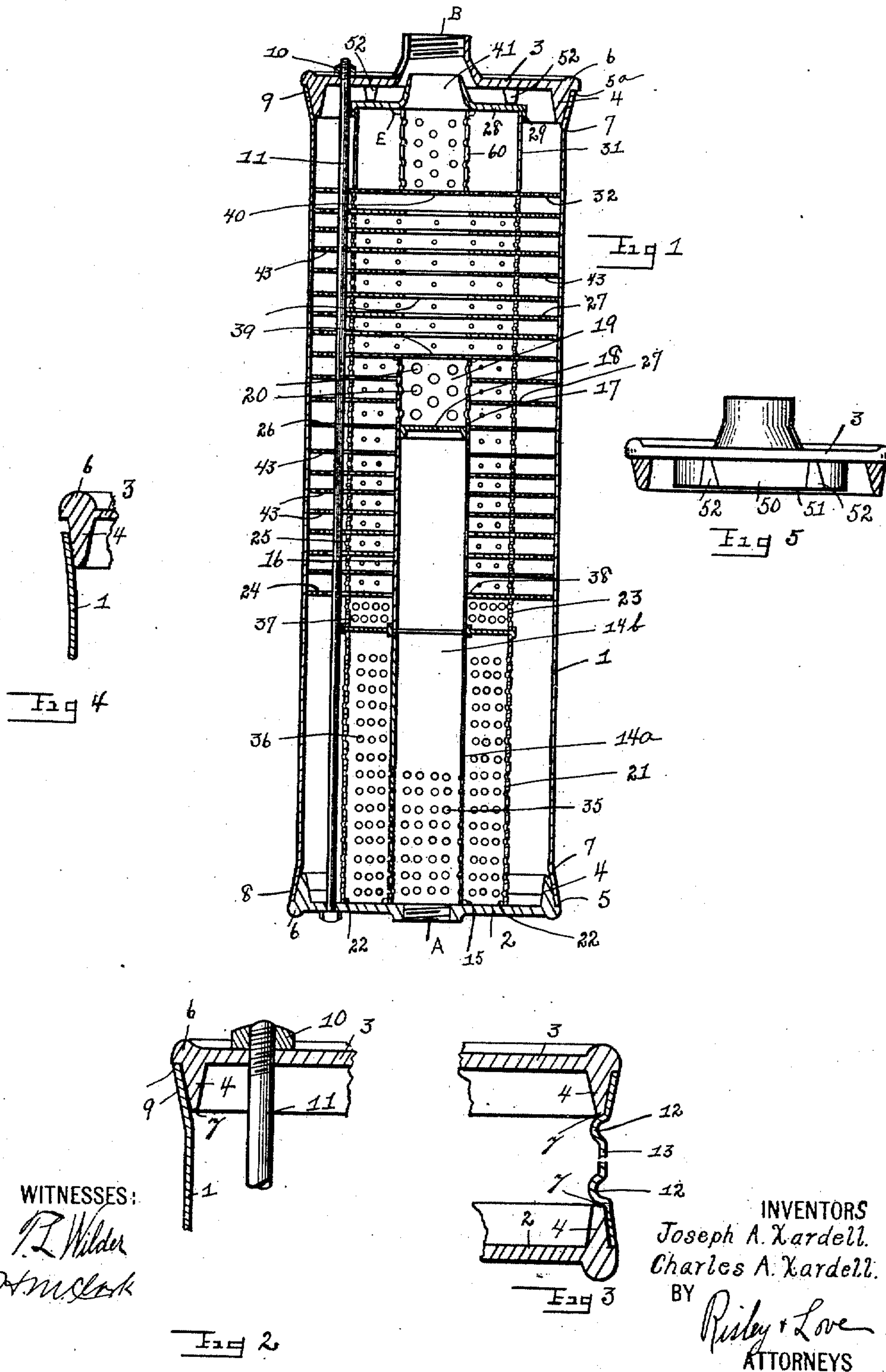


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MUFFLER.  
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# UNITED STATES PATENT OFFICE.

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## MUFFLER.

