E. SCHMITT.

MUFFLER.

APPLICATION FILED OCT. 19, 1915.

1,236,987. Patented Aug. 14, 1917.

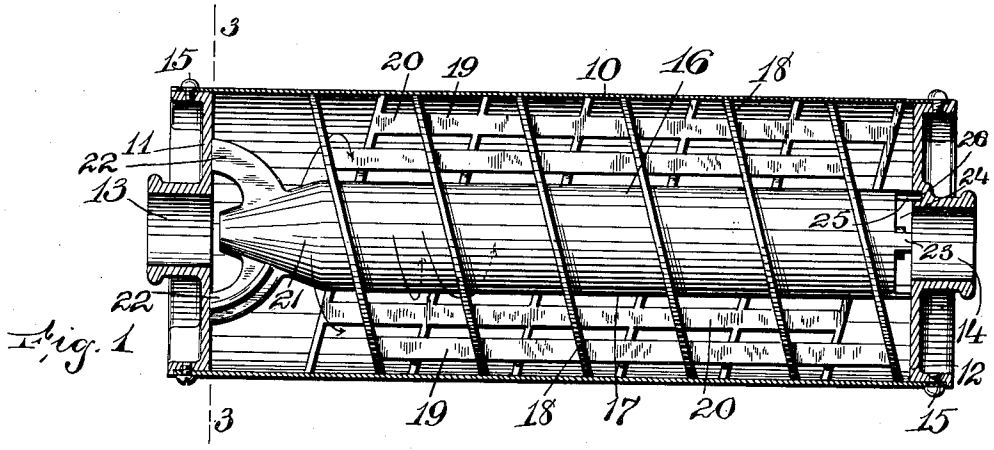


Fig. 1

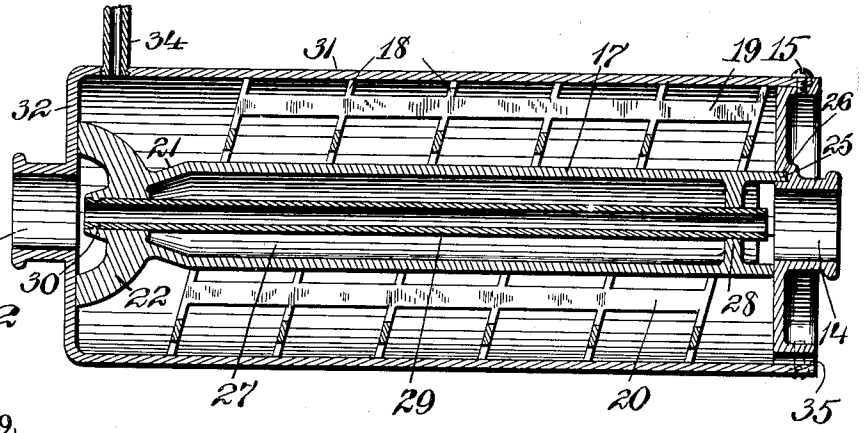


Fig. 2

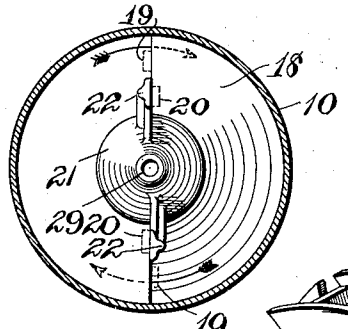


Fig. 3

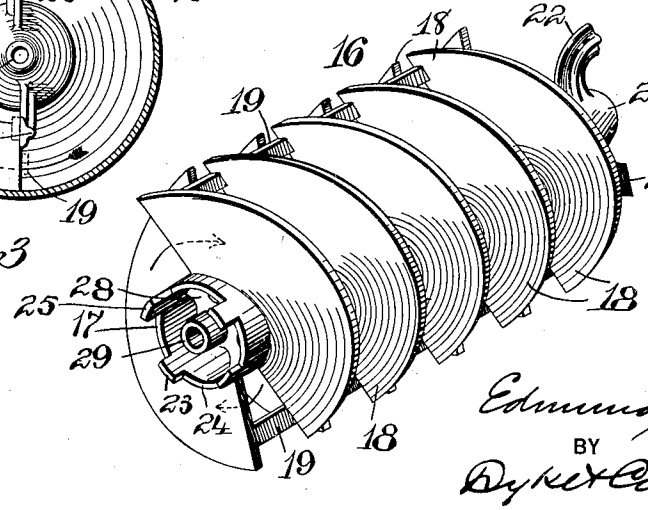


Fig. 4

INVENTOR
Edmund Schmitt,
BY
Dyer & Campfield,
ATTORNEYS.

UNITED STATES PATENT OFFICE.

EDMUND SCHMITT, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE NATIONAL SILENCER COMPANY, OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MUFFLER.

1,236,987. Specification of Letters Patent. **Patented Aug. 14, 1917.**

Application filed October 19, 1915. Serial No. 56,686.

To all whom it may concern:

Be it known that I, EDMUND SCHMITT, a citizen of the United States, and a resident of Bridgeport, county of Fairfield, and State of Connecticut, have invented certain new and useful Improvements in Mufflers, of which the following is a specification.

This invention relates to an improved muffler of the type that provides a circuitous passage for the gas, the circuitous passage being adapted to reduce the temperature of the hot discharge gases and to dissipate the pressure so that the gas emerges without a decided puff, and that furthermore enables a comparatively short muffler to contain a long passage, due to its shape, whereby every particle of gas is caused to travel a considerable distance when it goes through the muffler.

The muffler is designed to provide a clear passage which, while it breaks up and modifies the discharge gases, still allows no place for the accumulation of dead gas, and the explosion in the muffler is harmless and there is no back firing.

Another object of the invention is to provide a muffler of this kind in which the casing holds a fixture, the fixture being so formed that it coöperates with the casing to provide circuitous non-continuous passages, the fixture being made of one piece whereby its production is cheapened, its stability is insured and its cleaning is easy.

The invention also provides a device of this kind in which the fixture is longitudinally movable in the casing when one of the heads of the casing is removed, so that when this head, which is detachable and holds the fixture in place, is removed the fixture can be withdrawn and acts as a scraper to assist in such withdrawal and to initiate the cleaning of the casing by carrying with it the dirt from the interior walls of the casing. The parts used in the muffler are few, its assembling is easy and it is very effective.

