded as they pass through the opening 9 into the expansion chamber 19 or back through the perforations in the tubular member 2. This further reduces the noise incident to the expansion of the gases. The gases will then pass into the chamber 19 where they expand, breaking up the wave lengths and evening out the peaks of the positive impulses to a certain extent. When there is no baffle plate used, the gases pass either through the perforations 17 into the chamber 14, or into the tubular member and out through the perforations 16 into the chamber 14; or said gases expand into the closed cushioning chamber 15 and here again the noise incident to the expansion of the gases is greatly reduced. The gases come out through the end of the tubular member 18 in an almost continuous stream. The velocity of the exhaust gases coming out of the muffler is much faster than in the ordinary type of muffler, and the resistance to the free flow of the exhaust gases through the muffler is reduced to a minimum so that there is very little back pressure, and yet the noise incident to the expansion of the gases is practically silenced. When the cone-shaped baffle plate shown in Figures 1 to 3 is used, there is a greater surface exposed to contact of the passing gases. Furthermore, this type of baffle plate can be made very cheaply, as it can be cut to the proper contour and then merely bent or folded into shape. In place of the baffle plate shown, other types of baffle plates may be used in this center compartment for breaking up the flow of the gases. As noted above, the muffler is found to give very desirable results without the use of any baffle plates in this central expansion chamber due to the construction of the tubular member 18 of slightly smaller diameter than the tubular member 2 and the provision of the cushioning or deadening pockets which have been described in detail.

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

1. A muffler comprising, in combination, a casing through which the exhaust gases pass, a perforated tubular member extending into the inlet end of said casing, an inner partition located at the inner end of said tubular member and connecting the same to said casing, additional spaced partitions connecting said tubular member to said casing whereby to provide a plurality of separate compartments around said tubular member to permit a preliminary expansion and cushioning of the gases, a second perforated tubular member of smaller diameter than the first-named tubular member extending into the outlet end of said casing and having the inner end thereof spaced from the inner end of said first tubular member, an inner partition located at the inner end of said second tubular member and connecting the same to said casing whereby to provide a relatively large central expansion chamber for the gases between said inner partitions and the ends of said tubular members, and additional spaced partitions connecting said second tubular member to said casing whereby to provide a plurality of separate compartments around the same to permit a final expansion and cushioning of the gases before the same pass out of the muffler.

2. A muffler comprising, in combination, a casing through which the exhaust gases pass, a perforated tubular member extending into the inlet end of said casing, an inner partition located at the inner end of said tubular member and connecting the same to said casing, additional spaced partitions connecting said tubular member to said casing whereby to provide a plurality of separate compartments around said tubular member to permit a preliminary expansion and cushioning of the gases, a second perforated tubular member of smaller diameter than the first-named tubular member extending into the outlet end of said casing and having the inner end thereof spaced from the inner end of said first tubular member, an inner partition located at the inner end of said second tubular member and connecting the same to said casing whereby to provide a relatively large central expansion chamber for the gases between said inner partitions and the ends of said tubular members, additional spaced partitions connecting said second tubular member to said casing whereby to provide a plurality of separate compartments around the same to permit a final expansion and cushioning of the gases before the same pass out of the muffler, and a perforated conical baffle member secured between said casing and the inner partition connecting said second tubular member to said casing whereby to further retard the movement of the exhaust gases through the muffler.

3. A muffler comprising, in combination, a casing through which the exhaust gases pass, a separate perforated tubular member extending into each end of said casing and having the inner ends thereof opposing each other and spaced apart, inner partitions connecting the inner end of each of said tubular members to said casing whereby to provide a central expansion chamber for the gases, additional spaced partitions connecting said tubular members to said casing whereby to provide separate compartments around each of said tubular members to permit expansion and cushioning of the gases, the diameter of the tubular member at the discharge end of said casing being less than the diameter of the tubular member at the receiving end of said casing whereby to aid in retarding passage of gases through the muffler, and a perforated conical baffle member located in said central expansion chamber and covering the inner end of the discharge tubular member whereby to further retard the movement of the gases through the muffler.

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