

May 22, 1928.

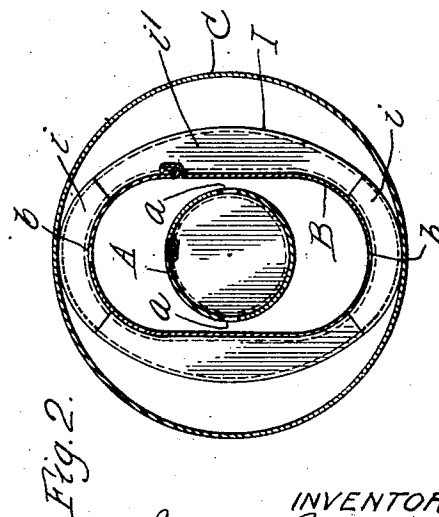
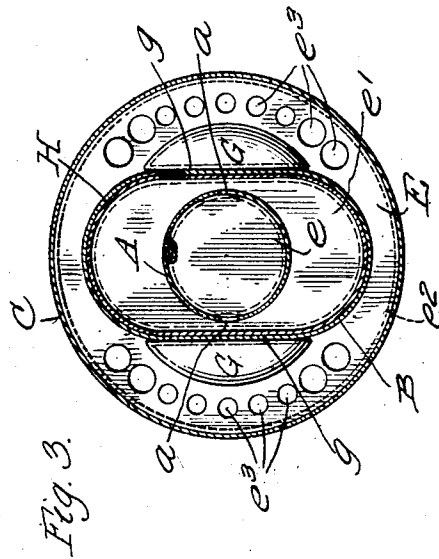
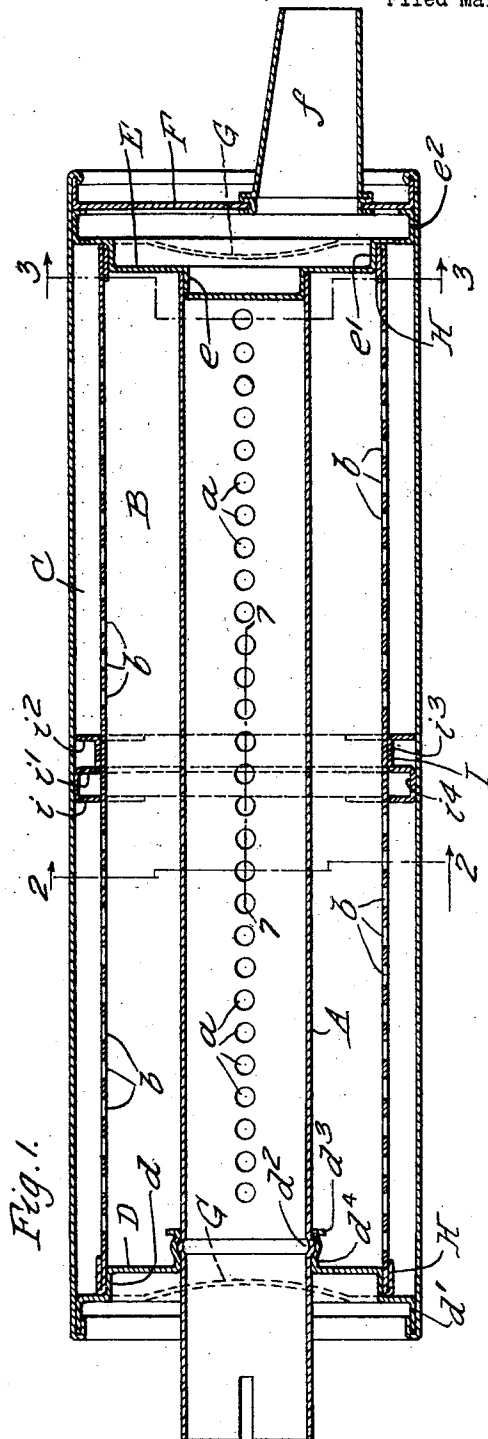
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1,670,766

MUFFLER

Filed March 13, 1924

2 Sheets-Sheet 1



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Fig. 4.

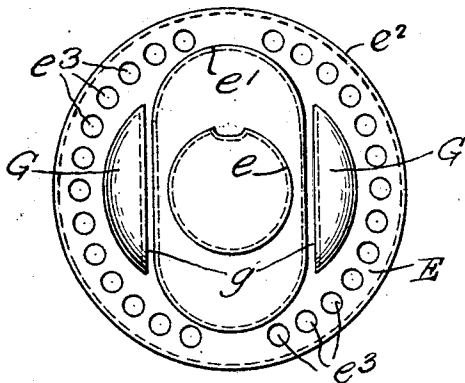


Fig. 5.

