W. STORRIE.

GAS ENGINE MUFFLER.

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1,382,810.

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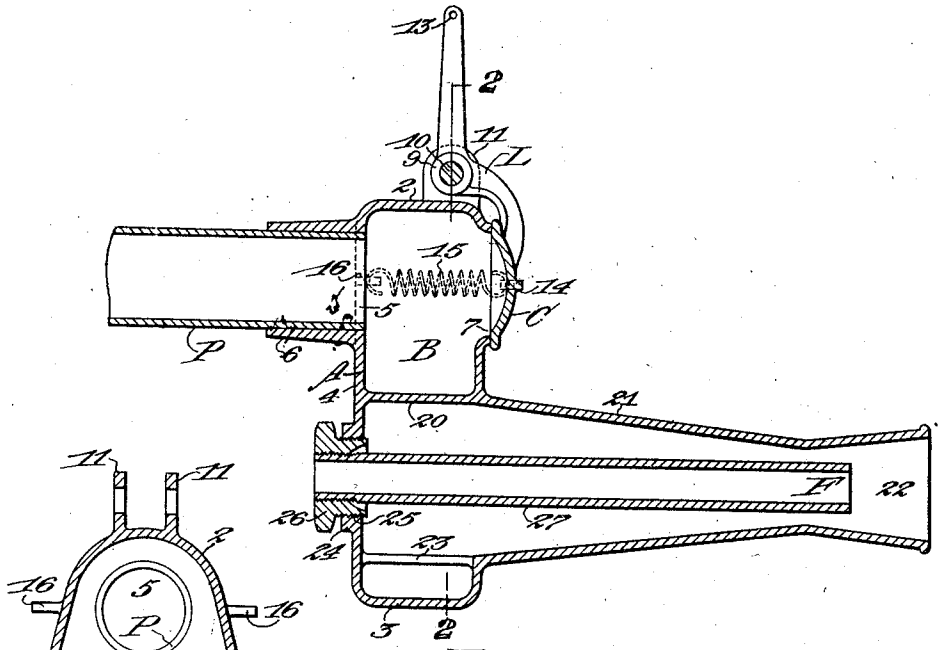

Fig. 1.

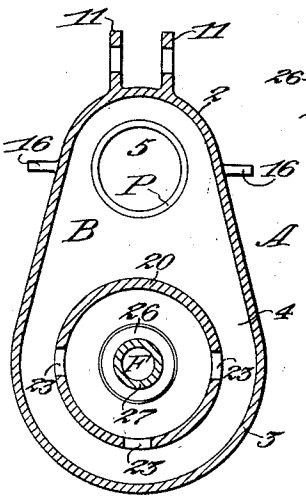

Fig. 2.

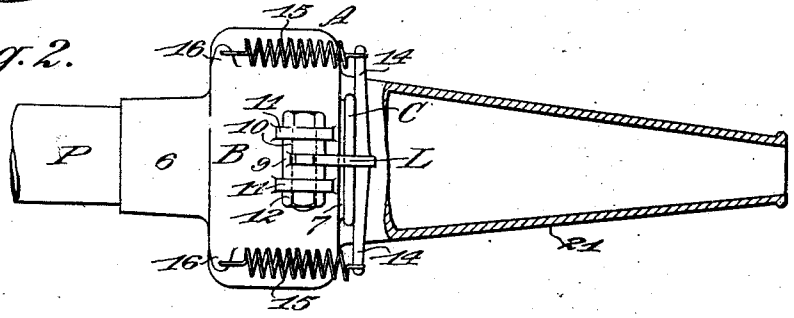

Fig. 3.

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UNITED STATES PATENT OFFICE.

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GAS-ENGINE MUFFLER.

1,382,810. Specification of Letters Patent. Patented June 28, 1921.

Application filed May 27, 1919. Serial No. 300,136.

To all whom it may concern:

Be it known that I, WILLIAM STORRIE, a subject of the King of Great Britain, residing at Providence, in the county of Providence, State of Rhode Island, have invented certain new and useful Improvements in Gas-Engine Mufflers, of which the following is a specification.

My invention is an improved muffler and cut-out for internal-combustion engines. The object of my improvement is to provide a muffler which may be cast or otherwise constructed in one piece, whereby to render it easy to manufacture at a minimum cost, and whereof to also provide a stronger and more durable structure. Another object of the improvement is to provide a cut-out on the muffler arranged directly opposite the end of the exhaust-pipe to which the muffler is connected; and further to provide an air-injector or draft-appliance to assist in expelling the exhaust-gases from the muffler whereby to prevent back-pressure therein.

