April 10, 1934. T. P. CHASE 1,953,927

OIL COOLER

Filed March 31, 1930 2 Sheets-Sheet 1

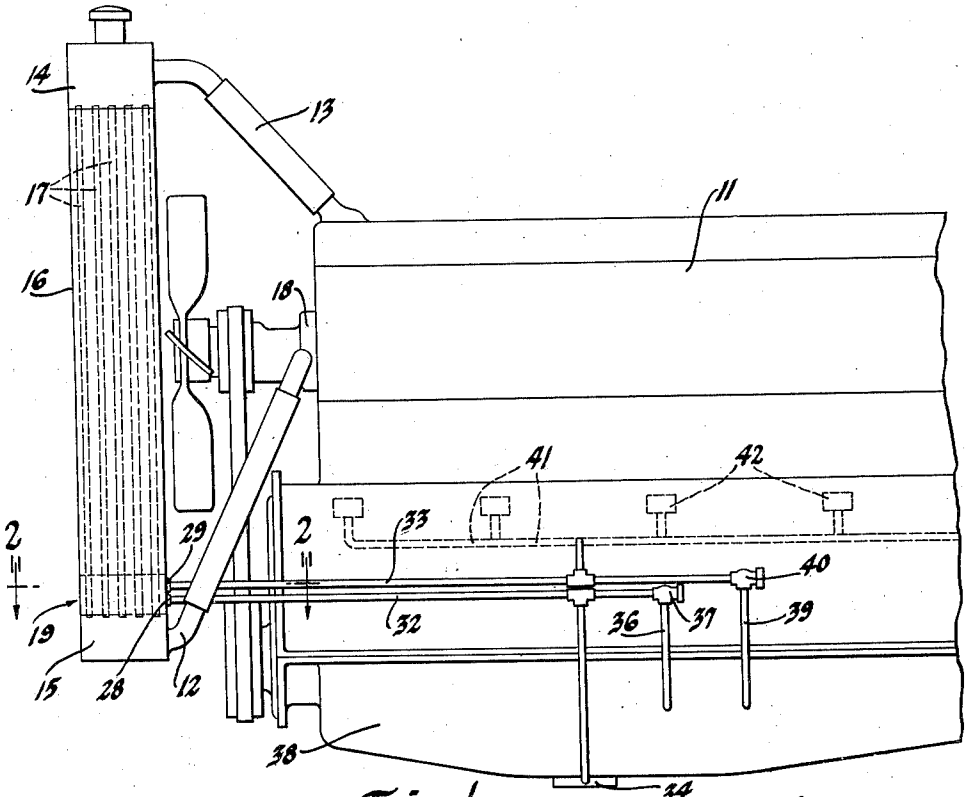


Fig. 1.

