

M. CRAWFORD.
EXHAUST SILENCER.

APPLICATION FILED DEC. 3, 1901.

NO MODEL.

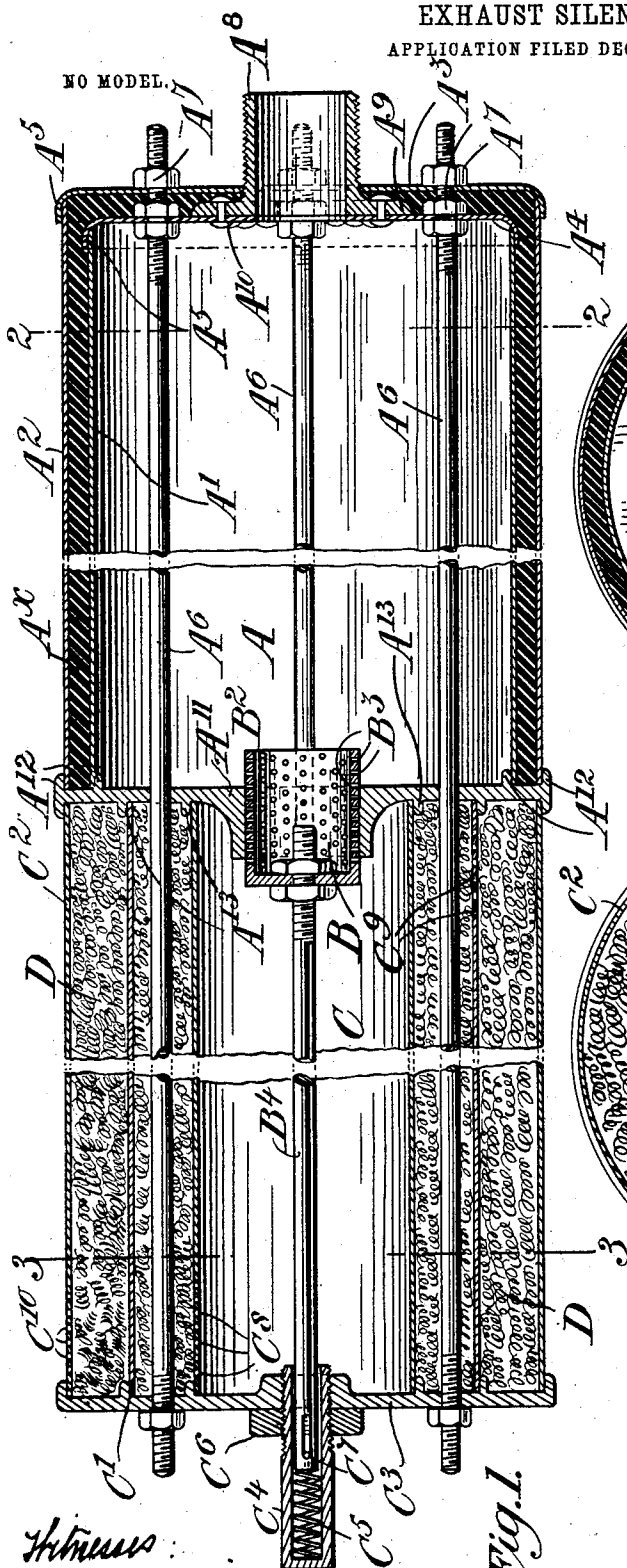


Fig. 1.

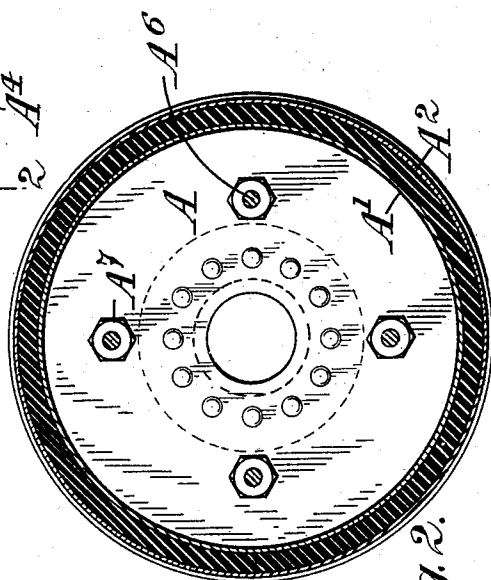


Fig. 2.

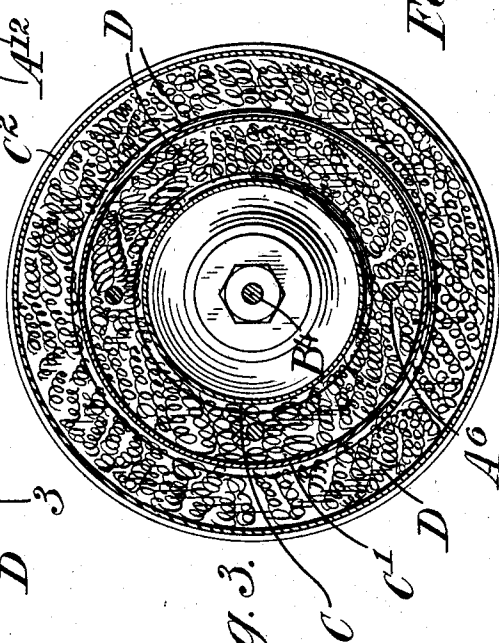


Fig. 3.

