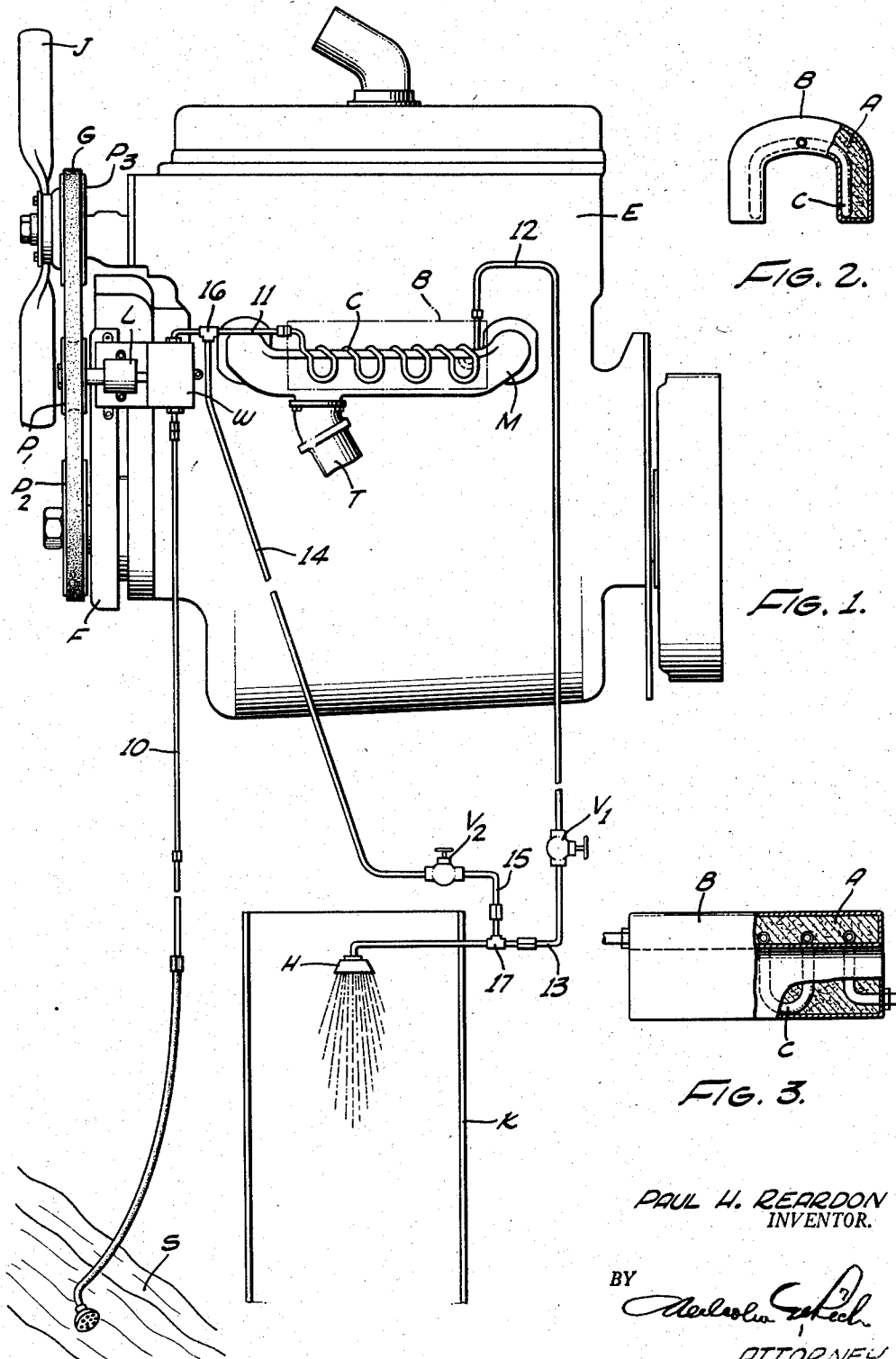


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WATER HEATING DEVICES

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This invention relates to heat exchange devices and more particularly to heat exchange devices for heating a stream of flowing water and has for its object the provision of a heat exchange device and means for heating a flowing stream of water to elevated temperatures by means of the exhaust gases of an idling internal combustion engine.

Another object is to provide a means to obtain from an idling internal combustion engine a continuously flowing supply of warm to hot substantially pure water.

Still another object is to provide a means to utilize the hot exhaust gases of an idling internal combustion engine to heat a continuously flowing stream of substantially pure clean water to elevated temperatures.

