

W. H. WINSLOW
MUFFLER.

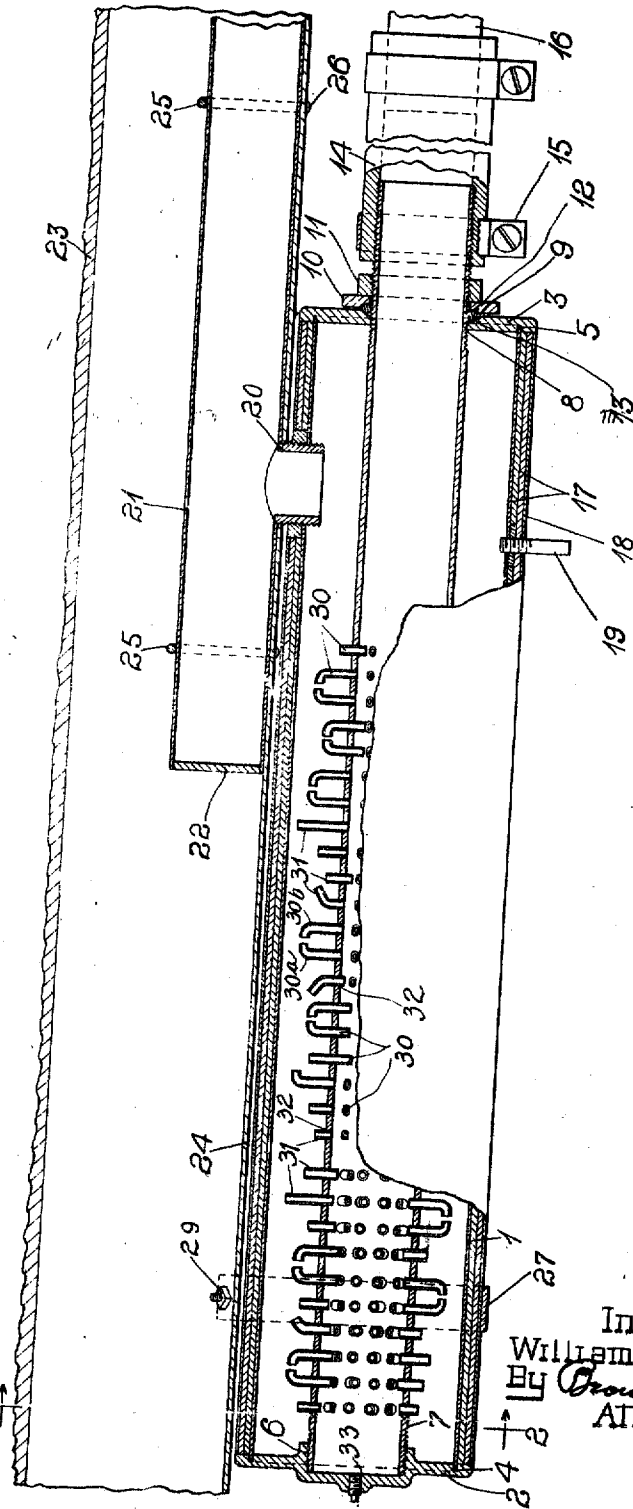
APPLICATION FILED DEC. 12, 1908. RENEWED JAN. 17, 1910.

1,005,913.

Patented Oct. 17, 1911.

2 SHEETS-SHEET 1.

Fig. 1.



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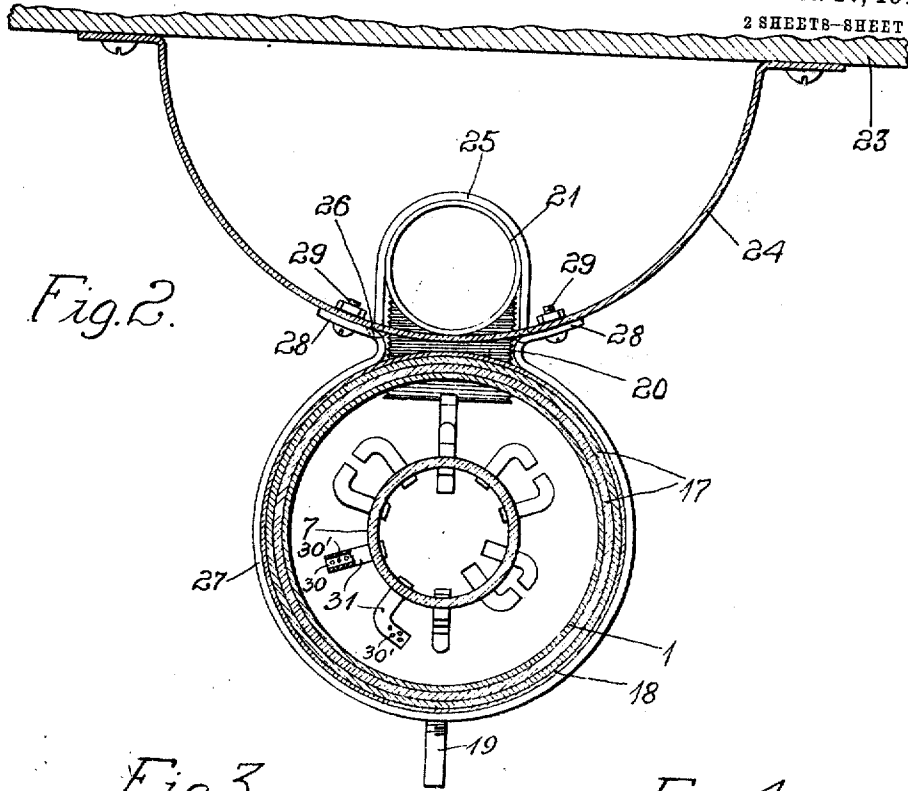


