April 9, 1940. R. L. HOYLE 2,196,920

EXHAUST SILENCING AND SPARK ARRESTING DEVICE

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Fig. 1

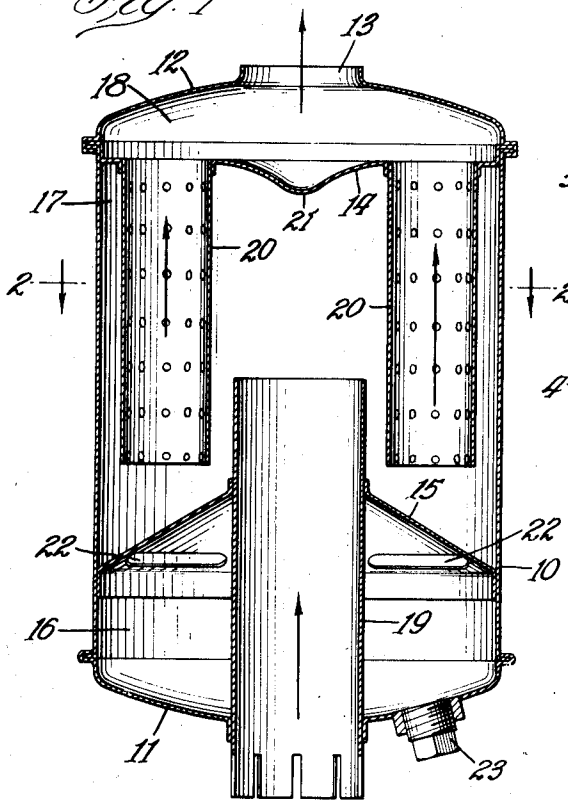
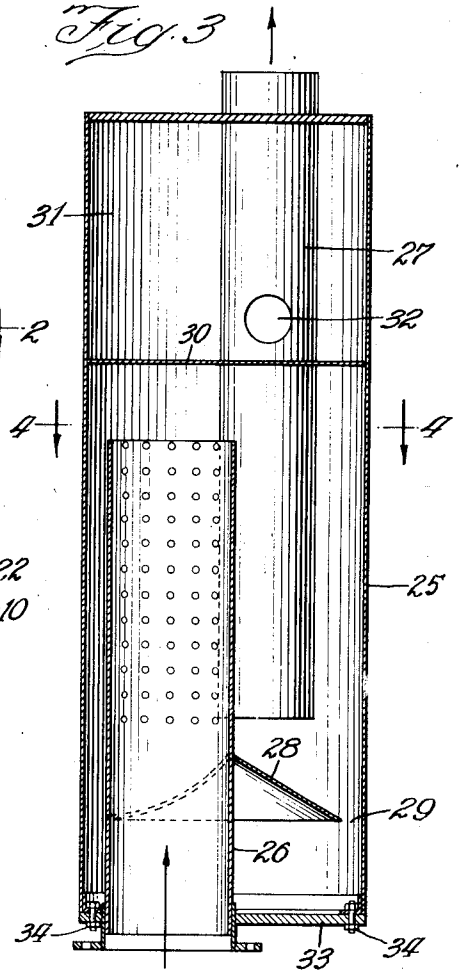


Fig. 3



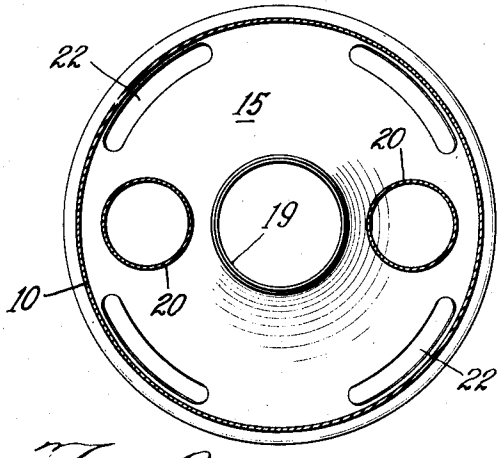
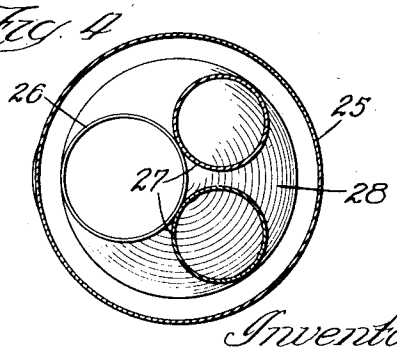


