

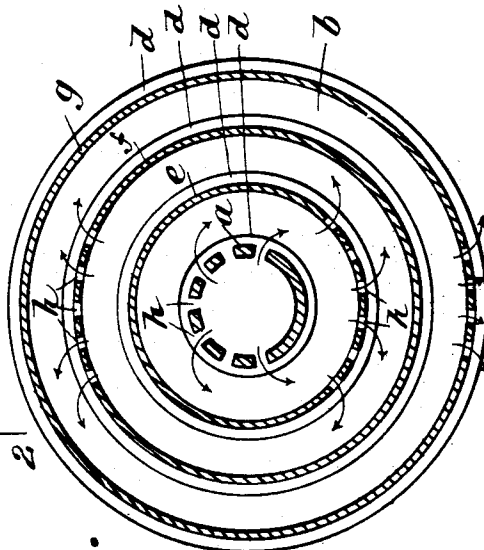
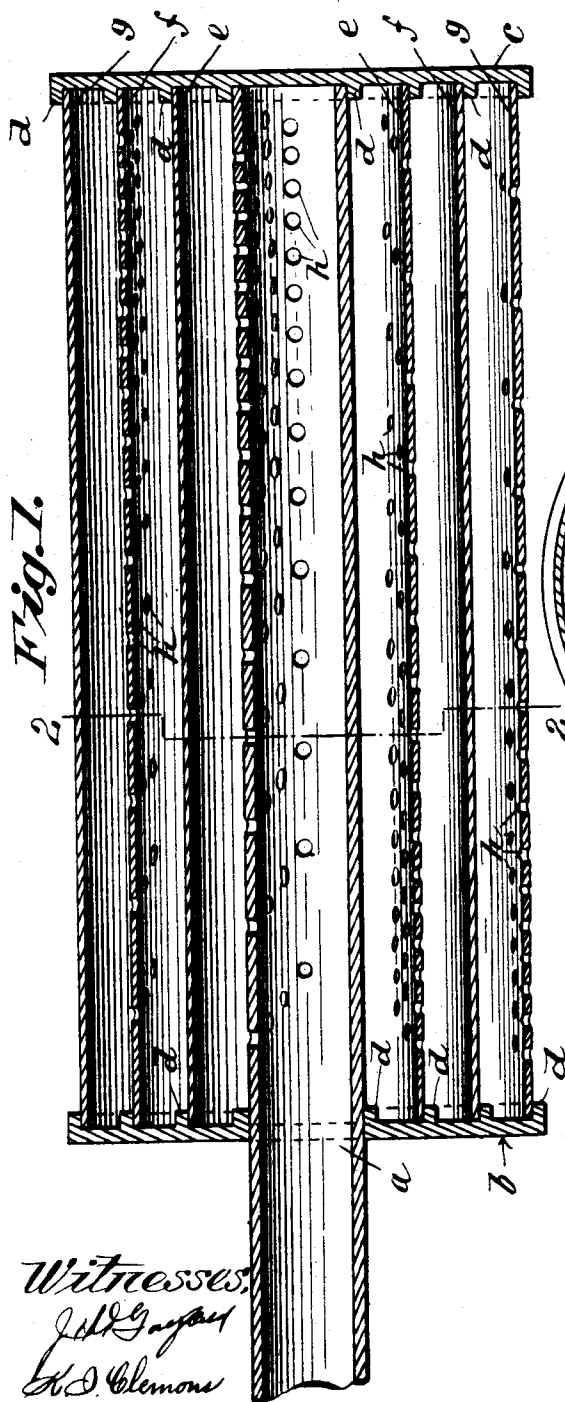
No. 681,522.

Patented Aug. 27, 1901.

A. O. VERY.
MUFFLING DEVICE.

(Application filed Jan. 25, 1901.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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MUFFLING DEVICE.

SPECIFICATION forming part of Letters Patent No. 681,522, dated August 27, 1901.

Application filed January 25, 1901. Serial No. 44,663. (No model.)

To all whom it may concern:

Be it known that I, ALPHA O. VERY, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Muffling Devices, of which the following is a specification.

