

Jan. 13, 1931.

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1,789,283

INTERNAL COMBUSTION ENGINE

Filed March 16, 1929

2 Sheets-Sheet 1

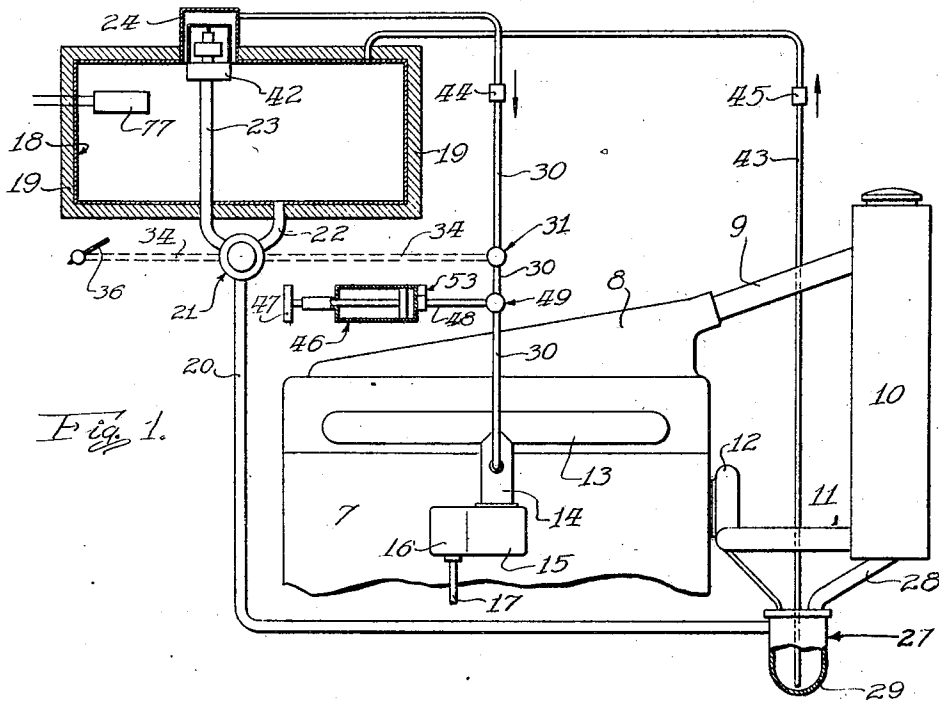


Fig. 1.

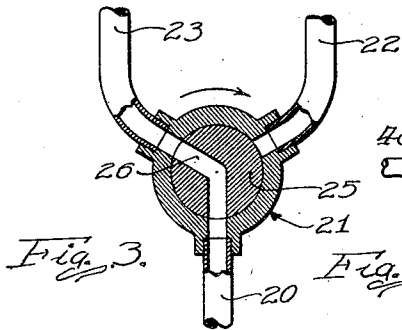


Fig. 3.

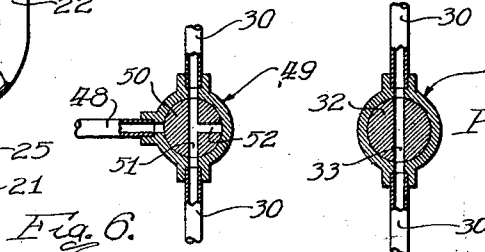


Fig. 6.

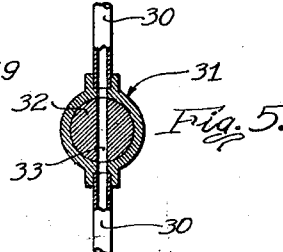


Fig. 5.

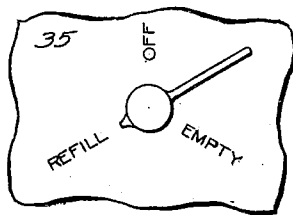


Fig. 4.

