March 26, 1940. W. L. H. DOYLE 2,194,928

EXHAUST APPARATUS

Filed Feb. 25, 1937 3 Sheets-Sheet 1

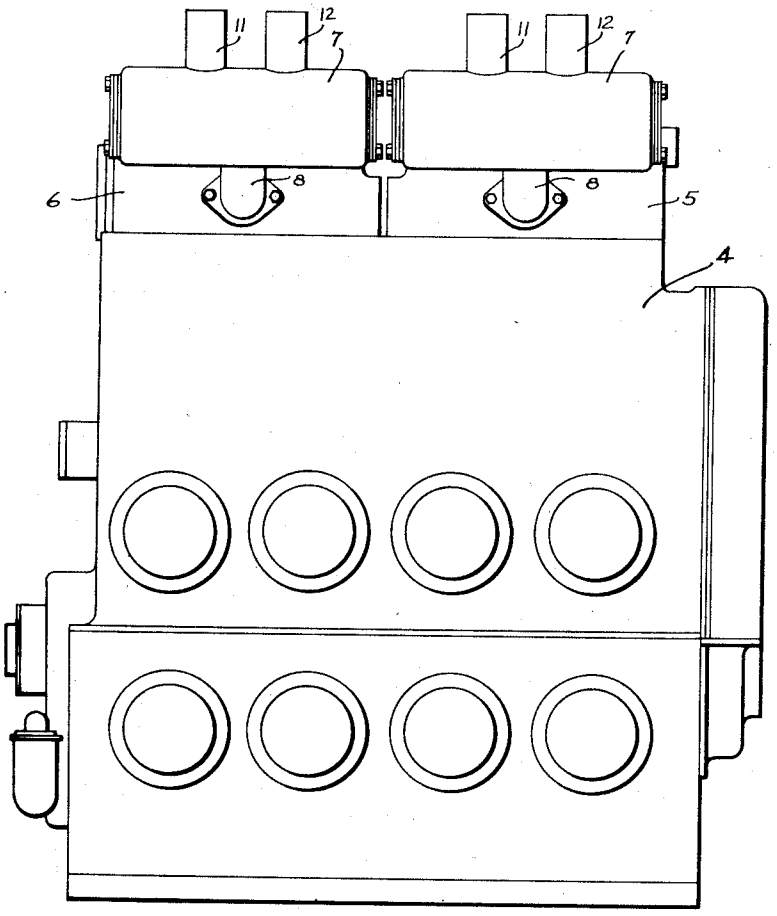


Fig. 1.

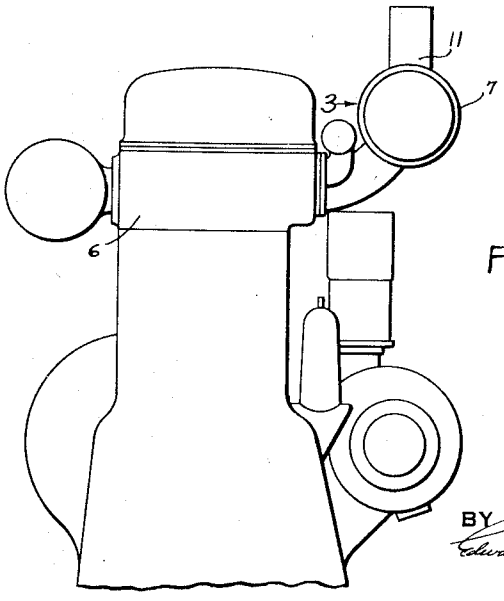


Fig. 2.

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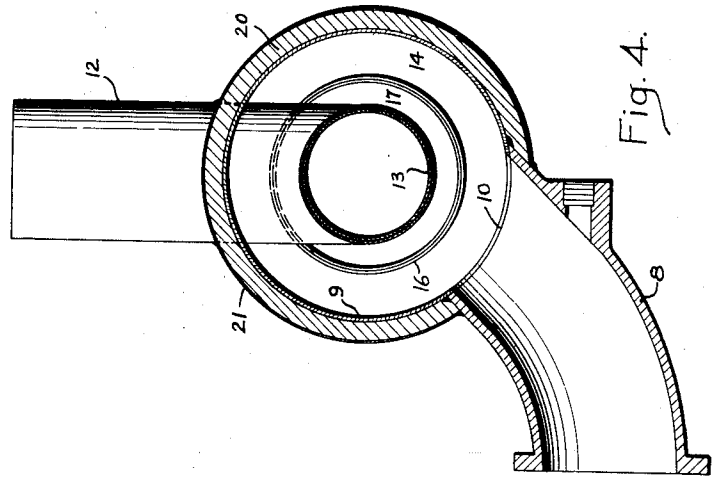


Fig. 4.

