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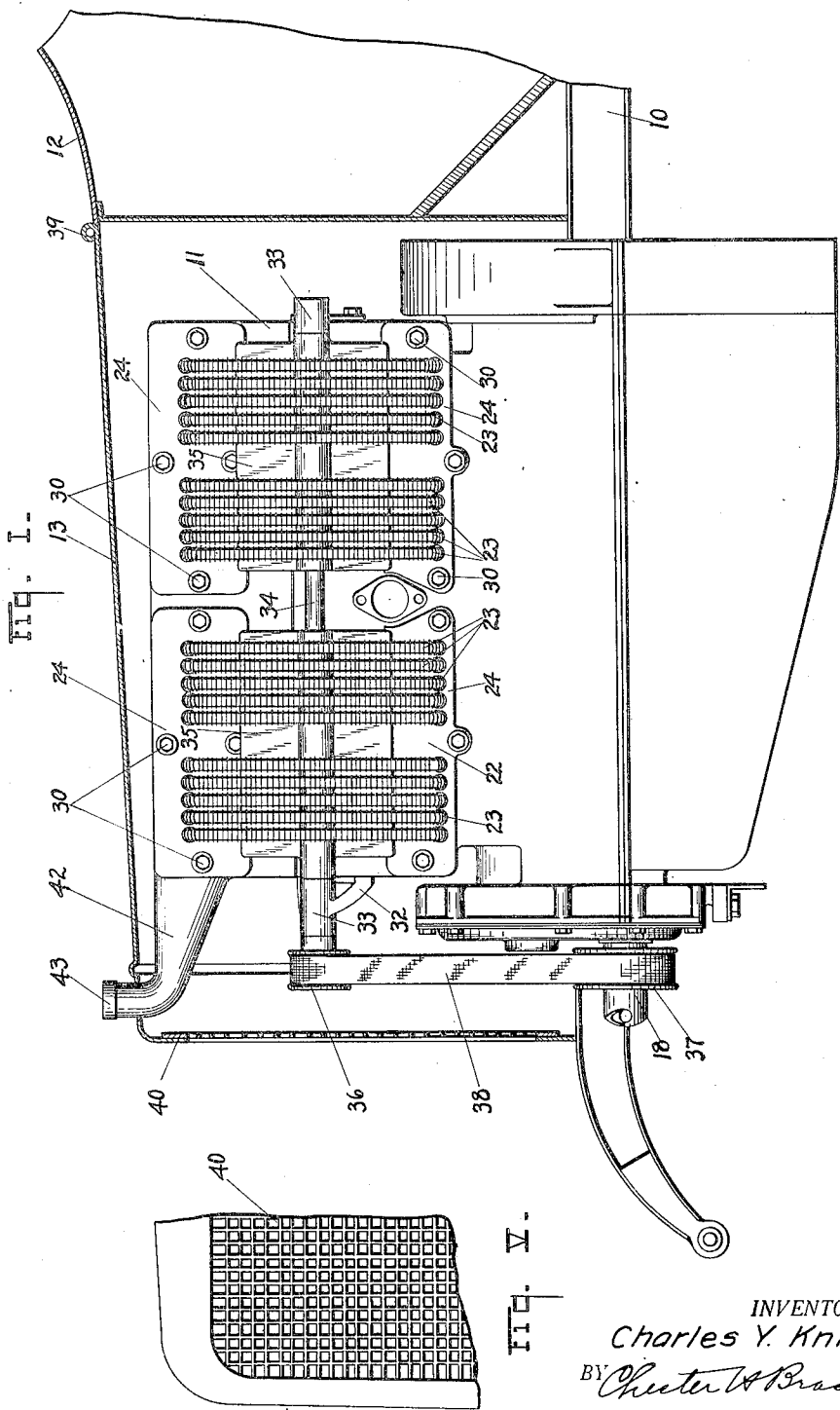
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C. Y. KNIGHT