Fig. 2

Fig. 4



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EXHAUST SILENCING AND SPARK ARRESTING DEVICE

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Fig. 5

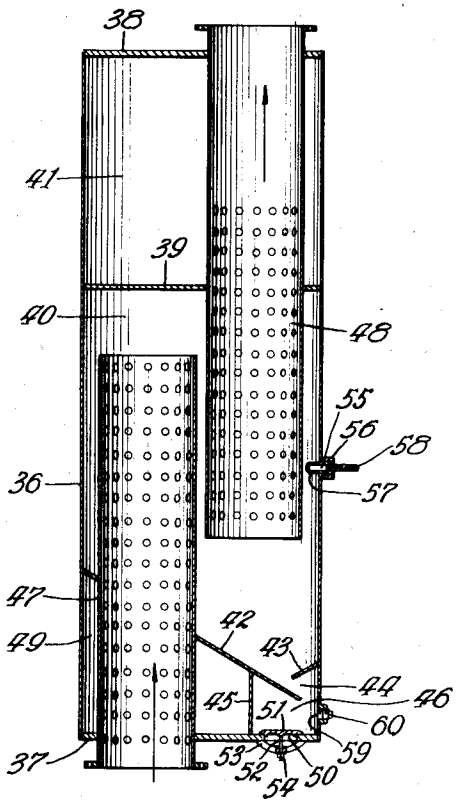


Fig. 6

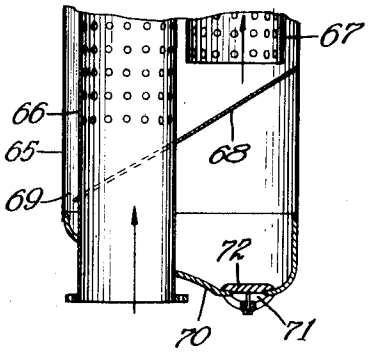
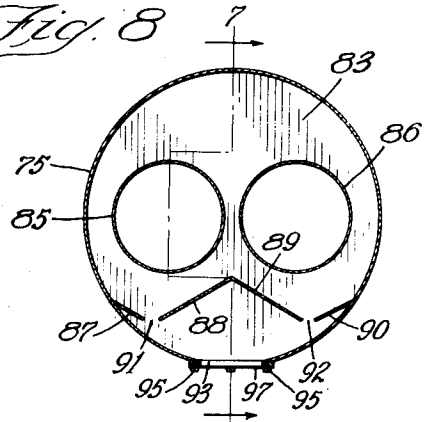


Fig. 8



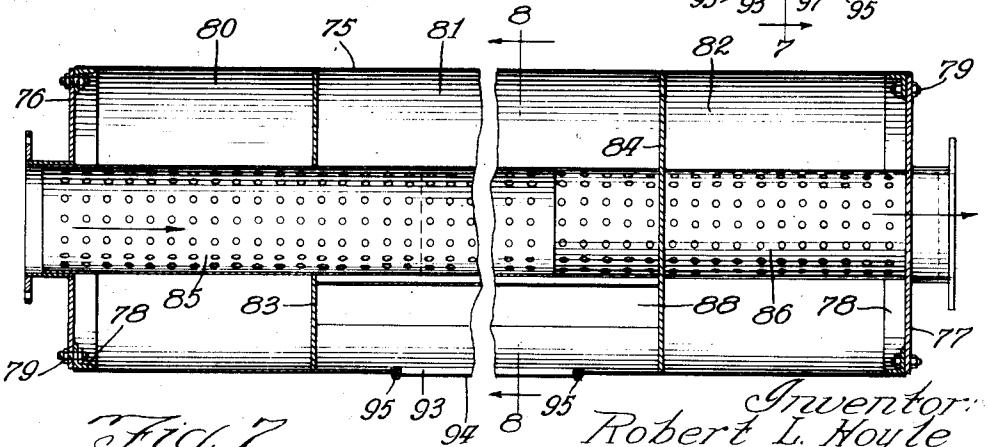


Fig. 7

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EXHAUST SILENCING AND SPARK ARRESTING DEVICE

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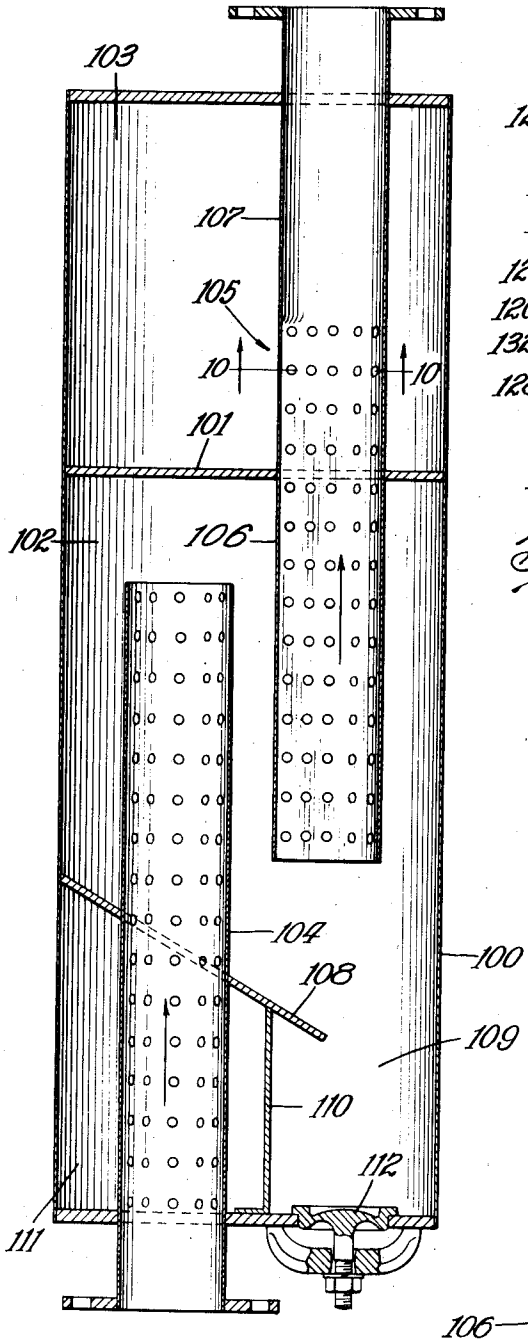


