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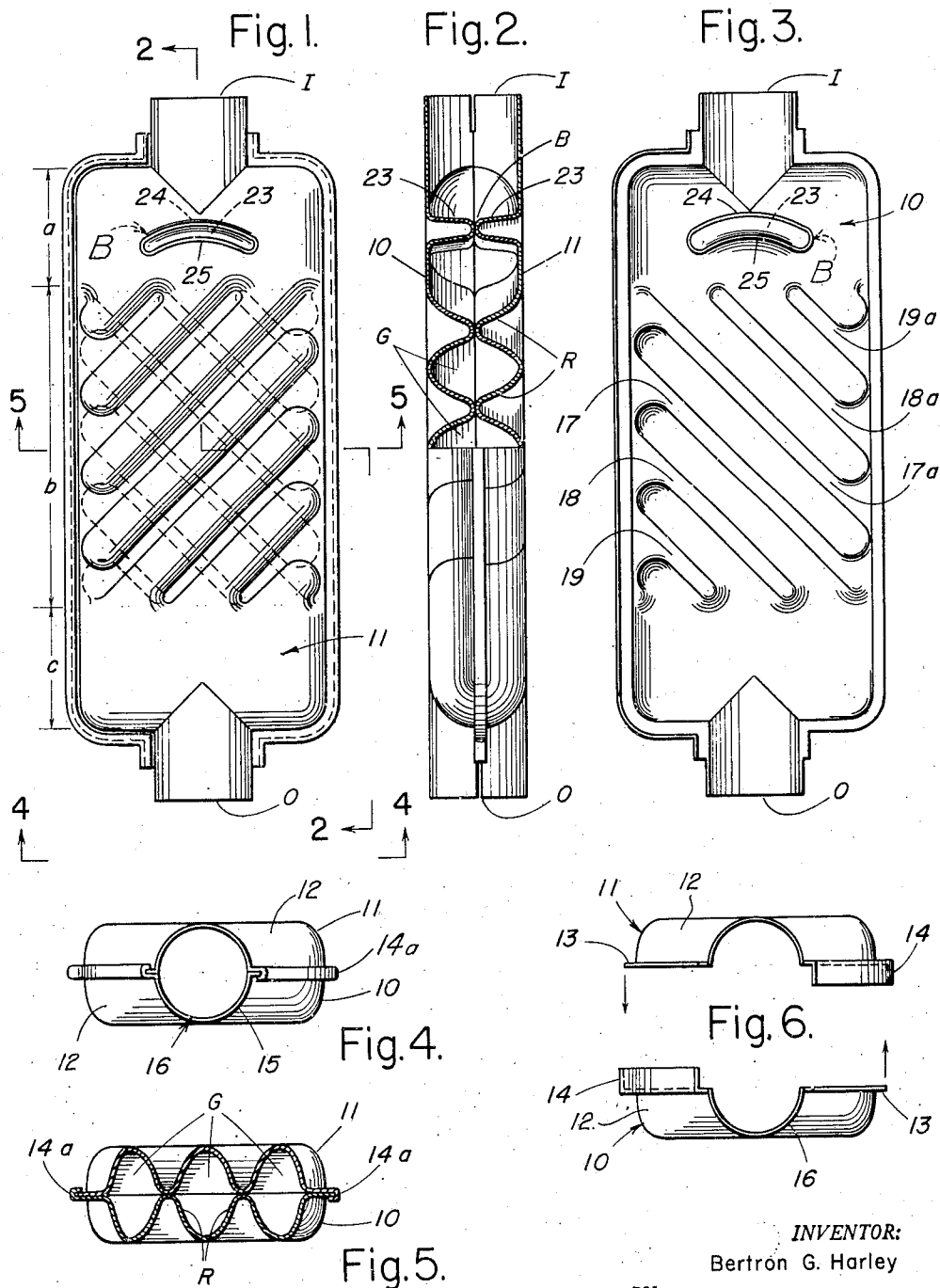
B. G. HARLEY