While details can be changed and minor modifications embodied in the construction, I do not wish to be understood as limiting myself to the form as illustrated, the illustrations, however, embodying preferred forms of muffler which adequately illustrate my invention.

In the drawing, Figure 1 is a section of a muffler of my improved type with the fixture inside the casing shown in elevation. Fig. 2 is a section of a casing of a modified form, the interior fixture being the same as in Fig. 1 but being shown in section to more clearly illustrate its construction. Fig. 3 is a section on line 3—3 in Fig. 1, and Fig. 4 is a perspective view of the interior fixture illustrated in Figs. 1, 2 and 3.

The muffler comprises a casing which can be made in different forms, the one shown in Fig. 1 consisting of a substantially cylindrical barrel 10 which can be made of sheet metal and is provided with end pieces 11 and 12, these end pieces having openings 13 and 14, the opening 13 being the inlet opening and the opening 14 being the outlet opening, these openings being of any desired form and being provided with screw-threaded connections or flanged connections or any other suitable connection for inlet and outlet pipes, these inlet and outlet openings being adapted to conduct the gas into the muffler from the engine and from the muffler into the atmosphere. The end pieces and the barrel can be suitably fastened together, in the form shown in Fig. 1 screws 15 being employed passing through perforations in the barrel and being screwed into screw-threaded holes in the flanges of the end pieces. The casing thus has one of its heads detachable, which is desirable to permit the removal of a fixture which is placed inside the casing and which coöperates with the casing to form the passage for the gas, and which is identified in the drawing by a general reference numeral 16, the fixture being illustrated in perspective view in Fig. 4. This fixture is designed so that it is possible to cast it in one piece, thus making it an integral fixture which can be placed into and removed from the casing as a unit and which is easily and cheaply manufactured due to the possibility of casting it in one piece.