Fig. 9

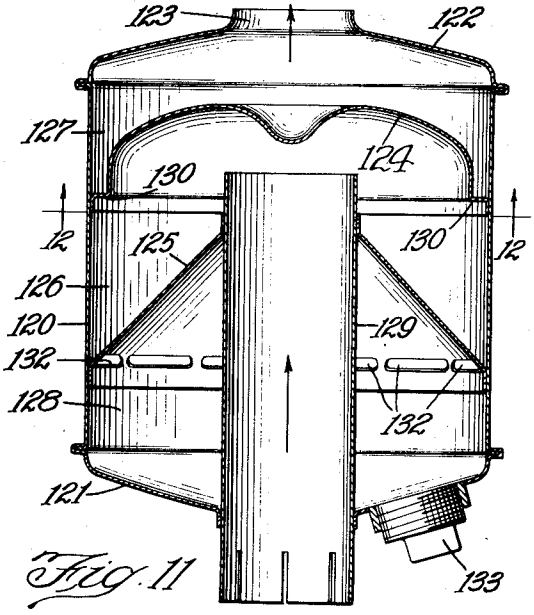


Fig. 11

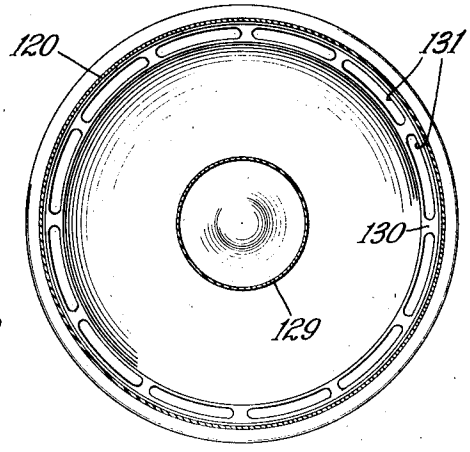


Fig. 12

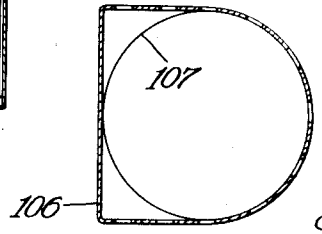


Fig. 10

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UNITED STATES PATENT OFFICE

2,196,920

EXHAUST SILENCING AND SPARK ARRESTING DEVICE

Robert L. Hoyle, Madison, Wis., assignor, by mesne assignments, to Burgess Battery Company, Chicago, Ill., a corporation of Delaware

Application March 21, 1938, Serial No. 197,133

12 Claims. (Cl. 181—36)

This invention relates to a combination exhaust silencer and spark arrester for internal combustion engines. The operation of an internal combustion engine usually is accompanied by the discharge of heated solid particles, principally particles of incandescent carbon, from the exhaust. The engines are used in many situations where it is desired to guard carefully against all fire hazards. For example, such is the case where the engines are used aboard ship, near gas wells or gasoline refineries, and also where they are employed for the operation of tractors. In view of the fire hazard created by the incandescent particles, such engines are usually equipped with spark arresters.

It is the object of the present invention to provide a simple and economical construction for accomplishing both the silencing and the spark arresting functions, this object being accomplished by utilizing the same structure for silencing the exhaust gases and separating the heated solid particles from them.

Briefly, the purposes of the invention are accomplished by providing a chamber in which the exhaust gases reverse their direction of flow several times, these flow reversals contributing substantially to the silencing function and also causing the solid particles to become separated from the exhaust gas stream by centrifugal action. A baffle member is arranged in the lower portion of the chamber in such a manner as to provide a zone of quiescence out of the gas stream and to cause the solid particles to be deposited therein. Means are provided for retaining the particles in this zone and for removing them periodically.