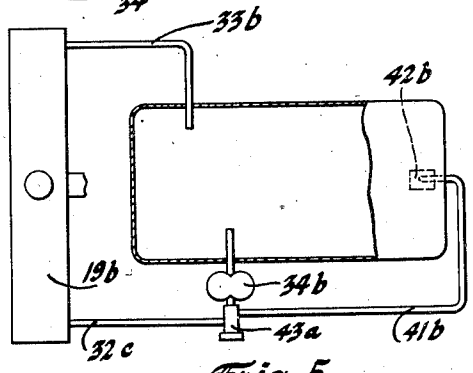


Fig. 5

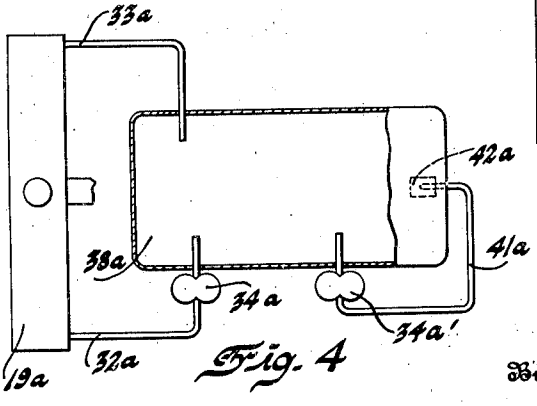


Fig. 4

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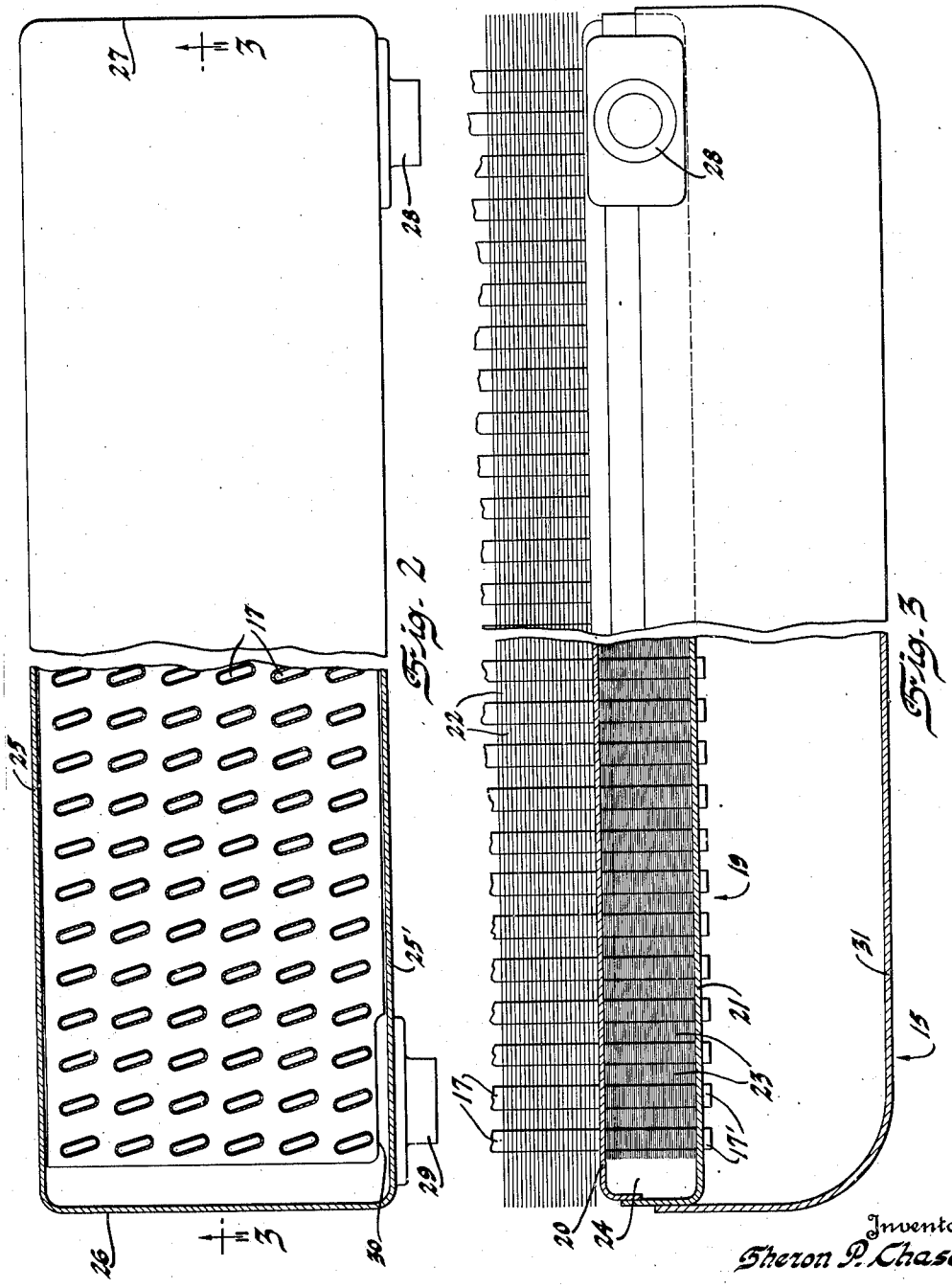


Fig. 2

Fig. 3

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UNITED STATES PATENT OFFICE

1,953,927

OIL COOLER

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3 Claims. (Cl. 257—125)

It is an object of this invention to provide simple and practical means for a direct utilization of engine-cooling water in the cooling of lubricant oil; and preferred embodiments of this invention may involve an innovation in the construction of air-cooled radiators employing vertical water tubes;—some or all of said tubes being extended through an oil cooler incorporated in said radiator.

