

June 23, 1925.

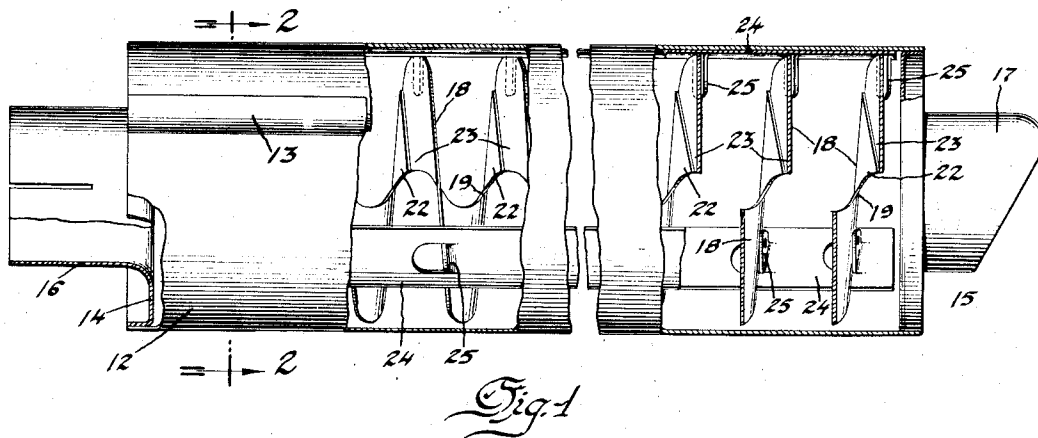
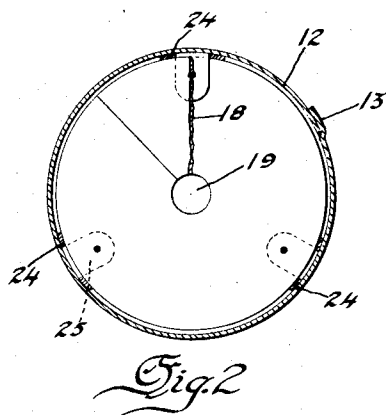
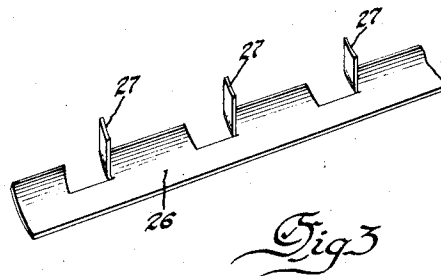
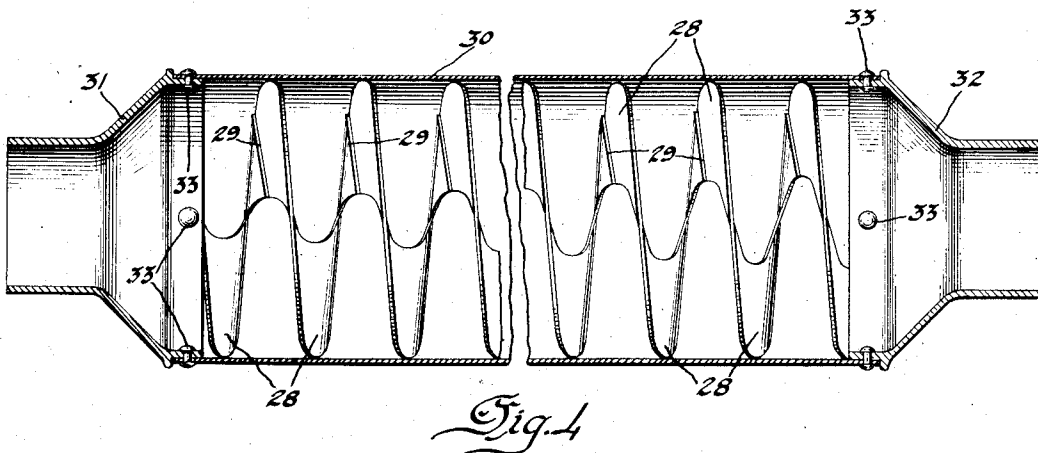
1,543,042

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MUFFLER FOR INTERNAL COMBUSTION ENGINES