The manner and means for carrying out the improvement are fully described in the following specification, illustrated by the accompanying drawings, in which like reference characters designate like parts. In the drawings:

Figure 1 is a vertical sectional view of my improved muffler taken on its longitudinal axis;

Fig. 2 is a vertical cross-section of the same taken in a plane indicated by the line 2—2 in Fig. 1; and

Fig. 3 is a plan view of a modified form of the muffler, showing it with a portion of its casing broken away.

Referring to the drawings, my improved muffler comprises a unitary casing A which may be cast in one piece from iron or other suitable metal. The main part of the casing A consists of a vertically arranged box-like expansion-chamber B having an arched top 2 and an enlarged cylindrical bottom-wall 3, see Fig. 2. The front, vertical wall 4 of the expansion-chamber B is provided at its top with an inlet-opening 5 surrounded by a cylindrical flange 6 projecting outwardly therefrom to adapt it to receive the end of the exhaust-pipe P of the engine. Directly opposite the inlet 5 is an exhaust-port 7 which serves as a cut-out to permit the discharge of the exhaust-gases from the pipe P without passing them through the lower part of the muffler.

The exhaust-port 7 is closed by a cap or cover C carried at the end of an arm or lever L. The lever L takes the form of a bell-crank having a hub 9 by which it is pivoted to the top of the casing A. As shown in Figs. 1 and 3, the lever L is pivoted on a bolt 10 passing through its hub 9 and held in vertical ears or lugs 11—11 on the casing A by means of a nut 12 screwed onto its end. The upper arm of the lever L extends vertically from the hub 9 and is provided with a hole 13 at its end, whereby it may be connected to a cord or rod operated from the driver's station to open the cut-out by swinging back the cover C. Extending horizontally from the sides of the cover C are two arms 14—14, to the ends of which are attached coiled, wire springs 15—15. The springs 15—15 are anchored at their opposite ends to lugs or ears 16—16 on the sides of the casing A, whereby to hold them under tension to maintain the cap C normally closed against the exhaust-port 7.

Within the main casing A is a cylindrical wall 20 formed concentric with the bottom wall 3 of the expansion-chamber B, in spaced relation therewith, see Fig. 2, and forming an interior passage which is extended at the rear of the muffler in a tube 21. As illustrated in Fig. 1, the tube 21 is slightly tapered, with its walls contracted near the outer end and then flared outwardly to provide an enlarged mouth or outlet 22. At its opposite end the tube 21 communicates with the combustion-chamber B of the casing A by means of inlet ports 23 cut through the interior wall 20. As illustrated in Fig. 2, there are three of these ports consisting of relatively narrow, longitudinal slits located on the bottom and sides of the cylindrical wall 20.

The structure above described constitutes in itself a complete muffler, but as an added feature of improvement I also provide a cold-air injector or draft-device which assists in cooling the gases and ejecting them from the muffler exhaust. Figs. 1 and 2 of the drawings show the cold-air injector F applied to the muffler, but in Fig. 3 it is omitted since it is not absolutely essential to

the proper working of the device. Fig. 3 shows the end of the tube 21 without the flaring mouth 22, this latter construction not being necessary when the cold air injector 27 is not used. Referring to Fig 1, the front vertical wall 4 of the casing A is formed with a hub or boss 24 arranged concentric with the cylindrical inner wall 3, and formed with a central bore 25 which is threaded to receive a plug or nipple 26. Screwed into the nipple 26 is a pipe 27 which extends rearwardly therefrom axially of the tube 21 to a point just within the flared outlet 22 thereof.

The manner of applying my improved muffler to use is as follows: The flange 6 extending from the main casing A is fitted to the end of the exhaust-pipe P, which leads from the engine, and is pinned or otherwise secured thereto to hold it in place. The cut-out lever L is then connected by a cord, wire or rod to a suitable operating device, such as a hand-lever or push-rod arranged near the driver's station of the automobile or other vehicle on which the muffler is used. With the cut-out port 7 closed by its cap C, as shown in Fig. 1, the muffler normally functions as follows: The waste gases formed by combustion within the engine cylinders are expelled therefrom through the pipe P and exhaust into the upper part of the expansion-chamber B. From this point they expand into the enlarged space at the bottom of the chamber B, and working their way around the inner wall 20, pass through the ports 23 into the outlet tube or exhaust-pipe 21. As the gases thus take a circuitous course from the inlet 5 of the muffler down through the expansion-chamber B, and thence out through the tube 21, the pressure is reduced by the cooling of the gases, and the noise from the explosions in the combustion-chambers of the engine is deadened or muffled. Hence as the gases exhaust at the rear end of the muffler tube 21 practically no pressure remains and very little sound is heard.

When the operator wishes to test the engine to determine if the several cylinders are firing properly he simply pulls the cut-out cord, or operates the lever or rod attached thereto, and the lever L will be rocked to swing the cap C away from the exhaust-port 7. The gases from the pipe P will then be allowed to exhaust directly through the port 7, without passing down through the expansion-chamber B, and thus a free vent is provided in line with the end of the exhaust-pipe P.