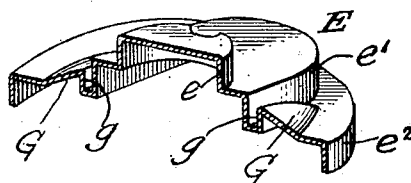


Fig. 6.

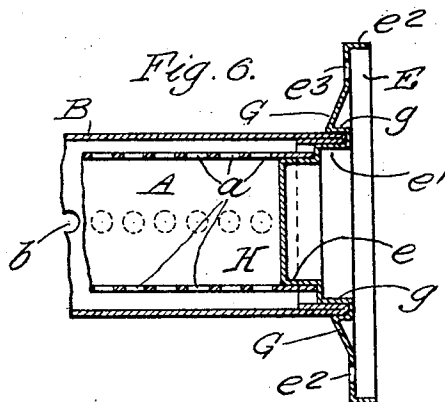


Fig. 7.

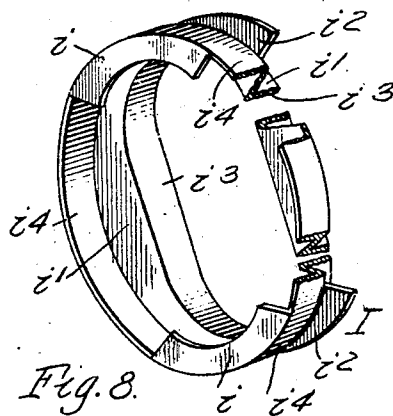
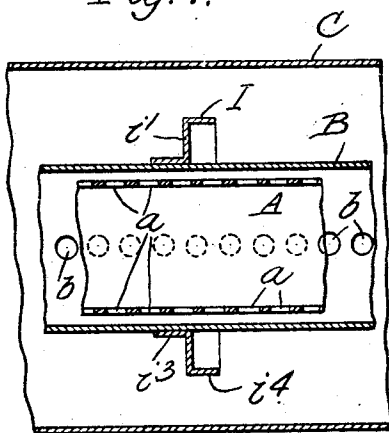


Fig. 8.

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MUFFLER.

Application filed March 13, 1924. Serial No. 698,868.

This invention relates to improvements in mufflers of the kind having tubes of non-circular cross section.

The objects of this invention are to provide mufflers of this kind with means for preventing deformation of the non-circular tubes due to explosions in the mufflers or from other causes; also to improve the construction of mufflers of this kind in other respects hereinafter specified.

In the accompanying drawings:

Fig. 1 is a central longitudinal sectional view of a muffler provided with the improvements embodying our invention.

Figs. 2 and 3 are transverse sections thereof on lines 2—2 and 3—3 respectively in Fig. 1.

Fig. 4 is an elevation of one of the heads of the muffler.

Fig. 5 is a fragmentary perspective view of one of the heads of the muffler.

Fig. 6 is a fragmentary longitudinal sectional view of the muffler showing the head and its connection with two of the tubes of the muffler.

Fig. 7 is a fragmentary longitudinal section thereof on line 7—7, Fig. 1.

Fig. 8 is a perspective view, partly broken away, of a truss member.

Our invention may be applied to any muffler having one or more tubes therein of non-circular cross section. The muffler shown in the drawings includes an inner cylindrical tube or shell A of substantially circular cross section into which the exhaust gases pass from an engine, an intermediate shell or tube B of substantially elliptical or analogous cross section, having its smallest diameter greater than the diameter of the inner tube A and arranged concentric with regard to the inner tube, and an outer tube or shell C also substantially circular in cross section and of greater diameter than the largest diameter of the elliptical shell B, and arranged concentric with regard to the inner tube A. The tubes or shells are held in place with regard to each other by means of a head D arranged at the inlet end of the muffler, and a head E at the discharge end thereof. The heads are preferably made of sheet metal and are provided with shoulders by means of which the shells are held in place, the head D having a shoulder d

