V. L. EMERSON.

MUFFLER FOR EXHAUST PIPES.

APPLICATION FILED DEC. 11, 1919.

1,376,263. Patented Apr. 26, 1921.

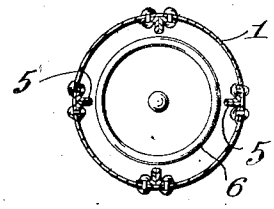


Fig. 2.

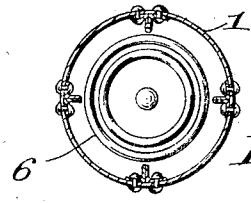


Fig. 5.

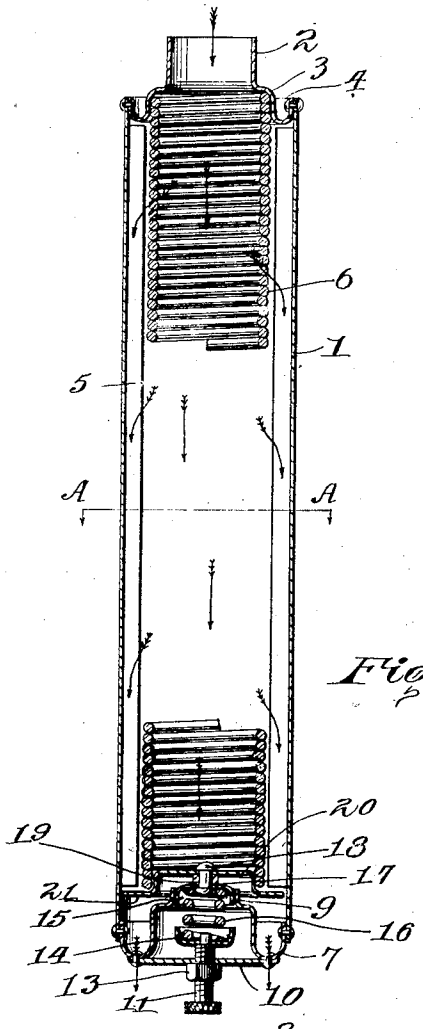


Fig. 1.

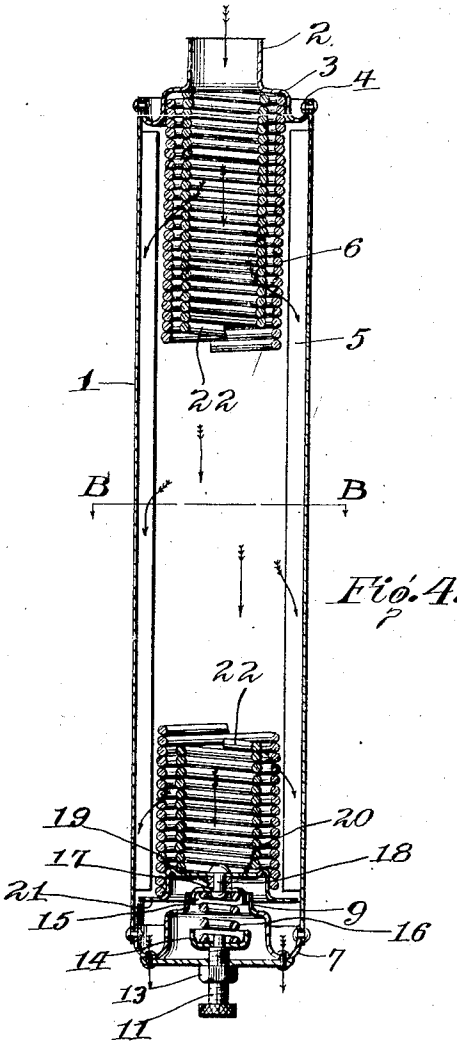


Fig. 4.

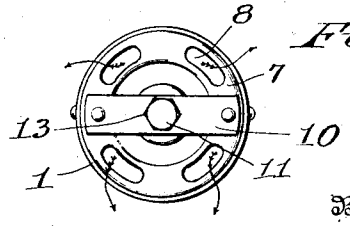


Fig. 3.