In the drawings:

Figs. 1, 3, 5, 9 and 11 are longitudinal sectional views of different modifications of the combined exhaust silencer and spark arrester of this invention;

Figs. 2, 4 and 12 are transverse sectional views along lines 2—2, 4—4 and 12—12 of Figs. 1, 3 and 11 respectively;

Fig. 6 is a fragmental longitudinal sectional view of a further modification of the invention;

Fig. 7 is a longitudinal sectional view of a still further modification, taken along line 7—7 of Fig. 8;

Fig. 8 is a transverse sectional view along line 8—8 of Fig. 7; and

Fig. 10 is a fragmental section along line 10—10 of Fig. 9.

The device shown in Figs. 1 and 2 is adapted to be disposed vertically, and the exhaust gases to travel vertically upward. It is understood that in the specification and the claims the words "horizontal" and "vertical" are not used in a restrictive sense, and any deviation from the horizontal or vertical arrangement which is not sufficient to disturb the principle of operation as it is described herein, is within the scope of the invention. The cylindrical casing 10 is provided with end walls 11 and 12, end wall 12 being provided with a flanged outlet opening 13. Spaced interiorly from outlet end wall 12 is a substantially disc-shaped partition 14, and spaced interiorly from inlet end wall 11 is frusto-conical partition or baffle member 15. Partition 14 divides the interior of the casing into chambers 17 and 18 and baffle member 15 defines a zone of quiescence 16 in the lower portion of chamber 17, as will be described hereinafter. Baffle member 15 and end wall 11 have substantially central openings therein and an open-ended imperforate inlet tube 19 is mounted in these openings and extends part-way through chamber 17.

Partition 14 has two eccentric openings within which are mounted the upper ends of foraminous open-ended outlet tubes 20, these tubes being offset with respect to inlet tube 19 and extending part-way through chamber 17 to a point adjacent baffle member 15. The inlet and outlet tubes are arranged in adjacent side by side relation throughout a portion of their length within chamber 17. The upper partition 14 has a substantially central, blunt downward projection 21, and baffle member 15 has a series of spaced circumferentially-elongated slots 22 therein adjacent the outer portion thereof which adjoins the cylindrical wall of casing 10. The bottom end wall of the casing has a clean-out opening therein which is normally closed by a threaded plug 23.

As stated heretofore, the casing and tubes are arranged vertically and in operation, the exhaust gases enter and pass upwardly through inlet tube 19. A small proportion of the gases emerging from tube 19 pass laterally from the end of inlet tube 19 through the perforations of tubes 20 and into said tubes, but the predominant proportion reverse their direction within chamber 17 and flow downwardly. The projection 21 of partition 14 assists in directing the gas flow during this reversal. The gases again reverse their direction in the bottom portion of chamber 17 and enter the lower ends of outlet tubes 20. At the first reversal of direction a small proportion of the solid particles may be thrown out of the gas stream by centrifugal action and drop upon the upper surface of baffle member 15. While the gases are flowing downwardly within chamber

17, they are free to spread out across the transverse area of the chamber and their velocity is greatly decreased. The force of gravity causes some of the particles to descend faster than the gases and they are thus separated from the gas stream. At the second reversal of direction at the bottom of the chamber centrifugal action and the force of gravity combine to accomplish an effective separation of the particles from the stream and the particles drop upon the baffle member 15. The particles on baffle member 15 are agitated more or less actively by the movement of the gas, and descend the inclined surface of said baffle member and pass into space 16 through slots 22. Baffle member 15 protects the space 16 below it from the gas streams and turbulence within chamber 17, and maintains such space as a zone of quiescence and prevents the particles therein from being swept up again by the gas stream. The particles collect upon the bottom end wall 11 of the casing and may be removed periodically through the opening in said wall by unscrewing plug 23. Slots 22 also serve to connect space 16 with the path of noises and gas in chamber 17, whereby space 16 functions as a resonator and exerts a silencing action. The gases after leaving outlet tubes 20 converge in upper chamber 18 and pass out of the device through outlet opening 13.

It is apparent that the invention provides, in a simple and economical manner, an effective means for silencing and removing the heated solid particles from the gases. The expansion and reversal of direction of the gases in chamber 17, together with the resonator action of space 16, combine to provide effective silencing. The arrangement of the baffle member 15 is such that it does not restrict the gas flow within the chamber, and does not resort to the flow-obstructing principle so frequently used in spark arrestors. Although the gases undergo two reversals of direction, this is done with a minimum restriction because they take place within the comparatively open volume of chamber 17. Chamber 17 is relatively small, and both reversals take place comparatively close together, whereby the size and cost of the equipment is reduced accordingly. The simplicity of the interior arrangement is evident, comprising as it does merely the three tubes, the partition 14 and the baffle member 15. This factor of simplicity contributes considerably toward the reduction of the cost of the device.

The construction shown in Figs. 3 and 4 is closely related to that of Figs. 1 and 2 and comprises a cylindrical casing 25 adapted to be disposed with its longitudinal axis extending vertically. The single inlet tube 26 and the two outlet tubes 27 are arranged eccentrically of the casing. This tube arrangement is shown in Fig. 4. This arrangement may be varied, and any one of the tubes may be arranged concentrically with the casing if desired. The inlet tubes extend laterally adjacent the outlet tubes for a portion of their length, and are in contact with the outlet tubes and joined to them, as by welding, whereby the tubes contribute to their mutual support within the casing.

