

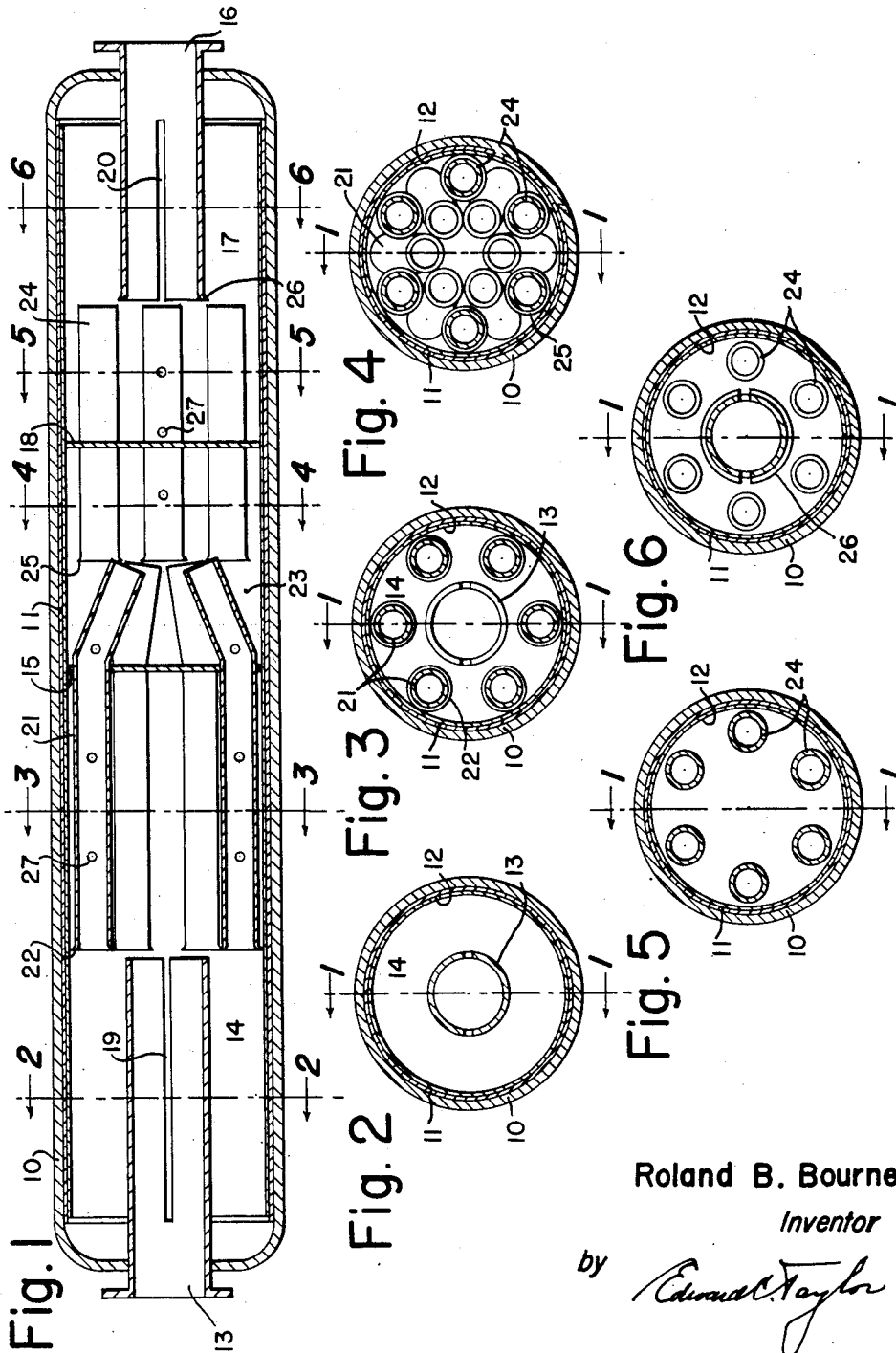
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R. B. BOURNE

2,624,418

MUFFLER WITH PLURAL PASSAGES

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## UNITED STATES PATENT OFFICE

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## MUFFLER WITH PLURAL PASSAGES

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2 Claims. (Cl. 181—46)

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This invention relates to silencing devices for internal combustion engines, and in particular to silencers which are mounted in confined spaces which require holding the diameter of the shell of the silencer to a minimum. One object is to produce a silencer which comprises an expansion chamber into and out of which the exhaust gas passes through two sets of tubes each located in general near the periphery of the casing, but with the open ends of the tubes in the two sets out of alignment with each other both radially and circumferentially, so that the possibility of direct transfer of gas pulses and sound waves from a tube of one set to a tube of the other set is prevented. A further object is to provide a silencer capable of withstanding high external hydraulic pressure and so constructed as to reduce greatly the transmission of sound from the silencer to the surrounding water.