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MUFFLER FOR EXHAUST-PIPES.

1,376,263. Specification of Letters Patent. Patented Apr. 26, 1921.

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To all whom it may concern:

Be it known that I, VICTOR LEE EMERSON, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Mufflers for Exhaust-Pipes, of which the following is a complete specification.

In the use of an internal combustion engine, ordinary running conditions demand provision against the unnecessary noise of the exhaust from the explosion cylinders. It is customary to provide baffled passageways which establish a tortuous path for exhaust gases. These tortuous paths are provided by rigid structures in the form of cylinders with metallic transverse baffles or other partial partitions. In the majority of cases such structures are rigid and no effort is made to provide an adjustment varying with the variations of the explosion.

The temperatures at which the exhaust gases pass through the ordinary muffler are high. On some cases it will be found that the metal of which the muffler is constructed will attain a dull red glow. Again, with faulty engine practice, unburned gases will reach the muffler and ignite within the muffler, causing disastrous explosions.

Where the exhaust of an engine carries with it smoke, oil or solid particles, the retardation of the gas current in the muffler serves to produce an accumulation there of all such foreign material. There results a deposition upon the walls and surfaces of the muffler which interferes with its normal operation and may ultimately be the cause of explosions or clogging. A muffler constructed in the manner outlined in my invention operates to clear itself continuously of all such depositions or accumulations. The incessant movement of the several parts of the muffler caused by the rapid variations in exhaust pressure serves to cause a rapid contact and separation of the parts of the expansion member. It follows that these contacting portions of the expansion member, which form the openings through which the gases pass, will remain bright, smooth and free from sooty accumulation. Any flakes of solid material entrained in the openings of the expansion member will be quickly broken up and dislodged during its operation.

It is an object of my invention to provide a muffler which while conforming to the existing practice of engine design so far as weight and size are concerned, will serve to reduce the exhaust to a practically noiseless current of burned gases, regardless of the speed at which the engine is driven or the amount of fuel which is utilized.

A further object of my invention includes the provision of a device which will be effective at all temperatures and will maintain its normal operation even in the event of unduly elevated temperatures. It is essential in these devices that the structure be not rendered useless by overheating.

My improvement maintains the device as an effective trap, or non-return valve in the current of the exhaust in such manner that there is no liability of the engine developing back pressure. The extremes of pressure are instantly responded to and the device as quickly returns to its normal position.

It is a further object of my invention to provide means controlling the shape of the muffler and guarding it against distortion or possible destruction from any explosion which may be caused therein by defective motor operation or imperfect combustion within the explosion cylinders.

By reason of the peculiar structure relied upon, overheating is practically eliminated. The structural parts of the device are such as to convey away the greater portion of the heat of the exhausted gases and to prevent the accumulation of heat within the muffler.

To prevent the detrimental effect of high temperature upon the operating spring of the expansion member, my invention aims to place the spring controlling the expansion member out of the current of exhaust gases and in a locality where it will not be subjected to excessive temperature and hence will not lose its temper.

It is an object of my invention to maintain the muffler free from the accumulation of oil or solid particles carried in by or deposited from the exhaust. This is accomplished by the intermittent contacting and separation of the adjacent parts of the expansion member. The contacting portions of the expansion member are kept clear and serve to break up and dislodge any depositions which might tend to accumulate.

Further advantages of my invention will

be evident from the following description and drawings, in which latter,—

Figure 1 is a longitudinal section of the muffler.

Fig. 2 is a cross section on the line A—A in Fig. 1.

Fig. 3 is an end view of Fig. 1.

Fig. 4 is a longitudinal section of the muffler containing an additional baffling element; and

Fig. 5 is a cross section through the line B—B of Fig. 4.

The muffler consists in a cylindrical casing or tubing 1. One end of the casing 1 carries an inlet pipe 2 having an outwardly turned shoulder 3 and flange 4. The flange 4 is bent backward to form means for fastening the pipe 2 to the casing 1. Longitudinally of the inner wall of the casing and equi-distant around it are bolted, or otherwise attached, a plurality of ribs 5.

