This invention relates to an exhaust device which is particularly applicable to marine internal combustion engines. This type of engine is provided with an exhaust pipe which communicates with the engine manifold. The other end of the exhaust pipe communicates with a muffler member. The pipe is cooled by being surrounded by a water jacket in which water sucked from the body of water in which the boat is travelling circulates. The muffler member of the device is also provided with a water inlet and the gases expelled from the exhaust pipe, which have been cooled somewhat by the water jacket, are mixed with the water entering the muffler member and then expelled therefrom.

The conventional device as described above has several serious disadvantages. The exhaust pipe must, of course, be rigidly secured to the muffler member and within the water jacket. However the differing temperatures produced within the exhaust pipe cause it to expand and contract. Since there is no way to relieve the stresses produced by such expansion and contraction cracks appear in the pipe requiring its early replacement and the withdrawal of the vessel from service until the replacement may be made. The ceramic coatings which are used to a great extent in protecting the metal parts of the exhaust device from corrosion are seriously affected by the stresses referred to above and chip off the pipe and jacket.

The conventional device has a further disadvantage in that the water permitted to enter the muffler member to mix with the hot gases emitted by the exhaust pipe is relatively cold. When such water impinges upon the hot exhaust pipe it causes a sudden contraction therein which either tears or chips off the protective coating.

It is an object of this invention to produce an exhaust device for an internal combustion engine in which the exhaust pipe may expand freely as its temperature changes so that it is not subject to stresses and strains.

It is a further object of this invention to produce an exhaust device for an internal combustion engine wherein the water entering the muffler member of the device is partially heated so that its contact with the exhaust pipe will not cause stresses therein.

It is a further object of this invention to produce an exhaust device for an internal combustion engine which will permit the outlet end of the exhaust pipe to wear considerably without causing the device to become inoperative.

Briefly stated the invention comprises a pipe member communicating with the engine manifold, a hollow jacket member disposed about the pipe member, a coolant circulating within the jacket member, a muffler member formed with an outlet tube communicating with the pipe member and means permitting the pipe member to expand and contract longitudinally within the muffler member. In the preferred modification of the invention the pipe member is secured within a recess provided in the muffler member and is spaced from the jacket member by means of a spacing member which surrounds the pipe member. The outlet end of the jacket member preferably communicates with the muffler member so that the water entering the muffler member has already been heated to some extent by contact with the pipe member before mixing with the hot gases emitted by the pipe member. Preferably, also, the pipe member extends for some distance into the muffler member so that breaking off of a portion of the end of the pipe member will not cause the device to become inoperative.

The invention will be further described by reference to the accompanying drawings which are made a part of this specification.

Fig. 1 is a front view of the exhaust device made in accordance with this invention.

Fig. 2 is a front sectional view of the exhaust device made in accordance with this invention.

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2, showing one method of allowing water to pass beyond the spacing member.

Fig. 4 is a front sectional view of a portion of an alternative form of this invention showing another method that may be employed to allow water to pass beyond the spacing member of this invention.

Fig. 5 is a sectional view of the form of the invention shown in Fig. 4 taken along line 5—5 of Fig. 4.

Fig. 6 is a sectional view of the material used to construct the metal parts of this invention showing the ceramic coating disposed upon the metal to protect it from corrosion.

Referring to the principal form of the invention as shown in Figs. 1, 2, 3, and 6 there is provided pipe member 11. Pipe member 11 communicates with the engine manifold either directly or connected to another pipe member 12. Where such pipe is used it is connected to pipe member 11 by means of bolts 13 which secure flange 14 disposed upon pipe member 11 with flange 15 disposed upon pipe member 12.

Jacket 16 surrounds pipe member 11, and is secured by flanges 17 and 18, 19 and 20. Bolts 21 secure flanges 17 and 20 and 18 and 19 to each other. Inlet tube 22 is provided in jacket 16 so that water may enter the hollow portion of jacket 16 and thereby cool pipe member 11. Flange members 18 and 19 depend from the inner surface of jacket member 16. Spacing member 23 is made of heat resistant material (preferably asbestos). Spacing member 23 holds pipe member 11 firmly in place within jacket member 16 but permits it to expand and contract longitudinally with changes in temperature. Spacing member 23, in the preferred modification of this invention, is provided with slot 24 so that the water in jacket 16 may pass through spacing member 23.

Muffler member 25 is formed with outlet tube 26 and provided with recess 27. Outlet tube 26 is spaced from muffler member 25 by spacer member 31 which is provided with perforations 30 therein. Pipe member 11 is disposed within recess 27 and preferably extends into muffler member 25 to some extent. Jacket member 16 also communicates with muffler member 25 by means of end 28 of jacket member 16 being open within recess 27.

Turning now to the alternative form of this invention shown in Fig. 4 it will be noted that the parts are identical with those shown in the principal form of the device except that spacing member 23 is not provided with slot 24. In order to permit the water in jacket member 16 to pass beyond spacing member 23 in this modification bypass tube 32 is provided. Tube 32 communicates with jacket member 16 at 33 and 34 and thus permits the water to bypass spacing member 23.

The operation of this device may now be explained.
Exhaust gases leave the engine manifold and then pass through pipe member 11. Water enters jacket member 16 through inlet tube 22. The water flowing through jacket member 16 cools the hot gases in pipe member 11 and by doing so becomes heated to some extent. The gases in pipe member 11 pass out of pipe member 11 into muffler member 25 and the water within jacket member 16 also passes into muffler member 25. At this point the gases from pipe member 11 are mixed with the water from jacket member in muffler member 25 and are discharged together through outlet tube 26.

It is pointed out that pipe member 11 may expand longitudinally into muffler member 25 since it is not fastened to spacing member 23. Furthermore the water entering muffler member 25 has already been partially heated and therefore does not cause such a sharp change in temperature when it comes in contact with the end of pipe member 11 in muffler member 25.

Fig. 6 shows the ceramic coating which may be applied to the metal parts of this invention in order to protect them from corrosion.

The foregoing specific embodiments of this invention as shown in the foregoing specification are for illustrative purposes and for purposes of example only. Various changes and modifications can obviously be made within the spirit and scope of the invention and would occur to those skilled in this art.

I claim:
1. An exhaust device for a marine internal combustion engine comprising a hollow muffler member formed with an open outlet tube vertically extending thereinto, a first spacer member about said outlet tube supported within said muffler and provided with openings therein, an exhaust gas carrying pipe member communicating with the engine manifold horizontally extending for some distance into said muffler member and slidably held therewith; a water jacket surrounding said gas carrying pipe member having a water inlet, a second spacer member disposed between said gas carrying pipe member and the wall of said water jacket separating said muffler from said water jacket, and a conduit connecting said water jacket and said muffler member disposed around said second spacer member.

2. An exhaust device as described in claim 1 wherein said spacing member is made of heat resistant material.

3. An exhaust device as described in claim 1 wherein said pipe member, water jacket and muffler member are ceramic coated.

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