

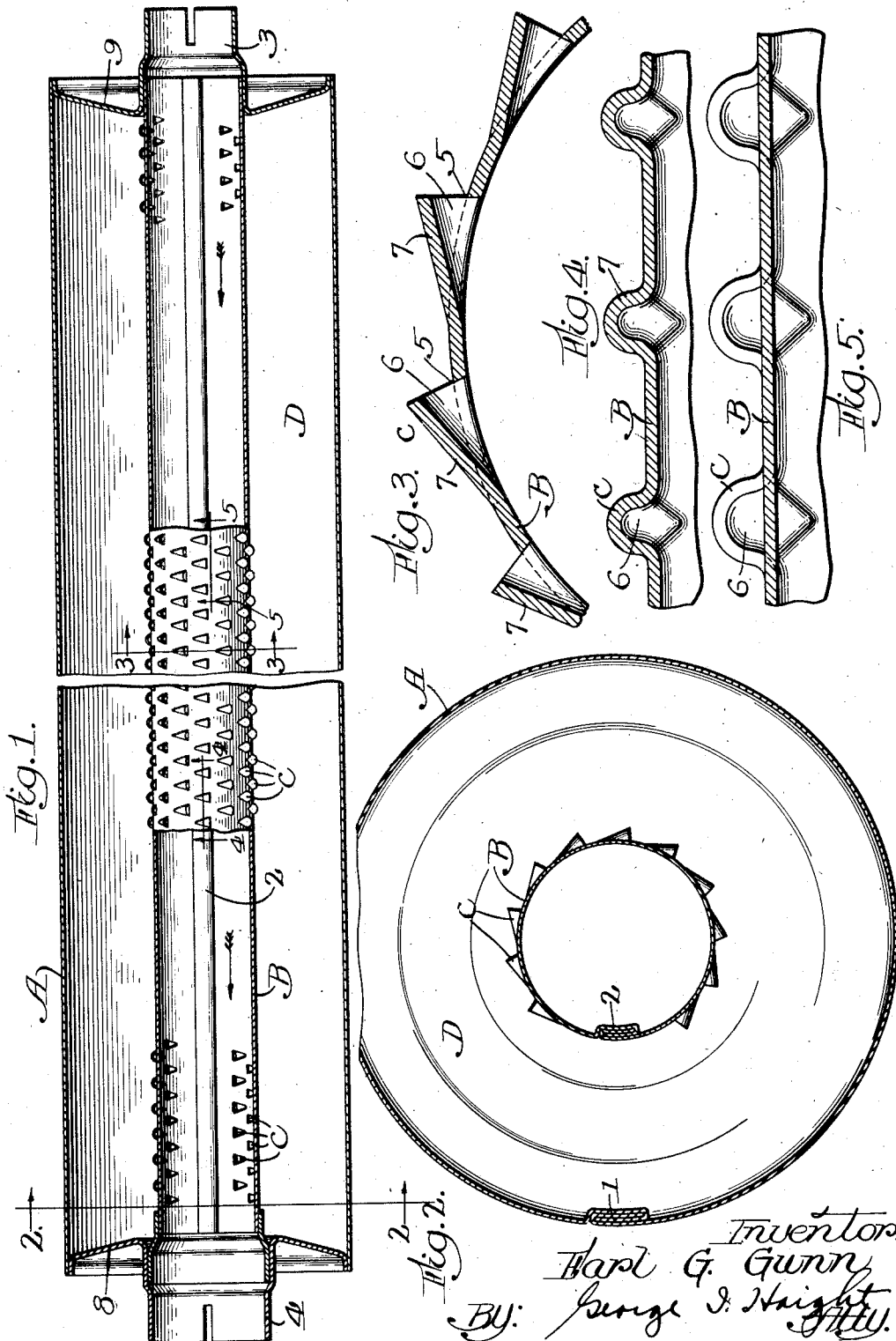
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MUFFLER

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5 Claims. (Cl. 137—160)

My invention relates to improvements in mufflers for destroying the noise or sound made by gases exhausted or discharged from internal combustion motors.

