T. REUTER.

COOLING OF PISTONS.

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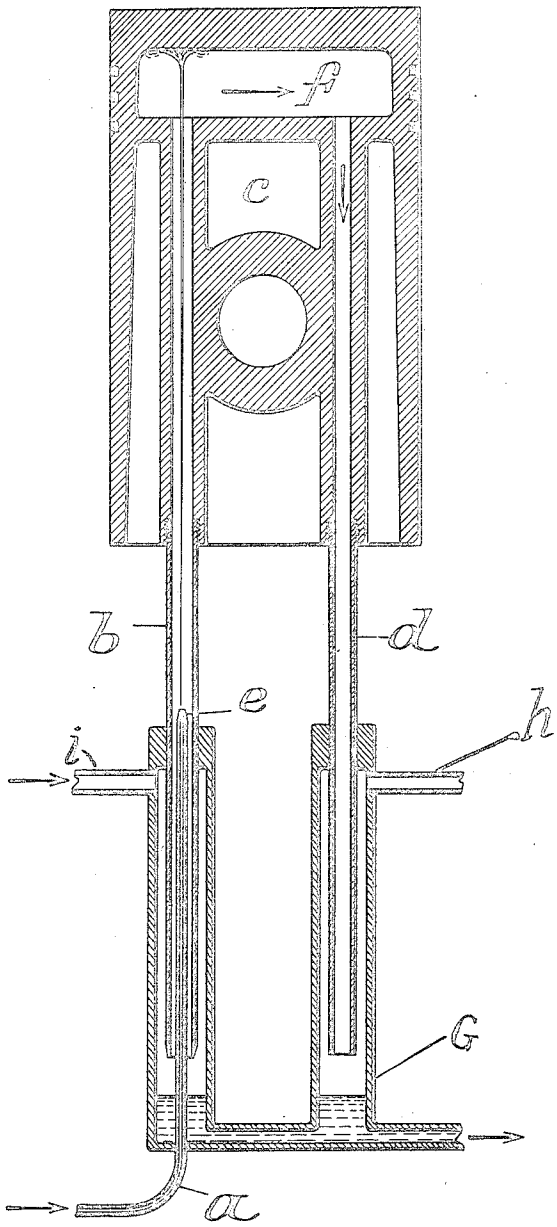
1,051,008. Patented Jan. 21, 1913.



WITNESSES

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COOLING OF PISTONS.

1,051,008. Specification of Letters Patent. Patented Jan. 21, 1913.

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To all whom it may concern:

Be it known that I, THEODOR REUTER, engineer, a citizen of the Swiss Republic, residing at 24 Obere Wielandstrasse, Winterthur, Switzerland, have invented certain new and useful Improvements in or Relating to the Cooling of Pistons; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention is an improved means for cooling reciprocating pistons or like members.

In systems of piston-cooling, heretofore employed, difficulty has been experienced with the stuffing-boxes, to keep them tight under the pressure of the cooling liquid and the shocks imparted to them by the reciprocation of the piston through which the cooling liquid is passing. The present invention overcomes such objections by mixing an elastic medium, such as air, with the liquid used for cooling, and causing such mixture to traverse the interior of the piston. Thereby back pressure of the cooling medium is eliminated and the pressure at which the cooling liquid is supplied can be accordingly reduced without sacrifice of cooling effect, and other improvements in the cooling efficiency are rendered available; in particular, the necessity for stuffing-boxes is avoided.

A construction of cooling apparatus embodying the present invention is illustrated, but merely by way of example, in the accompanying drawing, which represents an engine piston in longitudinal diagrammatic section, supplied with connections suitable for introducing therein the elastic cooling medium above referred to.

Cooling water or other liquid is admitted through a stationary pipe *a* disposed within a tube *b* of greater diameter, secured to and moving with the piston *c*. The relative dimensions of the stationary supply pipe *a* and the movable tube *b* are such that an annular passageway is left between them, through which air from the atmosphere or other source may be admitted to the chamber *f* formed inside of the piston. Also secured to the piston *c*, so as to reciprocate therewith, is a discharge pipe *d* which is parallel with the tube *b*. The pipes *b* and *d* in the present case have telescopic engagement with a casing *g* which is appropriately formed to accommodate their movements, without, however, affording communication from one to the other save through the interior of the piston.

