E. K. LUND.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED MAY 28, 1918.

1,285,267.

Patented Nov. 19, 1918.

3 SHEETS—SHEET 1.

Fig. 1

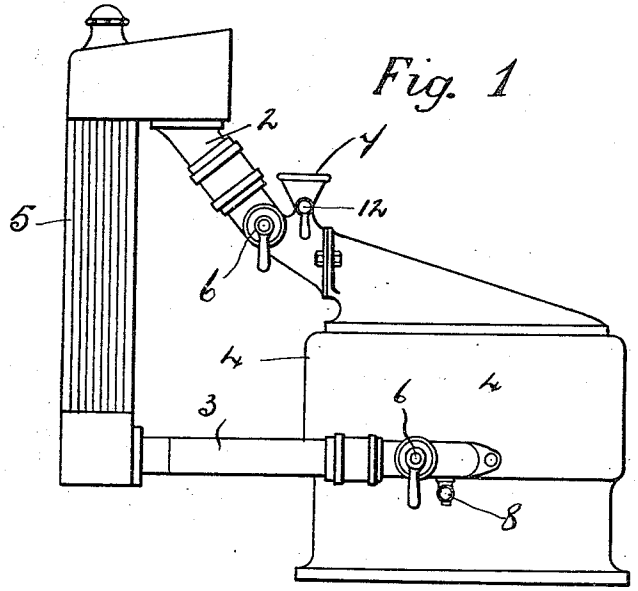
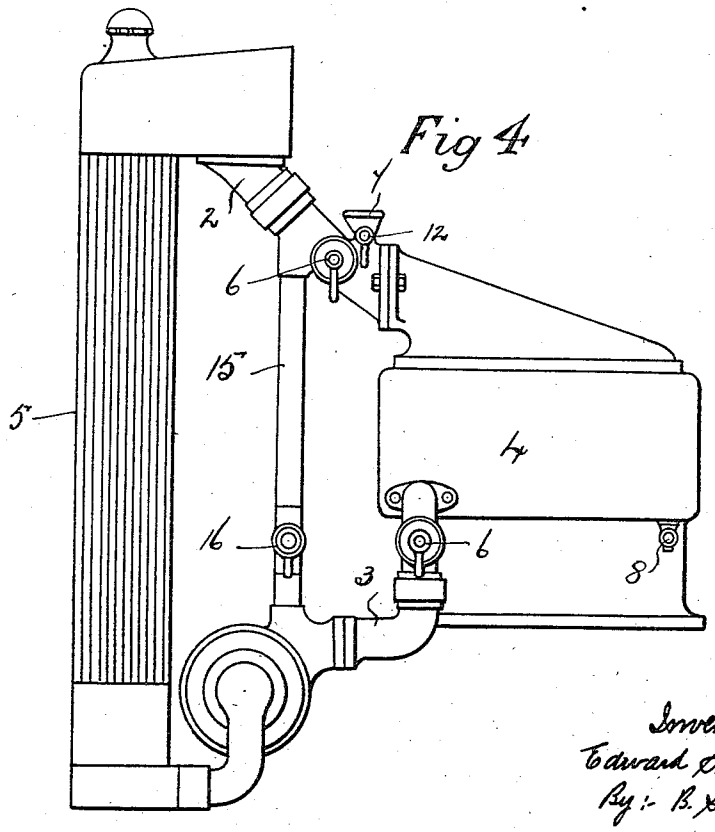


Fig 4



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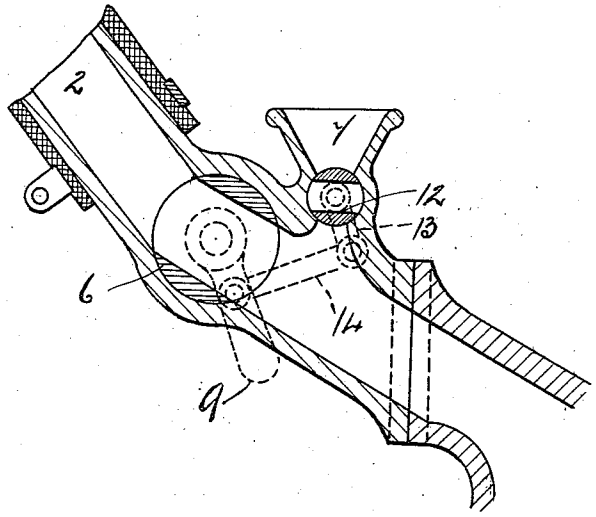
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3 SHEETS—SHEET 2.