Fig. 2.

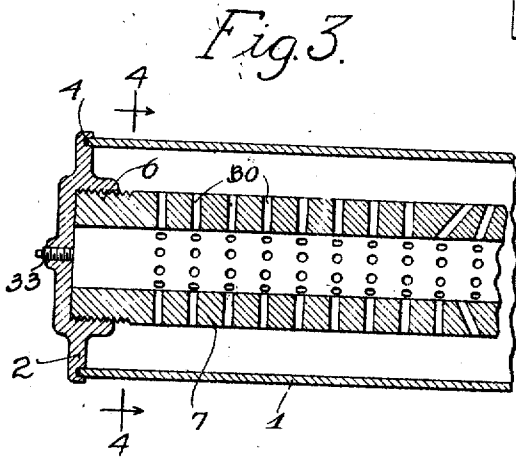


Fig. 3.

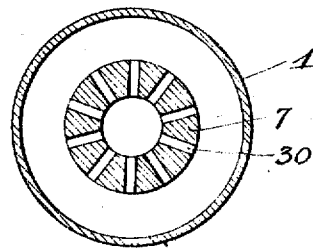


Fig. 4.

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UNITED STATES PATENT OFFICE.

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MUFFLER.

1,005,913.

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To all whom it may concern.

Be it known that I, WILLIAM H. WINSLOW, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Mufflers, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to mufflers, particularly to mufflers for muffling the exhaust from automobile engines. In some mufflers of the prior art a tube or pipe adapted for connection with the exhaust outlet of the engine extends through an inclosing shell, which connects with the atmosphere, there being a plurality of outlets from the inner tube to the shell. These outlets are intended to break up the exhaust gas into a plurality of streams, and thus to muffle the exhaust noise. In these prior mufflers, however, this inner plate has comparatively thin walls, and, therefore, the outlets are short and afford very little resistance to the gases flowing therethrough, the result being that considerable part of the energy is retained by the gas after leaving the outlets and there is still noise. The streams issuing from these outlets are also uniform and the individual noises produced tend to accumulate.

One of the main features of my invention is to increase the length of the passageways from the pipe to the inclosing shell, thereby interposing considerable resistance to the path of gases through said passageways, the result being that the gases have lost the greater part of their energy when they emerge from the passageways, and the noise will be very much reduced.

The second feature of my invention is to so arrange the passageways that the regularity of outflow is broken up, and I can also cause the streams to act differentially on each other. The individual noises are therefore prevented from accumulating, and the differential arrangement causes the noises to counteract and destroy each other, the final result being that a most efficient muffler is obtained. The passageways can be provided by the application of tubes to the pipe, which tubes may be of varying length and direction.

In the accompanying drawings the above

features of my invention and other features will be plainly illustrated.

In these drawings Figure 1 is a diametrical longitudinal sectional view of a muffler of my construction and the draft flue of a steam boiler associated therewith, Fig. 2 is an enlarged sectional view taken on plane 2-2 of Fig. 1, Fig. 3 is a diametrical sectional view of the end of a muffler showing a modified arrangement, and Fig. 4 is a sectional view taken on line 4-4 of Fig. 3.

