

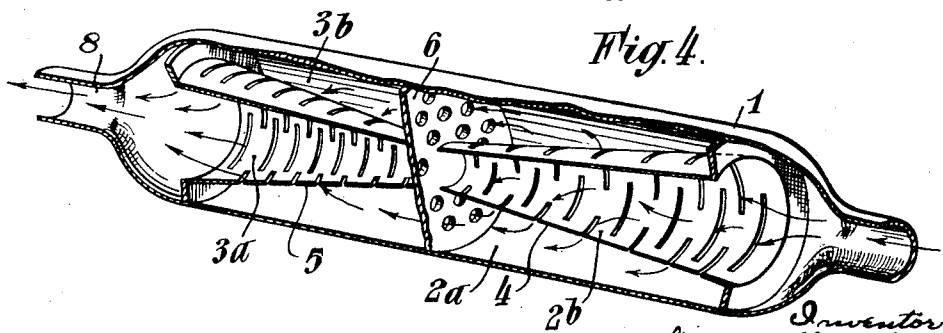
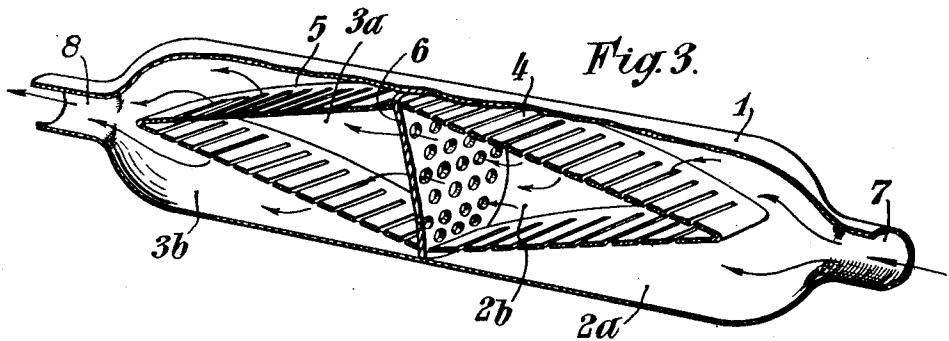
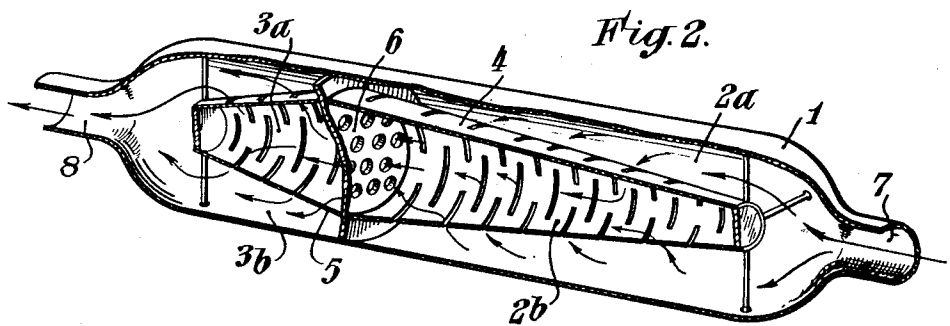
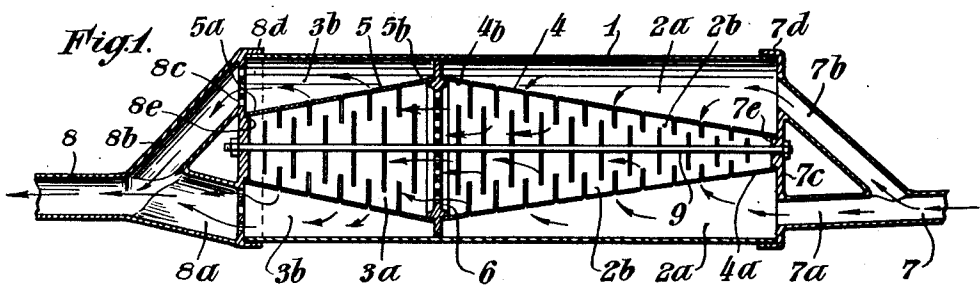
June 28, 1938.