The supply pipe *a* discharges the water through a nozzle *e*, of such dimensions that a jet of high velocity is produced, which remains a solid jet or column for some distance beyond the nozzle and preferably until it strikes the wall of the piston chamber *f*, upon which it impinges as indicated on the diagram. Simultaneously with the admission of the water jet, air from the atmosphere is drawn or forced into the casing *g* through the pipe *i* thereof and passes into the tube *b*, ultimately commingling with the water of the jet, so that an elastic mixture of commingled water and air is thereby produced, which mixture passes out through the discharge pipe *d* into the outlet side of the casing *g* which it will be observed, serves as a separator for the liquid and air, the air escaping to the atmosphere through the air pipe *h*, while the liquid collects in the bottom of the casing, where it can be separately removed to be used over again if desired. When cooling liquids other than water are employed the separate recovery of the same and also of the liquid passing off as vapor or particles entrained with the air is readily accomplished by the means indicated.

In some cases the cooling water, instead of being directly introduced into the cooling chamber formed in the piston, may be initially admitted as an air-entraining jet into an intermediate chamber in communication with the cooling chamber, and if desired two or more supply pipes, each provided with a nozzle, may be provided for one and the same piston, and more than one discharge pipe can be similarly employed if desired, these being matters of ordinary adaptation to the conditions encountered and not requiring special description. It will be obvious that the inlet and outlet tubes can be arranged on the piston in any suitable manner, concentric or otherwise as desired, and also that the apparatus can be used for cooling reciprocating pistons or plungers of all kinds, for instance plungers of compressors, or the pistons of internal combustion engines, and the like.

When the apparatus is used in connection with internal combustion engines having several cylinders, the cooling water for the various pistons may be derived from a common feed pipe arranged to supply the liquid under the same pressure to all of the pistons, but in order to insure that the delivery of such liquid will be made in equal amounts in all pistons, the chambers therein may be made to communicate with each other in any suitable manner so that the same pressure will prevail in each. Various other modifications in the form and arrangement of the essential parts of the apparatus may obviously be made for producing an elastic cooling medium in place of the solid liquid heretofore employed. In any such case, the joints or parts by which the reciprocating piston is connected to the stationary supply of the cooling liquid can be made without stuffing-boxes or other devices specially constructed to resist high pressure, the arrangement shown in the diagram being sufficient to confine the liquid without leakage, when the connections between the stationary supply pipe and the piston are formed by telescopic joints. In the case illustrated, the casing *g* is supposed to be stationary, as is also the supply pipe *a*, but it will be obvious that both might be movable with the piston if desired, in which case some provision for the supply of water thereto while in motion will, of course, be necessary.

Having described my invention, I claim the following:

1. Cooling apparatus for pistons and like reciprocating members, comprising means for introducing into the piston an elastic cooling medium consisting of a mixture of a cooling liquid and a gas.

2. In cooling apparatus for pistons and like reciprocating members, the combination with the piston having a cooling chamber, of a passage communicating therewith provided with an air inlet and a nozzle arranged to direct an air-entraining jet of liquid through the said passage.

3. Cooling apparatus for pistons and like reciprocating members, comprising the piston having a chamber, means for injecting into the chamber a jet of cooling liquid, means for admitting air to the jet and a discharge passage for the mixture of liquid and air.

4. Cooling apparatus for pistons and like reciprocating members, comprising means for passing a cooling medium, comprising liquid and gas into the piston, an outlet therefor, and a gas and liquid separator connected to the outlet.

5. The combination of a reciprocatory hollow piston having a tube movable therewith and communicating with the interior thereof, said tube also communicating with the atmosphere, and a fixed pipe to inject an air-entraining jet of water through the tube and into the piston.

6. In apparatus for cooling pistons, the combination of a piston having a chamber formed within it, an air supply tube communicating with said chamber and with the atmosphere and reciprocating with the piston, a cooling water supply pipe within the air tube and a warm water discharge tube communicating with the chamber and reciprocating with the piston as set forth.

In testimony whereof I have affixed my signature, in presence of two witnesses.

THEODOR REUTER.

Witnesses:

WILHELM BACHMANN,

AUGUST MARKLIN.