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BAFFLE TYPE MUFFLER WITH CORRUGATED CASING

Filed Oct. 17, 1946

2 Sheets-Sheet 1



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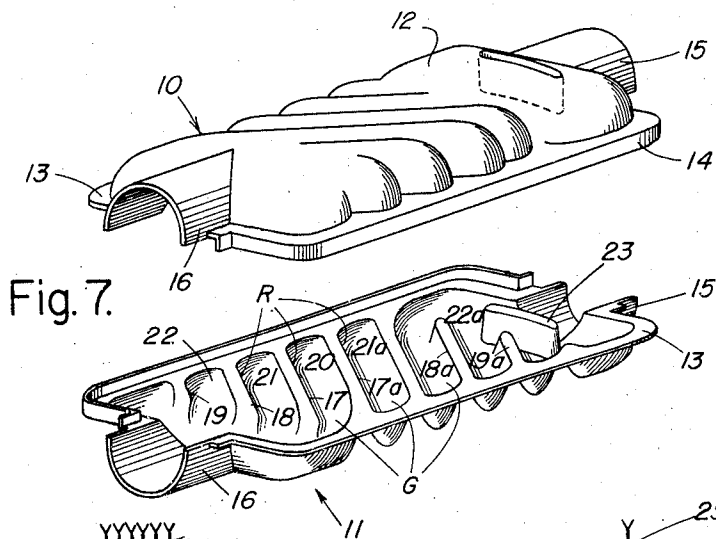
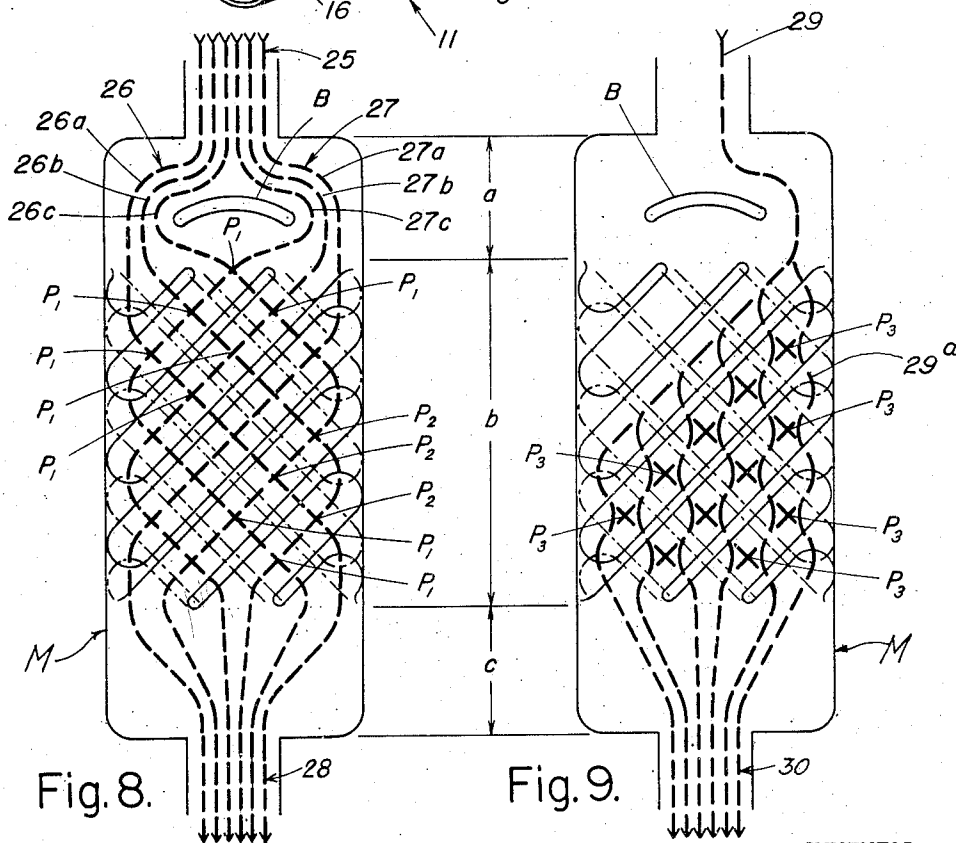
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UNITED STATES PATENT OFFICE

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BAFFLE TYPE MUFFLER WITH
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Application October 17, 1946, Serial No. 703,744

2 Claims. (Cl. 181-49)

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This invention relates to pulsation dampeners which may include, for example, mufflers or exhaust silencers for combustion engines and particularly automotive engines. It is among the objects of the invention to produce a dampener or muffler that is simple, compact and inexpensive to manufacture. Another object is to provide an efficient muffler consisting of a minimum of parts, preferably not more than two.

This invention proposes to dampen or silence undesired pulsations in a gas stream by subdividing such stream into a plurality of component sub-streams and, during their passage through the muffler, make varying directional changes in each and setting up neutralizing effects on one another by making these directional changes tortuous. The latter bring about certain silencing effects as parts of one sub-stream impinge on parts of another sub-stream or as they intersect with each other.

One feature of this invention is embodied in a dampener or muffler that is made up of a pair of pan-like shells each of which is provided with undulated or corrugated faces. The corrugations are made up of valleys, grooves or channels forming ridges or peaks between them in such a manner that when the shells are placed together face to face, i. e., in opposed but symmetrical fashion to provide the muffling space between them, the valleys and ridges in one shell complement or co-act with the valleys and ridges of the other shell to constitute an efficient dampening or muffling baffle system which is realized and becomes effective as such incident to the mere assembly and securing together of two such shells.

