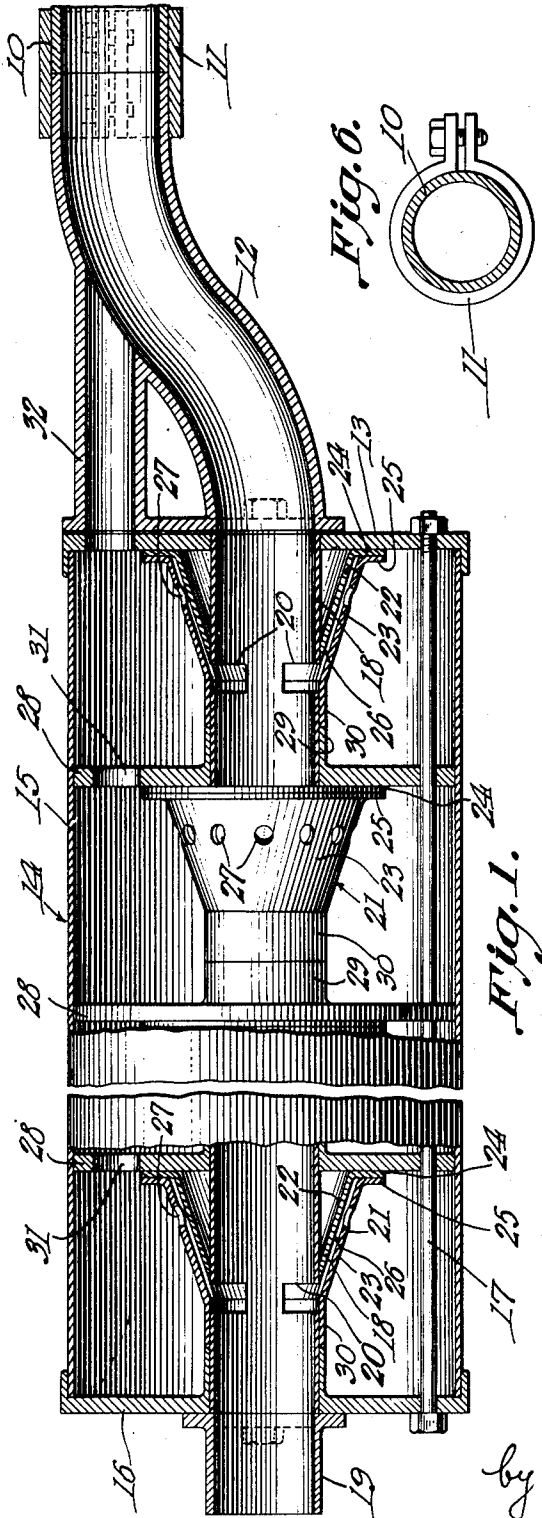
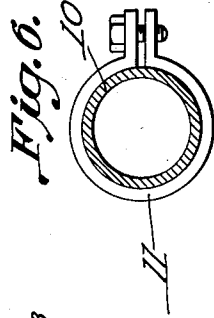
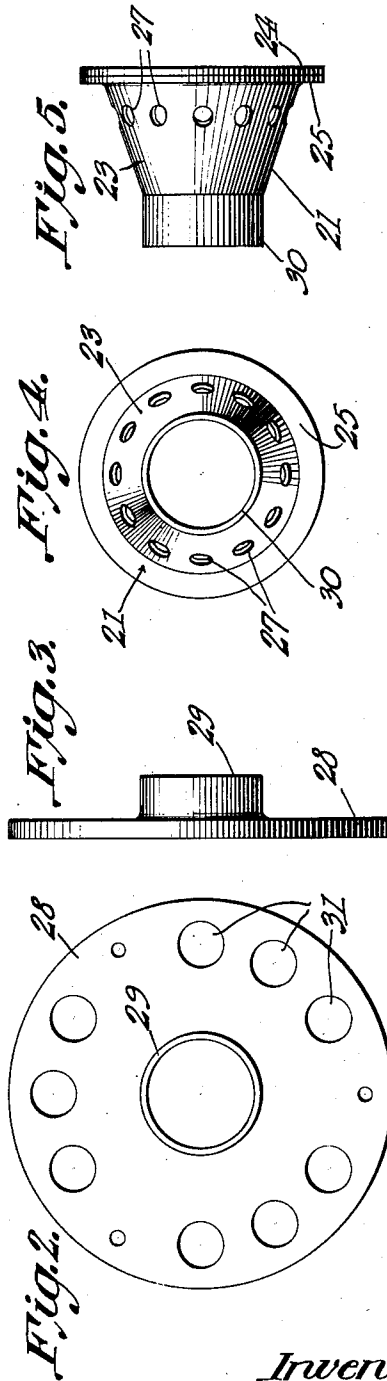


