

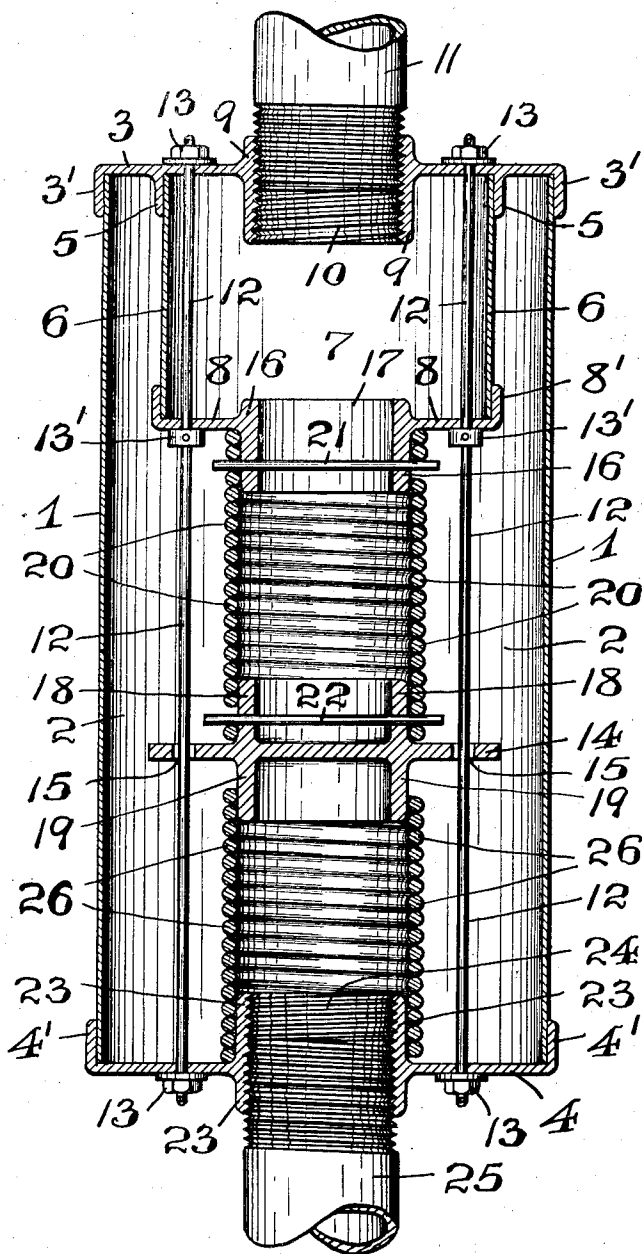
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MUFFLER.

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WITNESSES:

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MUFFLER.

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To all whom it may concern:

Be it known that I, JAMES M. SMITH, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Mufflers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The present invention has reference, generally, to improvements in mufflers for internal combustion engines; and, the invention relates, more particularly, to a novel construction of device which is designed for employment in connection with explosive gas or other engines, for the purpose of preventing loud detonations of the exhausted gas which is expelled after each explosion within the cylinder or cylinders of the engine, the device being peculiarly adapted to receive the exhausted gas from the engine and to permit a first expansion of the same prior to its final expulsion into the air.

The present invention has for its principal object to provide a novel and simply constructed and efficient exhaust-muffling device for internal combustion engines, which permits the expansion of the exploded gases passing out of the engine cylinder or cylinders, and so controls and retards the same against sudden expulsion into the air, to prevent noise or loud detonations; and, to this end the said muffling device comprises a receiving chamber and an expansion chamber, with a gas-pressure controlled means which permits the gas to pass from the former into the latter, and means for retarding the escape of the gas from said expansion chamber into the open air.

Other objects of this invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the present invention.

With the various objects of the present invention in view, the same consists, primarily, in the novel muffling device herein-after set forth; and, the invention consists,

furthermore, in the various arrangements and combinations of the several devices and parts, as well as in the details of the construction of the said parts, all of which will be more fully described in the following specification, and then finally embodied in the clauses of the claims which are appended to and which form an essential part of this specification.

The invention is clearly illustrated in the accompanying drawing, which illustrates a muffling device showing one embodiment of the principles of the present invention, the same being represented in longitudinal vertical section.

Referring now to said drawing, the reference-character 1 indicates a cylindrical shell providing an expansion chamber 2. Said shell 1 is closed at its upper end with a top end-plate 3, and at its bottom end with a bottom end-plate 4, said end-plates having peripheral flanges or skirts 3' and 4' which are fitted over the respective ends of said shell 1. Arranged upon the inner side of said top end-plate 3 is a flange or skirt 5, concentrically disposed with relation to said flange or skirt 3', and spaced away at a suitable distance therefrom. Said flange or skirt 5 is adapted to receive a second cylindrical shell 6, of smaller diameter, the same providing a receiving-chamber 7. Said shell 6 is closed at its bottom end by means of an end-plate 8 provided with a peripheral flange or skirt 8' adapted to properly engage said shell 6. Said top end-plate 3 is provided with a centrally disposed tubular hub 9 which is internally screw-threaded, as at 10, to provide the gas-inlet to said receiving-chamber 7. The said screw-threads within the opening 10 provide a means for receiving the screw-threaded end of an exhaust-pipe 11, leading from the engine cylinder or cylinders, and by means of which the exhausted gases are conveyed to the said receiving-chamber 7 of said muffling device. The said top and bottom end-plates 3 and 4, together with said end-plate 8, are all retained in their respective closing relation with the ends of said cylindrical shells 1 and 6 by means of suitable tie-rods or struts 12, which extend through suitable perforations with which the respective end-plates 3, 4 and 8 are provided, said tie-rods passing directly through the respective chambers 2