Fig 2



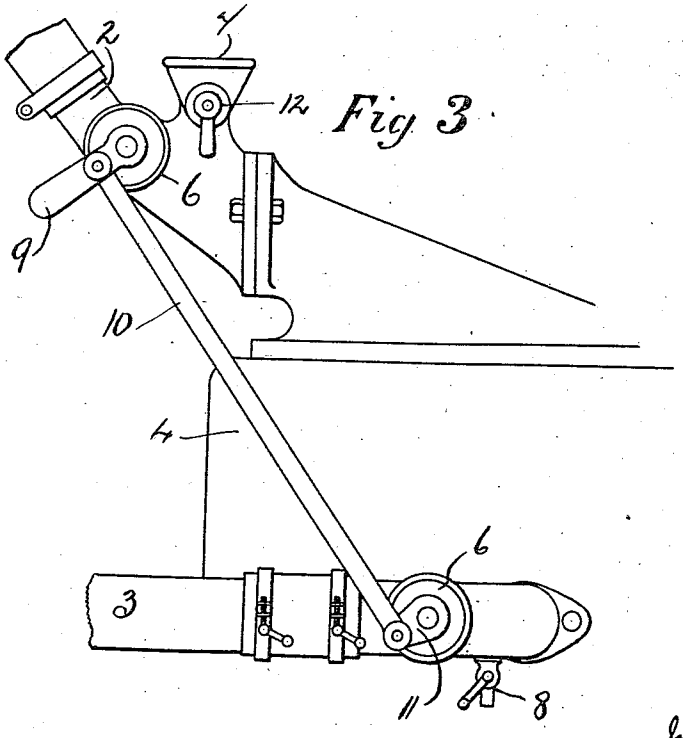


Fig 3

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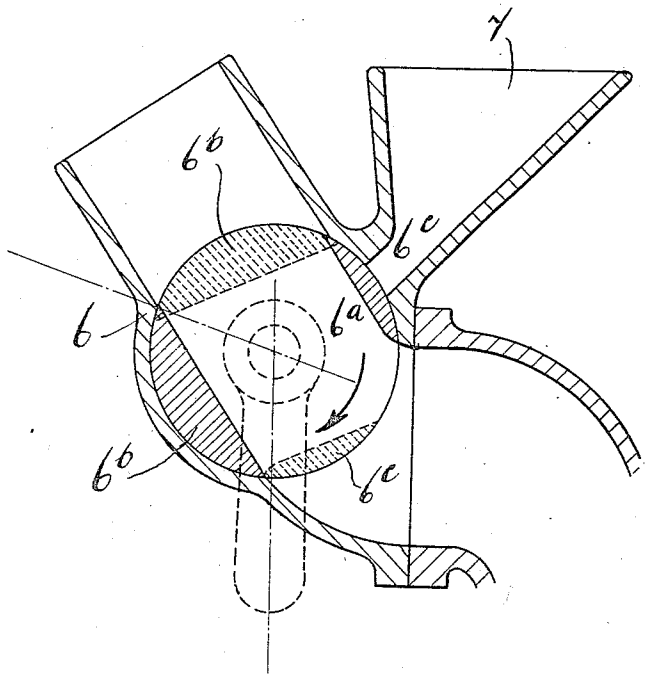
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3 SHEETS—SHEET 3.

Fig 5.



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,285,267. Specification of Letters Patent. Patented Nov. 19, 1918.

Application filed May 28, 1918. Serial No. 237,142.

To all whom it may concern:

Be it known that I, EDWARD KINGSTONE LUND, a subject of the King of Great Britain, residing at Wigan, in the county of Lancashire, England, have invented certain Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention has reference to internal combustion engines of the type in which provision is made for the circulation of a cooling medium around and about the cylinder walls and has for its object to facilitate the starting up of this class of engines more especially when cold or when run on heavy fuels such as paraffin.

As at present arranged the cylinder jacket or jackets is or are in constant open communication with the usual radiator, and in order to facilitate starting in cold weather, recourse is frequently had to the use of hot water, the cooling water being drained out of the jackets and radiator and a quantity of hot water poured in.