Filed March 5, 1923

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

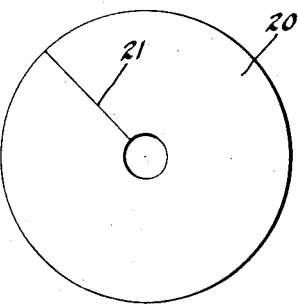


Fig. 5

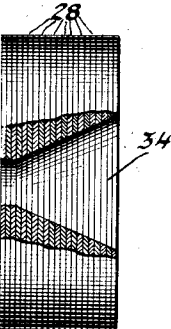


Fig. 6

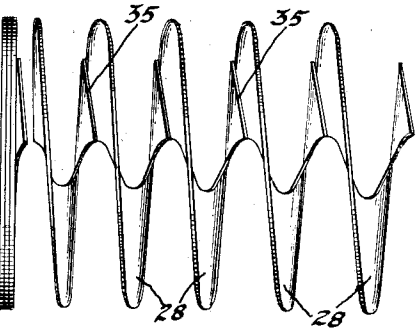


Fig. 7

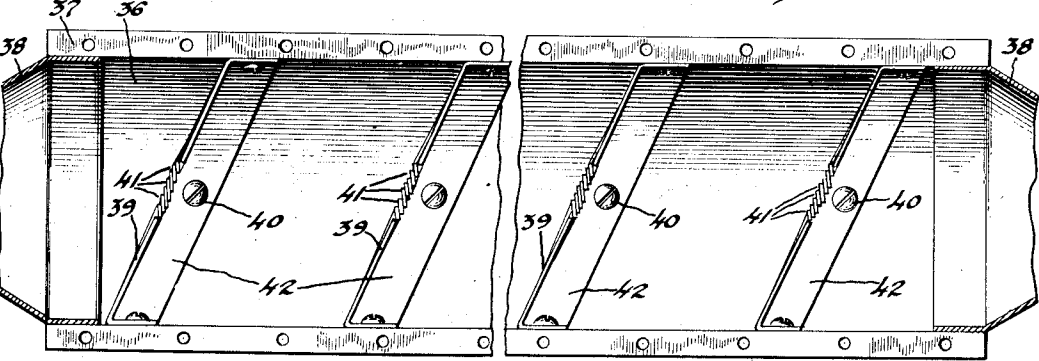
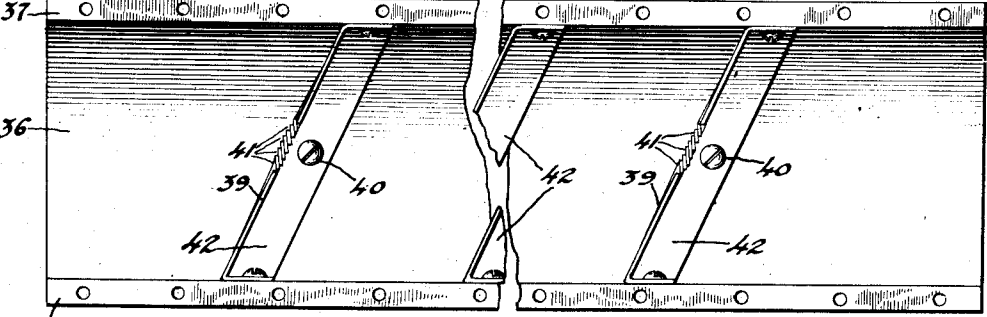


Fig. 8

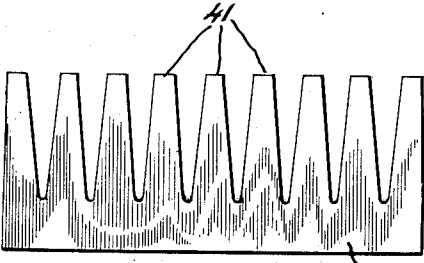


Fig. 9

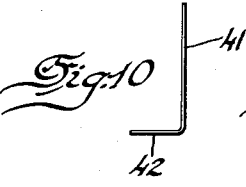


Fig. 10

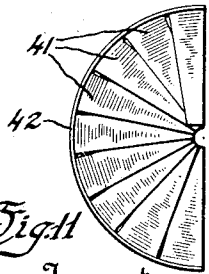


Fig. 11

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UNITED STATES PATENT OFFICE.

FRANK A. WHITTEN, OF DETROIT, MICHIGAN, ASSIGNOR TO GENERAL MOTORS CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF DELAWARE.

MUFFLER FOR INTERNAL-COMBUSTION ENGINES.

Application filed March 5, 1923. Serial No. 622,939.

To all whom it may concern:

Be it known that I, FRANK A. WHITTEN, a citizen of the United States, and a resident of Detroit, county of Wayne, and State of Michigan, have invented certain new and useful Improvements in Mufflers for Internal-Combustion Engines, of which the following is a full, clear, concise, and exact description, such as will enable others skilled in the art to which the invention relates to make and use the same, reference being made therein to the accompanying drawings, which form a part of this specification.

My invention relates to mufflers for use in connection with internal combustion engines to lessen the noise of the exhaust gases thereof, and particularly to mufflers designed to be used in connection with motor driven vehicles wherein a simple and effective muffler and one of minimum weight is required.