The baffle or expansion element of the muffler is formed of a helical metallic rod 6 which may be either rectangular or circular in cross section. This helix 6 extends substantially the full length of the casing 1 being fastened at one end to the shoulder 3 while the opposite end is free from engagement with the casing, as will be hereinafter described.

The helix extends in a coil closely adjacent to the inner edges of the ribs 5. It will be manifest, however, from the operation of the device, that the coils of the helix, when at rest, do not contact with the ribs 5.

The opposite end of the casing 1 is bridged by the outlet member 7. This member 7 is riveted or otherwise fastened to the end of the casing 1 and is bent inward. At the point of bending the member 7 is perforated with a plurality of openings 8. The inner edge of the member 7 is restricted to form a flange 9 extending longitudinally of the casing and within the same. This flange 9 forms a bearing co-incident with the axis of the casing 1 and the helix 6.

Extending across a diameter of the member 7 and fastened thereto is a brace 10. A screw-threaded rod 11 passes through the brace 10 along the axis of the muffler. One end of the rod is expanded to form a knurled head or other analogous means of attachment. The position of the rod through the brace 10 is determined by a lock nut 13 screw-threaded on the rod and engaging one face of the brace 10. The inner end of the rod 11 carries a concentric flanged cup 14, the lip of which is turned inward toward the bearing flange 9 on the member 7.

The adjacent end of the helix 6 is kept concentric of the casing 1 by means of the flanged cup 15 which rides along the inner surface of the flange 9. An expansion spring 16 has an end held in each of the cups 14 and 15 and serves to hold them apart. The cup 15 is pierced centrally as at 17 to receive one end of the rivet or other fastening means 18. The rivet 18 passes through a washer or spacing member 19 and a flanged plate 20. The flange of the plate 20 is so proportioned as to fit within the end of the helix 6, but to allow the helix to adjust itself rotatably on the flange. Outward of the flange is the lip 21 extending nearly to the inner wall of the casing 1. This lip in its innermost limit of travel abuts against the ends of ribs 5.

A second helix 22 may be placed within the helix 6 and may differ from it in the direction of its pitch. Such a structure is indicated in Fig. 4. When this assemblage is used the sizes of the respective helices vary and the inner one will offer the greater resistance to the passage of the exhausted gases. It follows that the outer helix need offer but slight resistance to the force of the current and merely completes the control of sound. The reversal of pitch in the second helix serves additionally to baffle the current of gases and where the first helix diverts the gases in one direction around the muffler, the second helix directs the gases in the opposite direction. The result will be that the gases take a longitudinal path.

As the intermittent currents of exhausted gases pass through the inlet pipe 2 and within the helix 6, the pressure will serve to expand the individual coils of the helix and separate them one from the other. It will also have the effect of driving the plate 20 outward. When the plate 20 is driven toward the outlet it permits the adjacent coils of the helix 6 to expand and promotes the establishment of a multiplicity of temporary outlets between the adjacent helix coils. The resistance to be offered by the helix is controlled by the adjustment of the screw-threaded rod 11 which in turn varies the resistance offered by the spring 16 to the outward movement of the plate 20. As the coils of the helix separate, there is a slight tendency for them to rotate with respect to the adjacent ribs. This rotation becomes a rebound when the pressure of the exhaust gases is relieved by their passage between the individual coils or by collapse of the pressure. This slight rotation of the coils is permitted by reason of the intervening space between the coils and the ribs 5. The rapid intermittent movement of the portion of the expansion member, *i. e.*, the coils of the helix, into and out of contact, keeps them bright and clears the openings of any accumulation of scale.

The alternate expansion and contraction of the helix 6 and the plate 20 are instantaneous with the surge of the gas current through the device. When the gases in-

crease the pressure by the opening of the exhaust valve in the engine, the helix instantly expands and provides an expanded outlet over substantially the full circumferential surface of the helix. In this manner the violence of the explosion is dissipated and unnecessary noise eliminated. As soon as the exhaust has passed, the helix 6 resumes its original and normal position of rest with a minimum of movement and each coil contacts with the adjoining ones, establishing a continuous close fit and breaking up any deposit of carbon or oil. It will be evident that the ribs prevent an undue expansion of one portion of the helix at the expense of lack of movement in another portion. These ribs serve to retain the helix in its normal position and prevent excessive explosions or vibrations through possible distortion of the helix. In like manner these ribs compel the gases to take a longitudinal path through the muffler.