The muffler comprises the cylindrical inclosing shell 1 having ends 2 and 3, which ends have annular grooves 4 and 5 respectively into which the ends of the shell engage. The end 2 is provided at its center with a cylindrical pocket 6 threaded internally to receive the threaded end of the eduction pipe 7. The end 3 has the central opening 8, through which passes the other end of the pipe 7. The outer edge about this opening 8 is cut away to form the tapered surface 9. The outer end of the pipe 7 is also threaded and receives a washer 10 and a nut 11, the washer 10 having the annular groove 12, which groove and the tapered surface 9 form a pocket for a gasket ring 13, which may be of asbestos. The pipe 7 being screwed into the pocket 6 and the nut 11 being drawn tight, the ends 2 and 3 will be securely clamped to the shell 1 and the packing ring will seal the opening 8. The outer end of the pipe 7 also receives a flexible coupling pipe 14, secured thereto as by means of a clamping band 15, the other end of this coupling plate being connected to the exhaust pipe 16 of any engine, such as an automobile steam engine or a gas engine. The shell may also be surrounded by layers 17 of material, such as asbestos, which may be surrounded by the ornamental covering shell 18. If the muffler is to be used for a steam engine, a drain pipe 19 connected with the interior of the shell 1 will serve to drain water of condensation from the shell.

Near the exhaust end of the muffler is provided the outlet stud 20, which is secured to and communicates with a pipe or tube 21 parallel with the muffler, this pipe being closed at its left end by the wall 22 and open at its other end.

In Fig. 2 is shown a convenient method for supporting the muffler when the muffler is used in association with an automobile steam engine. 23 represents the floor of the

vehicle, and 24 represents the semi-cylindrical draft flue from the boiler of the engine. The pipe 21 is supported by the shell 24 and is held thereto by bands 25 whose ends 26 pass through the shell 24 and are riveted thereto. The outlet stud 20 passes through the shell 24 and thus the exhaust end of the muffler is supported. The other end of the muffler is carried by a band 27 whose ends 28 are secured to the shell 24 by means of rivets or by means of bolts 29, as shown.

A multiplicity of passageways 30 is provided for connecting the interior of the pipe 7 with the interior of the shell 1. These passageways, as shown, in Fig. 1, are provided by small pipes or tubes 31 extending through openings 32 drilled through the wall of pipe 7. These eduction tubes are of considerable length in comparison to the thickness of the wall of pipe 7 and of comparatively small diameter. The exhaust gas entering with considerable force from the engine exhaust into the pipe 7 must flow through these eduction tubes and is broken up into a multiplicity of streams. The tubes, however, interpose considerable resistance to the flow of the streams, and the energy in the gas, which would tend to produce noise is in greater part transformed. To further reduce and destroy the noise factors, I have arranged the tubes so that the regularity of flow and direction is broken. If the tubes were all of the same length and their outlets all in the same plane, the noise factors of the individual streams would act cumulatively, but by having the tubes of varying length and arranged to direct the streams in varying directions, this unit or cumulative tendency is broken up and practically complete muffling results. As shown in Figs. 1 and 2, rows of openings 32 are drilled through the pipe 7 and the tubes 31 inserted and secured in any suitable manner, as by soldering or threading. As shown the tubes are of varying length, some being shorter and some longer. The arrangement is also shown whereby tubes may cause the streams therethrough to act differently upon each other, see for example tubes 30^a and 30^b in Fig. 1, whose ends are turned toward each other so that the streams issuing therefrom will strike each other and neutralize each other's energy so that there will be no resultant noise. The tubes may also be of varying diameter and I preferably employ a plurality of larger tubes, which will allow the escape of water of condensation from the pipe 7. The aggregate area of the tubes should also be such with relation to the cross-sectional area of the pipe 7 so that there will be no back pressure on the engine. An opening 33 will be provided in the end 2 by means of which a suitable gage (not shown) can be connected with the pipe 7 to test for back pressure. The exhaust gas,

therefore, when coming from the engine rushes into pipe 7 and is broken up into streams which flow through the tubes 31 and from which the greater part of the noise energy is extracted on account of the resistance of the tubes, the noise factors being further reduced and destroyed by the irregularity or differential arrangement of the tubes, the gases then flowing through outlet 20 and pipe 21 into the draft flue 24 and to the atmosphere. The gases are projected longitudinally through the draft flue and create more or less vacuum effect, which increases the boiler draft in a manner well-known in the art. Auxiliary outlets in the form of small holes 30' may also be provided to assist in breaking up the face and the direction of the gas streams.

In Figs. 3 and 4 is shown a modified arrangement. Instead of forming the resistance eduction passageways of tubes, the pipe 7 could have sufficiently thick walls through which the passageways 30 are drilled. The passageways thus formed could be of varying diameter and direction.

Other arrangements and constructions are also possible, which would produce the various features of my invention, and I do not, therefore, wish to limit myself to the particular constructions and arrangements shown.