5 The primary object of my invention is to muffle or destroy the undesirable sound of exhaust of gases from internal combustion engines by converting the rapid sharp pulsations of pressure to a steady flow of gas before the gas is released to the atmosphere, and to bring about this condition without developing, beyond the effective minimum, counter pressure which would otherwise interfere with the efficient operation of the engine.

15 A further object is to accomplish the above result by means of a simple muffler structure inexpensive to manufacture and capable of occupying the usual available space for installation.

Referring to the accompanying drawing,

20 Fig. 1 is a longitudinal sectional view of a muffler structure embodying my invention, a portion of the interior being shown in full to better illustrate the structure;

Fig. 2 is an enlarged transverse section on line 25 2—2 of Fig. 1; and

Figs. 3, 4 and 5 are enlarged detail sections on the lines 3—3, 4—4 and 5—5 of Fig. 1.

The structure illustrated in the drawing comprises outer and inner tubular or cylindrical members A and B, of suitable length for the purpose and disposed in concentric relation to each other. These members are preferably made of metal sheets rolled or formed into cylindrical form and the edges joined by suitable seams 1 and 2. The inner tubular member B is preferably about the same in diameter as the usual pipe (not shown) which conveys the exhaust gases from the motor. Its receiving and discharging ends 3 and 4 are formed for connection respectively with this exhaust pipe and other piping if desired. This inner tubular member is straight and unobstructed throughout its entire length so that it constitutes a direct passage for the gases to the atmosphere. Throughout substantially its entire length the wall of the tubular member B is provided with a large number of relatively small louvers C distributed throughout the area of the tube and arranged in longitudinal rows circumferentially spaced, with the louvers in the rows in staggered relation to adjacent rows. This arrangement of louvers is desirable from a manufacturing standpoint because they can be formed in the flat sheet of metal before it is rolled into cylindrical form. The louvers 55 are formed by cutting slits 5 in the sheet metal

and upsetting the adjacent metal to provide openings 6 facing in a circumferential direction. The upset portions 7 of the metal are disposed substantially tangential to the circumference of the tubular member so that the gas passing through the louvers will be directed circumferentially. 60

The outer tubular member A is relatively larger in diameter than the inner tubular member to provide a space or annular chamber D therein surrounding the inner tubular member. This annular chamber is closed at both ends by the closure heads 8, 9 through the center of which the inner tubular member extends. The closure heads are preferably made of sheet metal conformed to fit over the ends of the inner tubular member and flanged on their peripheries to fit within the ends of the outer tubular member to which they are suitably secured as by welding, thus securely holding the tubular members in their spaced concentric relation and sealing the enclosed chamber at the ends. The annular chamber D is longitudinally straight and unobstructed throughout its entire length. It is entirely closed except for communication with the interior of the inner tubular member through the circumferentially directed louvers. 70 75 80

One end of the inner tubular member (the right hand end in the structure shown) is connected to the discharge pipe from the engine, and the other end is open, the arrows indicating the direction of the travel of the gases. The gases flow through this tubular member, and because of its straight unobstructed passage practically no back or counter pressure is developed to interfere with the efficient operation of the engine. 85 90 95 100 105 110

The gases enter the tubular member B as they come from the engine, that is, in a rapid series of sharp pressure pulsations or puffs, and the velocity at which the gases enter tends to overcome the tendency of the gases to expand, even though the louvers through which expansion could take place are present. However, as the gases progress through the inner tubular member to the discharge end, this tendency to expand is permitted by the louver openings and expansion of the gases in turn slows down the velocity and facilitates further expansion. This reaches its maximum as the gases reach the vicinity of the discharge end of the muffler, and since expansion takes place through the louvers into the larger chamber D the pressure is reduced. The formation of the louvers directs the expanding gases in a circumferential direction in the chamber D and the effect is to set up within the chamber a whirling movement of gases. This whirling