WATER COOLING SYSTEM

Filed March 3, 1919

2 Sheets-Sheet 1



INVENTOR.
Charles Y. Knight
BY *Chester W. Braselton*
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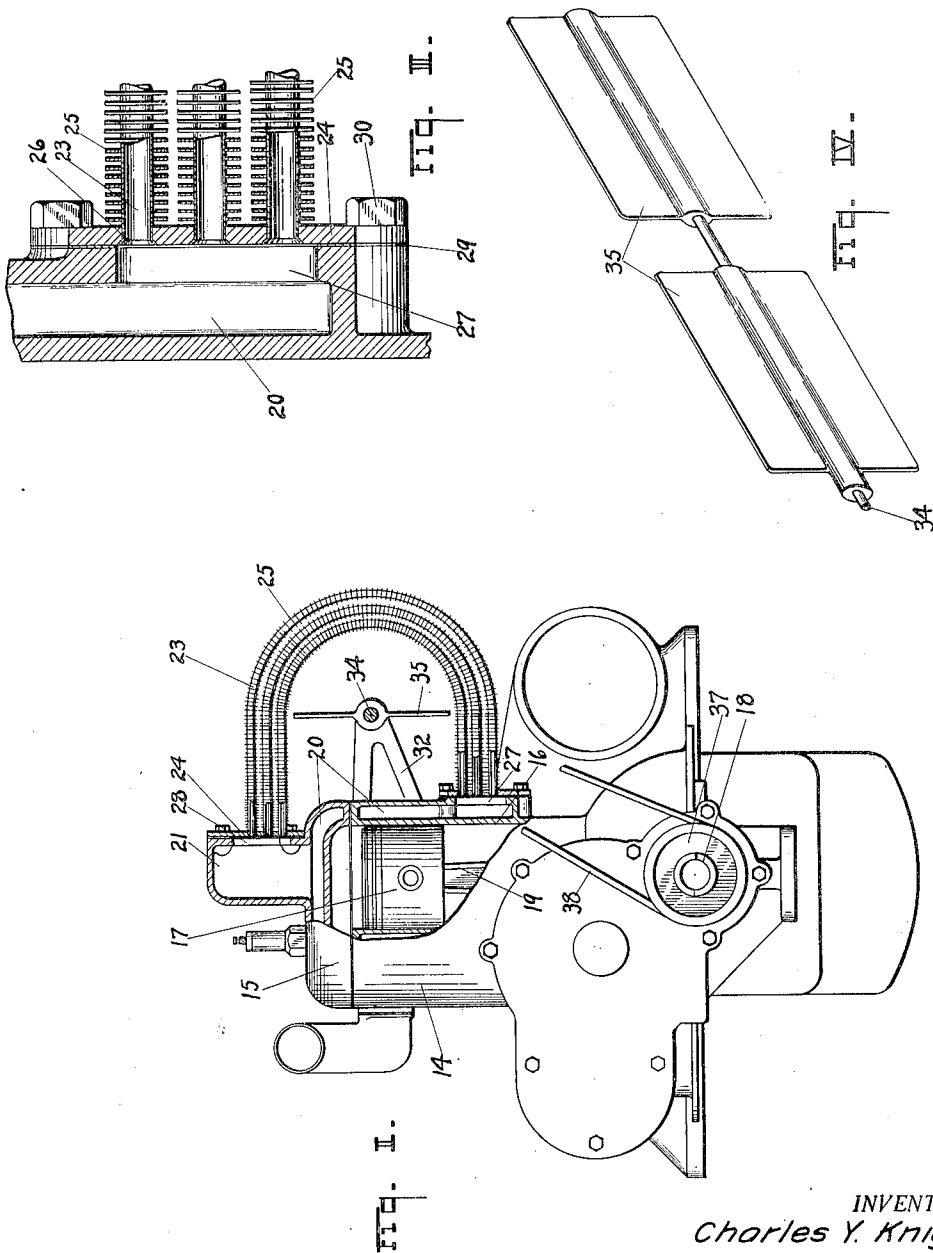
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UNITED STATES PATENT OFFICE.

CHARLES Y. KNIGHT, OF PASADENA, CALIFORNIA, ASSIGNOR TO KNIGHT AMERICAN PATENTS COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE.

WATER-COOLING SYSTEM.

Application filed March 3, 1919. Serial No. 280,501.