A baffle member 28 is supported within the lower end of the casing by means of inlet tube 26, the baffle member being substantially conical in shape and cut out to accommodate the inlet tube, the base of the cone extending toward the cylindrical wall 25 of the casing but being spaced therefrom to form an annular opening into the zone of quiescence below the baffle member. Inlet tube 26 is imperforate from the inlet end thereof to a point above baffle member 28, as shown and is foraminous from that point to its upper end. A transverse partition 30 extends across the interior of the casing at a point spaced above the outlet end of inlet tube 26, to define a resonating chamber or expansion chamber 31 in the upper portion of the casing. The outlet tubes 27 are imperforate and pass through partition 30 and directly through the outlet end wall of casing 25. Each outlet tube has one or more relatively large openings 32 therein within chamber 31 to provide communication between the interior of the tubes and the chamber. The lower end wall 33 of the casing is bolted in position as shown and may be removed for cleaning out the solid particles by loosening the bolts 34.

The operation of this modification is substantially similar to that described in connection with the construction of Figs. 1 and 2. In this modification, however, the gases cannot pass laterally through the walls of the outlet tubes because the latter are imperforate. This construction has been found to operate satisfactorily.

The modification of Fig. 5 comprises a vertically disposed cylindrical casing 36 having inlet and outlet end walls 37 and 38 and transverse partition 39 therein separating the casing into chambers 40 and 41. An inclined baffle member comprising two plate sections 42 and 43 is located in the lower portion of chamber 40. These two plate sections are inclined downwardly toward each other, the lower portion of section 43 overlying the lower portion of section 42 and being spaced therefrom to form opening 44 for the deposit of solid particles into the zone of quiescence. The overlying relation of section 43 to section 42 protects the opening 44 and the space within the zone of quiescence from the movement of gases within the casing to a greater extent than does a plain opening which is formed by having the bottom edges of the two sections at the same level. A vertical partition 45 extends between the bottom end wall 37 of the casing and baffle section 42 and confines the solid particles to a restricted zone of quiescence 46. A foraminous open-ended inlet tube 47 passes through inlet end wall 37 and baffle section 42 and part-way through chamber 40, and an open-ended outlet tube 48 passes through outlet end wall 38 and partition 39 and part-way through chamber 40. Outlet tube 48 is foraminous throughout its length in chamber 40 and a portion of its length in chamber 41. These tubes are offset laterally with respect to each other and extend laterally adjacent each other throughout a portion of their length within chamber 40. The space 49 adjacent the zone of quiescence 46 forms a resonating chamber or expansion chamber surrounding inlet tube 47.

The bottom wall 37 has a clean-out opening 50 therein providing access to the chamber 46 within which the particles are deposited. This opening is normally closed by means of a plate 51 which has a threaded rod 52 projecting downwardly therefrom. Plate 51 is held in place by means of bracket member 53 against which the nut 54 is threaded. When it is desired to remove the particles from the chamber 46 the cover 51 is removed in the manner well known for covers of this type.

Means is provided for quenching the incandescent particles. An opening 55 is provided in the wall of chamber 40 adjacent the lower end por-

tion of the side of outlet tube 48 which is remote from inlet tube 47. A bushing 56 is mounted, as by welding at the opening 55 and a nozzle 57 which is provided with a number of small jets is mounted in the bushing and projects into chamber 40. A water supply pipe or hose 58 is connected to the nozzle 57. Water may be sprayed into chamber 40 in the space between the casing wall and tubes 47 and 48, creating a mist in the lower portion of chamber 40 which descends upon baffle sections 42 and 43 and collects in bottom chamber 46. In the course of this action the water contacts and quenches the incandescent particles and assists in separating them from the gas stream. An opening 59 is provided in the bottom portion of the wall of chamber 46 for draining the water from the device, which opening may be closed by a plug 60 when the water spray is not in use.

The operation of this device is similar to that of the modification shown in Figs. 3 and 4 with the addition of the action of the water spray, as described heretofore.

In Fig. 6 is shown a modification of the construction of Fig. 5. Only the bottom portion of the casing 65 is shown, with an open-ended inlet tube 66 extending upwardly and an open-ended outlet tube 67 extending downwardly into the same. The baffle member is a single plate 68 which is inclined downwardly from the wall of the chamber at the side adjacent the end of the outlet tube 67 to the portion through which the inlet tube extends. Inlet tube 66 is imperforate to a point above the baffle member 68 as shown and is foraminous from that point to the upper end. An opening 69 is provided between the lower end of the plate 68 and the wall of casing 65 at the side remote from outlet tube 67. A portion of the bottom end wall of the casing is depressed downwardly as shown at 70, and the clean-out opening 71 is located in this portion. The opening is closed by removable cover 72, similar to the cover 51 of Fig. 5. The sloping walls of the depressed portion 70 cause the solid particles to collect in the space above clean-out opening 71 so that they are readily removed upon removing the cover 72.