A further object is to provide a heat exchanger device adapted to be detachably secured in heat exchange relation to the exhaust manifold of an internal combustion engine and a pump means adapted to be detachably connected to the said engine to be driven thereby to feed water through said heat exchange device thereby to obtain a supply of warm to hot water when the said engine is running in idling position.

Other objects will be apparent as the invention is more fully hereinafter disclosed.

In accordance with these objects I have devised a heat exchange means adapted to provide a strong free flow of warm to hot water from an idling internal combustion engine which means is characterized by having a heat exchange coil and a water pump each detachably mounted, respectively, upon and in heat exchange relation with the exhaust manifold and in a position to be actuated by the fan belt of the internal combustion engine and flexible tubing means to supply substantially pure, clean water to the pump, from the pump to the heat exchange coil and from the said heat exchange coil to a point remote from the internal combustion engine, such as to the shower head of a shower bath.

The heat exchange device of the present invention is of particular utility by those persons located or situated in places remote from a supply of warm to hot water, such as campers not provided with means for heating water for washing, bathing, etc.

Before further disclosure of the present invention reference should be made to the accompanying drawings wherein is illustrated by way of example but not by way of limitation one specific embodiment of the present invention.

In the drawings, Fig. 1 is a schematic diagrammatic view illustrating the heat exchange device of the present invention in association with an internal combustion engine of common design; and Figs. 2 and 3 illustrate in broken away end and side views, respectively, the details of construction of the heat exchange coil of the present invention.

Referring to Fig. 1, the specific embodiment illustrated is that wherein the invention is adapted for use in association with a portable shower bath. It is to be under-

2

stood, however, that the utility of the invention is not so limited to a portable shower bath.

In Fig. 1, the internal combustion engine E is one common in the art and may be any one of the plurality of different types of engines known in the art and, per se, forms no part of the present invention except as being necessary and essential thereto as a source of heated gases of combustion. In internal combustion engines of all types the heated gases of combustion are discharged therefrom into an exhaust manifold M and from this manifold the gases pass into an exhaust tube T for conduction to a muffler (not shown) before discharge into the open air.

The exhaust manifold M of most internal combustion engines is of common design with some slight variation in length and diameter in different types of such engines utilized in different makes and types of automobiles and trucks. In general, this slight variation in length and diameter of the manifold M is immaterial to the present invention and may be allowed for in the design of the heat exchange coil C, as will be more fully hereinafter disclosed.

In conformity with the present invention, the heat exchange coil C, shown in position on the manifold M in Fig. 1 and in broken away end and side elevation in Figs. 2 and 3, consists of a plurality of reversely bent and closely spaced turns of flexible metal tubing comprised of metal of relatively high thermal conductivity, such as copper and aluminum, the coil, per se, being substantially U-shaped with the sides of the coil inclined inwardly sufficiently to provide a spring gripping action against the outer surface of the manifold M.

The outer surface of the coil C is covered with thermal insulation A, such as with asbestos, to a thickness of about one-quarter inch, and a U-shaped housing B comprised preferably of sheet metal is provided within which the thermally insulated coil C is seated and secured in position therein in any convenient manner.

The average diameter of manifold M approximates 2½ inches and coil C should approximate this width at the base of the coil. By inclining the sides of the coil inwardly approximately one-half inch the coil will frictionally engage the manifold surface of varying diameter at least one-quarter inch smaller and larger than this average diameter. The coil C preferably is comprised of tubing of approximately one-quarter inch outside diameter and the length of the coil C is selected to seat along the entire length of the manifold M. The variation in length of manifold M generally requires several different length of coil C to fit the manifolds of different automobile engines.

In combination with the coil C, I provide a water pump W detachably mounted upon the engine E or upon the frame F sustaining the engine E, as may be convenient, in a position adapting the pump W to be actuated by means of the fan belt G normally provided to actuate the fan J. Flexible conduits 10, 11, 12, 13, 14 and 15 are provided to operatively connect the water pump W and the heat exchange coil C to draw water from a source S, such as a lake or flowing stream and to feed the water through the coil C to the shower head H of the portable shower K located at a distance from the engine E. The flexible conduits 10 to 15 inclusive are comprised preferably of some durable synthetic plastic material common in the art and, per se, form no part of the present invention and may be comprised of any suitable material.

Most automobile engines are set to idle at a speed of from 500 to 700 r.p.m. (revolutions per minute) and at this idling speed the water pump W may feed water through the coil C at such a rate that the water cannot be heated sufficiently. I have found it desirable to pro-

3

vide means, such as a Y or T joint 16, to divide the water effluent from the pump W into two streams, one passing through the coil C to the shower head H and the other passing to a Y or T joint 17 connected to the shower head H with a valve means V_1 and V_2 in the hot and cold water lines 12 and 14 respectively to regulate the rate of flow of hot and cold water in admixture into the shower head H.