To all whom it may concern:

Be it known that I, CHARLES Y. KNIGHT, a citizen of the United States, residing at Pasadena, Los Angeles County, California, have invented certain new and useful Improvements in Water-cooling Systems, of which I declare the following to be a full, clear, and exact description.

This invention relates to an improved water cooling system, particularly adapted for use in connection with engines provided with water jackets for cooling the interior of the engine cylinders.

One object of the invention is to provide a device of this character which will form a unitary structure with the engine.

A further object of the invention is to provide a device of this character so arranged as to dispense with the ordinary radiator positioned in front of the engine, thus rendering the parts of the engine readily accessible for the purpose of repair.

A further object of the invention is to provide a compact form of water cooling system, so constructed that the parts are unlikely to become injured so as to cause leakage therefrom.

A further object of the invention is to provide a device of this character, having the parts so arranged as to permit a more uniform distribution of cool air against the exterior surfaces of the radiating elements.

A further object of the invention is to provide a device of this character, which is capable of being readily detached from the engine for the purpose of repair, and readily replaced thereon.

A further object of the invention is to provide a device of this character, which is of simple construction and efficient in operation.

A further object of the invention is to provide a device of this character composed of sections, each of which is capable of being removed for the purpose of repair or replacement, independently of the other sections.

Further objects of this invention relate to economies of manufacture and details of construction as will hereinafter appear from the detailed description to follow.

The objects of the invention are accomplished in one instance by the devices and means described in the following specification, but it is evident that the same may be

varied widely without departing from the scope of the invention as pointed out in the appended claims.

A structure constituting one embodiment of the invention, which may be the preferred, is illustrated in the accompanying drawing forming a part hereof, in which:

Figure I is a view in side elevation of an automobile engine having the improved water cooling system shown therein.

Figure II is an end elevational view of an automobile engine, having certain of the parts broken away to better illustrate the manner of securing the water cooling system thereto.

Figure III is a vertical-sectional view through a portion of the water jacket and radiator tubes, illustrating the manner of connecting the radiator tubes to the water jacket.

Figure IV is a perspective view of a form of fan, which may be employed for the purpose of directing air current against the radiator sections of the water cooling system.

Figure V is a detail view, illustrating the construction of the front portion of the hood wherein the same is shown as formed in such a manner as to simulate the appearance of the usual radiator construction.

Referring to the drawings, similar reference characters designate corresponding parts throughout the several views.

In the embodiment of the invention illustrated herewith, 10 indicates one of the side frame portions of an automobile, which is provided with an internal combustion engine 11 of the usual type, adapted to be supported by the usual frame members 10 and to be positioned in front of the cowl portion 12 and beneath the hood 13. The internal combustion engine is provided with the usual cylinder casing 14 and head casing 15 which are adapted to be secured together in any well known manner commonly employed for this purpose.

The cylinder casing 14 is provided with a plurality of cylinders 16 suitably spaced from each other in the usual manner, each of which has mounted therein a piston 17 connected to the main crank shaft 18 of the engine by means of a connecting rod 19. The cylinder casing 14 as well as the head casing 15 are each formed with the usual spaced communicating recesses 20 in their

side walls, which spaced communicating recesses are adapted to comprise a water jacket adapted to be filled with a circulating fluid for the purpose of assisting in cooling the interior of the cylinders. The cylinder head casing 15 is provided with an upwardly extending extension 21, which communicates with the spaced recesses 20, forming the water jacket and serves as an additional water chamber. It will be readily understood that the water circulates freely throughout the various spaced recesses 20 formed in the side and top portions of the cylinder and cylinder head casings, being capable of passing from the recesses 20 formed in the cylinder casing to the recesses 20 formed in the cylinder head casing by means of communicating openings (not shown) of the usual construction.