The device shown in Figs. 7 and 8 is adapted to be disposed horizontally and have the gases flow therethrough in a horizontal direction. It comprises a cylindrical casing 75 having end walls 76 and 77 which may be bolted to flanges 78 at the ends of casing 75, by means of bolts 79 as shown. The interior of the casing is divided into three chambers 80, 81 and 82 by means of partitions 83 and 84.

The end walls and the partitions are provided with openings within which are mounted foraminous, open-ended inlet tube 85 and outlet tube 86. The openings are so arranged that the inlet and outlet tubes are offset laterally with respect to each other, and the inlet tube extends through chamber 80 and part-way through chamber 81. In the same way, outlet tube 86 extends through chamber 82 and part-way through chamber 81. Within chamber 81 the two tubes are arranged laterally adjacent one another for a portion of their lengths.

A baffle member is arranged within the lower portion of chamber 81, this member comprising plate sections 87, 88, 89 and 90, mounted at their ends, as by welding, upon partitions 83 and 84, sections 87 and 88 being inclined downwardly toward each other and having their lower edges spaced apart to form an opening 91. Sections 89 and 90 are arranged in a similar manner to form an opening 92. An opening 93 is provided in the bottom portion of the casing wall within chamber 81, this opening being closed by means of a plate 94 which is fastened in place by bolts 95.

The operation of this device is substantially similar to that of those described heretofore. The exhaust gases enter inlet tube 85 and pass therethrough into chamber 81. During the course of this passage chamber 80, being connected to the interior of the inlet tube 85 by means of the perforations of the tube, functions as a resonator or expansion chamber and exerts a silencing action upon the gases. Within chamber 81 the gases may pass directly from inlet tube 85 to outlet tube 86 through the perforations of the tubes, but the predominant proportion of the gases emerge from the end of tube 85, reverse their direction and flow backwardly within chamber 81, and reverse their direction again and flow into the end of tube 86 and through tube 86 to the atmosphere. During their passage through chamber 82 they are subjected to the silencing action of this chamber, the interior of which is connected to tube 86 by the perforations of the tube. Either one or both of chambers 80 and 82 may have sound-absorbing material therein surrounding the tubes. The reversals of gas flow within chamber 81 serve to dislodge the solid particles from the gas stream by centrifugal force. Some of the particles are dislodged at the first reversal and those which do successfully follow the first reversal are dislodged at the second. In addition, the force of gravity causes separation of some particles during the relatively slow return flow of the gases within chamber 81. The particles fall upon the baffle member in the lower portion of the chamber, and descend the inclined surfaces of the plate sections to the openings 91 and 92 and then fall to the zone of quiescence below the baffle member. They may be cleaned out periodically by unscrewing bolts 95 and removing plate 94 and cleaning the particles out through opening 93.

The construction of Fig. 9 is along lines similar to those of Figs. 5 and 6 and comprises a vertically disposed casing 100 having a transverse partition 101 dividing the casing into chambers 102 and 103. A foraminous inlet tube 104 extends upwardly into chamber 102, and an outlet tube 105 passes through chamber 103 and extends downwardly into chamber 102. The portion of outlet tube 105 located in chamber 102 and in the lower portion of chamber 103 is flattened at the side 106 which faces inlet tube 104, as shown in Fig. 10. The upper portion 107 of the tube is circular. The circular portion 107 is imperforate, as shown in Fig. 9, and the flat portion 106 is likewise imperforate, the rest of the tube wall being foraminous. An inclined baffle member 108 is located in the lower portion of chamber 102 and inclines downwardly from the portion of the casing wall near inlet tube 104 toward the remote portion of the casing wall. The lower end of baffle 108 is spaced a considerable distance from the casing wall to provide a relatively large opening 109 into the zone of quiescence. The lower portion of baffle member 108 is supported by a vertical partition 110 which restricts the deposited particles to the space adjacent the opening and provides a resonating chamber 111. A removable cover 112 is provided for the clean-out opening of the zone of quiescence.

In this modification the imperforate portion

106 of outlet tube 105 prevents the exhaust gas from passing directly laterally from the inlet tube to the outlet tube and carrying solid particles with it into the outlet tube. As a consequence, a greater proportion of the gases flow downwardly and enter the open end of the outlet tube, and the effectiveness of particle removal is increased. At the same time, the perforated portion of the walls of the outlet tube facilitates flow of the gases into said tube after their direction has been reversed, and this results in less restriction to flow being offered by the device. Outlet tube 105 may be cylindrical throughout its entire length, in which case the half of it, approximately, which is disposed toward the inlet tube is imperforate and the balance foraminous. The flattened side has the advantage that when it is inserted into the correspondingly shaped opening in partition 101 it is insured that the imperforate side will be disposed properly toward the inlet tube.

