

H. R. SELDEN.
EXHAUST MUFFLER.
APPLICATION FILED NOV. 16, 1904.

2 SHEETS--SHEET 1.

Fig. 1.

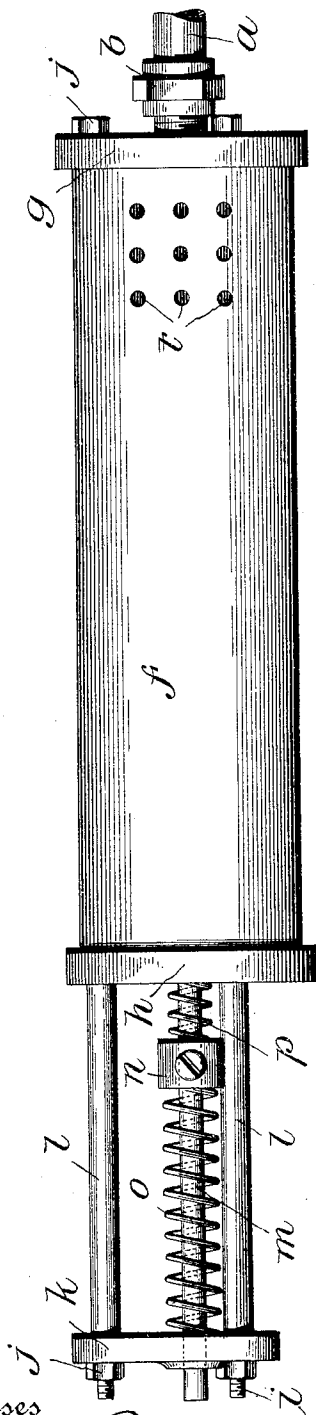
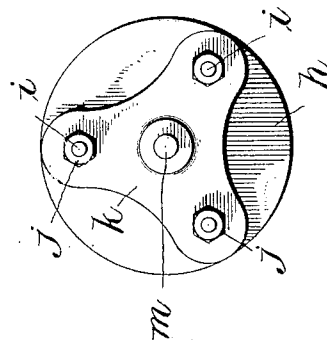


Fig. 2.



Witnesses

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2 SHEETS—SHEET 2.

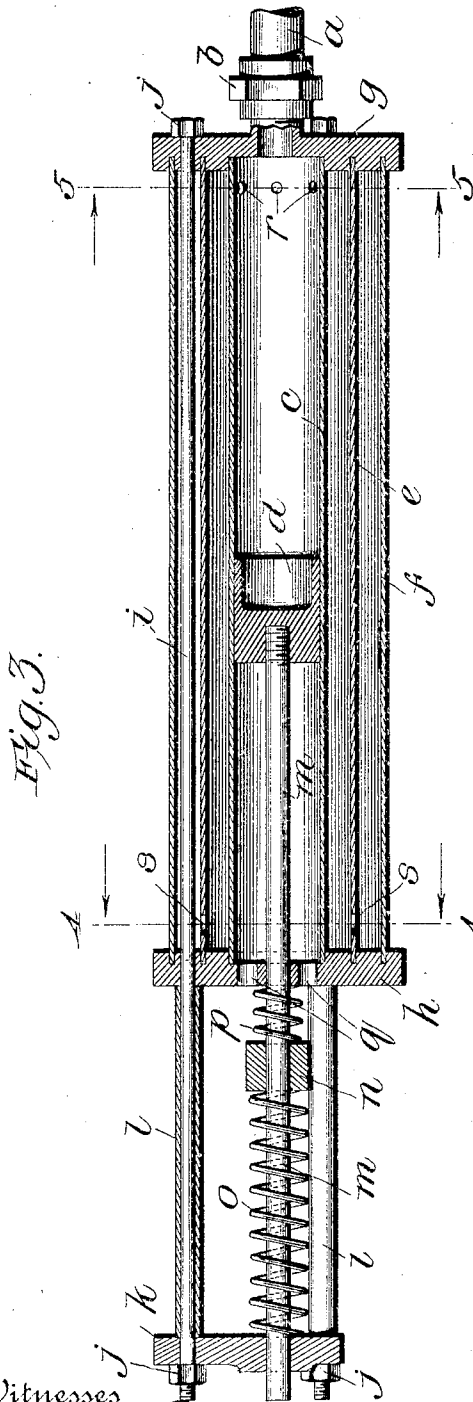


Fig. 3.