The water cooling system employed for the purpose of cooling the cylinders comprises in addition to the water jacket above described a plurality of radiating sections 22, each of which comprises a plurality of spaced circuits or tubes 23 symmetrically arranged with respect to each other and having their extremities secured in detachable cover plates 24. The radiating sections employed in the present instance are shown in Figure I as being two in number, although any desired number of these radiating sections may be employed, and, as shown in Figure I, each of these radiating sections is capable of being readily detached from the engine for the purpose of repair or replacement. The radiating circuits or tubes 23 are illustrated in the embodiment shown in the drawing as being bent so that a portion of each tube is of semi-circular form, and the various tubes are symmetrically arranged with respect to each other, and have their opposite ends firmly secured within the plates 24 so that each communicates with the upper and lower portions of the water jacket. Each of the tubes 23 therefore, forms a continuous circuit connecting the upper portion of the water jacket and the lower portion thereof for the purpose of conveying and cooling the water to disperse a portion of the heat generated within the engine cylinders. Each of the tubes is formed of thin metal and is preferably provided with radiating fins 25 employed for the purpose of assisting in dispersing the heat carried by the water. The end portions 26 of the tubes 23 are adapted to be inserted within openings formed in the plate 24 and swaged or expanded therein so as to provide water tight connections between each tube and the corresponding plate 24.

One of the plates 24 is adapted to be fitted against the outer surface of the cylinder casing and over the opening 27 formed therein, which opening communicates with

the various spaced recesses 20 formed in the cylinder casing. The other plate 24 is adapted to contact in a similar manner with the outer surface of the extension 21 formed upon the upper portion of the head casing, and to fit thereagainst in such a manner as to permit the ends of the tubes 23 to communicate with the interior of the extension 21 through the opening 28 formed in one face of the extension casing. Gaskets 29 may be employed between each of the plates 24 and the corresponding surface of the cylinder casing or extension casing against which it is adapted to rest. Bolts 30 may be employed for the purpose of firmly engaging each of the plates 24 with corresponding surface against which it is adapted to contact in such a manner as to secure a water tight engagement between the surfaces.

The various radiating sections which are employed, may be of identical construction so as to admit of their being interchanged, and so that a minimum number of extra sections may be reserved for the purpose of replacing or repairing injury to those already in use.

A plurality of brackets 32 extend outwardly from the cylinder casing for the purpose of providing bearings 33 for a fan shaft 34 which carries a plurality of fans 35 adapted to direct currents of air against the exterior surfaces of the tubes or circuits, which make up the radiating sections forming the exterior portion of the water cooling system. The entire water cooling system may be considered as comprising the spaced recesses 20 of the casing, which make up the water jacket; and the plurality of tubes or exterior circuits, which taken together, may be considered as comprising the exterior radiating portion of the system. The fan shaft 34 carries a pulley 36 firmly secured thereto and adapted to be driven from a pulley 37 secured to the main crank shaft 18 of the engine, by means of a belt 38. By reason of the bent form of the tubes or exterior circuits 23, a suitable open ended space is provided between the circuits for mounting the fan sections 35 in such a manner that the edges of the fan will be spaced a substantially equal distance from the tubes or circuits throughout a substantial portion of their length, whereby air currents directed by the fan against the exterior surfaces of the tubes will produce a maximum cooling effect upon the tubes and the water carried thereby.

The hood 13 is adapted to be hinged as at 39 to the cowl portion 12 in such a manner as to enable the entire hood portion to be turned about the hinge 39 so as to completely expose the entire front and side portions of the engine, and as the usual radiator in front of the engine is dispensed with in this con-

struction, the entire front portion of the engine is readily accessible for the purpose of repair. The hood 13 is constructed in the usual form and may be provided with a foraminous plate 40 secured to the front end portion thereof, and so constructed as to simulate in appearance the usual front radiator construction.

While the water cooling system illustrated herewith is shown as being applied only to one side of the engine casing, it is not intended to limit the use of the device upon one side of the engine casing if it should be found to be practicable or desirable to employ radiating sections on both sides of the engine casing. The extension 21 is provided with a spout 42 having a cap 43 for closing the open end thereof, which spout provides a ready means for adding fluid to the cooling system whenever it becomes necessary to replenish the supply.