The fixture as shown consists of a core 17 which is preferably cylindrical and concentric to the barrel 10, and it has arranged on the outside thereof a series of plates 18, these plates being disposed at an angle to the longitudinal axis of the muffler. These plates with the core and the shell provide a passage which is substantially helical and

extends from the inlet to the outlet opening of the muffler and conducts the gases through a circuitous route. I prefer to make these plates so that their edges do not abut, that is, the plates are not arranged to form an unbroken channel, but they are staggered so that in passing between two plates on the same side of the muffler, the gases when passing to the other side are divided so that some of the gas again passes around in the same channel, while another portion is advanced into the next succeeding passage. If desired the device can be strengthened by strips 19 and 20 which connect the adjacent edges of the plates 18 on opposite sides of the core and also act to form perforated partitions in the path of the gases, these partitions serving to break up the gases and to cause a thorough intermingling which is desirable, especially when a rich mixture is in the muffler due to the spark of the engine having been shut off, this sub-division of the mixture in the presence of preceding or succeeding poor mixtures modifying the rich mixture quickly and lessening the chances of any ignition thereof.

The inlet end of the core is made cone-shaped as at 21 and is provided with suitable spacing arms 22 which may be of any desired shape so long as they do not interfere with the ready admission and passage of gases from the inlet opening 13 to the channels between the plates. The arms or spider 22 are preferably cast with the core and abut on the end piece 11 and hold the fixture in place, since the other end of the core has spaced studs 23, the spaces 24 between the studs permitting the passage of gas from outside the core to the outlet opening 14, one of the studs, such as 25, being made longer than the others and projecting into a recess 26 which prevents rotation of the fixture relative to the casing. While such relative rotation is not particularly disadvantageous, it is essential in certain types of mufflers. The core 17 for the purpose of lightening the structure is preferably made hollow, forming a chamber 27. The chamber 27 has near one end a spider or brace 28 which suspends one end of the pipe 29, the pipe 29 extending to the end of the cone 21 and being opened to the inlet of the casing, the pipe being usually secured in place by being cast into the fixture when the fixture is made, being held in position by reason of an annular groove 30 into which the molten metal passes in the manufacture of the fixture and which positively secures the small pipe 29 in place. The small pipe acts to conduct a small amount of the gas directly to the outlet of the muffler and thus facilitates the passage of gas through the circuitous part of the muffler by reason of inducing a slight suction at the outlet end.

The plates shown in the drawing are plates that are straight but arranged at angles so as to incline in opposite directions on the opposite sides of the core and thus form substantially helical passages for the gases passing through the muffler. It will be understood that any form of plate, whether slightly curved or straight, can be used in this muffler, but it is desired that the plates be so arranged that as the gases are progressed in the circular direction through the muffler, that they be successively sub-divided by contact with the ends of the plates and with the perforated partitions when such partitions are placed in the muffler.