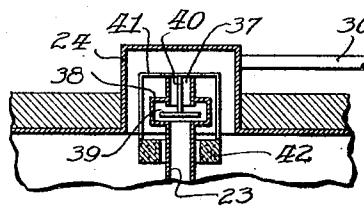


Fig. 2.

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2 Sheets-Sheet 2

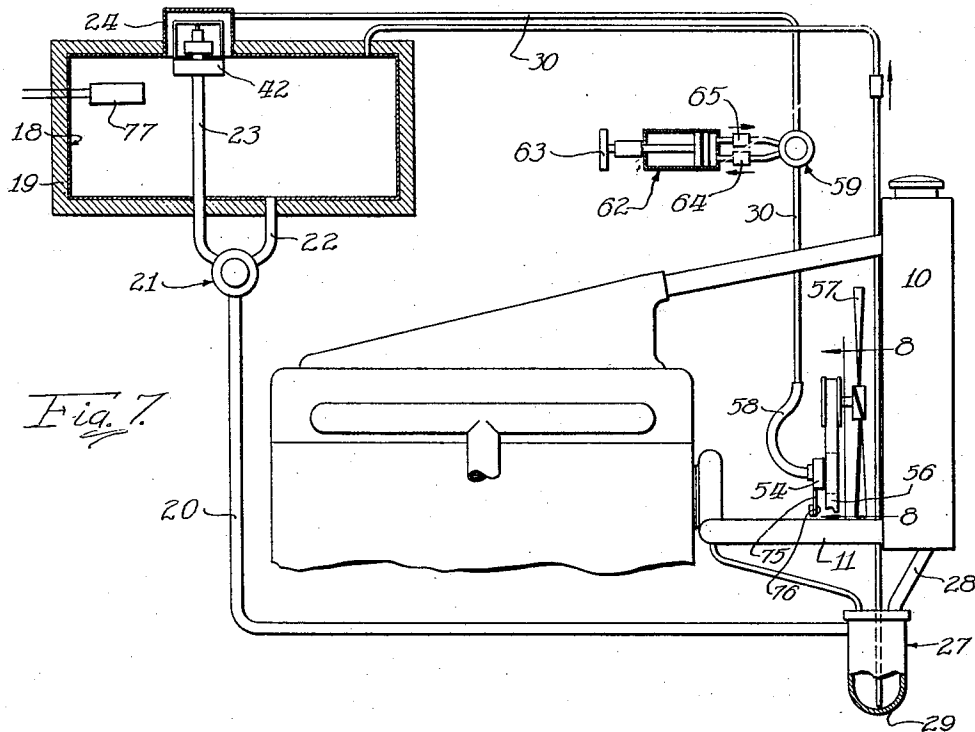


Fig. 7.

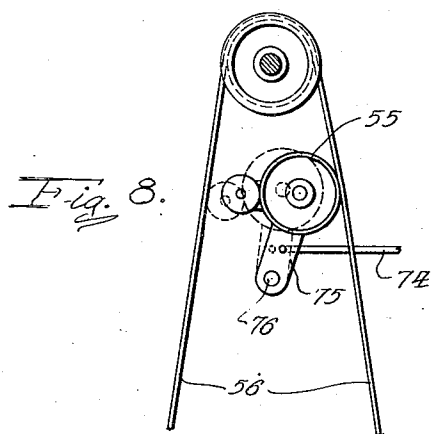


Fig. 8.

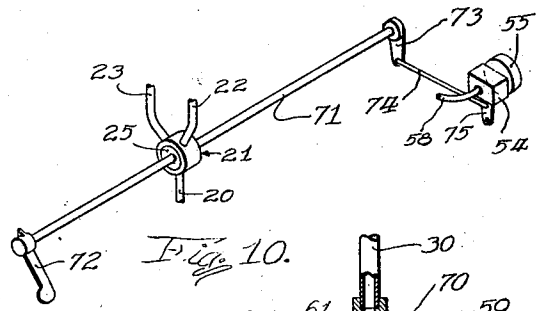


Fig. 10.