W. C. MILES.
MUFFLER.
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MUFFLER.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM C. MILES, a citizen of the United States, and a resident of Washington, in the District of Columbia, have invented new and useful Improvements in Mufflers, of which the following is a specification.

The object of the invention is to provide a muffler particularly adapted to be used in connection with the exhaust outlets of internal combustion engines employed in motor cars and boats, airplanes and other analogous vehicles, whereby the explosive sounds, reports or detonations ordinarily incident to the release of the spent gases or products of combustion are reduced in audibility or are eliminated without setting up back-pressure in the outlet, the exhaust manifold, or the engine.

A further object of the invention is to provide in a muffler of the above mentioned character a means for increasing the activity of release of exhaust gases from within the cylinders of the engine.

It is a well known fact that exhaust gases released from the cylinders of an internal combustion engine do not travel through the exhaust pipe in a continuous stream or column but on the other hand pass through in a pulsatory manner by reason of the fact that the exhaust gases, in the form of relatively short high tensioned columns or zones, are separated by relatively low tensioned zones of gases. The columns of exhaust gases of relative high tension, separated by relative low tensioned zones, when released from the exhaust pipe directly into the atmosphere by reason of sudden expansion to atmospheric pressure tend to create a partial vacuum at the point of release which partial vacuum is quickly filled in by the surrounding atmosphere, thereby producing sound waves of such intensity as to be audibly transmitted to the adjacent air strata.

The invention consists in effecting a redistribution of equalization of the densities or relative vapor tensions of the several portions or zones of a column of exhaust gases, so as to reduce the same from a condition of alternately high and low tension, relatively considered, to a condition of relatively continuous and uniformly tensioned outflow which, at the final point of release is expanded and dissipated without setting up sound waves or vibrations capable of being

audibly transmitted or communicated to adjacent air strata.

Other, and more or less dependent, objects and advantages of the invention will be apparent in the course of the following description of what at the present I regard as the preferred embodiment of the same.

In the drawings, forming a part of this specification wherein like numerals are employed to designate like parts throughout the same,

Figure 1 is a view showing the device embodying my invention partly in section and partly in elevation,

Fig. 2 is a face view of an abutment plate,

Fig. 3 is an edge elevation of the same,

Fig. 4 is an end elevation of a nozzle, and,

Fig. 5 is a side elevation of the same,

Fig. 6 is a cross section of the connection between the exhaust pipe and the muffler inlet, showing the clamping means.

The illustrated embodiment, which is intended primarily as merely a typical exponent of the principle of operation involved, contemplates, essentially, an unobstructed exhaust passage or conductor, having dimensions to suit varying conditions or factors. The invention further contemplates a supplementing means, for example, such as a storage reservoir or equivalent source of a preferably expansive medium disposed for distribution, progressive if desired, to the column of exhaust gases traversing the passage or conductor in such a way as to equalize or establish a continuity of vapor tensions or pressures in the column prior to complete liberation thereof, thereby insuring a continuous outflow at a modified uniform tension as distinguished from the periodic or pulsatory release of pressure incident to the strokes of the engine.

In the drawings wherein for the purpose of illustration is shown the preferred form of my invention, the numeral 10 indicates the exhaust pipe of an internal combustion engine (not shown) connected by means of a cylindrical clamp 11 to a conduit 12 deflected or curved from a straight line as shown and suitably connected to the head 13 of a reservoir indicated as a whole by the numeral 14. The reservoir comprises a shell 15 retained in engagement with the head 13 and the end plate or closure 16 by means of the rods 17. Within the reservoir there is disposed an equalizing tube 18 registering with the opening of the conduit