When the air-injector or draft-pipe F is employed with the muffler it assists in the functioning of the device in the manner as next explained: A general use for the muffler is on automobiles where it is applied to the underbody of the car adjacent the rear wheels. As the vehicle is driven rapidly over the ground it will cause a considerable draft of air through the injector-pipe F which passes longitudinally through the exhaust-tube 21. The relatively cold air entering through the front end of the pipe F and passing out at the rear maintains a continuous current which acts to reduce the temperature and velocity of the gases in the exhaust-tube 21, whereby to relieve the pressure; while the stream of air passing out through the flaring mouth 22 sets up a suction-draft which materially assists the exhaust from the muffler. In this way the device operates to relieve the pressure in the muffler and thereby assists in scavenging the burned gases from the combustion-chambers of the motor.

It is to be observed that my improved design for the muffler casing allows for its manufacture as a unitary structure, cast in one piece; thus avoiding fitting and bolting or otherwise securing its parts together. Furthermore, I am also enabled to provide a more rigid, stronger and durable structure by eliminating the end-flanges and sheet-metal casings usually employed, while adapting the device for manufacture at a minimum cost. In addition, the direct cut-out arrangement gives a better vent for the exhaust when it is required to test the engine; and the air-injector or draft-pipe device provides for a more thorough scavenging of the engine and muffler while preventing the danger of back-pressure and back-firing of unexploded mixtures.

Various modifications might be made in the structure and arrangement of the parts of the device without departing from the spirit or scope of the invention, therefore, without limiting myself to the exact embodiment herein shown, what I claim is:

1. In a muffler for gas-engines, the combination of a one-piece casing comprising a vertically arranged expansion-chamber adapted for attachment to the exhaust-pipe of the engine, and an interior compartment having cylindrical walls arranged in spaced relation to the walls of the expansion-chamber and extended at a distance beyond the vertical rear wall thereof to provide a discharge-tube, the walls of said compartment being formed with inlet-ports communicating with the interior of the expansion-chamber.

2. In a muffler for gas-engines, the combination of a one-piece casing comprising a vertically arranged box-like expansion-chamber having a flanged inlet on its forward side adapted to receive the end of the exhaust-pipe of the engine and a cut-out port on its rearward side arranged opposite and directly in line with said inlet, a hinged cover for closing the cut-out port, and a discharge pipe formed integral with the

expansion-chamber and extending through the rear wall thereof below the inlet to provide an interior compartment with inlet ports in its walls communicating with the interior of the expansion-chamber.

3. In a muffler for gas-engines, the combination of a one-piece casing comprising a vertically-extending expansion-chamber having an arched top and a cylindrical bottom wall and with an inlet-opening adapted to receive the exhaust-pipe of the engine, and an inner compartment having cylindrical walls arranged concentric with the bottom wall of the expansion-chamber in spaced relation thereto and extended rearwardly beyond the side of the expansion-chamber to form a discharge-tube, said inner compartment communicating with the interior of the expansion-chamber by means of restricted inlet-ports in its walls.

4. In a muffler for gas-engines, the combination of a one-piece casing having a vertically arranged box-like expansion-chamber provided with an inlet-port on its front side and a cut-out port arranged directly opposite thereto on its rearward side, a bell-crank lever hinged to the top of the casing and carrying a cap adapted to close the cut-out port, resilient means for maintaining said cap normally in closed position, and a cylindrical discharge-tube arranged below the inlet extending through the rear wall of the expansion-chamber and forming an inner compartment communicating with its interior through restricted inlet-ports.

5. In a muffler for gas-engines, the combination of a one-piece casing comprising a relatively narrow box-like expansion-chamber having vertical front and rear walls, an arched top and an enlarged cylindrical bottom, with a flanged inlet opening on the front side of the chamber and a cut-out port in the rearward side directly opposite the inlet, and an integral discharge-tube arranged below the inlet extending rearwardly from the expansion-chamber and intersecting the rear wall thereof to provide an interior compartment having spaced inlet ports on its sides.

6. In a muffler for gas-engines, the combination with a casing comprising a box-like expansion-chamber having an inlet-opening at its upper end and a discharge-tube projecting rearwardly from its lower end and flared outwardly at its outlet, the forward end of the discharge-tube being extended into the interior of the expansion-chamber and communicating therewith through restricted inlet-ports, and a cold-air injector-pipe secured in an opening in the front wall of the expansion-chamber and extending axially within the discharge-tube with its rearward end opening into the flared outlet thereof.

In testimony whereof I affix my signature.

WILLIAM STORRIE.