Owing however to the fact that the circulation system is primarily designed for very efficient cooling, a very large quantity of boiling water is often necessary for success because when introduced via the filling orifice at the top of the radiator, the water rapidly loses the greater part of its heat before it reaches the cylinder jackets where the heat is required to warm up the cylinder walls.

According to this invention means are provided whereby the cylinder jacket or jackets may be drained and filled at will independently of the remainder of the circulation system. By this means, only a comparatively small quantity of hot water is required to warm up the cylinders, the heating effect of the same being localized or confined to the cylinder jacket or jackets. This arrangement has the further useful advantage that it enables the cylinder jacket or jackets to be drained over night during frosty weather without having to draw off the water in the whole of the circulation system. This is particularly useful where for instance as in military operations, a water supply may not always be available. Where as is frequently the case the carbureter is provided with a water jacket fed from the cylinder water jacket, the present invention has the additional advantage in that it also provides a means whereby the carbureter may be rapidly warmed up thereby further facilitating a quick and sure start up.

A water cooled internal combustion engine embodying this invention is characterized by the provision of stop cocks or their equivalents in the top and bottom water connections between the radiator and the engine in combination with a filling orifice on the engine side of such cock in the top connection and a drain tap at the bottom of the water jacket or jacketing.

The said cocks or their equivalent may be of any suitable design and are preferably such that when fully open they offer no obstruction to the free circulation of the cooling medium. If desired the spindles of the various cocks may be coupled together so that any two or more of them may be opened and closed simultaneously.

In order that the invention may be clearly understood and readily carried into practical effect reference is made in further describing the same to the accompanying drawings wherein.

Figure 1 is a side view of a water-cooled cylinder block, radiator and water connections showing the application of the present invention thereto.

Fig. 2 is a sectional detail view of the cock in the top water connection and the filling orifice.

Fig. 3 is a further detail view showing the cocks in the top and bottom water connections coupled together.

Fig. 4 illustrates the application of the invention where pump circulation is employed.

Fig. 5 shows in section an alternative construction of cock for the top water connection and filling orifice.

Throughout the drawings like parts are designated by similar reference characters.

Referring to the drawing it will be seen that the top and bottom water connection 2, 3 between the cylinder jacket 4 and the radiator 5 are each provided with a cock 6 which is preferably of the barrel type so that when fully open a free and unrestricted passage for the circulation of the water is permitted. There is also a filling orifice 7 provided on the engine side of the cock in the top water connection 2 and a drain tap 8 at the bottom of the water jacket.

Where the invention is embodied in an original design the inlet and outlet water

fittings on the engine are specially designed for the purpose with the necessary cocks. Where however the invention is applied to existing engines having removable water inlet and outlet fittings on the engine, it is proposed to replace such fittings by means of special fittings provided with cocks and such fittings may be standardized in various designs to suit existing types of engines.

As it is necessary to close both cocks in order to isolate the water jacket from the rest of the circulation system, it may be found advisable where the design of the engine admits of it to couple the spindles or barrels of the two cocks together so that they will be opened and closed simultaneously. Such an arrangement is shown in Fig. 3 where it will be seen that the handle 9 of the upper cock 6 is connected by a rod 10 with a short arm 11 on the spindle of the lower cock.

It will of course be understood that when the engine is in use the said cocks are fully open so as to establish free circulation between the radiator and the engine jacket in the ordinary way and if found necessary means may be provided for preventing the said cocks accidentally closing as the result of vibration or otherwise.

In starting up an engine from cold in cold weather when fitted with the present invention, the cock 6 is closed and the cold water in the jacket drawn off by way of the drain tap 8 aforesaid provided for the purpose. A quart or so of boiling water is then poured direct into the jacket 4 through the filling orifice 7 at the top of the same.

By this means as already stated the cylinders receive the whole of the heat of the water and become sufficiently warmed up to insure a start being made without laborious cranking and undue exhaustion of the starting batteries in even the coldest of climates or with heavy fuels. When the engine has warmed up after running for a short time the cocks are reopened so as to restore the circulation.