and 7, formed by the said shells 1 and 6. The outwardly projecting free ends of said tie-rods or struts are screw-threaded for the reception thereon of the locking or binding nuts and washers 13, whereby said tie-rods or struts are caused to hold the parts together, as will be evident; and, furthermore, each tie-rod or strut is provided with a collar 13', suitably secured upon the tie-rod and forming a shoulder adapted to bear against the end-plate 8, whereby the same is retained in its proper closing relation within said cylindrical shell 6.

Slidably supported upon said tie-rods or struts 12, and within said expansion chamber 2, but beneath said receiving-chamber 7, is a pressure-plate 14, said plate being provided with perforations 15, through which the said tie-rods or struts pass, so that the latter serve to guide and retain said pressure-plate in a proper path of movement. Said end-plate 8 is also provided with a centrally disposed hub 16, in which is formed an opening 17 providing a gas-outlet from said receiving chamber 7. Said pressure-plate 14 is also provided, upon its respective upper and lower sides, with centrally disposed hubs 18 and 19, and extending between the hub 16 of said end-plate 8 and the hub 18 of said pressure-plate 14, with its ends seated around said respective hubs, is a relief-spring 20. Said relief-spring 20 is preferably formed of a closed spiral spring-member having its coils lying normally in close contact with one another. Said relief-spring is securely anchored at its respective ends, to said respective hubs 16 and 18, by means of transversely extending retaining-pins 21 and 22, which pass through the respective hubs 16 and 18, so that their free end-portions pass through the coils of the said relief-spring 20, lying about said hubs. In this manner, said relief-spring is so related to said receiving-chamber 7 and said pressure-plate 14, that any downward movement of the latter tends to pull upon said relief-spring, to thereby separate its coils and to provide intervening spaces for the escape of gas into said expansion-chamber from said receiving-chamber, as will be clearly evident. Said bottom end-plate 4 is also provided with a centrally disposed hub 23 provided with an internally screw-threaded opening 24, adapted to provide a gas outlet from said expansion chamber 2. Said screw-threaded opening 24 permits the connection with said expansion chamber of a suitable escape pipe 25, if it is so desired.

Seated upon the inner boss of said hub 23 is one end of a retarding spring 26, the opposite end of said spring riding freely upon the hub 19 of said pressure-plate 14, and in such a manner, so as to be guided and maintained in proper position, without, however, interfering with the proper movement of

the said pressure-plate 14, or being itself affected by the movement of said pressure-plate, thus retaining said retarding-spring in proper alinement with the outlet-opening 24 of the expansion-chamber 2. Said retarding-spring 26 is preferably normally compressed, so that its coils will lie in close contact with each other.

In operation, the exhaust gases are expelled from the cylinder or cylinders of the engine, and are conveyed through the exhaust pipe 11, from which they enter the receiving-chamber 7, wherein a certain amount of expansion of the gases takes place. The gas is quickly forced out of said receiving-chamber through the outlet opening 17, and following the path of least resistance, passes through the interior of the said relief-spring 20, thus being carried into contact with said pressure-plate 14. The expansive force of the gases, together with the force of its expulsion from the engine-cylinder or cylinders, operates upon said pressure-plate 14, so as to force the same in a downward direction, the movement of the pressure-plate thus produced, pulling upon said relief-spring 20 thereby tending to separate the coils thereof, and thus providing intervening spaces or interstices throughout the length of the spring, through which the gases may both expand and flow into said expansion-chamber, the gases in the meantime having expended a large part of their force in opening this escape. Within said expansion-chamber, the said gases undergo a further expansion and a consequent diminution of pressure, and then finally force themselves through the coils of said retarding-spring 26, at a further expenditure of their force and energy, and thence pass or flow quickly, but quietly, through said outlet-opening 24 into said escape-pipe 25, and finally into the open air.

It will thus be readily understood, that by the time the gases are thus passed into the open air, the greatest part of their expansive force has been relieved within the novel muffling device, and their sudden expulsion into the open air is properly checked and retarded; consequently, the gases are finally expelled noiselessly and without the usual sharp detonations generally accompanying their sudden and direct escape from the confined space of the ordinary exhaust-pipe.