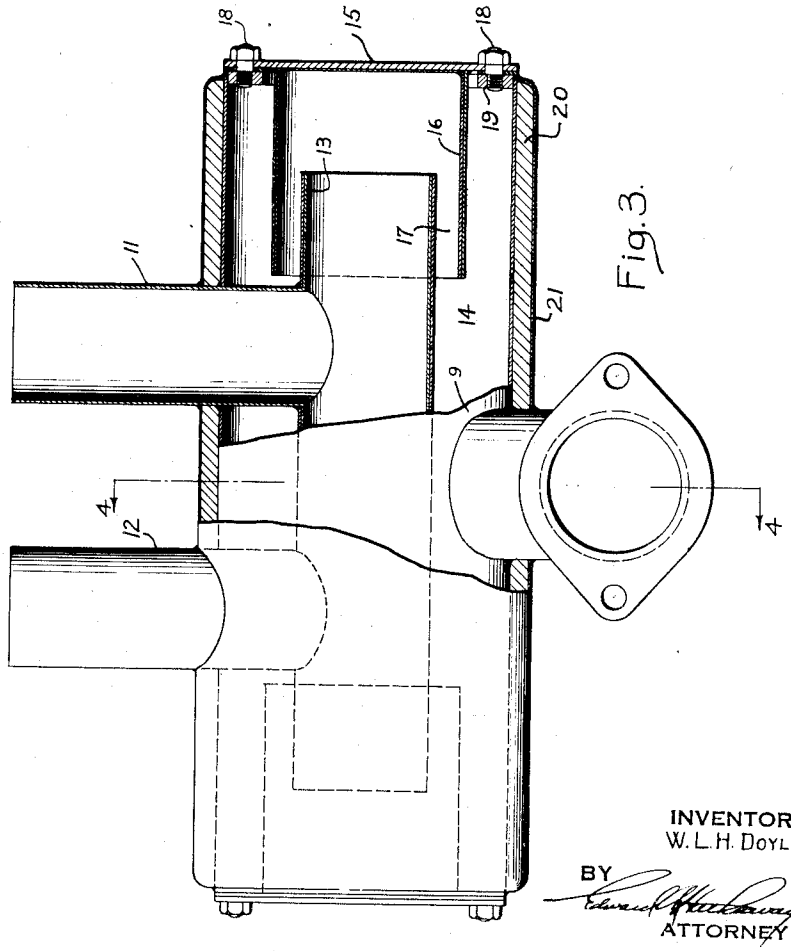


Fig. 3.

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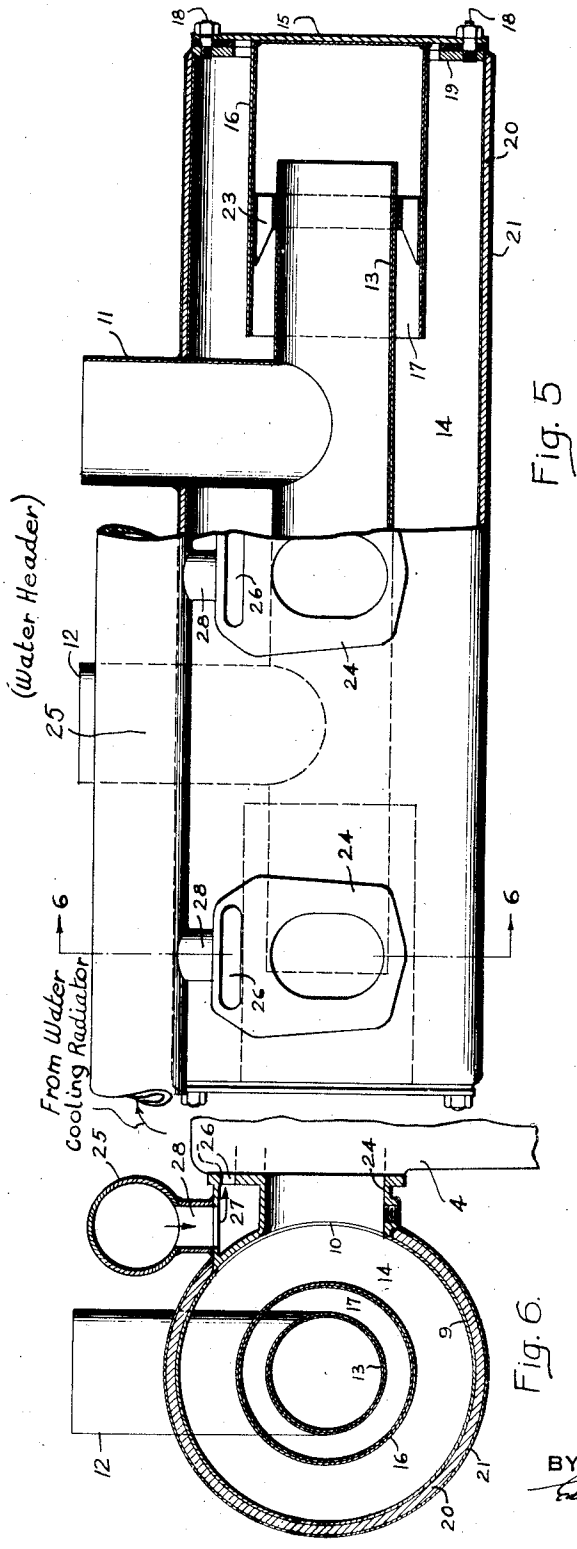