The invention will now be described with reference to the accompanying drawing, in which

Fig. 1 is a median section through the silencer, taken on line 1—1 of Figs. 2 to 6 inclusive;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a section on line 3—3 of Fig. 1;

Fig. 4 is a section on line 4—4 of Fig. 1;

Fig. 5 is a section on line 5—5 of Fig. 1; and

Fig. 6 is a section on line 6—6 of Fig. 1.

The silencer is enclosed primarily in a cylindrical pressure shell 10, preferably of circular cross-section and formed of stainless steel about one inch thick so that it will withstand a pressure of 700 p. s. i. g. Within the pressure shell are cylindrical laminations of sheet metal 11 and 12, here shown as two in number, but which may be varied in number in different chambers of the silencer if desired. These laminations are not relied on so much for strength as for deadening sound transmission through the outer shell, and in combination with a pressure shell which is relatively massive prove remarkably and unexpectedly efficient in that regard. An inlet conduit 13 passes through one end of the pressure shell into a chamber 14 defined by the shell and an intermediate transverse partition 15. The inlet conduit terminates with an open end at approximately the midpoint of the chamber 14. An outlet conduit 16 enters the other end of the pressure shell and terminates with an open end within and about halfway along a chamber 17 defined by the pressure shell and a second intermediate transverse partition 18. The inlet and outlet conduits preferably have antiresonance slots 19 and 20 respectively.

A plurality of intermediate tubes 21, preferably

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having their entrance ends flared as at 22, are circumferentially spaced as best shown in Fig. 3 and extend from a point in chamber 14 adjacent the terminus of the inlet conduit through the partition 15 and open into the chamber 23 formed between partitions 15 and 18. A second circular series of tubes 24 pass through the partition 18, and have open ends in both chamber 23 and chamber 17, terminating in the latter adjacent the entrance end of the outlet conduit. The entrance ends of the tubes 24 are preferably flared at 25 and that of the outlet conduit flared at 26.

It will be noted that the series of tubes 21 are located radially outwardly of the inlet conduit so that there can be no direct gas or sound passage from one to the other, and that a similar relationship exists between tubes 24 and the outlet conduit 16. Tubes 21 and tubes 24 are both arranged in sets adjacent the shell of the silencer, and in order to prevent direct transmission the ends of tubes 21 are bent inwardly towards the center of the chamber 23 as is shown in Figs. 1 and 4. The two sets of tubes 21 and 24 are preferably provided with anti-resonance holes 27 as described in my Patent 2,297,046, September 29, 1942.

What I claim is:

1. A silencer having a substantially cylindrical shell, a pair of spaced partitions dividing the interior of the shell into three chambers, an inlet conduit leading into the first chamber and terminating with an open end near the center thereof, a circumferentially spaced series of tubes located radially outwardly of the inlet conduit each having open ends one substantially in the plane of the open end of the inlet conduit and the other near the center of the second chamber, said tubes passing through the first partition into the second chamber and slanting radially inwardly towards the axis thereof, a second circumferentially spaced series of tubes circumferentially staggered with relation to the tubes of the first series, said second series of tubes extending substantially straight through the second partition into the second and third chambers and having open ends at substantially the mid-points of said chambers, and an outlet conduit entering the third chamber through the shell and terminating with an open end substantially in the plane of the open ends of the second series of tubes but located radially inwardly thereof.

2. A silencer having a substantially cylindrical shell, a pair of transverse partitions dividing the interior of the shell into three chambers, a pair of conduits coaxial with the shell and entering

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each end chamber respectively with an open end at a point intermediate its length, two series of circumferentially spaced tubes located adjacent the peripheries of said end chambers and staggered circumferentially with respect to each other, the tubes in each series terminating at substantially the midpoint of the middle chamber with open ends, the tubes of one series being bent inwardly at one end to open into the middle chamber closer to the axis of the cylindrical shell than the tubes in the other series.

ROLAND B. BOURNE.

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The following references are of record in the file of this patent:

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