A. A. CHASE

2,122,086

SILENCER FOR INTERNAL COMBUSTION ENGINES

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## UNITED STATES PATENT OFFICE

2,122,086

SILENCER FOR INTERNAL COMBUSTION  
ENGINESArthur Adelbert Chase, Southend-on-Sea, Eng-  
land, assignor to Frank Thomase Fogden,  
Westcliff-on-Sea, EnglandApplication October 23, 1937, Serial No. 170,696  
In Great Britain October 22, 1936

4 Claims. (Cl. 181-49)

This invention relates to silencers for internal combustion engines and aims at a construction which will avoid back pressure and assist effective scavenging, give very quiet running and be easy and cheap to manufacture; a further object is to enable the interior of the silencer to be readily and effectively cleaned.

A silencer made in accordance with this invention comprises two or more compartments through which the gases pass consecutively, an apertured wall in each compartment dividing same into primary and secondary chambers so that one chamber at least partially surrounds the other, the primary chamber(s) which first receive(s) the gases being of decreasing cross-sectional area with respect to the direction of flow of the gases, whilst the secondary chamber(s) which receive(s) the gases from the primary chamber(s) through the said perforated wall is (are) of increasing cross-sectional area, the arrangement being such that the secondary chamber(s) of one compartment communicate(s) with, and deliver(s) the gases directly to the primary chamber(s) of the next compartment.

The invention moreover includes a silencer comprising at least two compartments arranged to receive the gases consecutively, each compartment being divided into two chambers by means of an apertured wall so that one chamber surrounds the other chamber and so that the cross-sectional area of the first chamber to receive the gases decreases, whilst that of the second chamber increases in the direction of flow of the gases, with or without a perforated baffle between one compartment and the next.

According to one construction of silencer the gases pass consecutively through two pairs of chambers, the chambers constituting each pair being respectively of decreasing and increasing cross-sectional area with respect to the direction of flow of the gases and one chamber of each pair surrounding at least partially the other chamber of the pair and being separated from one another by an apertured wall, the increasing chamber of the first pair delivering into the decreasing chamber of the second pair.

The invention includes a silencer comprising two or more consecutively arranged compartments through which the gases travel in turn, each compartment containing inner and outer chambers separated by an apertured wall extending the full length of the compartment, the gases being gradually transferred from the outer to the inner chamber in the first compartment

and from the inner to the outer chamber in the second compartment and so on, or vice versa.

Various embodiments of the invention will now be described with reference to the accompanying drawing whereof:—

Fig. 1 shows a section of one form of silencer according to the invention, and

Figs. 2, 3 and 4 show modified forms of silencer, also in section.

In the embodiment of the invention illustrated in Fig. 1, the silencer comprises an outer casing containing two compartments, (2) and (3) each compartment including two chambers, i. e. a primary chamber 2a, 3a, and a secondary chamber 2b, 3b.

The primary and secondary chambers 2a and 2b of the first compartment (2) are separated from one another by an apertured wall in the form of a hollow conical member 4 extending the full length of the compartment, the smaller end 4a of the conical member 4 being located at the end of the compartment (2) where the gases enter. The larger end 4b of the conical member 4 faces the second compartment (3) and adjoins the larger end 5b of a similar hollow conical member 5, which forms the apertured dividing wall between the primary and secondary chambers 3a and 3b of the second compartment (3).

In the particular embodiment being described the silencer comprises only two main compartments, but three or more main compartments may be employed if desired.

Where the two conical members 4 and 5 are joined together at their large ends a perforated baffle 6 is located transversely to the axis of the cones and separates the first compartment from the second compartment.

The primary chamber 2a is of decreasing cross-sectional area, with respect to the direction of flow of the gases, whilst the secondary chamber 2b is of increasing cross-sectional area. The primary chamber 2a surrounds the secondary chamber 2b and first receives the incoming gases from a divided inlet pipe 7, 7a, 7b, located in the end wall 7c of the silencer casing.