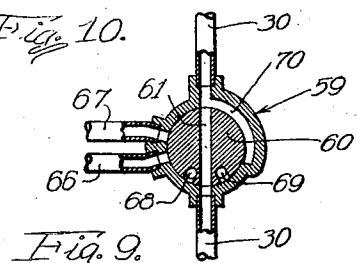


Fig. 9.

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INTERNAL-COMBUSTION ENGINE

Application filed March 16, 1929. Serial No. 347,603.

This invention has to do with certain improvements in internal combustion engines and the like. The invention has reference particularly to improvements in internal combustion engines for automobiles, trucks, tractors and other motor vehicles; but it will presently appear that the features are not limited to engines for the above purposes. Nevertheless, inasmuch as said features of invention are particularly intended for the above class of service, I have illustrated and will describe such uses and applications of the engine; but in so doing I wish it clearly understood that I do not extend thereby to limit myself except as I may do so in the claims.

The invention concerns itself particularly with the engine jacketing system or the oil circulating system. As is well understood, both of these systems are seriously influenced by the existence of low temperatures, particularly during the winter months. In the case of the engine jacketing system, the cooling and circulating liquid is subject to freezing with the attendant dangers and damages which are well understood; and in the case of the oil circulating system the low temperature is apt to interfere with a proper functioning of the oil pump at starting, as well as seriously impeding the starting operation itself.

In addition to the foregoing, it is also well understood that the starting of a dead cold engine entails not only a serious strain on the starting motor, battery, and other equipment, but also results in wear and deterioration of the engine itself. This is aggravated by the necessity of excessive use of the strangular or choke with resulting diluting of the circulating oil by gasoline.

The main object of the present invention is to make provision for storing the circulating liquid or the oil or both, as the case may be, in a suitable heat insulated or jacketed chamber during idle intervals so that the heat of the circulating liquid or of the oil will be effectively retained and the temperature of the liquid correspondingly maintained at said elevated degree. In this connection it is an object to provide such a storage cham-

ber of a sufficient capacity to receive and retain the liquid in question during the idle period, said liquid being substantially drained from the jacketing system or the oil circulating system as the case may be and stored in such heat insulated compartment or chamber during the idle interval. When the engine is to be again placed in service said liquid is allowed or caused to return to the circulating system in question so that it may again perform its normal function, and its temperature will be at a materially elevated degree as compared with what the temperature would have been if the liquid had not been so stored in the heat insulated compartment.

Inasmuch as the jacketed liquid is usually of water or alcohol or some other non-freezing material or a mixture of water and such material, and is different from the oil circulating system, it is substantially necessary to provide separate compartments for retaining these two bodies of liquid together with their entrained heat. For this reason I have chosen to illustrate and describe in the drawings and specifications of this application only the apparatus and connections used in conjunction with the jacketing system; but it will be understood that I do not intend to limit myself thereby to the jacketing liquid system except as I may do so in the claims.

Inasmuch as provision must be made for constant elimination of heat from the jacketing liquid during the normal operation of the system, such elimination of heat being performed mainly by the radiator, it will be understood that it is impractical to establish a heat insulating covering for the entire system. Therefore, according to my invention, I provide a separate chamber or compartment of a suitable capacity to receive and retain the entire volume of the jacketing liquid during periods of engine idleness, such chamber or compartment being very effectively heat insulated so that the liquid therein will retain its heat for a long interval of time even when the external temperature is very low as in winter conditions. I then provided suitable connections including

valves and pumping apparatus connecting this receptacle or chamber with the jacket circulating system so that the jacket liquid can be transferred back and forth between said chamber and the jacket circulating system under control of the operator. The arrangement is such that when the engine is stopped or is to be stopped the hot jacket liquid will be promptly transferred to this heat insulated chamber or compartment and retained therein under heat insulating protection; and the arrangement is such that thereafter the liquid may be transferred back to the jacket circulating system when the engine is to be again placed in service. The result will be that the jacket liquid will retain a very large portion of its original heat over a considerable interval of engine idleness, so that when said jacket liquid is again restored to the circulating system it will be at a materially elevated temperature and under the most advantageous conditions for placing the engine in service.