980,469.

Specification of Letters Patent.

Patented Jan. 3, 1911.

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*To all whom it may concern:*

Be it known that we, JOSEPH A. XARDELL and CHARLES A. XARDELL, citizens of the United States, residing at Utica, in the county of Oneida and State of New York, have invented certain new and useful Improvements in Mufflers, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention relates to mufflers and we declare the following to be a full, clear, concise and exact description thereof, sufficient to enable any one skilled in the art to which it appertains to make and use the same reference being had to the accompanying drawings in which like reference characters refer to like parts throughout the specification.

The object of the invention is to provide an efficient muffler which will receive the exhaust of an explosive engine and so disperse same that it will be sufficiently segregated and cooled, as to muffle or deaden the sound of the exhaust without producing any back pressure on the engine.

The invention further contemplates certain improvements over a patent granted to us December 28, 1909, No. 944,646. The improvement embodies a tubular casing held in cylindrical form by rivets or other suitable means and having its ends closed by members provided with wedge shaped peripheral buttresses adapted to closely fit the rims or edge of the tubular casing and by wedge principle force the respective rims or edge into a hermetically tight joint therewith.

Other objects will appear by referring to the drawings in which—

Figure 1 is a longitudinal transverse section of the muffler; Fig. 2 is a detail enlarged showing more particularly the wedge feature of the device; Fig. 3 is a detail view enlarged showing a modified feature; Fig. 4 is also a detail view showing an edge or rim of the tubular casing to which has been applied or fitted an end member, the parts being in their relative positions just before the connecting rods of the device have been screwed down taut in assembled position; Fig. 5 is a detail view of an end member showing a side elevation partially in section.

Referring more particularly to the drawings the cylindrical casing is represented by 1 being constructed of suitable material and of proper length and diameter to accord with its function. The open ends of casing 1 are closed by end members 2 and 3 having

cast integral therewith circumferential peripheral wedges or flanges 4 forming at their upper outer portions shoulders 5 and 5<sup>a</sup> respectively which are further strengthened by circumferential knobs 6 also cast integral with members 2 and 3. End member 2 is provided with exhaust inlet port A internally screw threaded to adapt it to be connected with the exhaust port of the engine. Member 3 is provided with outlet port B also internally screw threaded to adapt it to be screw mounted to a connecting link or other passage pipe. Members 2 and 3 are each provided with a circumferential peripheral wedge shaped flange 4 as described and are adapted to be assembled upon cylindrical casing 1, held in form by bolts or otherwise, and of smaller diameter than the diameter taken through any section above the lower portion 7 of wedge shaped flange 4. The end members 2 and 3 are assembled upon the respective open ends of cylindrical casing 1 by forcing said end members 2 and 3 down into the cylinder, so that wedge shaped flanges 4 of said end members 2 and 3 force out by leverage process the respective adjacent portions of cylindrical casing 1, in a flaring manner as shown clearly in Fig. 4. To completely assemble or seat end members 2 and 3 upon casing 1 or in other words to have rims 8 and 9 of the casing abut against shoulders 5 and 5<sup>a</sup> of end members 2 and 3 respectively contemplates the tightening of nuts 10 upon stay rods 11 of which there are a plurality in the device.

In Fig. 3 we show a modification which embodies an annular circumferential indentation or bead 12 formed in the casing 13 at either end adjacent the lower portion 7 of wedge shaped or tapering flanges 4. Beads 12 are disposed at a distance from ends 8 and 9 of casing 13 depending upon the length of flanges 4. Usually the distance is a little less than the flanges 4 in order to adapt the same to fit snugly against or upon beads 12 when the parts are assembled. The sides of the wedge shaped or tapering flanges 4 have a bearing on the casing 13 and the ends 7 of the same have a bearing upon beads 12 thereby forming a double bearing thus making a hermetically metallic gas tight joint.

In Fig. 5 we show more clearly end member 3 having cast integral thereto a central circumferential inner wall 50 adapted to have its lower edge 51 seated upon the up-



per surface of interior head 28 and having a plurality of apertures 52 to permit the passage of the gas.