The baffle member 108 extends beyond vertical partition 110 and over the zone of quiescence only a relatively short distance. It has been found that when the zone of quiescence is confined laterally by partition 110 a cushion of gas is created therein and a relatively large opening into it from above is permissible without causing the quiescence to be disturbed appreciably. This has the advantage that the deposit of solid particles into the zone is facilitated.

In Figs. 11 and 12 there is illustrated a construction which is along the line of Figs. 1 and 2, but which does not have the outlet tubes extending into the chamber. The casing 120 has end walls 121 and 122, end wall 122 being provided with an outlet opening 123. A partition 124 is spaced inwardly from end wall 122 and a frusto-conical baffle member is spaced interiorly from end wall 121. Partition 124 divides the casing into chambers 126 and 127, and baffle member 125 provides a zone of quiescence 128 in the lower portion of chamber 126. Imperforate inlet tube 129 passes through inlet end wall 121 and baffle member 125 and into chamber 126.

Partition 124 is curved or dished and provided with a downwardly extending annular shoulder 130, which is located at a lower level than the upper end of inlet tube 129. This shoulder is provided with outlet openings in the form of slots 131, as shown in Fig. 12. Baffle member 125 is provided with slots 132 similar to the slots 22 of Fig. 2.

The exhaust gases pass upwardly through inlet tube 129 and against partition 124 where they reverse their direction and flow downwardly within chamber 126. They again reverse their direction and flow upwardly through slots 131 in partition 124. During this reversal of direction the solid particles are rejected by centrifugal action and fall upon baffle member 125 and descend the same and pass through slots 132 into the zone of quiescence 128 where they may be periodically cleaned out by removing plug 133. The gases converge within chamber 127 and pass upwardly through outlet opening 123. This construction has been found to be effective for both the silencing and the spark removing functions.

Although one inlet tube and two outlet tubes are the most that are shown in the different modifications there may be any desired number of either, their size and number being regulated so that the device will handle the quantity of gas discharged by the engine with a minimum restriction to flow. Where the inlet and outlet tubes are referred to in the singular in the specification and claims, it is understood that this includes the plural as well.

I claim:

1. A combination silencer and solid particle separator comprising means forming a chamber, said chamber having inlet and outlet openings in opposite walls thereof, open-ended inlet and outlet conduits arranged in juxtaposed relation within said chamber, said inlet and outlet conduits being connected at one end thereof to said inlet and outlet openings respectively, and each extending from the wall opening to which it is connected part way toward the opposite wall and having an open end located within said chamber, said inlet and outlet conduits being arranged laterally adjacent one another throughout a portion of their length, the open ends of said inlet and outlet conduits located within said chamber being in free and unconfined communication with each other through the space within said chamber, the conduits extending from at least one wall of said chamber having openings in the walls thereof, and a baffle member within said chamber below the open ends of said conduits within said chamber and in spaced relation to the bottom wall of said chamber, said baffle member defining a zone of quiescence therebeneath and being constructed to provide one or more openings for the passage of solid particles from the space above said baffle member into said zone of quiescence.

2. The construction of claim 1 in which the inlet tube is in contact with and mechanically joined to the outlet tube along their juxtaposed portions.

3. A combination silencer and solid particle separator comprising means forming a chamber, said chamber having inlet and outlet openings in opposite walls thereof, open-ended inlet and outlet conduits arranged in juxtaposed relation within said chamber, said inlet and outlet conduits being connected at one end thereof to said inlet and outlet openings respectively, and each extending from the wall opening to which it is connected part way toward the opposite wall and having an open end located within said chamber, said inlet and outlet conduits being arranged laterally adjacent one another throughout a portion of their length within said chamber, the open ends of said conduits being in free and unconfined communication with each other through the space within said chamber, the conduit extending from one wall of said chamber having openings in the walls thereof on the side remote from the conduit extending from the opposite wall, and a baffle member within said chamber below the open ends of said conduits within said chamber and in spaced relation to the bottom wall of said chamber, said baffle member defining a zone of quiescence therebeneath and being constructed and arranged to provide one or more openings for the passage of solid particles from the space above said baffle member into said zone of quiescence.

4. The construction of claim 3 in which the imperforate side of the conduit having openings in the walls thereof is flat.

5. A combination silencer and solid particle separator comprising means forming a chamber adapted to be disposed vertically, said chamber having inlet and outlet openings in opposite walls thereof, open-ended inlet and outlet conduits arranged in juxtaposed relation within said chamber, said inlet and outlet conduits being connected at one end thereof to said inlet and

outlet openings respectively, and each extending from the wall opening to which it is connected part way toward the opposite wall and having an open end located within said chamber, said inlet and outlet conduits being arranged laterally adjacent one another throughout the portion of their length, the open ends of said conduits located within said chamber being in free and unconfined communication with each other through the space within said chamber, the conduits extending from at least one wall of said chamber having openings in the walls thereof, and a baffle member within said chamber below the open ends of said conduits within said chamber and in spaced relation to the bottom wall of said chamber, said inlet conduit passing through said baffle member, said baffle member defining a zone quiescence therebeneath and being constructed and arranged to provide communication for the passage of solid particles from the space above said baffle member into said zone of quiescence.

