

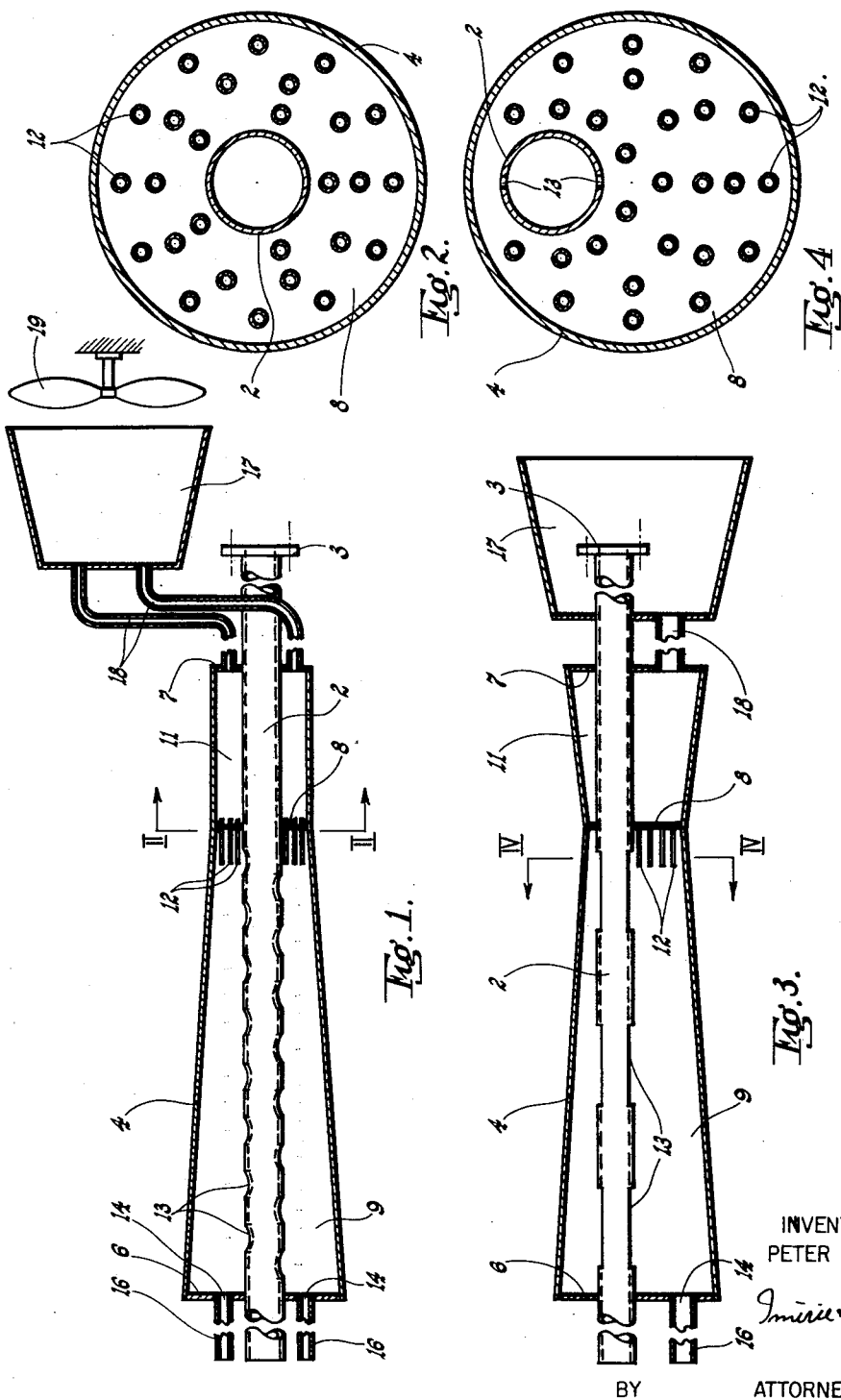
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INTERNAL COMBUSTION ENGINE EXHAUST SILENCERS

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INTERNAL COMBUSTION ENGINE EXHAUST SILENCERS

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This invention relates to internal combustion engine exhaust silencers of the kind having a gas expansion chamber surrounding an apertured exhaust pipe leading from the engine.

Prior attempts to provide an efficient exhaust silencer have usually involved the use of baffles or the like which have necessarily caused back pressure on the engine thereby reducing its efficiency and causing excessive carbon deposits in its cylinders.