Fig. 5

Fig. 6.

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UNITED STATES PATENT OFFICE

2,194,928

EXHAUST APPARATUS

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Application February 25, 1937, Serial No. 127,797

6 Claims. (Cl. 123—52)

This invention relates generally to exhaust apparatus for internal combustion engines and more particularly to an improved combined header and muffler that is especially applicable to locomotive Diesel engines.

While a great many types of exhaust mufflers have heretofore been proposed and used, yet they have been deficient in many respects, especially when employed with Diesel engines in locomotive service.

It is one object of my invention to provide an improved exhaust muffler that is of minimum weight and size for a given gas capacity, is adapted to be readily cleaned and forms a rugged unit with the engine. Another object is to provide an improved combined header and muffler that is relatively simple and economical in construction, operation and maintenance. A further object is to provide an improved header-muffler system adapted to facilitate removal of certain cylinder heads independently of other heads and of the exhaust apparatus connected thereto.

In the specific aspect of the invention I accomplish certain of the foregoing desirable features by providing a single structure adapted to function as a combined header and muffler so arranged that removable end plates may be used to permit access to the interior of the apparatus for cleaning or inspection and also arranged so as to eliminate the necessity for using water to cool the customary relatively heavy exhaust manifolds or headers of the prior art. By eliminating the necessity of using cooling water, it has been possible to reduce appreciably the capacity of the cooling water radiator used with the engine.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a side elevation of an internal combustion engine embodying my invention;

Fig. 2 is an end elevation of Fig. 1 viewed from the left end thereof;

Fig. 3 is a side elevation of the header-muffler removed from the engine and viewed in the direction of the arrow 3 in Fig. 2, parts of the unit being broken away to show details of internal construction;

Fig. 4 is a vertical transverse section taken on the line 4—4 of Fig. 3;

Fig. 5 is a modification employing the principles of construction of my invention but having a multiplicity of exhaust connections;

Fig. 6 is a vertical section taken substantially on the line 6—6 of Fig. 5.

In the particular embodiments of the invention such as are disclosed herein merely for the purpose of illustrating certain specific forms among possible others that the invention might take in practice, I have shown in Fig. 1 a conventional type of internal combustion engine 4 preferably of the locomotive Diesel type having cylinder heads 5 and 6 which may be provided with any conventional form of exhaust passages therein.

My improved header-muffler generally indicated at 7 is provided with a centrally located pipe 8 extending downwardly and inwardly as shown in Fig. 4 for connection to the side of the cylinder head to establish communication with the cylinder head exhaust passage. A relatively heavy sheet metal wall 9, preferably cylindrical, is welded or otherwise suitably secured to pipe 8 for communication therewith through an opening 10. Projecting downwardly through the top of the internal wall 9 is a pair of vertical discharge pipes 11 and 12, these also being welded or otherwise suitably secured to the wall 9. The inner ends of discharge pipes 11 and 12 dependently support an internal preferably cylindrical sheet metal wall 13 welded or otherwise suitably secured to the discharge pipes. The internal wall 13 is preferably concentrically arranged with respect to wall 9 to form an outer annular passage 14 therebetween while wall 13 forms an inner passage.

To close the ends of the outer wall 9 in a simple and effective manner while at the same time insuring maximum accessibility to the inside of the header-muffler together with completing an internal tortuous muffler passageway, I provide a preferably circular end plate 15 having an inwardly projecting preferably cylindrical wall 16 arranged in overlapping relation to the end of internal passage 13 thereby to provide an intermediate annular passageway 17. To rigidly reinforce the ends of outer wall 9 to provide a firm support for bolts 18, a relatively heavy annular ring 19 is welded or otherwise suitably secured to wall 9. The bolts 18 thus firmly hold the end plates 15 in position.