In some cases the chamber or compartment will be located at a higher elevation than the jacket circulating system. When this is the case a suitable pumping or liquid transferring arrangement is used for initially lifting the jacket liquid into such chamber or receptacle; the liquid being afterwards allowed to reenter the jacket system under a gravity flow. In other cases the chamber or receptacle may be placed at a lower elevation than the jacket system so that the liquid will run into the chamber or receptacle by gravity and may be afterwards pumped back into the jacket system. In some cases the back and forth movements of the liquid will both be promptly performed by pumping or otherwise.

The pumping apparatus may be of any convenient form either hand operated or power driven; and in some cases the transfer of the liquid may be performed by the suction of the engine itself. In any case, however, it is desirable to have suitable control devices located at or convenient of access from the dashboard position.

It is also very desirable to provide an arrangement such that the jacket liquid will be very completely drained from all portions of the circulating system so that all danger of freeze-ups will be eliminated. In this connection it will be recalled that even after the bulk of the liquid has been withdrawn from the circulating system, there will still remain a substantial amount of liquid on the surface or walls, which liquid will slowly drain to the lowest point. It is a further object of the invention to make provision for picking up this last portion of the liquid and transferring it also to the heat insulated chamber or compartment.

Other objects and uses of the invention will appear from a detailed description of the

same which consists in the features of construction and combination of parts hereafter described and claimed.

In the drawings:

Figure 1 shows more or less diagrammatically a jacket circulating system having applied thereto one embodiment of the present invention;

Figure 2 shows on enlarged scale a fragmentary section thereto, the valve device and upper end of the heat insulated chamber;

Figure 3 shows a section through one form of main control valve;

Figure 4 shows a detailed fragmentary face view of a portion of the dashboard at the position of the control handle;

Figure 5 shows a detail section through the companion suction line valve;

Figure 6 shows a detail section through another form of suction line valve used in conjunction with a hand pump arrangement;

Figure 7 shows a view similar to that of Figure 1 but it illustrates a modified form of arrangement in which a pump is used for transferring the liquid instead of making use of the engine suction;

Figure 8 shows a fragmentary view of the fan belt driven pump being taken on the line 8—8 of Figure 7, looking in the direction of the arrows and on enlarged scale;

Figure 9 shows a fragmentary section through the main control valve of the arrangement shown at Figure 7 but on enlarged scale; and

Figure 10 shows a perspective view of the control connections for the arrangement of Figure 7.

Referring first to the arrangement shown in Figures 1 to 6 inclusive, the internal combustion engine is designated by the numeral 7. It is provided with the usual jacket for cooling liquid. The liquid from this jacket rises to the manifold 8 and is delivered from said manifold through the connection 9 to the upper end of the cooling radiator 10, returning through the lower connection 11 and under the impulse of the circulating pump 12 to the jacket.

The engine illustrated is also provided with an intake manifold 13 supplied with combustible mixture through the connection 14 from the carburetter 15, having the float chamber 16, which is supplied with gasoline or other fuel through the connection 17 in the usual and well understood manner. The arrangements thus far disclosed are well known and understood in the art and it is not believed necessary to explain them at greater detail.

According to my present invention I provide a chamber 18 having a liquid capacity substantially equal to or greater than the liquid capacity of the jacketing system including the jacket, radiator, pump, and all connections which contain jacketing liquid.

This chamber 18 is either of heat insulating material or is adequately protected by a layer of heat insulating material 19 so as to give the desired amount of heat insulating protection according to the features of my present invention. Preferably the chamber 18 is located at a higher elevation than the engine and jacketing system so that the jacket liquid can return to the system by gravity. Furthermore, most automobile and motor vehicle constructions are such as to provide an ample space underneath the hood or cowl for the accommodation of this chamber 18 and above the level of the engine and without the necessity of redesigning the general layout.