In the second compartment the primary chamber 3a is the inner one and is surrounded by the secondary chamber 3b. The arrangement is such that the gases coming from the secondary chamber 2b of the first compartment pass through the perforated baffle 6 into the primary chamber 3a of the second compartment, the latter chamber being of decreasing cross-

sectional area. The gases after passing from the primary chamber 3a, through the wall 5, into the secondary chamber 3b thence emerge through a further perforated baffle to a divided outlet 8a, 8b, meeting in a common outlet 8, which tapers down to the diameter of the tail-pipe.

The outlet from the silencer is formed in the end wall 8c of the silencer casing opposite to the inlet. The two end walls 7c and 8c of the silencer casing are furnished with flanges 7d and 8d fitting over the casing proper 1; a central tie-rod 9 is passed axially through the casing and the two end walls and thus serves to hold the parts together and also to clamp in position the two conical apertured members 4 and 5. The latter may be located in their proper positions by means of projections 7e, 8e, on the two end walls 7c, 8c which fit into, or engage with, the ends 4a, 5a of the two conical members 4 and 5.

In operation the exhaust gases coming from the engine are split up into two streams and enter by the divided inlet at the end of the silencer casing, passing into the primary chamber 2a of the first compartment, which, as above mentioned, is of decreasing cross-sectional area, and as they travel along this chamber they are gradually transferred through the apertured wall 4 into the inner secondary chamber 2b, which is of increasing cross-sectional area.

The gases then pass from this secondary chamber 2b, through the transverse perforated baffle 6 into the primary chamber 3a of the second compartment. As they travel along this chamber, which is of decreasing cross-sectional area, they are gradually transferred to the outer or secondary chamber 3b, which is of increasing cross-sectional area.

The gases then emerge through a further perforated baffle to the outlet from the silencer casing.

The invention is in no way restricted to the embodiment above described. For example, instead of employing a twin inlet, one, two or more inlets may be provided in the silencer casing and these may be located either in the side of the casing or in the end thereof.

In the remaining examples shown in Figs. 2-4, like parts will be illustrated and referred to by like reference numerals.

In the example shown in Fig. 2, the entry and exit of the gas is straight through the end wall, i. e. in a direction parallel to the axis of the casing. In other respects the principle of the silencer is identical with that in Fig. 1.

On the other hand the entry may be in the plane of the axis but at an angle thereto, or again, the direction of entry may be tangential and at an angle to the axis of the casing.

Moreover, the construction may be such that the inlet and outlet passages to the silencer are adjustable for position, that is to say the inlet and outlet may be in axial alignment; or again, by turning the ends of the casings with respect to one another, the inlet and outlet may be moved to a position where they are out of alignment with one another.

The casing of the silencer is preferably so arranged as to be easily taken apart for cleaning, for which purpose one or both ends of the casing may be removable. In another construction the casing may be formed in two halves split transversely or longitudinally, and bolted together; the same may apply to the cones and baffles within

the casing. Such constructions are well known per se.

In the alternative construction shown in Fig. 3 the apertured walls 4 and 5 need not be cones but may take the form of pairs of flat plates disposed at an angle to the axis of the casing, so as to form an outer pair of primary chambers. The baffle 6 is optional, so that the primary chambers may enclose a single secondary chamber if the baffle 6 is removed, or vice versa.

It is not essential that the primary chamber of the first compartment be the outer of the two chambers, as the positions of the primary and secondary chambers may be reversed. Fig. 4 shows a case where the apertured walls 4, 5 of each compartment may take the form of truncated cones, the smaller ends of which adjoin at the junction between the first and second compartments.

The conical members forming the apertured wall between the primary and secondary chambers may be either smooth, or again they may be ribbed longitudinally or otherwise to increase their surface area. The cones may be doubled so as to provide a double and spaced division wall.

The various compartments may be of the same size or of different sizes increasing or decreasing progressively. The same may apply to the cones.