Witness:
H. E. Manning
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Inventor:
Middletown Crawford,
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UNITED STATES PATENT OFFICE.

MIDDLETON CRAWFORD, OF LONDON, ENGLAND, ASSIGNOR TO SILENT MOTOR CAR SYNDICATE, LIMITED, OF LONDON, ENGLAND.

EXHAUST-SILENCER.

SPECIFICATION forming part of Letters Patent No. 722,567, dated March 10, 1903.

Application filed December 3, 1901. Serial No. 84,569. (No model.)

To all whom it may concern:

Be it known that I, MIDDLETON CRAWFORD, a subject of the King of England, residing at London, England, have invented certain new and useful Improvements in or Relating to Exhaust-Silencers, (for which I have made application for Letters Patent in Great Britain under No. 9,452, dated May 7, 1901,) of which the following is a specification.

This invention relates to the silencing of the exhaust of engines, and refers more particularly to internal-combustion engines, because with such engines not only is a silencing of the noise of the exhaust obtained, but a scavenging action is produced in the cylinder, which in such engines is of the greatest importance.

According to this invention I employ any desired number of chambers or compartments to which the exhaust-gases from the cylinder are admitted, and these chambers or compartments may be arranged successively as entirely separate vessels connected together by suitable conduits or pipes or they may be arranged concentrically or otherwise combined to suit requirements.

An important feature of the invention is the employment of an automatic non-return valve, which may be placed in any portion of the exhaust system; but where the chambers are arranged successively or in series I prefer to place the valve between two of them, either in the pipes between the chambers or at the end of one chamber, so as to control the passage of the exhaust-gases into the next.

Referring to the drawings, Figure 1 is a longitudinal section, Fig. 2 a transverse section on the line 2 2, and Fig. 3 a transverse section on the line 3 3, showing the preferred form of an exhaust-silencer constructed in accordance with this invention.

A is the expansion-chamber or chamber into which the gases pass from the cylinder and in which they expand. The chamber is provided with inner walls A' and outer walls A², the space between the walls being filled with asbestos A^x or otherwise dealt with, so as to minimize or deaden the noise usually produced in exhaust-silencers. Although I

prefer to employ double walls, it is obvious that the same result may be obtained by merely lagging or lapping the walls of the chamber with some substance which tends to minimize or entirely obviate vibration.

End or cover plates A³ A⁴ are provided at one end of the chamber and formed at their outer edges with annular flanges A⁵, which engage the ends of the inner and outer walls to form a tight joint. These plates are secured in position by bolts A⁶, which pass longitudinally through the chamber and are secured firmly in position by nuts A⁷, screwed onto the ends of the bolts. An inlet-pipe A⁸ is secured to the inner end plate A⁴ by studs A¹⁰, which pass through flanges A⁹ on the end of the pipe.

From the chamber A exhaust-gases pass by an opening formed in the end plate A¹¹ of the chamber, the plate being provided with annular flanges A¹² to receive the ends of the double walls of the chamber between them to form a tight joint. The cylindrical valve B is situated in the opening and has its inner end B² open, or it may be provided with perforations through which the gases pass into the interior of the valve. Openings B³ are provided in the walls of the valve to permit the gases to pass into the inner compartment or chamber C or a series of compartments C C' C², arranged concentrically. Annular spaces are left between the walls of the compartments for the passage of the exhaust-gases. In order to break up the gases into fine streams and prevent vibration of the walls of the chamber from being communicated to the atmosphere, the annular spaces are packed, preferably, with steel shavings D, or other suitable material may be employed for this purpose.

The end plate A¹¹ of the chamber A forms the end plate of the concentric compartments at one end and is provided with annular flanges A¹³, which act as centering-pieces to retain the concentric compartments in position. The other end of the concentric compartments is closed by a plate C³, which is provided with concentric annular flanges similar to those on the plate A¹¹. The bolts A⁶ pass longitudinally through one of the concentric

chambers and through the end plate C³ and are provided at their ends with nuts to secure the end plate in position.

The valve-spindle B⁴ is extended through
5 an opening in the end plate C³, in which an adjustable sleeve C⁴, having a closed outer end, is screwed. Between the end of the sleeve and the end of the spindle is placed a spring C⁵, the tension of which can be regulated, and
10 thereby the pressure necessary to move the valve, by rotating the sleeve. A jam-nut or collar C⁶ is provided on the sleeve, and in order to prevent the spindle rotating independently of the sleeve and to support the
15 spindle a pin C⁷ is passed through the walls of the sleeve and through a slot in the spindle.

The gases pass with considerable force and rapidity, and immediately upon their escape
20 the spring closes the non-return valve, causing a partial vacuum to be left in the first silencer or system of pipes between the valve and the cylinder, which has the effect of withdrawing from the cylinder that portion of the
25 burned products which usually remains. The consequence of this is that the charge next sucked in by the engine is almost if not quite entirely composed of combustible gases, whereby the strength of the engine is materially
30 increased.