It will be understood that the unit above described is symmetrical about its vertical center and hence the description of one end of the unit will suffice for both ends. It will also be understood that wall 9 is covered with any suitable heat insulating material 20 which in turn is

covered by a sheet metal enclosure 21 welded or otherwise suitably secured to wall 9.

In operation of the Fig. 3 form, exhaust gases are discharged into pipe 8 of each of the plurality of units 7 and thence flow through the passageways 14 and 17 and pipe 13 to be discharged upwardly to the atmosphere through pipes 11 and 12. Due to the relatively simple and compact construction, it is seen that a plurality of these relatively small units may be attached to the cylinder heads or groups thereof. Also due to this improved construction, the units are adapted to function both as a header and muffler instead of employing a usual heavy exhaust manifold or header on the engine and a separate muffler.

In Figs. 5 and 6, the same general construction and arrangement of cylindrical sheet metal walls and end plates is used as shown in Fig. 3, and hence the same reference numerals are applied to the same parts. However, due to the relatively great length of wall 16, spacers 23 are interposed between the internal wall 13 and said wall 16. Also instead of a single exhaust pipe connection such as 8, a series of lateral connections 24 are provided one at the center and one at each end. These connections and also pipe 8, are made preferably of cast metal to which the outer sheet metal pipe 9 is connected. As shown in Figs. 5 and 6, the connections 24 also function to connect the cooling water jacket of the engine with a water header 25 as through a suitable opening 26, chamber 27 formed in the upper part of the connection 24 and thence to the vertical pipes 28. The mode of operation and advantages of this arrangement are the same as for the preferred form, and hence further discussion is not deemed necessary.

It will be seen in general that the principle of construction of my improved unit permits a compact and relatively inexpensive header-muffler to be constructed requiring minimum space, especially in a Diesel type locomotive, wherein very little excess space is available. Notwithstanding the cramped quarters in which an engine may be located, it is seen that my unit is conveniently accessible for cleaning and inspection by mere removal of the end plates and also in the Fig. 3 form any one of the individual units may be removed independently of the others to permit removal or inspection of a cylinder head.

It will of course be understood that various changes in details of construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. A combined exhaust manifold and muffler for internal combustion engines comprising, in combination, longitudinally extending inner and outer walls radially spaced to form inner and outer passageways, the inner passageway being of shorter length than the outer passageway and the inner passageway having its most axially remote portions provided with open ends, a laterally extending engine connection communicating with the outer passageway, a laterally extending exhaust discharge passage communicating with the inner passageway and extending transversely through said outer wall to discharge to the atmosphere, and end plates closing the ends of said outer passage and axially spaced from the remote open ends of said inner passage.

2. The combination set forth in claim 1 further characterized in that said end closure plate has a passage wall projecting inwardly so as to be interposed between and spaced from said inner and outer walls, one end of said passage wall being closed by said closure plate and the other end freely terminating so as to be entirely open.

3. The combination set forth in claim 1 further characterized in that said inner and outer walls are cylindrical in cross-section and are arranged substantially concentrically to each other to form an open ended passageway.

4. The combination set forth in claim 1 further characterized in that said end closure plate has a passage wall projecting inwardly so as to be interposed between and radially spaced from said inner and outer walls, said inner and outer walls and said inwardly projecting passage wall being substantially cylindrical in formation and being arranged substantially concentric relative to each other, a second laterally extending exhaust discharge pipe communicating with the inner passageway and extending transversely through said outer wall to discharge to the atmosphere, said exhaust discharge passages from the inner passage being respectively located adjacent the inner ends of said inwardly projecting passage walls.

5. A combined header and muffler comprising, in combination, longitudinally extending inner and outer walls forming inner and outer passageways, an end closure plate for said outer passageways, a cast inlet connection having communication with said outer passage and secured to said outer wall to support the same, a discharge pipe connected to said inner passageway and extending through said outer wall to discharge to the atmosphere, means forming a water chamber within said cast connection and provided with an engine jacket opening and a water header opening, a longitudinally extending water header separate from and vertically displaced from said muffler, and means for connecting said water header to said chamber through said water header opening.

6. A combined header and muffler comprising, in combination, longitudinally extending inner and outer walls forming inner and outer passageways, an end closure plate for said outer passageway, a cast inlet connection having communication with said outer passage and secured to said outer wall to support the same, a discharge pipe connected to said inner passageway and extending through said outer wall to discharge to the atmosphere, means forming a water chamber within said cast connection and provided with an engine jacket opening and a water header opening, a longitudinally extending water header overlying said cast connections, and vertically extending connecting passage means for supporting said water header by said cast connections and allowing communication with the water chamber therein through said water header opening.

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