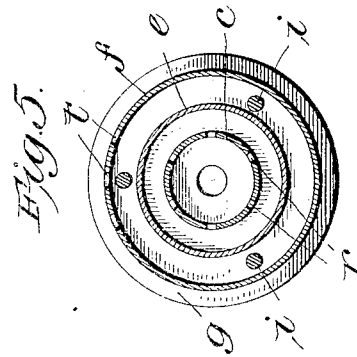


Fig. 5.

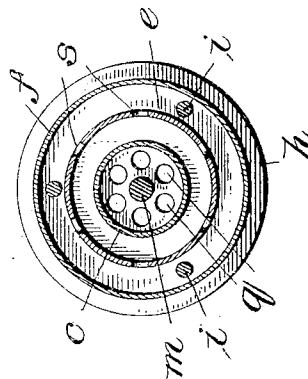


Fig. 4.

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UNITED STATES PATENT OFFICE.

HENRY R. SELDEN, OF ROCHESTER, NEW YORK.

EXHAUST-MUFFLER.

No. 807,322.

Specification of Letters Patent.

Patented Dec. 12, 1905.

Application filed November 16, 1904. Serial No. 233,034.

To all whom it may concern:

Be it known that I, HENRY R. SELDEN, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Exhaust-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.

My invention relates to improvements in exhaust-mufflers, and is especially designed for use in connection with internal-combustion engines, a common type of which is the gasoline-automobile; but it is not restricted to such use.

The object of my invention is to provide a device whereby the exhaust from an internal-combustion engine shall be muffled, cooled, and expanded, the noise of the exhaust being done away with entirely.

With this object in view my invention consists in the construction and combinations of parts as hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side view of my improved muffler. Fig. 2 is an end view of the same, taken from the lower end. Fig. 3 is a longitudinal section of the same. Fig. 4 is a cross-section thereof, taken on the line 4 4 of Fig. 3 looking in the direction of the arrows; and Fig. 5 is a cross-section on the line 5 5 of Fig. 3 looking in the direction of the arrows.

a represents the exhaust-pipe of an internal-combustion engine, and *b* the coupling which connects this exhaust-pipe with the muffler. This muffler consists of a plurality of concentric cylinders, although I do not restrict myself to this particular shape. The exhaust-pipe *a* delivers directly into the inner cylinder *c*, in which is mounted a piston *d*, which moves freely therein. This piston is normally at about the center of the cylinder, as shown in Fig. 3. Surrounding the tube or cylinder *c* is another cylinder *e*, and surrounding the cylinder *e* is another cylinder *f*. I have shown in the drawings three of these cylinders, but any number may be used. I have also shown them as concentric; but this arrangement is not necessary, it only being necessary that the inner one should exhaust into the next one.

The cylinders *c*, *e*, and *f* are supported at their ends in two heads *g* and *h*, provided with flanges, within or around which said tubes fit. Tie-rods *i*, of which any suitable

number may be used and which are provided with securing-nuts *j* at or near their ends, are used to hold the parts in their proper relative position. These tie-rods pass through a head *h*, which is supported at a distance from the head *g* by means of sleeves *l* passing around the tie-rods *i*. Through the heads *h* and *g* freely passes the piston-rod *m*, which is fastened to the piston *d*. This piston-rod is provided with a collar *n*, fastened thereto, and spiral springs *o* and *p* surround said rod between said collar *n* and said heads *h* and *g*, respectively. The head *h* is provided with perforations *q*, communicating with the outside air, which perforations are located immediately below the open end of the cylinder *c*, so that the piston *d* may freely travel in said cylinder without creating any air-pressure below it, which would restrict the movement of the piston.

The cylinder *c* is provided with a series of exhaust-holes *r*, whereby the gases from the engine pass from the inner cylinder *c* into the next cylinder *e*. These exhaust-holes are preferably located near the inlet end of said cylinder and in any case must not, of course, be covered up by the piston *d*. The cylinder *e* is also provided with a series of similar exhaust perforations *s*, which are preferably located near the opposite or lower end of said cylinder, so that the burned gases have to pass between these two cylinders before they can escape from the cylinder *e* into the space between said cylinder *e* and the outer cylinder *f*. This outer cylinder *f* is provided with a series of perforations *t*, through which the burned gases escape into the atmosphere.