It is sometimes desirable to inject water into the muffler so as to assist in cooling it, such mufflers being used in conjunction with marine engines. One form of muffler for the reception of water for cooling purposes is illustrated in Fig. 2, the casing 31 being made of cast metal and forming a barrel with the head 32 arranged integral therewith, the head 32 having the inlet port 33 which is the equivalent of the inlet port 13 in Fig. 1. The end piece 12 is fastened by screws 15 to the walls of the barrel at the end opposite the head 32. A water inlet pipe 34 is suitably placed to inject water into the muffler and is provided with any suitable source of water supply usually from a pump connected to the engine, and the usual disposition is to place this pipe so that the water descends on the forward end of the core, that is, the cone-shaped portion, and then travels through the muffler, emerging through an opening at the other end thereof, such as the hole 35 in the bottom of the end piece 12. The water in this construction cannot possibly choke the muffler, since it cannot flood it, has its independent outlet end, is well mixed with the gases and is well disposed through the muffler to cool it while it is passing through the muffler. On entering the muffler from the pipe 34 the water descends on the cone part of the core and then flows to the bottom of the muffler, and its normal path, undisturbed by any other conditions, would be to flow down the center of the muffler toward the outlet 35, but the staggered ends of the plates 18 cause the water to flow around such ends and thus pursue a path that is not direct since it must pass around these ends and is deflected first to the right and then to the left on its way toward the outlet. In addition to this it is subjected constantly to the whirling or rotating gases passing the channels between the plates and it is thus sprayed and spattered around in the muffler to cool the whole structure. The dissipation of the water in this way and the convenient outlet for the water prevent any interference by the water of the progress of the gases through the muffler, and thus prevent the choking of the muffler, but at the same time enough water

is present in the muffler to effectually assist in cooling it and the gases that pass through it. The hollow core 27 does not permit the congregation of unexploded gas therein, since any such gas passing through the muffler is forced through the outlet 14 by reason of the suction induced by the pipe 29 and the pressure of the gas passing between the plates 18 which follow it up, and there is no opportunity for entrance in sufficient quantity to cause any explosive mixture to be present within the chamber 27.

This muffler with its one-piece interior fixture is easily repaired and easily cleaned. In order to clean it the end piece 12 is removed from the barrel 10 or barrel 31 as the case may be, and then the fixture 16 is grasped and pulled longitudinally through the barrel, the plates 18 act as scrapers and carry with them any sediment or deposits that line the barrel, and on the withdrawal of the fixture 16 what little dirt remains in the barrel 10 can be easily removed. The fixture itself is easily cleaned and can be readily replaced in the barrel of the casing and secured in position by the reattachment of the detachable end piece 12. The free and unobstructed passages for the gas prevent explosions in the muffler sufficient to damage it or to cause any back-fire. If a rich mixture passes from the engine into the muffler, due to the shutting off of the spark of the motor, and it is followed by a hot explosive mixture that is liable to ignite it, any obstruction of the unexploded mixture that takes place in the first one or two turns of the circuitous passage simply forces the mixture ahead of it through the muffler, since there is no serious obstruction to such quick passage of the unexploded gas, and furthermore, the continual breaking up of the mixture by reason of its being constantly sub-divided and scattered by the perforated partitions 19 results in a mixture that is apt to be poor enough to not lend itself to ready ignition, and there are no places for unexploded gases to congregate in the muffler except in these direct passages for gas, and, as before stated, the sub-divisions of gas at each half rotation in the muffler makes an inferior mixture.

The plates 18 as illustrated in the drawing are shown as semi-circular plates, but it will be understood that they can be made in larger or smaller segmental shapes. The disposition of the plates in the form illustrated provides two end plates that have their ends uncovered at the inlet end of the muffler so as to provide a ready entrance and initial expansion when the gases enter the muffler, and there is no retarding at the inlet end of the muffler of any gases entering therethrough. The cone-shaped end of the core also assists in deflecting the gases toward these entrance ends or portions and does it in a way so as to not seriously interfere with the progress of the gas at this point. The constant and frequent intermingling of the gases in the passage through the helical channels mixes the gases at different temperatures, that is, a gas cooled by a partial rotation will part of it go back and be rotated once more with the succeeding volume, and this gradual lowering and intermingling of the gases at different temperatures cools the mixture so that when it emerges it is comparatively cool and at substantially atmospheric pressure. Furthermore, the regular non-continuous passage provides in the aggregate a long distance of travel for every part of gas that passes through it, since it is certain that it is frequently sub-divided in its passage through the muffler, and this function of the muffler permits the use of a shorter muffler than would be necessary to provide the same distance of travel in a direct channel.