6. The construction of claim 5 in which the inlet conduit is imperforate below said baffle member and has openings in the walls thereof above said baffle member.

7. A combination silencer and solid particle separator comprising means forming a chamber, said chamber having inlet and outlet openings in opposite walls thereof, open-ended inlet and outlet conduits arranged in juxtaposed relation within said chamber, said inlet and outlet conduits being connected at one end thereof to said inlet and outlet openings respectively, and each extending from the wall opening to which it is connected part way toward the opposite wall and having an open end located within said chamber, said inlet and outlet conduits being arranged laterally adjacent one another throughout a portion of their length, the open ends of said conduits located within said chamber being in free and unconfined communication with each other through the space within said chamber, the conduits extending from at least one wall of said chamber having openings in the walls thereof, a baffle member within said chamber below the open ends of said conduits within said chamber and in spaced relation to the bottom wall of said chamber, said baffle member defining a zone of quiescence therebeneath and being constructed and arranged to provide communication for the passage of solid particles from the space above said baffle member into said zone of quiescence, and one or more additional sound-suppressing chambers cooperatively associated with said conduits.

8. The construction of claim 1 in which the baffle member comprises one or more pairs of sections, the sections of each pair being inclined downwardly toward each other, said sections being arranged to provide one or more openings at the lowermost portions thereof for the passage of solid particles to said zone of quiescence.

9. A combination silencer and solid particle separator comprising means forming a chamber, said chamber having inlet and outlet openings in opposite walls thereof, open-ended inlet and outlet conduits arranged in juxtaposed relation within said chamber, said inlet and outlet conduits being connected at one end thereof to said inlet and outlet openings respectively, and each extending from the wall opening to which it is connected part way toward the opposite wall and having an open end located within said chamber, said inlet and outlet conduits being arranged laterally adjacent one another throughout a portion of their length, the open ends of said conduits being in free and unconfined communication with each other through the space within said chamber, the conduits extending from at least one wall of said chamber having openings in the walls thereof, a baffle member within said chamber below the open ends of said conduits within said chamber and in spaced relation to the bottom wall of said chamber, said baffle member defining a zone of quiescence therebeneath and being constructed and arranged to provide communication for the passage of solid particles from the space above said baffle member into said zone of quiescence, means for spraying water into the portion of said chamber surrounding said conduits, and means for draining said water from said chamber.

10. A combination silencer and solid particle separator comprising means forming a chamber, said chamber having inlet and outlet openings in opposite walls thereof, open-ended inlet and outlet conduits arranged in juxtaposed relation within said chamber, said inlet and outlet conduits being connected at one end thereof to said inlet and outlet openings respectively, and each extending from the wall opening to which it is connected part way toward the opposite wall and having an open end located within said chamber, said inlet and outlet conduits being arranged laterally adjacent one another throughout a portion of their length, the open ends of said inlet and outlet conduits located within said chamber being in free and unconfined communication with each other through the space within said chamber, the conduits extending from at least one wall of said chamber having openings in the walls thereof, and a baffle member within said chamber below the open ends of said conduits within said chamber and in spaced relation to the bottom wall of said chamber, said baffle member defining a zone of quiescence therebeneath and being constructed to provide one or more openings for the passage of solid particles from the space above said baffle member into said zone of quiescence, the bottom wall of said chamber at said zone of quiescence having a clean-out opening therein.

11. A combination silencer and solid particle separator comprising means forming a chamber, said chamber having inlet and outlet openings in opposite walls thereof, open-ended inlet and outlet conduits arranged in juxtaposed relation within said chamber, said inlet and outlet conduits being connected at one end thereof to said inlet and outlet openings respectively, and each extending from the wall opening to which it is connected part way toward the opposite wall and having an open end located within said chamber, said inlet and outlet conduits being arranged laterally adjacent one another throughout a portion of their length, the open ends of said conduits being in free and unconfined communication with each other through the space within said chamber, the conduits extending from at least one wall of said chamber having openings in the walls thereof, a baffle member beneath the open ends of said conduits within said chamber and in spaced relation to the bottom wall of said chamber, said baffle member being constructed and arranged to provide an opening for the passage of solid particles from above said baffle member into the space below said opening, and a partition extending upwardly from the bottom wall

of said chamber to said baffle member and being adapted to confine said solid particles to the space adjacent said opening, the wall of said chamber having a clean-out opening therein providing access to said space.

12. The construction of claim 5 in which the baffle member is attached to and supported by the inlet conduit and extends laterally toward the walls of said chamber, but stops short of said chamber walls to form an opening through which the particles may pass into the zone of quiescence.

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