From the foregoing description it will be obvious that the water cooling system illustrated herewith furnishes many advantages over the cooling systems ordinarily employed for cooling the water used in connection with internal combustion engines, or for the purpose of cooling other surfaces which are adapted to be subjected to extreme heat. In the system employed herewith the proper operation of the same is not dependent upon a single connecting tube, which is liable to become clogged and thus prevent proper circulation of the cooling fluid, but a considerable number of circuits are employed which insures a proper circulation of the cooling fluid at all times, and under all conditions of use. Moreover, in that embodiment of the invention illustrated herewith the entire cooling system is carried by the engine, and forms a unitary structure therewith so that the engine and cooling system may be removed as a unit, thus preventing the necessity of disconnecting certain of the connections if it is found desirable to remove the engine and replace it at any time. By forming the water jacket of upper and lower sections comprising the spaced recesses formed in the head casing and the cylinder casing respectively, and connecting these upper and lower sections with each other by means of a series of separate circuits making up the various external radiating sections a plurality of open circuits are provided for the free circulation of the cooling fluid in such a manner as to permit the feeding of the cooling fluid through the radiating tubes more rapidly than is possible with the usual water cooling system, and thus provide a more efficient cooling system for the cylinders. By having the various circuits or tubes connected in parallel with the upper and lower sections of the water jacket, i. e., by having each tube or circuit directly connected at its opposite ends to the sections

of the water jacket, a rapid circulation of the cooling fluid is insured and a substantially uniform dispersion of the heat carried thereby is effected as it traverses each of the circuits or tubes comprising the exterior radiating sections.

While the term water cooling system is used in the specification and claims, since this term is commonly employed in connection with cooling systems of this type as used in connection with systems for cooling internal combustion engines, it is to be understood that the use of this structure is not limited thereby to use with water only but is capable of being employed and is intended for use wherever a self contained liquid or fluid cooling means is employed with any liquid which is now used or may be found to be practicable for use in cooling the cylinders of internal combustion engines. Some of the liquids ordinarily employed for this purpose are water, alcohol and calcium chloride solution, and wherever the term water is used throughout the specification and claims it is intended to embrace the use of any of these liquids or any other liquid which may be employed as a cooling agent since the structure shown herewith is not dependent for its utility upon the particular character of the liquid employed.

While I have shown and described in considerable detail a specific embodiment of my invention, it is to be understood that this showing and description is illustrative only and for the purpose of rendering my invention more clear, and that I do not regard the invention as limited to the details of construction illustrated or described, nor any of them, except in so far as I have included such limitations within the terms of the following claims, in which it is my intention to claim all novelty inherent in my invention broadly as well as specifically.

What I claim as new and desire to secure by Letters Patent is:—

1. A water cooling system for engines comprising cooling jackets for said engines having circulating pipes extending approximately from the upper to the lower parts of said jackets and means for drawing air between said jackets and circulating pipes and throwing said air outwardly into contact with said pipes.

2. In an engine, a water jacket, a water cooling system comprising a plurality of spaced circuits, each of which is directly connected at two points to the water jacket, and a fan carried by the engine and having blades of such length as to be substantially coextensive with the several circuits for directing a current of air against the circuits.

3. In an engine, a water jacket formed of upper and lower sections, and a radiating section directly connected to the upper

and lower sections of the water jacket, and a fan mounted upon the engine and partially surrounded by the radiating section for directing a current of air thereagainst.

6 4. In an engine, a water cooling system comprising a water jacket formed of upper and lower sections provided with communicating openings therebetween, and an exterior radiating section directly connected to
10 the upper and lower sections of the water jacket and extending outwardly therefrom, and a fan positioned between the outwardly extending portion of the radiating section and the water jacket for directing currents
15 of air thereagainst.

5. In an engine, a water cooling system therefor comprising a plurality of tube sections spaced from each other and arranged in semicylindrical form said sections being
20 each carried directly by the engine, and a fan mounted within the semicylindrical

space between the tube sections and extending throughout a substantial portion of the length of the radiator.

6. In an engine, cylinders arranged in
25 succession, circulating and cooling pipes extending from the upper to the lower parts of the cooling jackets of said cylinders and a means for drawing air between said jackets and said pipes and for distributing said
30 air throughout said circulating and cooling pipes.

7. In an internal combustion engine, a water jacket surrounding the engine cylinders, a plurality of separate tube sections,
35 each having its opposite ends connected with the water jacket and a means between said cylinders and said tube sections for directing air outwardly into contact with said
40 tube sections.

In testimony whereof I affix my signature.
CHARLES Y. KNIGHT.