12 and a tail pipe 19 carried by the end plate or closure 16. The equalizing tube 18 is provided with a plurality of ports 20 which connect the equalizing tube 18 with the reservoir 14 through nozzles or directing elements, each of the nozzles or directing elements being indicated as a whole by the numeral 21 and comprising inner and outer funnel shaped members 22 and 23. The funnel shaped members 22 and 23 are provided respectively with flanges 24 and 25 which are preferably secured together by spot welding to hold the inner and outer walls of the funnel shaped members 22 and 23 respectively in a spaced relation to provide a passage 26 which communicates with the reservoir 14 through a plurality of openings 27 provided in the outer funnel shaped member 23. The several nozzles or directing elements 21 are maintained in a spaced relation by means of abutment plates 28 disposed upon the equalizing tube 18, each of the plates being provided with a flange 29 adapted to abut the overlapping or flanged end 30 of the outer funnel shaped member 23. The abutment plates 28 are each provided with suitable openings as shown at 31 to permit distribution of pressure throughout the reservoir 14, the pressure being built up within the reservoir by shunting a portion of the exhaust gases from the conduit 12 through a bypass 32 communicating with the reservoir and arranged preferably coaxial with the exhaust pipe 10 or the comparatively straight portion of the conduit adjacent the coupling 11.

The effect of the device shown and described as my preferred form of the invention is to produce a confined volume of gases or vapors held in a condition of more or less compression within the reservoir by the pulsations entering the same through the bypass, from which reservoir the gases are distributed progressively to the exhaust column advancing under unrestrained conditions through the main passage of the muffler, so that zones of the column wherein the vapor is at relatively low tension or pressure are supplied from the reserve pressure thus created in the reservoir to produce an equalization of tension throughout the column whereby at the point of release determined by the ultimate outlet the gases emerge in an approximately continuous stream or column, devoid of the characteristic of pulsations or successive slugs of vapor under high tension separated by zones of low tension, as they are received at the inlet end of the muffler from the exhaust of the engine.

By redistributing the exhaust gases to effect an equalization of the relatively high tensioned and low tensioned zones a lengthening out of the slugs of exhaust gases passing through the equalizing tube 18 is in

part depended upon as a means for destroying the kinetic energy thereof rather than a radial expansion or baffling as has been the means employed to accomplish this object in the heretofore employed methods of destroying the activity of exhaust gases escaping under pressure from internal combustion engines. By the angular disposition of the nozzles or directing elements 21 which supply the relatively low tensioned zones with an expansive medium under pressure from the reservoir 14 an injector action is set up within the equalizing tube 18 which tends to increase the activity of forward movement of the exhaust gases in the line of travel thereof from the engine.

The object of the coaxial alinement of the bypass 32 with the exhaust pipe 10 or with the straight portion of the conduit 12 is to make possible the building up of pressure within the reservoir 14 without setting up a back pressure at any point within the main line of travel of the exhaust gases such as within the exhaust pipe 10, the conduit 12, and the equalizing tube 18. The impetus of the molecules of exhaust gases which always tend to travel in a straight line is dependent upon and deemed sufficient to create and maintain at all times during the operation of the engine at a uniform speed a constant or uniform pressure within the reservoir 14, which pressure bears a specific relation to the pressure within the main line of travel, the relation being dependent upon or governed by the relative diameters of the bypass 32 and the conduit 12 or exhaust pipe 10.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

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

1. A muffler having a passage for carrying a column of exhaust, and means for angularly injecting a tension equalizing medium into said passage to create a tendency toward increasing the activity of flow of said column of exhaust within said passage.

2. A muffler having a passage for carrying a column of exhaust, and means for injecting a tension equalizing medium under pressure into said passage to increase the activity of flow of said column of exhaust within said passage.

3. A muffler having a passage for carrying a column of exhaust, and means for progressively injecting a tension equalizing medium angularly into said passage to

create a tendency toward increasing the activity of flow of said column of exhaust within said passage.

4. A muffler having a passage for carrying a column of exhaust, and means for progressively injecting a tension equalizing medium under pressure angularly into said passage to create a tendency toward increasing the activity of flow of said column of exhaust within said passage.

5. A muffler comprising means for carrying a column of exhaust, means for storing an expansive medium under pressure, and means for injecting said expansive medium into the column of exhaust to increase the activity of flow of said column of exhaust.

6. A muffler having a passage for carrying a column of exhaust, and means accessible to exhaust pressures for receiving exhaust gases and distributing the same progressively and angularly to said column at various points along its line of travel, whereby a tendency toward increasing the activity of flow of said column of exhaust within said passage is set up.