The principal object of my invention is to provide an improved muffler for the purpose above stated which will be simple in construction and light in weight in its finished form and which, while effective for the purpose of deadening the noise of the exhaust, will afford the least possible resistance to the flow of exhaust gases there-through; the construction of the muffler being such as to provide a permanently open and unobstructed passage leading directly from the inlet to the outlet end of the muffler, and which passage, being of comparatively large area in cross section, affords a minimum of resistance to the flow of exhaust gases through the muffler.

A further object of my invention is to provide an improved muffler the construction of which is such that abrupt changes of the flow of exhaust gases is avoided, and wherein the back pressure due to the presence of the muffler in the exhaust conduit is reduced to a minimum, and as a matter of fact is practically eliminated.

A further object of my invention is to provide an improved muffler which may be readily and cheaply manufactured at a minimum of expense, and in which the several parts which form the same are electrically welded together; thereby providing a muffler in which relative motion of the

parts cannot occur, and in which rattling when the muffler is in use will be prevented, the resulting muffler being substantially gas tight throughout so that leakage of the exhaust gases from the muffler cannot occur to any appreciable extent.

A further object of my invention is to provide an improved muffler which may be readily cleaned without taking the same apart, and which will not be likely to become clogged with soot or other deposits when the same is in use.

The drawings accompanying and forming a part of this application illustrate various forms of my invention; although it will be appreciated that the same may be otherwise modified, and that my invention includes such variations of the particular forms and constructions thereof illustrated and hereinafter described as come within the scope of the concluding claims.

In the drawings accompanying and forming a part of this specification:

Figure 1 is a view partly in side elevation and partly in section showing the preferred specific form of my improved muffler complete, the middle portion of the same being omitted to reduce the length of the figure.

Figure 2 is a view showing a section upon a transverse plane indicated by the line 2-2, Figure 1, looking toward the right.

Figure 3 is a perspective view showing a modified form of one of a plurality of spacers employed in my improved muffler for spacing the convolutions of the spiral rib thereof proper distances apart from one another.

Figure 4 is a view showing a form of my muffler modified in certain respects.

Figure 5 is a view illustrating one of a plurality of divided annular disks used in making the spiral rib member of my improved muffler.

Figure 6 is a view illustrating an operation performed upon a series of annular disks from which the spiral rib is made up in order to secure a passage of gradually increasing cross sectional area extending directly through the muffler.

Figure 7 is a view illustrating the manner in which the annular disks after having

been properly prepared are assembled and connected with one another to provide the spiral rib.

Figure 8 is a view showing a further modified form of my improved muffler.

Figure 9 is a view showing one of several toothed strips used in making the form of muffler shown in Figure 8.

Figure 10 is a view illustrating an operation performed upon the blank or strip shown in Figure 9.

Figure 11 is a view illustrating one of several semi-circular sections employed in the form of muffler shown in Figure 8, to provide the spiral rib thereof.

Referring now to the drawings, the reference numeral 12 designates a hollow casing ordinarily cylindrical in form and the side edges of which are secured together as by means of a lapped joint at 13, the joint being riveted, spot welded, or otherwise formed to secure the meeting edges of the casing together, as will be appreciated. This casing member is provided with suitable heads 14, 15 at the ends thereof, said heads having reduced portions 16, 17 which form a conduit through which exhaust gases are led into and flow from the muffler. The cylindrical casing shown in Figure 1, as well also as the heads thereof, are made from comparatively thin sheet metal in order to reduce the weight of the muffler, and the heads are secured in place in the ends of the casing by means of spot welding or riveting the meeting parts together.

Located within the casing 12 and extending throughout substantially the entire length thereof is a spiral rib 18 which extends inward from the wall or casing so as to leave an open and unobstructed passage, indicated at 19, extending along the axis of and from end to end of the muffler to thereby permit to a certain degree a free and unobstructed flow of exhaust gases from the inlet passage 16 through said passage 19 and out through the outlet passage 17.

The spiral rib above referred to is made from a plurality of annular disks 20 having a central hole to provide the passage 19, and which disks are split or cut apart from the outer periphery inward to the said hole, as indicated at 21, Figure 5. The disks are then given a spiral form by separating the meeting edges at the cut 21 to a sufficient extent, and the complete spiral rib is then built up by securing the end portion of each disk, indicated by the reference numerals 22 in Figure 1, to the beginning of the next following disk of the series, indicated by the numerals 23 in said figure, the ends being overlapped to secure joints of sufficient extent for security at each joint, and the disks being secured one to another throughout the length of the rib

18 regarded in its entirety. The joints between the meeting and over-lapping edges of the separate spiral disks may be riveted, welded, or otherwise formed to provide a rib structure which will be permanent and the parts of which will not move relative to one another, to thereby reduce rattling of the muffler structure.