I provide a connection 20 of relatively large size in conjunction with the chamber 18 at the lowest point of the jacket system so that the jacket liquid can be transferred back and forth through said connection 20. For this purpose the connection 20 preferably leads directly into a valve 21 having two branches 22 and 23. The branch 22 leads into the bottom of the chamber 18 and the branch 23 leads preferably up to the top of said chamber 18 or to a small dome 24 constituting an upward extension of said chamber. The valve 21 is provided with a control plug 25 having an angular disposed passage 26. With the plug standing in the position indicated in Figure 3, communication is established between the pipes 20 and 23 which is the emptying position. By turning the valve through a movement of 120° in the direction of the arrow in Figure 3 the pipe 20 is cut off from both pipes 22 and 23 which is the off position. By turning the valve through a further movement of 120° the pipes 20 and 22 are placed in communication which is the refill position.

The pipe 23 may in some cases be dispensed with and both of the operations of emptying and refilling the jacket may be performed through the single connection 22 terminating in the bottom of the chamber 18. In such case however, the flow of the jacket liquid up into the chamber 18 will cause considerable eddies of the liquid to take place since the inflowing liquid will be compelled to move up against the body of liquid already present within the chamber. This objection is done away with by the use of the two separate pipes as indicated.

Preferably the pipe 20 does not reach directly into the lower end of the radiator or into the connection 11, but rather it leads into a small sump 27 which is placed slightly below the level of the lowest point of the circulating system as previously existing. A connection 28 leads between the sump 27 and the lower end of the radiator 10. It will also be noted that the bottom 29 of said sump 27 is rounded or brought to a focus. It will also be understood that the sump 27 is

closed so that the jacket liquid will not run out of its top.

In the arrangement illustrated in Figure 1 there is provided a suction connection 30 leading from the upper end of the dome 24 to the intake manifold 13 or to some other element wherein there exists a suction during the running of the engine, as, for example, the connection 14. A valve 31 is placed in the connection 30 having a plug 32 with a cross passage 33. With the plug 32 standing in the position of Fig. 5, suction is established into the dome 24, but by turning the valve 32 slightly in either direction this connection is broken.

The valve plugs 25 and 32 are interconnected as by a rod 34 which in turn reaches over to the position of the dashboard 35 where said rod is provided with a control handle 36 in position for convenient manipulation by the operator. The turning of said handle 36 turns both of the valve plugs in harmony. Said valve plugs are so synchronized, that when the passage 26 stands in the position shown in Figure 3, the passage 33 stands in the position shown in Figure 5. This will permit suction from the running engine to be communicated to the upper portion of the chamber 18 simultaneously with the communication of the pipe 20 with the pipe 23. As a result the jacket liquid will be drawn up and discharged from the upper open end 37 of the pipe 23 and into the dome 24. This jacket liquid will then fall back into the chamber 18 and accumulate therein. There is an enlargement 38 at the upper end of the pipe 23, and valve 39 being placed in said enlargement. A stem 40 connects the valve 39 by a yoke 41 with a float 42 surrounding the pipe 23. This float is placed well up in the chamber 18 and will only be acted upon by the accumulating liquid when the level of the latter is almost up to the top of the chamber 18. Thereupon the valve 39 will be closed to prevent any further up-flow of liquid through the pipe 20.

There is another small pipe 43 leading from the lower portion of the sump 27 upwardly and terminating in the top of the chamber 18. As soon as the valve 39 closes the entire force of the suction coming through the pipe 30 will be communicated on to the pipe 43 so as to drain the last portions of the liquid from the jacket system and connected parts, and so as to completely drain the sump 27. This will insure a complete removal of the liquid which has been running down over the surfaces of the walls and pipes so that practically no liquid whatsoever will be left where it might be frozen.

Preferably check valves 44 and 45 are placed in the pipes 30 and 43 to permit movement only in the directions indicated by the arrows in Figure 1.