The gases passing out of the exhaust are all at elevated temperatures and there results an absorption of heat by the helix and the associated parts of the device. In some instances the muffler itself may reach an elevated temperature. The radiating ribs serve to carry the heat away from the helix, and the helix itself being in one continuous metallic element serves to distribute the heat uniformly throughout its length.

It will be evident that the temper of the spring 6 in itself might be affected by this accumulation of heat and ultimately lose its resilient power to restore itself to the original helical conformation. Emphasis is laid upon the fact, however, that the helix 6 is positively restored to its normal position of rest, not by its inherent resiliency but by the force of the spring 16. The member 7 in its inwardly flaring form serves to divert the exhausted and hot gases which have passed the outer lip 21 through the openings 8. In this way the spring 16 being in the outer atmosphere and not in the current of the exhausted gases will retain its resiliency and serve to maintain the helix 6 positively in its normally operating position.

Where the circumstances demand greater protection against back pressure and the force of the current is too great to be completely controlled by a single helix, a second helix, such as shown at 22, may be used. In this latter case the greater part of the violence of the exhausted gases is controlled by the inner coil in the manner above described.

It will be evident that the purpose of this invention is not limited to the use of a helical baffle or expansion member, but that the latter may be variously constructed, for example, with longitudinally extending strips or sheets of metal held closed by resilient means and responsive to the pressure of the exhaust gases. Or in like manner the same result may be obtained within the scope of my invention by the use of a plurality of sleeves with coöperating vents brought into and out of registry by means not in the path of the gases nor subjected to their heat.

It is also to be understood that other modifications and equivalents than those above described may be used and are within the scope of the invention as defined in the appended claims.

What I claim is:

1. In a muffler, a housing having an inlet and outlet, an expansion member leading from said inlet and carrying a plate at the end thereof, adjustable retaining means located at the outlet end of said casing, a retaining means attached to said plate, and a resilient means located between both said retaining means for controlling the movement of said plate and expansion member.

2. In a muffler, a housing having an inlet and outlet, an expansion member leading from said inlet and carrying a plate at the end thereof, a guide member located at the outlet end of said casing having an aperture therethrough, an adjustable retaining means located at the outlet end of said casing, a retaining means attached to said plate, and a resilient means located between both said retaining means and passing through the aperture in said guide member and guided thereby for controlling the movement of said plate and expansion member.

3. In a muffler, a housing having an inlet and an outlet, an expansion member leading from said inlet and carrying a plate at the end thereof, a guide member located at the outlet end of said casing having an aperture therethrough with a struck up portion surrounding said aperture, a cup shaped member attached to said plate and adapted to move within said struck up portion and be guided thereby, an adjustable cup shaped member mounted in line with the cup shaped member on said plate, and a resilient means located between said cup shaped members for controlling the movement of said plate and expansion member.

4. In a muffler, a housing having an inlet and an outlet, an expansion member leading from said inlet and carrying a plate at the end thereof, a guide member located at the outlet end of said casing having an aperture therethrough, said guide member forming a closure piece for the outlet end of said housing and having outlet ports therein, a supporting member attached to said guide member, an adjustable screw plug mounted in said supporting member and a resilient means located between said plate and screw plug for controlling the movement of said plate and expansion member.

5. In a muffler, a housing having an inlet and an outlet, said housing being provided

with internal ribs extending longitudinally thereof, an expansion member leading from said inlet and carrying a plate at the end thereof positioned adjacent the extremities of said ribs adjacent said outlet and a resilient means located adjacent said outlet for controlling the movement of said plate and expansion member.

6. In a muffler, a housing having an inlet and an outlet, an expansion, member leading from said inlet composed of a plurality of concentric coil springs the coils of which being normally close together, a plate attached to the outlet end of said springs and a resilient means for controlling the movement of said plate and springs.

In testimony whereof I have hereunto set my hand.

VICTOR LEE EMERSON.