7. A muffler having means for dividing a column of exhaust, a passage for conveying one portion of the divided exhaust, and means for receiving the remainder of the divided exhaust and distributively injecting the same angularly into said passage to create a tendency toward increasing the activity of the flow of said exhaust within said passage.

8. A muffler having a passage for carrying the main column of exhaust, means for receiving and storing a fractional portion of the exhaust, and means for distributively injecting the fractional portion angularly into the relatively low tension zones of the main column at intervening points to create a tendency toward increasing the activity of flow of the main column within said passage.

9. A muffler having a passage for carrying the main column of exhaust, a reservoir for receiving fractional portions of the exhaust, and a plurality of injector nozzles or directing elements for conducting the exhaust from the reservoir to said passage to increase the activity of flow of the main column of exhaust within said passage.

10. A muffler having a passage for conveying the main column of exhaust, a reservoir for receiving a fractional portion of the exhaust previous to the entry of exhaust into said passage, and means for distributively injecting the exhaust from said reservoir angularly into said passage to create a tendency toward increasing the activity of flow of the main column of exhaust within said passage.

11. A muffler adapted to be connected to an exhaust pipe, a reservoir having an equalizing tube therein, said equalizing tube being in direct communication with the ex-

haust pipe, a bypass for shunting a portion of the exhaust from the exhaust pipe into said reservoir, and means for angularly injecting the exhaust from said reservoir into said equalizing tube to increase the activity of the flow of exhaust through the equalizing tube.

12. A muffler adapted to be connected to an exhaust pipe, a reservoir having an equalizing tube therein, said equalizing tube being in direct communication with the exhaust pipe, a bypass for shunting a portion of the exhaust from the exhaust pipe into said reservoir, said bypass being arranged concentric with the exhaust pipe, and means for angularly injecting the exhaust from said reservoir into said equalizing tube to create a tendency toward increasing the activity of the flow of exhaust through said exhaust pipe.

13. A muffler having a passage for carrying the main column of exhaust, a reservoir for receiving fractional portions of the exhaust, and a plurality of injector nozzles or directing elements for conducting the exhaust from the reservoir and angularly injecting it into said passage to create a tendency toward increasing the activity of flow of the main column of exhaust within said passage.

14. A muffler comprising means for carrying a column of exhaust, means for storing an expansive medium, and means for angularly injecting the expansive medium into the column of exhaust to create a tendency toward increasing the activity of flow of said column of exhaust.

15. A muffler having a passage for carrying a column of exhaust, and means for angularly injecting a tension equalizing medium under pressure into said passage to create a tendency toward increasing the activity of flow of said column of exhaust within said passage.

16. A muffler having a passage for carrying a column of exhaust, and means for injecting a tension equalizing medium into said passage in the direction of flow of the exhaust within the passage to create a tendency toward increasing the activity of flow of the exhaust therein.

17. A muffler having a passage for carrying a column of exhaust, means for storing an expansive medium under pressure, and means for injecting the expansive medium into said passage in the direction of flow of the column of exhaust within said passage to create a tendency toward increasing the activity of flow of the column of exhaust.

18. A muffler adapted to be connected to an exhaust pipe, a reservoir having an equalizing tube therein, said equalizing tube being in communication with the exhaust pipe, a bypass for shunting a portion of the exhaust from the exhaust pipe into said reser-

voir, and means for injecting the exhaust from said reservoir into the equalizing tube in the direction of flow of the exhaust through the equalizing tube to create a tendency toward increasing the activity of flow of exhaust through the equalizing tube.

19. A muffler having a passage for carrying a column of exhaust, a reservoir for receiving a fractional portion of the exhaust, and a plurality of injector nozzles for injecting the exhaust from the reservoir into said equalizing tube in the direction of flow of the column of exhaust therein to create a

tendency toward increasing the activity of flow of the column of exhaust.

20. A muffler having means for dividing a column of exhaust, a passage for conveying one portion of the divided exhaust, means for receiving the remainder of the divided exhaust, and means for injecting said remainder of the divided exhaust into said passage in the direction of flow of exhaust therein to create a tendency toward increasing the activity of flow of the exhaust therein.

WILLIAM C. MILES.