The operation is as follows: The burned gases are forced under pressure and with a rush into the cylinder *c*, carrying back the piston *d* to the left from the position shown in Fig. 1 and compressing the spring *o*. As the piston *d* moves the gases become expanded, and therefore cooled, and they immediately begin to escape through the perforations *r*, which action is aided by the expansive force of the spring *o*, which has been compressed and which gradually forces the piston *d* back to its normal position, as shown in Fig. 3, the spring *p* serving merely as a cushion. The gases then pass through the space between the cylinders *c* and *e*, out through the holes *s* in the cylinder *e*, down through the space between the cylinders *e* and *f*, and out through the perforations *t*, whence they emerge into the air quietly without shock and consequent

noise and very much cooler than when they were delivered into the muffler. The cushion effect of the spring *o*, together with the tortuous passage through which the gases are forced to travel, has the effect of completely muffling the exhaust, with the additional advantage of cooling it at the same time. The gases as they come into the cylinder *c* come in with a rush, and their first effect is to move the piston *d*, compressing the spring *o*. Besides the cooling effect referred to, this lessens the shock, inasmuch as the escape of gas through the holes *r* is comparatively small at first, and all the shock is practically taken up by the spring *o*. The escape of gas goes on with a gradually-increasing velocity for a time as the spring expands, and then gradually decreases again, thus entirely obviating the atmospheric disturbance incident to the ordinary unmuffled exhaust.

While I have described my invention in the preferred form as including a series of concentric cylinders, I do not wish to limit myself to this construction. Indeed, the device would work if only one cylinder were employed. For example, the cylinders *e* and *f* might be omitted entirely and good results still be obtained. The essential feature of the invention is the reception of the blow or shock of the exhaust by a spring-controlled piston, whereby said shock is taken up by the spring, the gases allowed to become expanded and thereby cooled, and then gradually and quietly delivered into the air.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an exhaust-muffler, the combination of a casing into which the exhaust is delivered and which is always open to receive the exhaust, and spring-operated means fitting in said casing, to receive the force of the exhaust and to allow the burned gases to expand, said casing being provided with means whereby the burned gases may escape therefrom, substantially as described.

2. In an exhaust-muffler, the combination of a casing into which the exhaust is delivered, and a spring-controlled piston movably located in said casing, said casing being provided with means for allowing the burned gases to escape therefrom, substantially as described.

3. In an exhaust-muffler, the combination of a cylinder provided with outlet-ports, one end of said cylinder being open to the atmosphere and the other end connected with the exhaust-pipe, a piston freely movable in said cylinder, a piston-rod connected to said piston, and a spring supported by said rod, substantially as described.

4. In an exhaust-muffler, the combination of a casing into which the burned gases are delivered, spring-controlled means located in said

casing for receiving the shock of the exhaust, and a plurality of receptacles into which the burned gases are successively delivered from said casing, substantially as described.

5. In an exhaust-muffler, the combination of a cylinder provided with outlet-ports, one end of said cylinder being open to the air and the other connected to the exhaust-pipe of the engine, a piston freely movable in said cylinder, a piston-rod fastened to said piston, a spring supported by said piston-rod, and a plurality of receptacles into which the gases successively pass after leaving said cylinder, substantially as described.

6. In an exhaust-muffler, the combination of a series of concentric cylinders each provided with exhaust-ports, whereby communication is established between said cylinders, one of said cylinders being connected to the exhaust-pipe of an engine, and a spring-controlled piston located in one of said cylinders and freely movable therein, substantially as described.

7. In an exhaust-muffler, the combination of a plurality of concentric cylinders each provided with a series of outlet-ports, the inner cylinder having one end open to the air, and the other end connected with the exhaust-pipe of an engine, a piston freely movable in said inner cylinder, a piston-rod connected to said piston, and a spring surrounding said rod, substantially as described.

8. In an exhaust-muffler, the combination of a plurality of concentric cylinders each provided with a series of exhaust-ports, said exhaust-ports being located near the opposite ends of said cylinders respectively, one end of the innermost cylinder being open to the air, and the other end connected to the exhaust-pipe of an engine, a piston freely movable in said innermost cylinder, a piston-rod connected to said piston, and a spring supported on said piston-rod, substantially as described.

9. In an exhaust-muffler, the combination of a plurality of concentrically-arranged cylinders each provided with outlet-ports, flanged heads supporting said cylinders, a piston freely movable in the innermost cylinder, a piston-rod fastened to said piston, a third head supported at a distance from one of said heads, tie-rods passing through all three of said heads, thimbles keeping two of said heads at the proper distance apart, said piston-rod passing through two of said heads, a collar on said piston-rod, and springs mounted one on each side of said collar, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY R. SELDEN.

Witnesses:

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