The segmental plates arranged so that their ends do not abut to form a continuous irregular channel can be arranged at various angles to shorten or lengthen the channel, and the perforated partitions, in the type illustrated these being formed by the bars 19 and 20, break up the sound waves, but do not materially retard the progress of the gases, and these partitions can be of different forms and with various sizes of openings in them, but I prefer in any case to connect them to the adjacent ends of the segmental plates and thus stiffen the structure.

Having thus described my invention, I claim:

1. A muffler comprising a fixture which comprises a core, inclined plates, a tapered end on the core, spacing arms on the tapered end, the core having outlet spaces at the opposite end, the fixture being made in one piece, and a casing around the fixture, the casing having a detachable end piece to permit the longitudinal removal of the fixture.

2. A muffler consisting of an interior fixture which is made of one piece and comprises a core, inclined plates arranged on the core to form an approximately helical and continuous irregular channel, one end of the core being tapered and the opposite end being cut away to permit the passage of gas, an exterior casing surrounding the plates, and end pieces, at least one of said end pieces being removable to permit the longitudinal withdrawal of the fixture.

3. A muffler consisting of an interior fixture made of one piece, said fixture comprising a core, inclined plates on the core to form a continuous irregular channel, the plates being segmental in shape with their ends out of alinement, the end of the core being tapered and having arms thereon, and

an exterior casing consisting of a barrel and end plates, one of said end plates being removable, the interior fixture abutting on the end plates to prevent its longitudinal movement.

4. A muffler consisting of an interior fixture, the interior fixture comprising a core, inclined segmental plates on the core to form a substantially helical and continuous irregular channel, the ends of the plates being out of alinement, perforated partitions between the ends of adjacent plates, and a casing surrounding said fixture and having inlet and outlet openings in communication with the channel between the plates.

5. A muffler comprising a fixture, said fixture consisting of a core, inclined segmental plates on the core to form a substantially helical and continuous irregular channel between them by reason of the plates being arranged with their ends out of alinement, perforated partitions joining the ends of adjacent plates, the core being tapered at one end and having a spider thereon, an exterior casing comprising a barrel surrounding the plates and into which the plates fit, and end pieces, one of said end pieces being removably attached to the barrel.

6. A muffler comprising a fixture, said fixture consisting of a core, inclined segmental plates on the core to form a substantially helical and continuous irregular channel between them by reason of the plates being arranged with their ends out of alinement, perforated partitions joining the ends of adjacent plates, the core being tapered at one end and having a spider thereon, an exterior casing comprising a barrel surrounding the plates and into which the plates fit, and end pieces, one of said end pieces being removably attached to the barrel, the interior fixture being made in one piece and abutting on the end plates to hold the fixture against longitudinal movement.

7. A muffler comprising a fixture, said fixture consisting of a core, inclined segmental plates on the core to form a substantially helical and continuous irregular channel between them by reason of the plates being arranged with their ends out of alinement, perforated partitions joining the ends of adjacent plates, the core being tapered at one end and having a spider thereon, an exterior casing comprising a barrel surrounding the plates and into which the plates fit, end pieces, one of said end pieces being removably attached to the barrel, the interior fixture being made in one piece and abutting on the fixture and on the casing to prevent their relative rotation.

8. A muffler comprising a casing, inclined plates within the casing to form a substantially helical channel, the ends of the plates being separated at the bottom of the muffler, and a water inlet pipe at one end of the casing, the casing having a water outlet at the opposite end, water in the casing pursuing a substantially zig-zag course between the ends of the plates as it proceeds toward the outlet.

9. A muffler comprising an interior structure having a circuitous passage for gas, a casing inclosing the structure and having inlet and outlet openings, and lugs on the end of the structure, the casing having a recess in its end to receive one of the lugs to prevent rotation of the structure relative to the casing.

In testimony that I claim the foregoing, I hereto set my hand, this 15th day of October, 1915.

EDMUND SCHMITT.