The features of the device which are old and are more fully set forth in our application above referred to are as follows: tubular member 14<sup>a</sup> of slightly larger diameter than the inlet port A and held concentrically disposed to port A by abutment 15 and provided with apertures as shown, tube 16 having plug 17 with escapement orifices 18, chamber 19 provided with apertures 20, tube 21 outside tube 14<sup>a</sup> and held concentrically disposed thereto by abutment 22, collar 23 provided with apertures in much the same manner as tube 21, disks or baffle-plates 24, annular rings 25, transverse disk or partition 26, transverse disks or plates 27 having circumferential apertures the same as disk 26 but having central apertures of less diameter which is substantially the diameter of the central tube, interior head 28 having an outer flange 29 to receive section of tubular member 31 bearing at one end on disk 32, and tubular member 60 bearing at one end on disk 32 and at the other on inner head member 28 and held concentrically disposed thereto by abutment E, all assembled and apertured as more fully described in the application referred to above.

The operation of the muffler is substantially as follows: The exhaust from the engine enters the inlet port A and expands into tubes 14<sup>a</sup> and 16, succeeding jets of the exhaust enter port A in the same manner and impinge against the body of gas in said chamber. Immediately the jet of gas enters chamber 14<sup>a</sup> the jet is stripped, as it were, by certain portions of the gas passing through openings 35. The main body of the jet impinges against the body of the gas in tubes 14<sup>a</sup> and 16, which acts as a spring column. The impact compresses the body of gas but deadens the force and the sound of the discharge of the exhaust. The recoil or expansion of the gas in tubes 14<sup>a</sup> and 16, compressed under force of the impact tends to urge the gas out through openings 35 into the chamber formed by tube 21 which chamber being much larger than that in tube 14 there is a free and easy escape of the gas thereto without producing any back pressure on the engine. From chamber 21 the gas expands outward into chamber formed by casing 1 by means of the numerous outlets or apertures 36 provided for the purpose. In this latter chamber the gases are subjected to the cooling effect created by the atmosphere which is in contact with the outer surface of casing 1. From this last mentioned chamber the gases pass on through the openings 37 into collar 23 whence they pass through the straight openings 38 which provide ready passageways and are disposed around the central tube 16,

since the gases seek the passageway of least resistance. On reaching the end of this passageway the gases pass through the wall of the cylinder into chamber 19. Since the gases contained in tubes 14<sup>a</sup> and 16 tend to expand toward the inlet they also expand at the opposite end and a portion passes through outlet 18 forming a small jet of gas which tends to relieve the pressure in chamber 14<sup>b</sup> formed of tubes 14<sup>a</sup> and 16 and to clear chamber 19, and also forms a suction to assist the gases in passing along the wall of tube 16 and into chamber 19 and through the same. After having passed through chamber 19, the gases pass through the larger central passages or openings 39 until they reach the disk 32 which bars their further advance and disperses them to the side. A small central aperture 40 is provided, however, in disk 32 so that the passage of the gases will not be completely barred and thus a small jet will pass through aperture 40 to clear the chamber formed by tubular member 60. The greater portion of the gases comes into this chamber through the side walls and seeks a natural and easy egress through nozzle 41. Although most of the gases pass from the space surrounding cylinder 21 as described, the peripheral apertures 43 in the several disks provide outlets for a portion of the gas which escapes therethrough until it comes to the chamber at the other end of the muffler between casing 1 and cylinder 31 and between heads 3 and 28. The volume of gases which passes out through the opening 41 being so much greater than that which passes through the small peripheral apertures 43 and through the outermost chamber an aspirating action is formed which keeps the gas in the outermost chamber moving promptly, and results in a vacuum effect in said chamber and consequent easy communicating of the cooling influence of the outer casing 1 to the inner parts of the muffler.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. In a muffler, the combination of end members provided with tapering flanges and one of said end members having a circumferential inwardly projecting wall, a casing adapted to be forced outwardly by said tapering flanges whereby to make hermetically air tight joints, substantially as described.