In order to provide for free expansion of the heated water in the jacket prior to the opening of the cock 6 a cock 12 in the filling orifice 7 may, as shown in Fig. 2, be coupled up with the cock in the top water connection so that when the latter is closed the cock of the filling orifice is opened and vice versa. For this purpose, as shown in dotted lines in Fig. 2, the spindle of the barrel of said cock 12 may carry a short arm 13 which is connected by means of a link 14 with the handle 9 of the cock in the upper water connection.

Instead of employing a separate cock for the filling orifice the top stop cock may function as a two-way cock. For example as shown in Fig. 5 the filling orifice 7 may be arranged to open into the top cock 6 and the barrel 6^a of the latter bored a little out of center so that when the said barrel is turned in the direction of the arrow to the position shown in dotted lines, the part 6^b closes the cock while the part 6^c allows the water entering from the filling orifice to find its way into the cylinder jackets. Conversely, when the cock is open the filling orifice is closed by the part 6^c as shown in full lines in the aforesaid Fig. 5.

This construction as will be seen is very simple and compact and for this reason more suitable where space is limited as is the case in certain makes of motor vehicles.

Where the water circulation includes a pump it will be obvious that provision will be necessary either for throwing the pump out of action when starting up according to this invention, or alternately, for completing the circulation in that part of the system which is temporarily disconnected from the cylinder jacket.

In the former case the pump shaft may be provided with a clutch and in order to avoid any danger of the engine being run after starting, with the pump out of action, said clutch may be operatively connected with the stop cocks above referred to so that when the said cocks are closed, the clutch is thrown out and vice versa. The same effect may also be obtained where space admits of it by arranging the bottom stop cock between the pump and radiator in which case the possibility of the pump freezing in cold weather would be eliminated.

In the alternative case above referred to a water by-pass 15, may as shown in Fig. 4 be provided between the top and bottom water connections 2, 3 on the side of the stop cocks 6 remote from the cylinder jacket, said by-pass being provided with a cock 16 which may conveniently be connected up with the stop cocks aforesaid so that when the latter are closed the said cock in the by-pass will be opened and vice versa. In this way the circulation will be temporarily short circuited. Where as aforesaid the bottom stop cock is arranged between the radiator and the pump the need for a by-pass is obviated.

The various cocks may if desired all be connected so that by turning a single handle or lever on one of them the others will be rotated to the proper position relatively to each other.

The invention may advantageously be applied to all kinds of water cooled internal combustion engines and is not limited to such as are used on motor vehicles being equally applicable and valuable to motor boat, aeroplane and stationary engines.

What I claim then is:—

1. In internal combustion engines wherein the cylinders are cooled by a circulating water system, cylinder jackets, means whereby the cylinder jackets may be drained and filled at will independently of the remain-

der of the circulation system, for the purpose described.

2. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, water circulating connections between said cylinder jacket and radiator, and means whereby the cylinder jacket may be cut off from the radiator and circulating connections and drained and filled at will independently thereof, for the purpose described.

3. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, water circulating connections between said cylinder jacket and radiator, stop cocks whereby the jacket may be cut off from the radiator, and filling orifice and drain tap whereby the jacket may be filled and drained at will independently of the radiator and connections for the purpose described.

4. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, top and bottom water circulating connections between said cylinder jacket and radiator, a stop cock on said top and bottom circulating connections to cut off the jacket from the radiator, a filling orifice in the top circulating connection situated intermediate of the stop cock and the jacket, and a drain tap at the bottom of said jacket substantially as described.

5. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, top and bottom water circulating connections between said cylinder jacket and radiator, a stop cock on said top and bottom circulating connections to cut off the jacket from the radiator, a filling orifice in the top circulating connection situated intermediate of the stop cock and the jacket, a cock to open and close the filling orifice to the jacket, and a drain tap at the bottom of said jacket, substantially as described.

6. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, top and bottom water circulating connections between said cylinder jacket and radiator, a stop cock on each of said connections, and means coupling the stop cocks of the top and bottom connections together whereby simultaneous opening and closing of the same is effected, substantially as described.

7. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, top and bottom water circulating connections between said cylinder jacket and radiator, a stop cock on each of said connections, an actuating arm on each stop cock, and a rod forming a connection between the arm of the top stop cock and the arm of the bottom stop cock, substantially as and for the purpose described.

8. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, water circulating connections between said cylinder jacket and radiator, stop cocks to cut off the cylinder jacket from the radiator, a filling orifice and a cock to open and close same to the jacket, and operative connections between said cock and one of the aforesaid stop cocks, for the purpose described.

9. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, top and bottom water circulating connections between said cylinder jacket and radiator, a stop cock on each of said connections to cut off the cylinder jacket from the radiator, a filling orifice and a cock to open and close same to the jacket, an actuating arm on said cock, a handle on the stop cock of the top circulating connection, and a link connecting said arm and handle whereby when the stop cock is closed the other cock is opened and vice versa, substantially as described.

10. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, top and bottom water circulating connections between said cylinder jacket and radiator, a stop cock on each of said connections to cut off the cylinder jacket from the radiator, and a filling orifice for the jacket the opening and closing of which is effected by the stop cock on the top water circulating connection, for the purpose described.

11. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, top and bottom water circulating connections between said cylinder jacket and radiator, a stop cock on each of said connections to cut off the cylinder jacket from the radiator, and a filling orifice on the top water circulating connection situated between the stop cock of said connection and the cylinder jacket, said stop cock when operated closing the connection and opening the orifice, and vice versa, substantially as described.

12. In internal combustion engines wherein the cylinders are cooled by a circulating water system driven by a pump means whereby said cylinders may be temporarily isolated from said circulating system and the cylinder jackets drained and filled at will independently of said system, and means to put the pump out of action when the aforesaid means for isolating the cylinders are operative, for the purpose described.

13. In an internal combustion engine wherein the cylinder is cooled by a circulating water system driven by a pump, stop cocks on the water circulating connections whereby the cylinder may be temporarily

cut off from the said circulating system, means to put the pump out of action when the cylinder is cut off from the circulating system, and an operative connection between said means and the stop cocks whereby the pump is put into action when said cocks are opened and vice versa, substantially as described.

14. In internal combustion engines wherein the cylinders are cooled by a circulating water system driven by a pump, means whereby said cylinders may be temporarily isolated from said circulating system and the cylinder jackets drained and filled at will independently of said system, and means to short circuit the circulating system when the cylinders are isolated therefrom, for the purpose described.

15. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a pump, water circulating connections between said pump and cylinder jacket, stop cocks to cut off the cylinder jacket from the pump and connections, and a by-pass between said circulating connections to short circuit the circulation when the cylinder jacket is cut off, for the purpose described.

16. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a pump, water circulating connections between said pump and cylinder jacket, stop cocks to cut off the cylinder jacket from the pump and connections, a by-pass between said connections to short circuit the circulation when the cylinder jacket is cut off, and a cock in said by-pass to render same operative and inoperative, for the purpose described.

17. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a pump, water circulating connections between said pump and cylinder jacket, stop cocks to cut off cylinder jacket from the pump and connections, a by-pass between said connections to short circuit the circulation when the cylinder jacket is cut off, a cock in said by-pass to render same operative and inoperative, and an operative connection between said cock and the aforesaid stop cocks to close same when the stop cocks are opened and open same when the stop cocks are closed, substantially as described.

18. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, top and bottom water circulating connections between said cylinder jacket and radiator, a pump to effect circulation and through said jacket, radiator and connections, stop cocks on said connections to cut off the jacket from the pump and radiator, a by-pass between the top and bottom circulating connections situated on the side of the stop cocks remote from the cylinder, a cock in said by-pass to render it operative and inoperative, a filling orifice in the top circulating connection situated on the side of the stop cock nearest the cylinder, a cock to open and close said orifice to the cylinder jacket, and a drain tap at the bottom of said jacket, substantially as described.

19. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, top and bottom water circulating connections between said cylinder jacket and radiator, a pump to effect circulation through said jacket, radiator and connections, and stop cock on said top and bottom connections to cut off the cylinder jacket from the radiator, said stop cock on the bottom circulating connections being situated between the radiator and the pump, substantially as and for the purpose described.

20. In an internal combustion engine, in combination, a jacketed cylinder adapted for water cooling, a radiator, top and bottom water circulating connections between said cylinder jacket and radiator, a pump to effect circulation through said jacket, radiator and connections, a by-pass between said top and bottom connections, a filling orifice, a stop cock in said top and bottom connections, by-pass and filling orifice, and connecting means between the said stop cocks whereby the actuation of one effects the requisite actuation of the others, substantially as and for the purpose described.

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