This invention relates to devices for muffling the exhaust from various kinds of motors; and the object of the invention is to produce a muffler for this purpose in which the noise of the exhaust may be stifled and in which the pressure of the exhaust gases or vapors may be dissipated with a minimum resulting amount of back pressure; and the invention consists in a construction whose novel features will be fully described in the following specification and set forth in the claims forming part thereof.

The construction is particularly well adapted to internal-explosion engines.

In the drawings forming part of this specification, Figure 1 is a longitudinal sectional view of a muffler constructed according to my invention; and Fig. 2 is a transverse section on line 2 2, Fig. 1.

In the drawings the diameter of the perforations is somewhat exaggerated for the sake of more clearly illustrating the invention, and the same exaggeration may be found in the thickness of the various cylinders going to make up the construction.

Referring to the drawings, *a* indicates the end of the exhaust-pipe of a motor. On this pipe are supported two cylindrical heads *b* and *c*, the first one being bored out to slide onto said pipe and the other to fit over and close the end thereof, these heads being provided with annular concentric flanges *d* on the inner surfaces thereof, which flanges are equally spaced from the center outward, the inner one serving as means for securing the heads to the exhaust-pipe. To the other flanges there are respectively secured by each end the cylinders *e*, *f*, and *g*, cylindrical in form and made of one sheet. The manner of securing the heads *b* and *c* to the exhaust-pipe *a* or the cylinders to the head is immaterial. Preferably they are brazed.

This construction of muffler devices, comprising a series of nested cylinders concentrically arranged on an exhaust-pipe and providing a tortuous passage from said pipe around the walls of the cylinders in various

ways, is not new. (See, for example, the patent to Charles E. and James Frank Duryea, dated August 10, 1897, No. 588,103.) In practice, however, I have found there is a wide difference in the efficacy of mufflers of this type in respect of the suppression of noise of the explosion and of the amount of back pressure on the motor, this difference being due to the different methods used for conducting the exhaust-gases to their final point of exit from the muffler. As a result of study and experimentation I have found that a muffler constructed as below described more efficiently dissipates the exhaust-gases from the motor without noise and practically without back pressure.

In carrying my invention into practice the exhaust-pipe *a* is pierced with a number of holes *h*, preferably distributed along one side thereof—as, for instance, the top of the exhaust-pipe *a*. (Shown in Fig. 1.) These holes in the cylinder *e* are distributed along the bottom side of said cylinder. Therefore exhaust-gas from the pipe *a*, issuing from the holes *h*, bored therethrough along its upper side, must pass to the holes in the cylinder *e* in a spiral course. The gases issuing from the cylinder *e* first encounter the dead wall of the cylinder *f*, and they in turn must pursue a spiral course to reach the outlet in the opposite side of the cylinder *f*. Issuing from thence in the same manner they reach the perforations at the bottom of the cylinder *g*, through which they escape to the open air. It will be observed by a glance at the drawings that these perforations possess two characteristics. Starting with the exhaust-pipe *a* it will be seen that the perforations *h* therein are fewer in number at the end of the pipe toward the motor and that the number of these perforations increases as the closed end of the pipe is approached. Observing now the cylinders *e*, *f*, and *g*, respectively, it will be seen that the perforations *h* in the cylinder *e* are fewer in number than the perforations in the exhaust-pipe *a*, and, furthermore, that these perforations are arranged like those in the exhaust-pipe—fewer at one end of the cylinder than at the other—and that end of the cylinder containing the smaller number of perforations lies under that end of the exhaust-pipe containing the greatest number. The same relative arrangement is found in the cylinders *f* and *g* of the holes *h*