for the elliptical shell B and an outer flange or shoulder d' for the outer tube C, and the head E having shoulders e and e' engaged respectively by the shells A and B, and an outer flange or shoulder e^2 around which the outer shell C of the muffler extends. In the particular construction shown another head F is arranged beyond the head E and the heads are held in place by the outer shell C, the end of which is turned over and engages the head F. The head D also has an inwardly extending flange d^4 which engages the inner shell A and which is preferably secured to the shell to form a substantially airtight joint therewith by means of an outwardly extending bead d^2 in the shell A, which cooperates with a corresponding bead in the flange d^4 . These cooperating beads also serve to hold the inner tube or shell in its correct position in the muffler. In order to assist in the forming of the bead in the flange d^4 by means of an expanding tool which is inserted into the shell A, the inner end of the flange d^4 is provided with a substantially radial flange or enlargement d^3 which holds the inner end of this flange d^4 in its original form during the expanding of the intermediate part of the flange d^4 to form the bead therein. The inner shell which is connected directly with the exhaust pipe of the engine is provided with a series of perforations or holes a which are so arranged that the gases passing through these perforations enter into the chamber between the tubes A and B at the portions thereof of smallest cross section, or in other words the gases impinge upon the portions of the elliptical tube B of smallest diameter, and pass from the portion of the chamber of smaller diameter to those of greater diameter, causing expansion of the gases. The elliptical shell B is provided at the portions thereof of greater diameter with a plurality of perforations or holes b through which the gases pass into the outer chamber formed by the tubes or shells B and C and are further expanded in this chamber by passing from the portions of smaller cross sectional area to those of greater area. The gases are discharged from the outer chamber through a series of perforations e^3 arranged in the head E and enter into a chamber formed between the

heads E and F. The head F is provided with a discharge pipe or nozzle *f* through which the gases pass out of the muffler.

It is well known that if a tube of non-circular cross section is subjected to internal pressure, the tendency of this pressure is to change the shape of the tube to a circular cross section. Consequently the elliptical tube or shell B may, if the muffler is subjected to an explosion of sufficient violence, be changed from its form as shown in the drawings to a form more resembling a shell of circular cross section, and in order to avoid distortion of the shell B due to unusually severe explosions in the muffler, the following construction is preferably employed.

The heads D and E are provided adjacent to the shoulders *d* and *e'* thereof with which the shell B engages, with inwardly extending projections G, which may be of any suitable or desired form and which are preferably formed integral with the head. The projections G are provided with substantially square shoulders *g* which are arranged in proximity to and substantially parallel with the shoulders *d* and *e'* engaged by the shell B. The other portions of the projections G may be of any suitable form, those shown flaring gradually toward the flat portions of the head D or E, so that these portions of the projections strengthen or brace the inner ends of the shouldered portions *g*. The square shoulders *g* of the projections are arranged near the elongated portion of the elliptical shoulders *d* and *e'* and consequently engage those portions of the elliptical shell B which are most subject to distortion by the internal pressure in the muffler. The square shoulders *g* of the projections are spaced closely to the shoulders *d* and *e'* of the heads D and E respectively so that the ends of the shell B fit comparatively snugly into the space between the square shoulder *g* and the shoulder *e* with which the tube C engages. Preferably a sleeve or cuff is formed at the end of the shell B by turning over the metal at the ends of the tubes or shells before the shells are formed and the double thickness of metal thus formed at the ends of the shells fits into the space between the shoulders *g* and the shoulders *d* and *e'* of the heads. These sleeves or cuffs H further reinforce the ends of the shell B against distortion. For reasons which will be apparent later, one of the cuffs H, namely the one adjacent to the head E, is turned inwardly with reference to the shell B.

The portions of the elliptical tube or shell intermediate of the ends thereof are preferably reinforced against the distorting action of explosions in the muffler by means of a bridge or truss member I which surrounds the shell and engages the elongated sides

thereof so as to prevent these sides from bending or bulging outwardly. In the particular construction shown this truss member is made of sheet metal and is bent so that the portions thereof of greatest diameter are bent to provide three substantially radial webs *i*, *i'* and *i''* connected by two circumferential webs *i³* and *i⁴*, the web *i³* bearing on the elliptical shell B and the web *i⁴* may if desired bear on portions of the outer shell C. The parts of the truss member which are adjacent to the flattened sides of the elliptical shell are provided with one radial web *i'* and the circumferential webs *i³* and *i⁴*, the radial web gradually increasing in depth from the portions of the elliptical cross section of greatest diameter, so that at the middle portions of the flattened sides of the elliptical shell are reinforced by the parts of the web *i'* of greatest depth. In this manner the radial web *i'* is able to offer an increased resistance to bending out of the flattened portions of the elliptical shell, and the circumferential webs stiffen the radial portions of the truss member. The truss member is preferably welded or otherwise secured to the shell B to hold the truss member in place and one or more of these truss members may be provided at different portions of the shell if desired. The outer periphery of the truss member is also substantially elliptical in shape so that the gases can flow lengthwise in the space between the shells B and C, past the truss member. A truss or bridge member of any other form may be provided if desired.