The particular type of water pump W employed in this invention may be widely varied without departure from the invention. In the specific embodiment illustrated I employ a Jabsco pump Model No. A.L. $\frac{1}{4}$ inch pipe size. This pump is designed to deliver water at 4.3 lbs. per square inch at 500 r.p.m. and up to 21.6 lbs. per square inch at 1750 r.p.m. I have found that at the usual idling speed of 500 to 700 r.p.m. for most automobile engines the rate of flow of the water delivered by this pump through the $\frac{1}{4}$ inch pipe comprising the coil C is too great for favorable heat exchange reaction and therefore provide means, such as a gear reduction means L, to reduce the r.p.m. of this water pump to about 300 r.p.m. at the usual idling speed of the engine E of 500 to 700 r.p.m. In the arrangement shown the pulley P_1 actuating the gear reduction means L is disposed in a position to be driven by the fan belt G and the pump W is connected to the gear reduction means L to be driven thereby at the desired r.p.m. of about 300.

As indicated in the drawings, the fan belt G is driven by the drive pulley P_2 driven by the engine E and the belt G derives the fan pulley P_3 as heretofore in the art.

In substitution for the portable shower K, the hot water may be fed into a storage tank, for example, without departure from the invention, for use in washing dishes or laundry. The invention by providing a supply of warm to hot water from an idling automobile engine is adapted for wide utility by the motoring public, particularly those who like to camp out in locations where warm water is difficult to obtain.

Having hereinabove disclosed the present invention generically and specifically and having described and illustrated one specific embodiment of the same, it is believed apparent that the invention may be widely modified without essential departure therefrom and all such modifications, departures and adaptations of the same are contemplated as may be within the scope of the following claims:

What I claim is:

1. A means for obtaining a continuously flowing supply of hot water from an idling internal combustion engine, said means comprising a heat exchange coil adapted to be detachably mounted on and in heat exchange relation to the exhaust manifold of an internal combustion engine, said coil consisting of a plurality of reverse bends of tubular material of relatively high thermal conductivity each substantially of U-shape, a water pump and means detachably mounting the pump in a position relative to the said engine to be driven thereby at a determined rate at idling speed, and flexible conduit means connecting the said pump to a supply of water and connecting the pump and coil to feed the

4

water through the coil and to a point remote from the said engine.

2. The means of claim 1, and a portable shower including a shower head and means feeding the hot water thereto.

3. Apparatus for heating a flowing stream of water by heat exchange with the exhaust gases in the exhaust manifold of an internal combustion engine, said apparatus comprising in combination a substantially U-shaped coil consisting of a plurality of reverse bends of tubular metal of relatively high thermal conductivity each substantially of U-shape, said coil having a width and length adapting the coil to be detachably mounted in direct heat exchange relation to and upon the exhaust manifold of an internal combustion engine, thermal insulation material surrounding the outer surface of said coil and a substantially U-shaped housing enclosing the thermally insulated coil, the sides of said coil being inclined inwardly to provide for the spring engagement of said coil to the outer surface of said exhaust manifold, a water pump detachably mounted adjacent to the internal combustion engine and means connecting the water pump to be driven by the internal combustion engine, flexible conduit means having one end connected to the water pump and the other end adapted to be connected to a source of supply of water for feeding water from said supply source to the pump and a second conduit means connected at one end to the pump and connected at the other end to the said coil to conduct the water from the pump to and through the coil, means associated with said pump for maintaining the speed of the pump to that adapted to provide hot water when the engine is running in idle position, and a third conduit means associated with said apparatus for conducting the hot water from the said coil to a point remote from the engine.

4. The combination of claim 3, and a shower head disposed at said point remote from said engine and said third conduit means conducting the hot water from the coil to the shower head.

5. The combination of claim 4, and means by-passing a portion of the water effluent of the pump around the coil to the shower head for admixture with the hot water delivered thereto.

6. The combination of claim 5, and valve means disposed in said third conduit means and said means by-passing a portion of the water effluent of the pump around the coil to the shower head, said valve means regulating the relative amounts of cold and hot water entering the shower head.

References Cited in the file of this patent

UNITED STATES PATENTS

1,098,476	Carpenter	June 2, 1914
1,159,773	Joy	Nov. 9, 1915
1,372,598	Buka	Mar. 22, 1921
2,576,198	Stuart	Nov. 27, 1951

FOREIGN PATENTS

185,589	Great Britain	Sept. 4, 1922
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