The above-described muffling device provides, therefore, a very simple and efficient construction of device for controlling the venting of exhaust-gases, the same being self-acting, of few parts, easily and cheaply manufactured and assembled, and little likely to be disarranged or disordered during the operation and use of the device. Furthermore, the muffling-device is constructed so as not to be injuriously affected

by the pressure of any water within the same, and if desired, water may be passed therethrough for cooling the same when in operation.

5 I am aware that changes may be made in the various arrangements and combinations of the several devices and parts, as well as in the details of the construction of the same, without departing from the scope
10 of the present invention as herein set forth, and as defined in the clauses of the claims which are appended thereto. Hence, I do not limit my invention to the exact arrangements and combinations of the several devices and parts as described in the said
15 specification, nor do I confine myself to the exact details of the construction of the said parts, as illustrated in the accompanying drawings.

20 I claim:

1. A muffling device comprising a shell providing a receiving-chamber having a gas-inlet and a gas-outlet, a movable pressure-plate, a relief-spring arranged between
25 said gas-outlet of said receiving-chamber and said pressure plate, a shell surrounding said relief-spring and said pressure-plate so as to provide an expansion-chamber, and means for securing said relief-spring in connection with said pressure-plate, whereby
30 the downward movement of the latter opens the coils of said relief-spring so as to permit the gas to enter said expansion-chamber from said receiving-chamber.

35 2. A muffling device comprising a shell providing a receiving-chamber having a gas-inlet and a gas-outlet, a movable pressure-plate, a relief-spring arranged between said gas-inlet of said receiving-chamber and
40 said pressure-plate, a shell surrounding said relief-spring and said pressure-plate so as to provide an expansion-chamber, and means for securing said relief-spring in connection with said pressure-plate, whereby the
45 downward movement of the latter opens the coils of said relief-spring so as to permit the gas to enter said expansion-chamber from said receiving-chamber, means connected with said expansion-chamber providing a gas-outlet, and means for retard-
50 ing the flow of gases out of said expansion-chamber.

3. A muffling device comprising a chambered body providing an expansion-chamber, a chambered body providing a receiving-chamber, means providing communication between said receiving-chamber and said expansion-chamber, means for normally closing said means of communication,
55 means operated by the pressure from said exhausted gas for opening said means of communication, means connected with said expansion-chamber providing a gas-outlet, and means for retarding the flow of gases
60 out of said expansion-chamber.

4. In a muffler, the combination with a cylindrical shell forming an expansion-chamber, of end-plates provided with openings forming inlet and outlet gas passages, a second cylindrical shell forming a receiving chamber connected with one of said
70 end-plates and registering with the inlet gas passage thereof, another end-plate connected with said second cylindrical shell having an opening affording communication
75 between said receiving-chamber and said expansion-chamber, tie-rods for securing said shells and end-plates in their assembled relation, a pressure-plate slidably supported within said expansion-chamber, and a spiral relief-spring having its coils normally compressed so as to lie in close contact with one
80 another, said relief-spring being secured at one end to said end-plate of said receiving chamber and in alinement with the said gas-outlet of said receiving-chamber and at the other end to said pressure-plate.

5. In a muffler, the combination with a cylindrical shell forming an expansion-chamber, of end-plates provided with openings forming inlet and outlet gas passages, a second cylindrical shell forming a receiving chamber connected with one of said end-plates, and registering with the inlet gas
90 passage thereof, another end-plate connected with said second cylindrical shell having an opening affording communication between said receiving-chamber and said expansion-chamber, tie-rods for securing said shells and end-plates in their assembled
95 relation, a pressure-plate slidably supported within said expansion-chamber, and a spiral relief-spring having its coils normally compressed so as to lie in close contact with one another, said relief-spring being secured at
100 one end to said end-plate of said receiving-chamber and in alinement with the said gas-outlet of said receiving chamber and at the other end to said pressure-plate, and means connected with the outlet gas-passage of
105 said expansion-chamber for retarding the outward flow of gases therefrom.

6. In a muffler, the combination with a cylindrical shell forming an expansion-chamber, of end-plates provided with openings forming inlet and outlet gas passages, a second cylindrical shell forming a receiving chamber connected with one of said end-plates and registering with the inlet gas
115 passage thereof, another end-plate connected with said second cylindrical shell having an opening affording communication between said receiving-chamber and said expansion-chamber, tie-rods for securing said shells and end-plates in their assembled
120 relation, a pressure-plate slidably supported within said expansion-chamber, and a spiral relief-spring having its coils normally compressed so as to lie in close contact with one another, said relief-spring being secured at
125 130

one end to said end-plate of said receiving-chamber and in alinement with the said gas-outlet of said receiving chamber and at the other end to said pressure-plate, a retarding
5 spring having its coils normally compressed so as to lie in close contact with one another and arranged within said expansion-chamber in alinement with the outlet gas-passage of said expansion-chamber, and means for

supporting said retarding-spring in such 10 connection.

In testimony, that I claim the invention set forth above I have hereunto set my hand this sixth day of April, 1912.

JAMES M. SMITH.

Witnesses:

JOSEPH M. BAKER,
CHAS. A. MAGRUDER.