A further feature of the invention resides in that when the shells are secured together in dampening or muffling relationship, the ridges and valleys of one shell lie at an angle less than 180° apart relative to those of the other shell and preferably nearer to 90° apart. These valleys and ridges of a shell thus lie at an angle of less than 180° to the longitudinal axis of that shell. In an X-ray view through the assembled muffler, the ridges and valleys of one shell would appear to intersect the valleys and ridges of the other shell but since in reality the valleys and ridges of one shell lie in a different plane from those of the other shell, the valleys and ridges of the two shells do not actually intersect but grooves of one shell overlie the grooves of the other shell at an angle so the grooves and edges of the one shell traverse the grooves and ridges of the companion shell. This enables the gases to pass from one shell to the other in a multiplicity of tortuous

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directional changes. Hence, the term "intersecting" is to be thus understood in defining the angular disposition of the ridges of one shell relative to the ridges of the companion shell. The shells preferably are stamped out of metal and their corrugations formed during the stamping process. Therefore, the corrugations appear on each side of each shell, namely on the outer face thereof as well as on the interior face thereof. Of course, when corrugations are formed in this way, what is a "ridge" on the outside face of a shell becomes a "valley" or "groove" on the inner face or inside of the shell, while a "valley" or "groove" on the outside becomes a "ridge" on the inside, and so on.

According to another definition of one embodiment of this invention the muffler comprises a pair of companion pan-like shells assembled in symmetrical fashion with a general longitudinal flow-path therethrough. Each shell has a set of parallel diagonally extending baffles rising from the interior face of the shell presenting free baffle edge portions. By assembling a pair of shells the baffle edge portions of the one shell are placed in proximity with the baffle edge portions of the companion shell although in traversing or intersecting relationship thereto. The assembling of the shells establishes a co-action of the respective sets of baffles with each other whereby an effective dampening system is attained.

According to another feature, each shell also has a portion that is depressed on the outside of the shell but is raised on the inside of the shell and is disposed in such a manner that when the shells are placed together in a symmetrical fashion, the internally raised portions are aligned and abut so as to be complementary to each other in constituting a primary baffle at the inlet end of the dampener or muffler that is effective to split the entering gas stream in such a manner that one portion of the gas stream is guided to enter one set of diagonally disposed grooves or channels and the other portion is guided to enter the other set of differently inclined diagonal grooves or channels.

The invention possesses other objects and features of advantage, some of which with the foregoing will be set forth in the following description. In the following description and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the claims hereof will permit. In the accompanying drawings there has been illustrated the best embodiment of the invention known to me,

but such embodiment is to be regarded not as limiting but as typical only of many possible embodiments and structural arrangement.

The novel features considered characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawings in which

Fig. 1 is a view upon one diagonally grooved side of the dampener or muffler;

Fig. 2 is a part-sectional view taken on the line 2—2 in Fig. 1;

Fig. 3 is a view upon the opposite diagonally grooved side of the muffler;

Fig. 4 is an end view taken on line 4—4 in Fig. 1;

Fig. 5 is a cross-sectional view taken on line 5—5 in Fig. 1;

Fig. 6 shows two identical half shells apart and with their swaging edge portions open;

Fig. 7 is a perspective of the half shells in Fig. 6 illustrating the structural and manufacturing identity of the two shells;

Fig. 8 is an idealized diagram of component flow-paths of the gases passing through the muffler illustrating the neutralizing interferences among them;

Fig. 9 is an idealized diagram of one of the component streams illustrating hypothetical flow-paths resulting from a further subdivision into sub-component streams and also illustrating the potential interferences among them.

The muffler comprises a pair of pan-like shells 10 and 11 which are identically shaped but in such a manner as to enable them to be assembled in symmetrical fashion and swaged together as will be further described below. Because of their structural identity the detailed description of one shell 10 will suffice.

Such a shell has a longitudinal pan-shaped body portion 12 having an edge portion 13 in the form of a male swaging flange and an opposite edge portion 14 in the form of a female swaging flange. At one end of the body portion the edge portion is interrupted by a longitudinal channel-shaped portion 15 representing one longitudinal half of an inlet neck I of the muffler. At the opposite end the body portion is provided with a similar longitudinal channel-shaped portion 16 representing one longitudinal half of an outlet neck O of the muffler. The inlet and outlet neck portions are shown to be in line with the longitudinal central axis of the muffler.