2. In a muffler of the character described, the combination of end members provided with tapering wedge shaped flanges, one of said end members having cast integral therewith an inwardly projecting circumferential wall, a casing with annular beads adjacent the ends thereof adapted to form seats for end portions of said tapering flanges, substantially as described.

3. In a device of the character described,



the combination of end members having peripheral wedge shaped flanges, one of said members provided with an inwardly projecting wall adapted to permit the passage of gas, and a cylindrical casing having at either end annular beads to form seats for the lower portions of said flanges, substantially as described.

4. In a device of the character described, the combination of end members having peripheral wedge shaped means cast integral therewith and one of said members having also cast integral therewith an inwardly projecting wall adapted for the passage of gas, a cylindrical casing adapted to have its end portions pressed outwardly by said wedge shaped flanges, and said casing provided with annular beads adapted to form seats for the bottom portions of said wedge shaped flanges, substantially as described.

5. In a muffler of the character described, the combination of a chamber partitioned and apertured in a manner to adapt it to muffle and cool the exhaust of an engine, annular beads disposed near the ends of said casing forming said chamber, end members provided with circumferential flanges adapted to force said casing outwardly into a hermetically air tight joint, said annular beads adapted to form seats for the end portions of said flanges, and one of said end members having an inwardly projecting inner wall adapted for the passage of gas, substantially as described.

6. In a muffler, the combination of a casing in cylindrical form, end members provided with peripheral wedge shaped flanges adapted to force said casing outwardly and thereby form a hermetically gas tight joint, beads disposed adjacent the ends of said casing to form seats for the lower portions of said flanges, and one of said end members provided with an inwardly projecting wall adapted for the passage of gas, substantially as described.

7. In a muffler, the combination of a cylindrical casing having a given diameter, end members provided with peripheral tapering flanges, said flanges adapted to force outwardly the end portions of said casing whereby to make a hermetically gas tight and metallic joint, and one of said end members having cast integral therewith an inwardly projecting wall adapted for the passage of gas, substantially as described.

8. In a device of the character described, the combination of end members having peripheral wedge shaped means adapted to force outwardly the end portions of a casing whereby to form a hermetically gas tight joint, and said casing having annular beads disposed adjacent its end portions

whereby to form seats for the end portions of said flanges, and one of said end members having cast integral therewith an inwardly projecting wall, adapted for the passage of gas and to contact with an inner head member, substantially as described.

9. In a muffler of the character described, the combination of end members having peripheral wedge shaped flanges, one of said members having an inner notched flange adapted to permit the passage of gas, a casing having annular beads at a given distance from its ends, said flanges adapted to force the ends of said casing outwardly in a flaring manner whereby there is formed a hermetically tight joint and said beads adapted to form seats for the bottom portions of said flanges, substantially as described.

10. In a muffler, the combination of a chamber having a central passageway surrounded by an intermediate chamber, apertures from said central passageway to said intermediate chamber, an outer chamber, apertures leading from said intermediate chamber to said outer chamber, and members provided with peripheral wedge shaped flanges adapted to force the side of said chamber outwardly in a flaring manner whereby hermetically gas tight joints are secured, and an inner depending circumferential notched wall cast integral with one of said end members, said wall adapted for the passage of gas, and stay rods adapted to aid said flanges to press outwardly the side of said chamber and to hold said parts in assembled position, substantially as described.

11. In a muffler, the combination of a casing having annular beads disposed adjacent its end portions, end members cast with peripheral depending tapering flanges adapted to force the end portions of said casing outwardly in a flaring manner whereby to secure hermetically tight joints, and said casing having a central passageway surrounded by an intermediate chamber, apertures from said central passageway to said intermediate chamber, an outer chamber, apertures from said intermediate chamber to the outer chamber, and stay rods adapted to hold said parts in assembled position whereby the muffler will be hermetically sealed, substantially as described.

In testimony whereof we have hereunto affixed our signatures in the presence of two witnesses.

JOSEPH A. XARDELL.  
CHARLES A. XARDELL.

Witnesses:

J. M. WILBERT,  
T. L. WILDER.