The silencer may be constructed of any desired material or combination of materials and may be stamped, rolled, pressed, forged, welded, extruded, cast or any combination thereof.

The casing of the silencer may either consist of a single wall or of double walls. In the latter case intervening lagging may be interposed, or in the case of a single wall casing external lagging may be used, to prevent resonance and deaden sound.

Perforated baffles may be located between every compartment or only between some of the compartments. These may be placed at the entry, at the exit or intermediately of the compartments; the baffles may be either flat or ribbed, coned or otherwise. They may moreover be single or double.

The perforations in the conical apertured walls may take the form of holes, slots, saw-cuts or any convenient form of opening and the direction of the cuts or slots may be such as to facilitate the flow of gases or to direct the gases in the path which they are desired to take.

Two or more silencers as described herein may be employed in series or in parallel.

What I claim and desire to secure by Letters Patent is:—

1. A silencer comprising an elongated casing, a transverse partition member mounted within said casing dividing the same into two consecutively arranged compartments, substantially conical apertured wall members extending in opposite directions from said transverse partition member to the respective ends of said casing and dividing each of said compartments into primary and secondary chambers having communication through said apertured walls, said apertured wall members being supported at their inner ends by said transverse partition member, and means for supporting the outer ends of said apertured wall members in spaced relation to said casing, said transverse partition member having apertures providing communication between the secondary chamber of one of said compartments and the primary chamber of the succeeding compartment, an inlet to the primary chamber of one compartment

and an outlet from the secondary chamber of the succeeding compartment.

2. A silencer comprising an elongated casing, a transverse partition member mounted within said casing dividing the same into two consecutively arranged compartments, end closures for said casing, a truncated conical baffle member mounted in each compartment, said baffle members being supported between said transverse partition member and the respective end plates and having apertured walls dividing said compartments into primary and secondary chambers having communication through said apertured walls, said primary and secondary chambers being substantially concentric and coextensive and being of progressively decreasing and increasing cross-sectional area respectively, said transverse partition member having apertures providing communication between the secondary chamber of one compartment and the primary chamber of the succeeding compartment, said end closures providing an inlet to the primary chamber of one compartment and an outlet from the secondary chamber of the succeeding compartment.

3. A silencer comprising an elongated casing, a transverse partition member mounted within said casing dividing the same into two consecutively arranged compartments, a substantially conical baffle member mounted in each of said compartments disposed substantially coaxially therewith and having apertured walls dividing said compartments into primary and secondary chambers having communication through said apertures, said baffle members having adjacent ends thereof

engaging opposite sides of said transverse partition member and supported thereby, said primary chambers progressively decreasing and said secondary chambers progressively increasing in cross-sectional area in the direction of flow, said transverse partition member having apertures providing communication between the secondary chamber of one compartment and the primary chamber of the succeeding compartment, an inlet to the primary chamber of one compartment and an outlet from the secondary chamber of the other compartment.

4. A silencer comprising an elongated casing, a transverse partition member mounted within said casing dividing the same into consecutively arranged compartments, end closures for said casing, a substantially conical apertured wall member disposed in each compartment, means on opposite sides of said transverse partition member and means on the inner faces of said end closures engaging the respective ends of said conical wall members for supporting the latter in spaced relation to the walls of said casing, said apertured wall members dividing said compartments into primary and secondary chambers, having communication through said apertures, said transverse partition member having apertures therein establishing communication between the secondary chamber of the first compartment and the primary chamber of the succeeding compartment, an inlet to the primary chamber of the first compartment and an outlet from the secondary chamber of the succeeding compartment.

ARTHUR ADELBERT CHASE.

#### CERTIFICATE OF CORRECTION.

Patent No. 2,122,086.

June 28, 1938.

ARTHUR ADELBERT CHASE.

It is hereby certified that the name of the assignee in the above numbered patent was erroneously written and printed as "Frank Thomase Fogden" whereas said name should have been written and printed as Frank Thomas Fogden, of Westcliff-on-Sea, England, as shown by the record of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of September, A. D. 1938.

Henry Van Arsdale

Acting Commissioner of Patents.