The body portion 12 is formed with internal ridges of different lengths although collectively designated by the character R which extend diagonally of the longitudinal axis of the body portion whereby there are created channels or grooves of corresponding lengths collectively designated by the character G, the angle of inclination of the ridges relative to the longitudinal axis being shown to be about at 45°. These ridges rising from the interior face of the pan-shaped body portion and having free edge portions constitute baffles within the muffler in a manner further to be described.

In this pattern of ridges and grooves the ridges R comprise a pair of long ridges 17 and 17^a, a pair of slightly shorter ridges 18 and 18^a, and a pair of short ridges 19 and 19^a. The channels G comprise a long channel 20, a pair of slightly shorter channels 21 and 21^a, and a pair of shortest

channels 22 and 22^a. There is also provided a transverse ridge 23 facing the inlet neck portion I.

The end view of two shells 10 and 11 constituting the muffler in Fig. 6 shows them apart although in position about to be assembled and joined. In assembling the shell 11 is placed face to face with its companion shell 10 so that the respective edge portions 14 can be swaged over their associated edge portions 13 as indicated at 14^a in Fig. 5. This assembly places free edge portions of one set of ridges R, that is the ridges in one shell, in traversing or intersecting relationship and in proximity if not actual contact with the free edge portions of the ridges of the companion shell. Such traversing relationship is indicated by the X-ray (dotted line) showing in Fig. 1 of the ridges at the far side of the muffler. This also places the free edge portions of the transverse ridges 23 of one shell in proximity and registry with the corresponding free edge portions of the ridges 23 of the companion shell so as to constitute a baffle B in the path of the inflowing stream of gases entering the inlet neck I of the muffler. This baffle B, herein briefly termed "the inflow-splitting inlet baffle," offers to the incoming stream a convex face 24 and has a correspondingly concave face 25 in the rear.

The interior of the muffler (see Figs. 1 and 3) may be defined as by an inlet space or zone *a* containing the primary baffle B for splitting the incoming stream into two portions—a zone *b* which is the baffling zone constituted by the two sets of intersecting ridges and grooves; and a zone *c* which is the outlet zone where the component streams emerging from the grooves combine and whence they pass from the muffler.

Diagrammatic idealized views in Figs. 8 and 9 illustrate how the silencing effect is created in this muffler by subjecting the entering main stream of the gases to split-ups into component streams as well as to tortuous directional changes while causing these streams to intersect with one another.

According to Fig. 8 a stream 25 of gases indicated by a family of six cognate stream lines enters the muffler M schematically shown to be split in half by the inlet baffle B, namely a stream portion 26 indicated by three stream lines 26^a, 26^b and 26^c and another stream portion 27 indicated by three stream lines 27^a, 27^b and 27^c. This primary helixing or split-up guides one portion towards and into one set of inclined grooves G and another portion into the opposite set of grooves G.

Thus, according to one idealized concept, the stream lines 26^a, 26^b and 26^c will intersect with the opposed stream lines 27^a, 27^b and 27^c as at points P₁. An example of stream lines of the same portion, say, portion, intersecting with one another is represented by intersection points P₂.

All stream lines emerging from the baffle zone *b* join in a stream 28 in the zone *c* to pass from the muffler through the outlet neck thereof.

An idealized concept illustrated in Fig. 9 shows a single isolated stream line 29 being initially deflected by baffle B, then divided into component streams such as represented by the undulating lines 29^a. These undulating lines result when a component stream is repeatedly directed from the diagonal direction in one groove into the diagonal direction of adjacent traversing grooves as the stream passes back and forth between the two companion shells of the muffler. Superimposed upon this pattern of undulating component streams there is shown a pattern of component

streams which intersect with one another as at points P₃, although the component streams are shown to join again by forming a stream 30 passing through the outlet neck of the muffler.

While the embodiment herein shown has the inlet and the outlet neck disposed in line with the longitudinal central axis of the muffler, the underlying principles of function, and of structure can also be embodied in a muffler having off-center inlet and/or outlet connections.

An advantage of this muffler construction lies in the fact that before assembling the shells can be nested in stock to conserve shipping space, to be assembled in the manner above described at their point of destination.

I claim:

1. A pulsation dampening device for exhaust gases having a general flow-path substantially longitudinally therethrough comprising a pair of companion pan-like shells, the bottom portion of each of said shells being formed with impressions extending diagonally of the flow-path and constituting substantially a wave-like cross-sectional pattern resembling corrugations which inwardly present ridges constituting flow baffle portions which baffle portions outwardly present corre-

sponding grooves having corresponding outer cooling surfaces, the baffle portions of the one shell lying adjacent to and extending transversely of similar baffle portions of the other shell to constitute a dampening device when the two shells are assembled with their inner sides facing each other.

2. A device according to claim 1, in which the shells are substantially identical, each shell having a female swedging flange along one side and a male swedging flange along the other side.

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