From a slightly different point of view, this invention may be said to contemplate an oil thermalizing unit which includes heat-exchange or oil tempering elements, such as the mentioned tubes, in which unit the oil is passed between numerous parallel partition plates adapted to function as fins upon said heat-exchange elements,—fins external to said unit and internal thereto being preferably similar but differently spaced.

Other objects of this invention, which need involve no change in the external form or the general appearance of a radiator organization of a type currently applied to automotive vehicles (the mentioned oil-cooler unit being preferably disposed immediately above a lower water tank with which the mentioned vertical or other tubes communicate by extending through parallel horizontal walls between which numerous heat conductive fin sheets are compactly disposed) may be best appreciated by the following description of an illustrative embodiment thereof, taken in connection with the appended claims and the accompanying drawings.

Figure 1 is a partial and diagrammatic side elevational view of an engine equipped with one form of a water cooling and oil cooling radiator organization illustrative of the present invention, parts being broken away.

Figure 2 is an enlarged partial sectional view, with parts broken away, taken substantially as indicated by the line 2—2 of Figure 1.

Figure 3 is a partial section view, taken substantially as indicated by line 3—3 of Figure 2.

Figures 4 and 5 are diagrammatic plan views.

Referring to details of that embodiment of the present invention which has been chosen for purposes of illustration, an engine 11 is shown as provided with cooling-water conduits 13 and 12 respectively communicating with an upper tank 14 and a lower tank 15 comprised in a radiator organization 16 which includes parallel vertical tubes 17, extending between said tanks.

A pump 18 is shown as interposed in the conduit 12, to advance cooled water from the tank 15 to the engine 11; and an oil cooler unit 19 is shown as including an upper wall 20 and a lower wall 21, through both of which the tubes 17 extend in such manner that one of said walls may be regarded as common to said oil cooler and the lower water tank 15,—the tubes 17 thus serving as oil tempering elements.

In the present instance, the tubes 17 are shown as provided, externally of the cooler 19, with spaced horizontal plates or sheets 22, commonly soldered thereon and serving as air-cooled fins to reduce the temperature of said tubes and that of the water descending therethrough; and those portions of said tubes which extend into and through the oil cooler 19 are shown as provided with similar but shorter and more closely packed parallel partition sheets or plates 23, to serve as heat transferring fins,—the length of the last-mentioned sheets or fins being such as to leave what may be termed header spaces or manifold spaces 24 at the respective ends of the oil cooler.

In the illustrated cooler unit 19, the respective walls 20 and 21, through which the substantially parallel water-cooling and oil-tempering tubes 17 extend, are shown as horizontal and as formed of metal sheets which are so stamped or drawn or otherwise cupped as to cooperate in incidentally providing parallel front and back walls 25 and 25′ and end walls 26 and 27 of said unit,—the mentioned back wall 25′ being shown as provided with an inlet fitting 28 and an outlet fitting 29 opposite which the fin sheets 23 may be specially shaped or slightly cut away as suggested at 30, Figure 2,—said sheets otherwise fitting snugly between walls 25 and 25′.

In assembling, so much of the described radiator structure as lies, during use, above the plate or wall 20 may be put together in any usual or preferred manner; and, whether or not the organization has been inverted or otherwise specially oriented favorably to the positioning of the plate wall 20 upon the projecting tubes 17, the fin sheets 23 may be assembled directly thereon,—slight annular bosses, not shown, but optionally formed adjacent the apertures and/or elsewhere incidentally to the aperturing of the sheets, being preferably relied upon suitably to space the same. The cupped or other "lower" wall element 21 of oil cooler 19 may be then so applied as to leave fin sheets 23 compacted to a desired degree and the respective ends 17′ of tubes 17 flush or projecting slightly therethrough; and a cupped or other bottom element 31, preferably adapted to receive the similarly

cupped wall element 21 may then be applied, substantially as suggested in Figure 3.