It will be noted that with this arrangement the operation of transferring the jacket liquid into the chamber 18 depends on the existence of the suction of the pipe 30, this in turn being dependent on the operation of the engine. Consequently, when the jacket liquid is to be transferred into the chamber 18 the engine is left running for a short interval while the valves 25 and 32 stand in the proper position. As soon as a sufficient interval of time has elapsed the engine may be stopped and the valves 25 and 32 may be turned to the off position.

In case of engine trouble or a complete exhaustion of fuel so that the engine can not be run, the necessary suction would not be created in the pipe 30. To meet this condition I have provided a hand pump 46 having the handle 47 convenient of access to the driver. This pump 46 is connected by a pipe 48 with a valve 49 located in the pipe 30 beyond the position of the valve 31. The valve 49 has the plug 50 with a transverse passage 51 and a cross passage 52 communicating therewith. Normally the valve 49 stands in the position shown in Figure 6. In case of emergency, however, said valve is turned 90° in a counter clock-wise direction so that the pump 46 is placed in communication with the dome 24. The pump is provided with the necessary check valves 53 so that upon operating the handle 47 suction will be created in the dome.

In the modified construction shown in Figures 7, 8, 9, 10, the suction connection to the engine is dispensed with. In place thereof there is provided a small air pump 54. The same has a pulley 55 which can be brought into contact with either run of the fan belt 56 which drives the cooling fan 57. With the pump in the full line position of Figure 8 it will operate as a compressor whereas by moving the pump over into the dotted line position of Figure 8, it will operate as an exhauster. The pump connects by a flexible hose 58 with the pipe 30 which leads into the upper portion of the dome 24 as in the previous arrangement. By setting the pump in one position it will operate to exhaust air from the chamber 18, whereas by setting the pump into the other position it will operate to create a pressure such as would be useful for forcing the liquid out of the chamber 18 back into the circulating system in case the chamber 18 was located at a lower level than the circulating system.

The main control valve 59 is placed in the pipe 30, said main control valve including a plug 60 which has a cross passage 61. This plug normally stands in the position indicated in Figure 9.

The hand pump 62 may be provided, the same having handle 63 located at a position for convenient operation. The pump 62 is provided with check valves 64 and 65 work-

ing in the direction of the arrows in Fig. 7 these check valves in turn lead into the valve 59 by means of pipes 66 and 67 respectively.

The valve plug 60 is provided with a pair of supplementary ports 68 and 69 which lead sidewise and communicate with the atmosphere. The valve casing 59 is provided with a relatively long passage 70 with which the plug passage 61 will make connection throughout a considerable amount of valve movement.

By turning the valve plug 60 so as to bring the port 68 into communication with the pipe 67 the passage 61 will communicate with the pipe 66. Thereupon the operations of the pump plunger of the pump 62 will cause said pump to operate as a suction pump so that the jacket liquid can be transferred to the chamber 18. By turning the plug 60 through a further angular movement the passage 61 will communicate with the pipe 67 and the port 69 will communicate with the pipe 66 so that the pump will operate as a pressure pump serving to deliver air under pressure to the chamber 18.

By the above means it is possible to operate this system by hand both for the suction and pressure operations.

Preferably the pump 54 is interconnected with the valve 60 as shown in Figure 10 by means of a rod 71. This rod carries the finger piece 72 at one end, the plug 60 in its middle portion and a crank 73 at its other end, said crank 73 connecting by a link 74 with the arm 75 which carries the pump which arm 75 is pivoted at the point 76. With this arrangement the position of the pump is synchronized with the other parts.

I wish to call attention to the fact that if desired the electrical system may be properly connected up with the valves and other parts so that for example the engine can not be inadvertently operated during times when the jacket liquid is not present in the jacket system.

In some cases it may be desired to create additional heat for the jacketing liquid so as to maintain its temperature, at an elevated degree while in storage over very long intervals. In such cases a small heater 77 may be placed in the chamber 18, such heater being for example a small electric unit supplied with current from any suitable source.

While I have herein shown and described only certain embodiments of my present invention, still I do not intend to limit myself thereto except as I may do so in the claims.