The valve-spindle may be provided with a screw portion, on which nuts or collars may be mounted, and a helical spring may be placed between the collars and the end cover
35 C³. In addition to this spring a buffer-spring may be provided and arranged between the end of the casing and a collar on the spindle. After traversing the compartment C the gases pass by openings C⁸ into the annular space
40 between the walls of the inner concentric compartment and the next one, and after passing along this space enter by openings C⁹ the annular space between the walls of the second and third concentric compartments.
45 The gases after traversing this annular space escape by openings C¹⁰ to the atmosphere.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an exhaust-silencer, the combination
50 of an expansion-chamber, a conduit between the chamber and the engine-cylinder, a series of concentric compartments through which the gases pass successively from the expansion-chamber to the atmosphere and a
55 non-return valve placed between the expansion-chamber and the compartments substantially as set forth.

2. In an exhaust-silencer, the combination of an expansion-chamber having double walls,
60 of a series of concentric compartments communicating with each other, an end plate for the contiguous ends of the chamber and compartments, a non-return valve in said end plate and plates or covers for the other end
65 of the chamber and compartments.

3. In an exhaust-silencer, the combination of an expansion-chamber having double walls,

a series of concentric compartments, communicating with each other, an end plate for the contiguous ends of the chamber and compartments, an automatic non-return valve in said
70 end plate, end plates or covers for the other ends of the chamber and compartments, and bolts and nuts securing the end plates in position.
75

4. In an exhaust-silencer, the combination of an expansion-chamber having double walls, an inlet-pipe to the chamber, a series of concentric compartments communicating with each other, an end plate for the contiguous
80 ends of the chamber and compartments, annular flanges on each side of said plate, an automatic non-return valve in said end plate, end plates or covers for the other ends of the chamber and compartments, and bolts and
85 nuts securing the end plates together.

5. In an exhaust-silencer the combination of an expansion-chamber having double walls, packing between the walls of the chamber, a series of concentric compartments communicating with each other, an end plate for the
90 contiguous ends of the chamber and compartments, an automatic non-return valve in the plate, end plates or covers for the other ends of the chamber and compartments, bolts and
95 nuts securing the end plates together substantially as set forth.

6. In an exhaust-silencer the combination of an expansion-chamber having double walls, packing between the walls of the chamber, a
100 series of concentric compartments communicating with each other, and having annular spaces between them through which the gases pass in a zigzag manner an end plate for the contiguous ends of the chamber and compartments, a non-return valve in the plate, end plates or covers for the other ends of the
105 chamber and compartments, bolts and nuts securing the end plates together, substantially as set forth.
110

7. In an exhaust-silencer the combination of an expansion-chamber having double walls, packing between the walls of the chamber, a series of concentric compartments communicating with each other, and having annular
115 spaces between them, an end plate for the contiguous ends of the chamber and compartments, a non-return valve in the plate, end plates or covers for the other ends of the chamber and compartments, annular flanges
120 on the plates, bolts and nuts securing the end plates together, substantially as set forth.

8. In an exhaust-silencer the combination of an expansion-chamber having double walls, packing between the walls of the chamber, a
125 series of concentric compartments communicating with each other and the inner of which communicates with the expansion-chamber and the outer with the atmosphere, means for splitting up the exhaust-gases into broken
130 streams when passing along the annular spaces between the concentric compartments, an end plate for the contiguous ends of the chamber and compartments, a non-return

valve in the end plate, end plates or covers for the other ends of the chamber and compartments and bolts and nuts securing the end plates together substantially as set forth.

5 9. In an exhaust-silencer the combination of an expansion-chamber having double walls, packing between the walls of the chamber, a series of concentric compartments communicating with each other and the inner of which
10 communicates with the expansion-chamber and the outer with the atmosphere, metal shavings in the annular spaces between the concentric compartments, an end plate for the contiguous end of the chamber and compartments, a non-return valve in the end
15 plate, end plates or covers for the other ends of the chamber and compartments and bolts and nuts securing the end plates together substantially as set forth.

20 10. In an exhaust-silencer the combination with the expansion-chamber, the concentric compartments, the plate between the chamber and the compartments, of a cylindrical valve adapted to slide in an opening in the
25 plate and provided with openings in one end

and around its periphery a valve-spindle connected to the valve, a spring for the valve-spindle and means for regulating the tension of the spring substantially as set forth.

11. In an exhaust-silencer the combination 30 with the expansion-chamber, the concentric compartments, the plate between the chamber and the compartments, of a cylindrical valve adapted to slide in an opening in the plate and provided with openings in one end 35 and around its periphery, a valve-spindle connected to the valve, an adjustable sleeve in which the end of the valve-spindle slides, a spring situated between the end of the valve-spindle and the end of the sleeve and means 40 for regulating the tension of the spring substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MIDDLETON CRAWFORD.

Witnesses:

HARRY S. BRIDGES,
WM. J. DOW.