The primary object of the present invention is to provide an improved internal combustion engine exhaust silencer which is adapted to accelerate the escape of exhaust gases from the engine and thus materially reduce undesirable back pressure. It follows that the engine performance is improved and carbon deposits in the engine cylinders are reduced to a minimum.

In accordance with the present invention the improved exhaust silencer for an internal combustion engine comprises an open ended exhaust pipe adapted at one end for detachable connection to the exhaust outlet of said engine, a tubular casing surrounding said pipe and which is provided with opposite end walls forming a gas expansion chamber, a series of longitudinally spaced apertures in said pipe within said gas expansion chamber, a plurality of open ended jet tubes entering said chamber at that end remote from the discharge end of said pipe, one or more discharge ports in that end wall of the casing adjacent to the discharge end of said pipe and means for delivering air under pressure to said jet tubes whereby air under pressure flowing lengthwise through the gas expansion chamber from said jet tubes induces some of the gases passing through said exhaust pipe to enter said gas expansion chamber and thereby materially reduces undesirable back pressure on the engine.

The improved silencer is of relatively simple and inexpensive construction and involves the use of a minimum number of component parts which are not likely to get out of order or require frequent maintenance.

Other objects and advantages of the invention will be more readily apparent from the following description of several practical embodiments.

But in order that this invention may be better understood reference will now be made to the accompanying sheets of drawings which are to be taken as part of this specification and read herewith.

FIGURE 1 is a longitudinal section of an exhaust silencer in accordance with the present invention parts being broken away for convenience of illustration.

FIGURE 2 is a cross section on an enlarged scale taken on the line II—II of FIGURE 1.

FIGURE 3 is a longitudinal section of a modified form of the exhaust silencer.

FIGURE 4 is an enlarged cross section taken on the line IV—IV of FIGURE 3.

In accordance with the embodiment illustrated in FIGURES 1 and 2, the improved exhaust silencer includes an open ended exhaust pipe 2 which is adapted at one end for detachable connection by a flange 3 or in any other suitable manner to the exhaust outlet of an internal combustion engine.

A tubular casing 4 surrounds the pipe 2 and is provided with opposite end walls 6 and 7 respectively and an intermediate transverse partition 8 which is adapted to form a gas expansion chamber 9 at one side of the

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partition and an air pressure chamber 11 at the opposite side thereof, the gas expansion chamber being relatively larger than the air pressure chamber.

Communication is established between these two chambers by means of a plurality of open ended jet tubes 12 extending through the partition and which may be circumferentially spaced around the pipe 2.

A series of longitudinally spaced apertures 13 are formed in the pipe within the gas expansion chamber and these apertures may be in the form of circular or oval shaped holes, elongated slots or of any other suitable formation.

One or more discharge ports 14 each of which may be fitted with a discharge pipe 16, are formed in the end wall 6 of the gas expansion chamber opposite to the partition.

Associated with the foregoing are means for delivering air under pressure to the air pressure chamber 11. For this purpose, one or more air scoops 17 may be employed and connected to the end wall 7 of the air pressure chamber opposite to the partition by one or more air inlet pipes 18. If the exhaust silencer is fitted for example, to a motor vehicle, an air scoop may be located at any suitable position either adjacent to or remote from the silencer with the open end of the scoop facing the direction in which the vehicle would normally travel. Alternatively, such an air scoop may be located adjacent to a power driven fan 19 such as the radiator fan on the vehicle.

In the case of a stationary engine or slow moving vehicle such as a tractor, an electric or other power driven fan may be employed for delivering air under pressure to the air scoop.

As seen in FIGURE 1, the side wall or walls of the gas expansion chamber 9 preferably diverge from the partition 8 towards the opposite end wall of the casing so that the cross sectional area of the gas expansion chamber progressively increases from the jet tubes towards the discharge port or ports 14 at the opposite end of the chamber.

If desired, the side walls of the air pressure chamber 11 may also diverge from the partition towards the opposite end wall of the casing whereby the cross sectional area of the air pressure chamber progressively decreases as it approaches the partition thereby increasing the air pressure entering the tubes.

In use, it will be appreciated that air being forced into the air pressure chamber 11 flows through the series of jet tubes 12 and into the gas expansion chamber 9 at a relatively fast rate thereby providing a rapid flow of air lengthwise of the gas expansion chamber over the apertured portion of the pipe 2. Due to the provision of the series of jet tubes, the air stream flows through the gas expansion chamber at a faster rate than the gases flow through the exhaust pipe. In the result, some of such gases are induced to enter the gas expansion chamber and pass out to the atmosphere through its discharge ports instead of continuing on to the discharge end of the pipe 2. By this arrangement, a material reduction in the back pressure on the engine is effected followed by a marked increase in its all-round efficiency.