By means of the construction shown, both the ends and the intermediate portions of the elliptical shell B are reinforced so that they can, if desired, be made of thinner metal than was heretofore used, without any sacrifice of strength, and the elliptical tube or shell can be made with flattened sides as shown, without danger of having the flattened sides bend outwardly.

We claim as our invention:

1. In a muffler, the combination of a shell of substantially elliptical cross section, a head with which an end of said shell engages, a shoulder on said head about which said end of said shell is arranged, and projections at opposite sides of said head adjacent to said shoulder and adapted to engage portions of the outer surface of said shell of lesser diameter to hold said portions in engagement with said shoulder.

2. In a muffler, the combination of a shell of substantially elliptical cross section, a head with which an end of said shell engages, a shoulder on said head about which said end of said shell is arranged, and projections at opposite sides of said head adjacent to said shoulder and forming with said shoulder recesses into which the portions of said shell of lesser diameter are

adapted to enter to hold said shell against outward distortion due to internal pressure.

3. In a muffler, the combination of a shell of substantially elliptical cross section, a head with which an end of said shell engages, a shoulder on said head about which said end of said shell is arranged, and projections at opposite sides of said head adjacent to said shoulder and adapted to engage portions of the outer surface of said shell of lesser diameter to hold said portions in engagement with said shoulder, said end of said shell being turned over to provide a double thickness of metal with which said projections cooperate.

4. In a muffler, the combination of a shell of substantially elliptical cross section, a head with which an end of said shell engages, a shoulder on said head about which said end of said shell is arranged, and projections at opposite sides of said head adjacent to said shoulder and adapted to engage portions of said shell of lesser diameter to hold said portions in engagement with said shoulder, and a truss member arranged at an intermediate portion of said shell to hold said intermediate portions of said shell against deformation.

5. In a muffler, the combination of a shell of substantially elliptical cross section, means for supporting the ends of said shell, and a truss member which extends around an intermediate portion of said shell and which offers greater resistance to distortion at the portions thereof which engage parts of said shell of smaller diameter than at other portions thereof, to hold the portions of said elliptical shell of smaller diameter against bulging outwardly due to internal pressure.

6. In a muffler the combination of a shell of substantially elliptical cross section, means for supporting the ends of said shell, and a substantially elliptical truss member extending around an intermediate portion of said shell and having radially extending and circumferentially extending connected webs, the portions of said truss member which engage the parts of said shell of smaller diameter being formed to offer greater resistance

to distortion than other portions of said truss member, the circumferential webs bracing said radial webs to hold said shell against bulging outwardly due to internal pressure.

7. In a muffler the combination of a shell of substantially elliptical cross section, heads with which the ends of said shell engage, and a truss member extending around an intermediate portion of said shell, said truss member having a radially extending part which is of greater depth at the portions of said shell of smaller diameter than at the portions of said shell of larger diameter.

8. In a muffler the combination of a shell of substantially elliptical cross section, heads with which the ends of said shell engage, and a truss member extending around an intermediate portion of said shell, said truss member having a radially extending part which is of greater depth at the portions of said shell of smaller diameter than at the portions of said shell of larger diameter, and circumferential flanges arranged at the edges of said radial flange and serving to reinforce said radial flange, one of said circumferential flanges engaging said shell.

9. In a muffler, the combination of a shell of non-circular cross section, heads having shoulders which extend into the ends of said shell, means formed on the heads for engaging portions of the outer surface of said shell to prevent outward distortion thereof due to excessive pressure in the muffler, and a truss member arranged intermediate of the ends of said shell and engaging the outer surface of said shell to prevent distortion thereof.

10. In a muffler, the combination of a shell of substantially elliptical cross section, a head having an integral shoulder pressed out of the same and extending into an end of said shell, and integral projections pressed out of said head adjacent to said shoulder and adapted to engage the portions of the outer surface of said shell of lesser diameter to prevent deformation thereof.

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