ing body at the same time progresses towards the receiving end of the muffler and the gases return to the incoming stream in the tubular member B through the louvers adjacent the receiving end. In the process of expanding into the annular chamber, the pressure of the gas is reduced and the peaks of the pressure curves of the individual puffs or pulsations are reduced or softened to a point where a flow of gas at relatively lower steady pressure re-enters the inner tubular member and acts to baffle or soften the incoming pulsations of gas, with the result that the pressure of the gases as they leave the discharge end of the inner tube is converted to an average relatively low point and the gases leave the muffler in a steady unvarying stream at such low pressure that no audible sound is emitted. The whirling movement of the body of gases in the annular chamber D, caused by the directional effect of the louvers, I have found in actual use to be very essential to the effective muffling of the sound, and that without these directional louvers the efficiency of the structure is very materially reduced.

I claim:

1. A muffler for destroying sound of the exhaust gases of internal combustion engines comprising a straight unobstructed tubular member adapted to be connected at one end to the source of exhaust gases and forming a direct through passage through which the stream of gases flow and discharge at its other end, said tubular member having a plurality of louvered openings on its exterior, all facing in the same direction and arranged to direct pressure waves tangentially of said tubular member, and a larger tubular member closed at its ends and surrounding said first mentioned tubular member to form a longitudinal unobstructed annular chamber having communication with the interior of the first mentioned tubular member only through said openings, the walls of said larger tubular member cooperating with said louvered openings to impart an annular movement to the body of the gases in said annular chamber.

2. A muffler for exhaust gases of internal combustion engines comprising a pair of straight cylindrical members of different diameters disposed in concentric relation—one within the other, to form an annular unobstructed chamber between said members, the inner cylindrical member being open at both ends and forming a direct passage for gases, and the outer cylindrical member being closed at both ends, and a plurality of struck-up portions on the exterior of said inner cylindrical member and distributed throughout substantially the area and length of the inner cylindrical member and formed to provide openings on the exterior of said inner cylindrical member facing in a tangential di-

rection with respect to the inner cylindrical member for causing the pressure waves passing through said openings from the inner member to travel circumferentially in said annular chamber.

3. A muffler of the class described, including a shell closed to the outer atmosphere, and a tubular member positioned within said shell and spaced from the wall thereof, thereby forming a closed chamber surrounding said tubular member, the tubular member forming a direct unrestricted passage for the flow of the stream of gases through the muffler, and being provided with a large number of openings in its wall through which the pressure waves in the gas stream flowing through said tubular member are communicated to the body of gases in said chamber, and means on the exterior of said tubular member associated with said openings for directing said communicated gas pressure waves to impart rotary movement to the body of gases in the chamber about said tubular member as an axis.

4. A muffler of the class described, including an imperforate closed cylindrical outer shell and a cylindrical tubular member extending therethrough and spaced from the outer shell to provide an annular chamber surrounding said tubular member, said tubular member forming a direct through passage for the flow of the main body of gas under varying pressure, and being provided in its wall with a large number of small, closely spaced openings distributed along its length and circumference and in communication with said annular chamber, and louvers associated with said openings and projecting from the exterior of the tubular member all in the same direction and arranged to direct the gas pressure waves tangentially in said annular chamber and cause to be imparted to the gas body in said annular chamber a rapid rotary movement substantially transversely to the direction of flow of the gas through said tubular member.

5. A sound muffler of the class described, including a tubular member having an inlet and an outlet and forming a through passage for the stream of gases and having a plurality of openings in its wall, a shell surrounding said tubular member and spaced therefrom to form a chamber around said tubular member having communication with said tubular member through said openings, said shell being closed to the outer atmosphere, and means within said chamber associated with said openings for causing the pressure waves entering said chamber through said openings to impart rotary movement to the body of gas in said chamber for attenuating said pressure waves.

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