According to a modification as illustrated in FIGURES 3 and 4, the open ended pipe 2 is offset laterally within the tubular casing 4 in such a manner that the gas expansion chamber 9 and the air pressure chamber 11 are of substantially crescent shape as seen more clearly in FIGURE 4 with the largest portion of each chamber located beneath the exhaust pipe. In this case, most of the jet tubes 12 are located beneath the pipe 2 and the discharge port or ports 14 in the opposite end wall 6 of the casing are also preferably located in the same zone. By this arrangement, most of the gas entering the gas expansion

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chamber from the pipe 2 flows downwardly so that it escape from the pipe 2 is assisted by its own weight.

It will be understood that various alterations, modifications and/or additions may be introduced into the foregoing construction and arrangement of parts without departing from the ambit of the invention as defined by the appended claims.

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

1. An exhaust silencer for an internal combustion engine, comprising an open ended exhaust pipe defining a through passage adapted at one end for detachable connection to the exhaust outlet of an engine, a tubular casing surrounding said pipe and which is provided with opposite end walls sealingly secured to said pipe and forming a gas expansion chamber, said pipe having in its walls a series of longitudinally spaced apertures opening into said gas expansion chamber, a plurality of open ended jet tubes entering said chamber at that end remote from the discharge end of said pipe, that end wall of the casing adjacent to the discharge end of said pipe having at least one discharge port therein, and means in communication with said jet tubes for delivering air under pressure thereto whereby air under pressure flowing lengthwise through the gas expansion chamber from said jet tubes induces some of the gases passing through said exhaust pipe to enter said gas expansion chamber.

2. A device according to claim 1 wherein said tubular casing is also provided with an intermediate transverse partition forming an air pressure chamber at one end of said gas expansion chamber remote from the discharge end of said exhaust pipe, said jet tubes being carried by and extending through said partition, said means being in communication with said air pressure chamber.

3. A device according to claim 2 wherein said open ended pipe is located off centre within said casing so that said gas expansion chamber and said air pressure chamber are of substantially crescent shape in cross section, the largest portion of each chamber being located beneath said pipe.

4. A device according to claim 2, wherein the side walls of said gas expansion chamber diverge from said partition towards the opposite end wall so that the cross sectional area of said gas expansion chamber progressively increases from said jet tubes towards said discharge port end of said casing.

5. A device according to claim 2 wherein the side walls of said air pressure chamber diverge from said partition towards the opposite end wall of casing so that the cross sectional area of said pressure chamber progressively decreases as it approaches said jet tubes.

6. A device according to claim 1, wherein said open ended pipe is located substantially axially of said tubular

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casing and said jet tubes are spaced circumferentially around said pipe.

7. Apparatus according to claim 2, wherein said means for admitting air under pressure to said pressure chamber includes at least one air scoop and at least one pipe extending between said scoop and through the end wall of said air pressure chamber.

8. An exhaust silencer for an internal combustion engine, comprising an open ended exhaust pipe defining a through passage adapted at one end for detachable connection to the exhaust outlet of an engine, a tubular casing surrounding said pipe, said casing being provided with opposite end walls sealingly secured to said pipe and forming a gas expansion chamber, an intermediate transverse partition sealingly secured between said casing and said pipe and forming an air pressure chamber at one end of said gas expansion chamber remote from the discharge end of said exhaust pipe, the open ended pipe being located off-centre within the casing so that said gas expansion chamber and said air pressure chamber are of substantially crescent shape in cross-section with the largest portion of each chamber being located beneath said pipe, said pipe having in its walls a series of longitudinally spaced apertures opening into said gas expansion chamber, a plurality of open ended jet tubes carried by and extending through the partition, that end wall of the casing adjacent to the discharge end of said pipe having at least one discharge port therein, the side walls of said gas expansion chamber and said air pressure chamber diverging from said partition towards the respective opposite end walls of said casing so that the cross sectional area of each chamber progressively decreases toward the partition, at least one air scoop for receiving air under pressure, and at least one pipe extending between said scoop and through the end wall of said casing for delivering air under pressure to said air pressure chamber, whereby air under pressure flowing lengthwise through the gas expansion chamber from said jet tubes induces some of the gases passing through said exhaust pipe to enter said gas expansion chamber.

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