as exists in the exhaust-pipe and the cylinder *e*; but from the exhaust-pipe, successively, to the cylinders *e*, *f*, and *g* the combined area of the holes *h* through the cylinders progressively decreases, and the smallest area of these holes in any one cylinder will be found opposite the largest area thereof in the cylinder inside of it, assuming the exhaust-pipe *a* also to be one of the exhaust-cylinders. It is, in effect, the central one of the nested cylinders, one of its ends being open to receive the exhaust from the engine. It will be observed that there are two points of novelty in this arrangement. One is the decreasing area of the holes *h* from one end of the construction toward the other in the various cylinders, which decrease is substantially in proportion to the reduction of the volume of the gas by condensation, the other point being that these exhaust-holes *h*, which extend along one side of one cylinder and along the opposite side of the next, are so arranged that the greatest area of the holes *h* in the inner cylinder shall lie opposite the smallest area of these holes in the next outer cylinder, and so on. In operation the result of this construction is that as a volume of gas enters the pipe *a* and moves from the end of the muffler next to the motor toward the opposite end it finds freer and freer vent as it moves along, and the extent or area of the openings in the pipe *a*, progressively increasing as they do, prevents any accumulation of pressure at one end of the pipe. As the volume of gas clears itself from the pipe *a*, filling the cylinder *e*, the tendency thereof will be toward the opposite end and the opposite side of the cylinder *e*, where the area of the holes *h* is the greatest. The greatest volume of gas, however, will be found in the right-hand end of the cylinder *e*, opposite the greatest area of holes in the pipe *a*, and as the volume moves toward the opposite end of the cylinder *e* it finds a progressively-increasing area of the exhaust, and emerging from the cylinder *e* the operation is repeated in respect of cylinders *f* and *g*. Thus it is seen that the accumulation of pressure at any given point in the course of the gas through the muffler is obviated; but, on the contrary, the arrangement of the exhaust area tends to constantly and progressively reduce the pressure of the gases and, coincidentally, to reduce the total area of exhaust-opening in proportion to the reduction in the volume of the gas by condensation. Furthermore, the alternate arrangement of the exhaust-openings *h* in the various cylinders on the top and bottom thereof brings the gases into contact with as large an area of the cylinders as possible, whereby to a greater or less extent their volume is reduced by condensation.

In the type of mufflers referred to above and illustrated in the patent referred to, where the exhaust-openings are made only at alternate ends of the cylinders, the exhaust is reduced by a series of diminishing puffs as the gas passes from one cylinder to another,

which is just the opposite of the effect sought to be produced by the herein-described construction, in which the increasing area of exhaust-opening, following the direction of movement of the gases, combined with the constantly increasing size of the cylinders, prevents any accumulation of pressure in the latter, and consequently eliminates all noise of the exhaust.

While it is advantageous to locate the exhaust-openings in the various cylinders at opposite sides thereof, it is not essential to the operation of the device.

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

1. An exhaust-muffler comprising a plurality of nested concentric cylinders, heads in which the ends of the cylinders are supported, an opening through one of said heads for the admission of exhaust-gases to the innermost cylinder, and a series of exhaust-openings through the walls of the cylinders, the area of said exhaust-openings in each cylinder-wall decreasing progressively from the inner to the outer cylinder, substantially as described.

2. An exhaust-muffler comprising a plurality of nested concentric cylinders, heads in which the ends of the cylinders are supported, an opening through one of said heads for the admission of exhaust-gases to the innermost cylinder, and a series of exhaust-openings through the walls of the cylinders, the area of exhaust-opening in each cylinder increasing from one end of the cylinder to the other in the direction of movement of the exhaust-gases, whereby the greatest area in one cylinder will be opposite the smallest area in the next, substantially as described.

3. An exhaust-muffler comprising a plurality of nested concentric cylinders, heads in which the ends of the cylinders are supported, an opening through one of said heads for the admission of exhaust-gases to the innermost cylinder, and a series of exhaust-openings through the walls of the cylinders, the area of exhaust-opening in each cylinder increasing from one end of the cylinder to the other in the direction of movement of the exhaust-gases, and the total exhaust area of the cylinders decreasing progressively from the central cylinder to the outermost cylinder, substantially as described.

4. In an exhaust-muffler, a plurality of contiguous chambers, exhaust-openings in the walls of the latter whose area increases in the direction of movement of the exhaust, the total area of said opening in each chamber decreasing also in the direction of movement of the exhaust, and an opening in one of said chambers for the admission of the exhaust, substantially as described.

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