T. C. LUCE.

COOLING SYSTEM FOR EXPLOSIVE ENGINES.

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1,044,065. Patented Nov. 12, 1912.

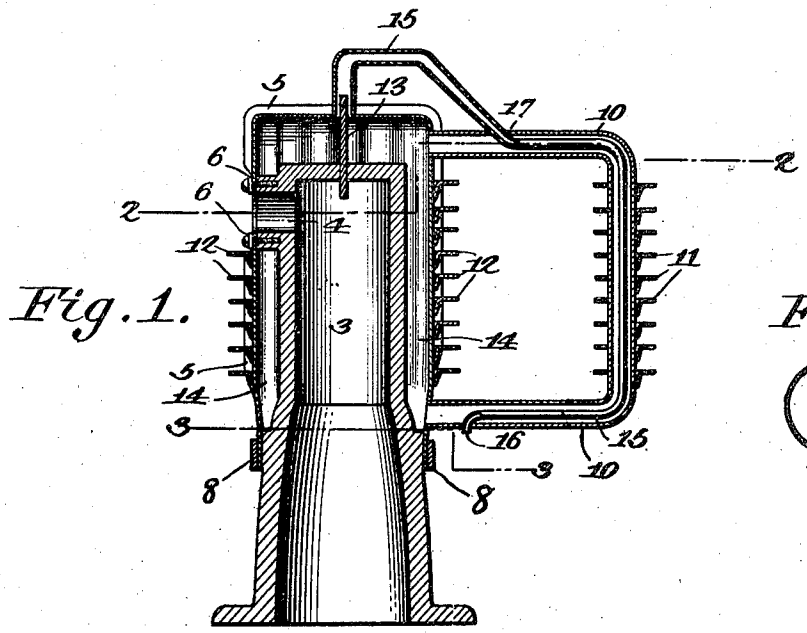


Fig. 1.

Fig. 5.

Fig. 4.

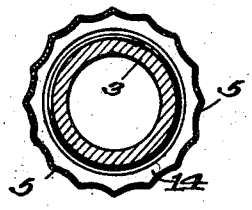


Fig. 3.

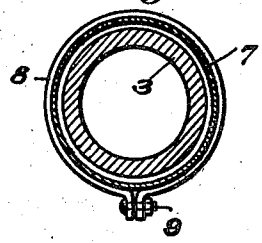
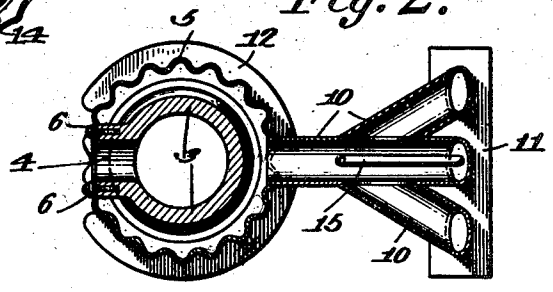


Fig. 2.



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UNITED STATES PATENT OFFICE.

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COOLING SYSTEM FOR EXPLOSIVE-ENGINES.

1,044,065. Specification of Letters Patent. Patented Nov. 12, 1912.

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To all whom it may concern:

Be it known that I, THOMAS C. LUCE, a citizen of the United States, residing at Dalton, in the county of Berkshire and State of Massachusetts, have invented a new and useful Cooling System for Explosive-Engines, of which the following is a specification.

My invention relates to improvements in cooling systems for explosive engines in which a body of water is held between the cylinder and outside jacket and is allowed to circulate through a radiator to cool, and the objects of my improvements are first; to provide a cooling system for explosion engines that may be allowed to freeze without damage to any part of its mechanism; second, to provide a cooling system using water, that when frozen will melt the ice without damage to any part of the mechanism, by the starting and continued running of the engine; third, to provide a cooling system for explosion engines with sufficient radiation on the jacket of the cylinder to eliminate entirely or reduce to a minimum the necessity of a radiator apart from the jacket proper.

I attain these objects by the mechanism illustrated in the accompanying drawing in which—

Figure 1 is a vertical section of the entire cooling system. Fig. 2 is a cross section of Fig. 1 on the line 2—2. Fig. 3 is a cross section of Fig. 1 on the line 3—3. Figs. 4–5 are illustrations of variations in construction of parts of Figs. 1 and 2.

Similar numerals refer to similar parts throughout the several views.

To the cylinder 3 of an explosion engine is attached a corrugated jacket 5 constructed of some material as of brass or copper, with high conductivity and some tension. The corrugations at the lower end are blended into a round band fitted to the cylinder 3 and held there by the band 8 which is drawn tight by the bolt 9. To the explosion chamber 4 of the cylinder 3 the corrugated jacket is attached by being bolted to the face of explosion chamber 4, under the ring 6.

It will be noticed that the corrugations in the jacket are longitudinal, and this is important; and while the corrugations are not shown as being very deep in the drawing, in practice I make the corrugations deep so as to provide for a very large radiating surface. In this way I attain two important objects. First, I get a jacket with a very large radiating surface so that the liquid in the jacket is kept cool, and second in case of freezing, the longitudinal corrugations provide amply for expansion so that no injury is done to the jacket.