I claim:

1. The combination with the jacket system for jacket cooling liquid of an internal combustion engine, including the engine jacket, radiator, and circulating connections, of a chamber for liquid having a capacity at least as great as the liquid capacity of the jacket system aforesaid, a coating of heat insulat-

ing material on said chamber, a jacket liquid delivery connection between the lower portion of said chamber and the lower portion of the jacket liquid system, for delivery of jacket liquid to the system, a jacket liquid removal connection from the lowest point of the jacket liquid system to the upper portion of the chamber for transfer of liquid from the jacket system to the chamber and a connection between the upper portion of said chamber and the suction connection of the engine, valves in both of said connections, and independent manual means for creating a suction in the suction connection independently of the engine operation.

2. The combination with the jacket liquid system for the cooling liquid of an internal combustion engine, including the liquid jacket, the radiator, and circulating connections, of a heat insulating storage chamber for jacket liquid, a liquid delivery connection between the lower portion of said chamber and the lower portion of the jacket liquid circulating system for delivery of jacket liquid to the system, a jacket liquid removal connection from the lowest point of the jacket liquid system to the upper portion of the chamber for transfer of liquid from the jacket system to the chamber, and means for causing reduction of the pressure in said chamber for the purpose of causing transfer of liquid to said chamber from the liquid jacket system.

3. The combination with a jacket system for jacket cooling liquid of an internal combustion engine, including the engine jacket, radiator, and circulating connections, of a heat insulating chamber for liquid having a capacity at least as great as the liquid capacity of the jacket system aforesaid, a sump location at a lower elevation than the jacket system, and three connections from said chamber, one of said connections extending from the lower portion of the chamber to the lower portion of the circulating system, and another of said connections extending from the upper portion of said chamber to the lowest portion of the sump, and another connection leading from the upper portion of said chamber for causing change of pressure within said chamber, together with valves in the first and third mentioned connections operative effectively to permit drainage of liquid from the chamber into the circulating system or to permit creation of pressure differential in the chamber with the valve of the first mentioned connection closed.

4. The combination with the jacket system for jacket cooling liquid of an internal combustion engine including the engine jacket, radiator, and circulating connections, of a heat insulating chamber for liquid, having a capacity at least as great as the liquid capacity of the jacket system aforesaid, a sump located below the radiator level, connections

from the lower portion of said chamber to the lower portion of the jacket system for transfer of liquid from the chamber to the system, and from the lowest portion of the sump to the upper portion of the chamber for the transfer of liquid from the sump to the chamber, a valve in the first mentioned connection, and manual means for creating pressure differential in the upper portion of the chamber when the valve aforesaid is closed.

5. The combination with the devices of a jacket system for jacket cooling liquid of an internal combustion engine including the engine jacket, radiator, and circulating connections, of a heat insulating chamber for liquid having a capacity at least as great as the liquid capacity of the jacket system aforesaid, a sump located at a lower level than any of said devices, connections from the lower portion of said chamber to the lower portion of the jacket system for transfer of liquid from the chamber to the system, and from the lowest portion of the sump to the upper portion of the chamber for the transfer of liquid from the sump to the chamber, a valve in the first mentioned connection, and manual means for creating pressure differential in the upper portion of the chamber.

6. The combination with the devices of a jacket system for jacket cooling liquid of an internal combustion engine, including the engine jacket, radiator, and circulating connections, of a heat insulating chamber for liquid having a capacity at least as great as the liquid capacity of the jacket system aforesaid, a sump located at a lower level than any of said devices, three connections from said chamber, one of said connections leading from the lower portion of the chamber to the lower portion of the circulating system, another of said connections leading from the lowest portion of the sump to the upper portion of said chamber, and another connection leading from the upper portion of said chamber to a point of pressure differential such as a manifold of the engine, a valve in the first mentioned connection, supplemental manual means for creating pressure differential in the third connection, and a valve for connecting the third connection either to the point of pressure differential of the engine or to the supplemental pressure differential influencing means, selectively.

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