The spiral rib in its entirety will be placed within the muffler casing as will be appreciated, and the successive convolutions thereof are preferably spaced apart from one another throughout the muffler by means of a plurality of spacing members 24 arranged within the muffler casing. These spacing members are commonly made from thin sheet metal portions of which are cut free along two sides and one end and bent inward a short distance along the spiral rib, and are preferably secured to said rib by riveting or welding the same thereto, as it is important throughout the muffler construction that parts adjacent one another, and which would cause noise should they engage during the vibration set up by the exhaust gases, be permanently secured to one another in order that relative movement between such parts may not occur.

Figure 3 shows a somewhat modified form of spacing strip 26 in which portions are cut free at one side thereof and bent inward to form lugs 27, which lugs act to space the periphery of the spiral rib 18 throughout the length thereof, the same as is the case with the spacing strips 24 above referred to.

Figure 4 shows a form of my invention in which the spiral rib is made up of a plurality of spiral disks 28, the end of each of which is secured to the beginning of the next disk throughout the series at the joints 29 in substantially the same manner as hereinbefore explained. In this form of my invention, however, the spiral rib fits tightly within the casing 30 and may be welded or otherwise secured directly thereto should it be desired to secure the parts together more firmly than is the case where the rib after having been built up is placed inside the casing with its periphery in engagement with the inner surfaces thereof. In this form of muffler the heads 31, 32 are in the form of castings and are fastened to the ends of the muffler casing by rivets 33.

Figure 1 shows a form of my improved muffler wherein the passage 19 extending therethrough is of substantially the same size throughout its length, whereas in Figure 4 this passage is of gradually increasing area from the inlet to the outlet end of the muffler.

A series of disks for building up a spiral rib having a central passage of gradually

increasing area may be conveniently formed as indicated in Figure 6 in which a plurality of disks are arranged one on top of the other and the bundle then provided with a tapering hole, as shown at 34, as by holding the entire bundle of disks in a suitable chuck or upon a suitable face plate and boring out a tapering recess in the collection of disks by a suitable lathe tool. Figure 7 shows the manner in which the disks are secured together to form a spiral rib, the end of each disk being secured to the beginning of the next, as indicated at 35, throughout the length of the rib, the disk with the largest opening at one end and the disk with the smallest opening at the other end of the completed spiral rib, as will be appreciated.

Figure 8 shows a form of muffler in which the sheet metal casing thereof is made up of two semi-cylindrical sections 36 having flanges 37 at their free edges, the completed muffler having heads 38—38 at the end thereof of such diameter as to fit within the ends of the casing when the parts thereof are secured together. In this form of my invention the spiral rib is formed from a plurality of rib sections 39 each independently secured in the semi-cylindrical casing sections by rivets 40, by welding, or otherwise, the separate rib sections being so arranged relative to the casing sections that when the casing sections are properly matched and secured together to form the complete muffler the end of one rib section in one casing member registers with the beginning of another rib member in the other casing section throughout the length of the rib and throughout the entire extent thereof, thus providing a continuous rib half of which is permanently secured in place in one of the semi-cylindrical casing sections and the other half in the other of said sections.

Figure 9 shows a form of blank employed in providing the separate semi-cylindrical rib sections which collectively form the spiral rib in the form of my improved muffler shown in Figure 8. This blank is provided with a series of tapering teeth 41 and

with a margin 42 which is bent at right angles, as shown in Figure 10, as a step preliminary to the formation of the separate rib sections. The blank is then bent into semi-circular form, as shown in Figure 11, thus causing the tapering portions or teeth 41 to overlie one another at their edges, as shown in Figures 8 and 11, thus providing one of the individual spiral rib sections employed in forming the muffler shown in Figure 8.

In the completed muffler the flanges 42 of the several rib sections after being bent and distorted, as indicated in Figure 8, to fit closely to the interiors of the semi-cylindrical casing sections, provide attaching flanges whereby the said sections are secured in place within the casing sections by the rivets 40, as hereinbefore explained. The meeting edges of the teeth 41 are preferably electrically welded to one another throughout the entire series of teeth of each section to thereby prevent noise due to striking of the teeth together which might be set up by the vibration produced by the exhaust gases were such edges not secured together in the manner explained.

Having thus described and explained my invention, I claim and desire to secure by Letters Patent:

A muffler comprising a hollow cylindrical casing; a spiral rib extending inward from the inner surface of said casing and terminating short of the axis thereof; to thereby provide a spiral passage and a straight and unobstructed passage both extending from end to end of the muffler; heads secured to the ends of said casing and having passages leading into and out therefrom; and a plurality of circumferentially spaced supporting members arranged within said casing and having each a plurality of supporting lugs struck up from the material thereof, which lugs are secured to the periphery of said spiral rib to thereby hold the convolutions thereof properly spaced apart from one another.

In testimony whereof I affix my signature.

FRANK A. WHITTEN.