I am aware that jackets have been used with transverse corrugations, but it will be readily seen that while these might provide for a certain amount of additional radiating surface, they do not provide for expansion.

Surrounding the corrugated jacket 5 are radiating rings 12. These rings are flanged on their inner circumference and rest against the corrugations of the jacket only on the ends of the flanges. The corrugations of the jacket 5 allow expansion and the springing of the flanges of the radiating rings 12 allows the jacket 5 to expand without damage to the rings 12.

Tube 10 connects with the jacket 5 approximately at the top and bottom. This tube 10 divides into a number of tubes in the perpendicular section for radiation purposes. Surrounding the vertical sections of the tube 10 are the radiation plates 11 with flanges like those of the rings 12. The tube 10 is constructed oval shape or as shown in cross section in Fig. 5 to allow expansion. Connected with and opening into the water jacket 5 is the tube 15; entering the tube 10 at 17 and lies within the tube 10 to the point 16 where it leaves the tube 10. A heat conducting plug 13 is firmly held in the head of the cylinder 3 and enters into tube 15 and is designed to conduct heat from the explosions within the cylinder 3 to the opening into tube 15.

Having described these various parts of the cooling system I will further illustrate the action of the same.

By the corrugated construction of the jacket 5 as shown in Figs. 2 and 4 and construction of tube 10 as shown in Fig. 5 and by the construction in the form of flanges of the radiation rings 12 and plates 11 the whole cooling system will expand sufficiently to allow water to freeze within it without breaking the mechanism and when the ice melts the tension of the metal brings it back to its original position.

If the engine is started while the cooling system is frozen the heat from the explosions within the cylinder 3 will be conducted

along the plug 13 and will melt an opening into the tube 15 before any steam can be generated within the jacket 5. No water gets into the tube 15 but the heat from the warmed water in the jacket 5 will pass through the tube 15 and gradually thaw an opening of water in pipe 10 along its whole distance to its port at 16. This will establish a circulation and gradually through the radiation plates 11 the heat will be communicated to the other sections of the tube 10. The corrugations of the jacket 5 may be slight as in Fig. 4 or sharp and extended and yet remain within the designs of my invention.

Having thus fully described my invention I claim—

1. In a cooling device for gas engines, the combination of an engine cylinder, a longitudinally corrugated jacket therefor adapted to retain a circulating liquid, means forming a circulating chamber exterior of said jacket, and means forming a duct connecting with the interior of the jacket extending above the water level thereof and extending into said circulating chamber.

2. In a cooling system for explosive engines, the combination with an engine cylinder and an expansible jacket, an expansible tube connected with said jacket near the top and bottom thereof, said tube being divided into several divisions, expansible radiating plates in contact with said divisions of the tube, a smaller tube partly lying within said expansible tube, and a heat conducting plug leading from this smaller tube to within the engine cylinder.

3. In a cooling device for gas engines, the combination of an engine cylinder, a jacket therefor adapted to retain a circulating liquid, means forming the circulating chamber exterior of said jacket, and means forming a duct connecting with the interior of the jacket extending above the water level thereof and extending into said circulating chamber.

4. In a cooling device for gas engines, the combination of an engine cylinder, a jacket therefor adapted to retain a circulating liquid, means forming a circulating chamber exterior of said jacket, a pipe, a plug tapping the said cylinder and extending into said pipe, said pipe extending above the liquid level of said jacket and extending into the said exterior circulating chamber.

5. In a cooling device for gas engines, the combination with an engine cylinder, a liquid jacket therefor, pipes connected with and forming a cooling chamber exterior of the jacket, a pipe connected with said jacket and extending above the liquid level thereof, said pipe passing into the said cooling chamber and having a vent exterior thereof.

6. In a cooling device for gas engines, the combination of an engine cylinder, means forming a cooling chamber exterior of said jacket and communicating therewith near the top and bottom of the jacket, and a pipe connected with the said jacket and extending upwardly and entering the said cooling chamber.

7. In a cooling device, the combination of an engine cylinder, a liquid jacket therefor, a circulating pipe forming a cooling chamber exterior of the jacket and communicating therewith near the top and bottom of the jacket, said pipe being substantially crescent shape in cross section and having corrugations in its flattened sides, and means for communicating heat from the engine cylinder to said cooling chamber.

8. In a cooling device the combination of an engine cylinder, a liquid jacket therefor, pipes exterior of said jacket and communicating therewith and leading from one end portion of the jacket to the other, radiation ribs on said pipes, and a pipe communicating with the interior of said jacket extending above the liquid level thereof and entering one of the exterior pipes and having a vent exterior of said pipes.

9. The combination with the engine cylinder and the jacket inclosing the same, of an exterior pipe leading from one end portion of the jacket to the other, said pipe extending outside the said jacket, a second pipe leading from one end portion of the jacket and entering the first named pipe following the course thereof and discharging therefrom, and a heat plug extending from the engine cylinder into said second pipe.

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