I desire to secure the following claims by Letters Patent:

1. In a muffler, the combination of a pipe adapted for connection with an engine to receive the exhaust gases, and a multiplicity of small-bore tubes extending from said pipe in different and irregular directions, said tubes being also of different lengths.
2. In a muffler, the combination of a pipe closed at one end and adapted for connection at its other end with an engine to be muffled, and a plurality of outlets from the interior to the exterior of said pipe, said outlets being irregular as to their direction, length and size.
3. In a muffler, the combination of a pipe closed at one end and adapted for connection at its other end with an engine to be muffled, and a plurality of fine tubes supported by and connecting the interior of the pipe with the exterior thereof, said tubes being relatively irregular and different as to their direction and length.
4. In a muffler, the combination of a shell forming an expansion chamber, a pipe extending centrally through said shell, the entrance to the end of said pipe being adapted for connection with an engine to be muffled, the other end of said pipe being closed by an end wall of said shell, and a plurality of high-resistance outlets for connecting said other end of the pipe with the interior of the shell, there being an atmosphere outlet from said shell near the entrance end of said pipe.

5. In a muffler, the combination of a cylindrical shell forming an expansion chamber, a pipe extending centrally through the shell, the entrance end of said pipe extending through one end wall of said shell and adapted for connection with the engine to be muffled, the other end of said pipe screwing into the other end of said shell to be closed thereby, and an outlet for connecting said other end of the pipe with the expansion chamber, said outlets being relatively irregular as to their direction, there being an atmosphere outlet from the shell near the entrance end of the pipe.

6. In a muffler, the combination of a cylindrical shell, a pipe extending centrally through said shell, the entrance end of the pipe extending through one end wall of the shell and adapted for connection with an engine to be muffled, the other end of said pipe being supported and closed by the other end wall of said shell, and a multiplicity of small-bore tubes connecting said other end of the pipe with the exterior, said tubes being irregular as to size, direction and length, there being a single outlet from said shell connected with the atmosphere.

7. In a muffler, the combination of a pipe adapted for connection with an engine to receive the exhaust gases, a multiplicity of tubes extending from said pipe in different and irregular directions, the bore and length of said tubes being such that flow therethrough is deprived of the pressure element to cause the gas to issue in the form of compact jets having only a velocity element.

8. In a muffler, the combination of a pipe adapted for connection with an engine to receive the exhaust gases, a multiplicity of tubes extending from said pipe in different and irregular directions, the bore and length of said tubes being such that flow therethrough is deprived of the pressure element to cause the gas to issue in the form of compact jets having only a velocity element, said pipe extending differentially against each other.

9. In a muffler, the combination of a pipe adapted for connection with an engine to receive the exhaust gases, and a multiplicity of small bore tubes extending from said pipe to break the gas flow into a plurality of jets, the walls of said tubes at their ends being perforated to further assist in breaking up of the gas flow.

10. In a muffler for engines, the combination of a first cylindrical compartment for receiving the exhaust gases, a concentric compartment for receiving such gases from the first compartment, and an annular partition separating such compartments, such partition having formed therethrough a

plurality of holes of less diameter than length to afford surfaces for frictional engagement with the exhaust gases.

11. In a muffler for engines, the combination of two concentric tubes of different diameter adapted to form two compartments, one of such compartments adapted to be connected to the engine to receive the exhaust gases and communicating with the other compartment solely by means of openings of smaller diameter than length through the inner tube, such other compartment having a free outlet opening to the atmosphere.

12. In a muffler for engines, the combination of a first compartment for receiving the exhaust gases, and a second compartment for receiving such gases from the first compartment and delivering the same to the atmosphere, such compartments formed by means of two concentric tubes of different size, the inner tube being comparatively thick and having a multiplicity of small bore holes formed therethrough.

13. In a muffler for engines, the combination of a first pipe, a second pipe disposed within the first pipe and small bore tubes extending from the second pipe and adapted to afford high surface resistance to the passage of exhaust gases from one pipe to the other.

14. In a muffler for engines, the combination of a first pipe, and a second pipe disposed within the first pipe, such second pipe having formed therethrough openings of small bore relatively to their length to afford high surface resistance to the passage of exhaust gases from one pipe to the other.

15. In a muffler for engines, the combination of a first compartment for receiving the exhaust gases, a second compartment adapted to deliver the exhaust gases from the muffler, and small bore tubes extending from one compartment to the other such tubes being of different lengths and extending in different directions.

16. In a muffler for engines, the combination of a first compartment for receiving the exhaust gases, and a second compartment adapted to deliver the exhaust gases from the muffler, such compartments separated by a partition having formed therethrough a plurality of openings of small bore relatively to their length to afford a high surface resistance to the passage of the exhaust gases from the first to the second compartment.

In witness whereof, I hereunto subscribe my name this 8th day of December A. D. 1908.

WILLIAM H. WINSLOW.

Witnesses:

CHARLES J. SCHMIDT,
FRANK J. THELEN.