It will be understood that the horizontal fin sheets 22 (which may or may not be formed of a slightly heavier stock than the fin sheets 23) and also the respective wall elements 20, 21 and 31, are to be held in place by soldering, welding or other known means; but any soldering within the oil cooler 19 may aim primarily at the promotion of heat interchange between mentioned parts.

Obviously either of the openings 28, 29 whether provided in a vertical wall 25 or elsewhere near the ends of the described unit, may serve as an inlet opening connected with any oil feed conduit 32, the other opening of said unit being then connected with any oil delivery conduit 33; and the latter may lead either to a suitable reservoir or directly to engine bearings, as desired. In the latter case, a pump interposed at any suitable point, as at 34, may serve not only to advance the oil through the described cooler but to deliver the same therefrom under a predetermined pressure. The relatively large cross-sectional area of the cooler, and the very extensive heat-transfer surface provided therein by the fin sheets 23, between whose closely-opposed surfaces the oil must pass, are favorable to the capacity and efficiency of the described cooler,—preventing any stagnation of chilled superficial layers of oil; and, if desired, a pressure-limiting by-pass return conduit 36 shown as controlled by an adjustable valve at 37, may be interposed between the conduit 32, and a sump or other reservoir 38. A similar return conduit 39, valved at 40, is shown as conditionally connecting conduit 33 with sump 38. The valve 37 being set at a little higher pressure than valve 40, when both are used, the oil brought to an optimum condition from either direction, may be advanced to any pressure conduits 41, leading to bearings 42, either under an invariable bearing pressure or under a pressure varied by manual or other manipulation of valve 40,—adjusted with reference to thermal or other conditions; and excess oil, if pumped, may be returned to reservoir 38 via either conduit 36 or conduit 39,—a filter unit (not shown) being optionally interposed at some suitable point.

One advantageous mode of operation of all mentioned parts has been clearly indicated in connection with the description thereof; and, although said description has included but one complete embodiment of the present invention, it will be understood not only that various features thereof might be independently employed but also numerous modifications and/or auxiliary features, additional to those suggested herein, might easily be devised,—all within the scope of the present invention. In particular it should be understood that this combined water-cooling radiator and oil cooler may be used in any of a great variety of systems. For example, Figure 4 suggests that pipes 32*a* and 33*a*, through which oil is sent to and from cooler 19*a* by pump 34*a*, may be connected only with a reservoir such as a sump 38*a*, any desired additional means, such as a pump 34*a'*, being used to deliver the tempered oil to bearings 42*a* via pipe 41*a*; and Figure 5 suggests adaptation of a single pump 34*b* to serve the functions of both of the pumps 34*a* and 34*a'*,—as by interposition of a pressure relief valve 43*a* in such a manner that, delivery of oil to bearings 42*b* being always provided for by pipe 41*b*, excess oil may be conditionally circulated through "cooler" 19*b* via conduits 33*b* and 32*c*; but the systems last referred to are obviously capable of use with other coolers.

I claim:

1. In an engine and lubricant cooling system: a tank comprised in a radiator organization for cooling water for an automotive vehicle engine, said tank having a set of water cooling tubes extending through a wall thereof; and an oil cooling chamber provided with an inlet and an outlet enclosing portions of said tubes, said chamber being subdivided by parallel heat-transferring partitions between which said oil is advanced from said inlet to said outlet.

2. In an engine lubricating system: a lubricant conditioning chamber provided with an inlet and an outlet spaced apart; parallel tempering elements extending inwardly through a wall of said chamber; and spaced heat-transfer means disposed in parallel upon said elements within said chamber, said heat-transfer means being partition plates which are so arranged as to provide header spaces opposite said inlet and said outlet.

3. Apparatus for cooling the engine cooling liquid and regulating the temperature of the lubricant of a liquid cooled internal combustion engine including means defining passages through which engine cooling liquid is adapted to flow in heat-exchanging relation with air, a compartment through which engine lubricant is adapted to flow in heat-exchanging relation with the engine cooling liquid in the first-mentioned passages and enclosing portions of the first mentioned passages, fins or the passages without the compartment, and more closely juxtaposed fins on the passages within the compartment.

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