W. SCHMIDT.

DEVICE FOR REMOVING WATER FROM HEATED PISTONS.

APPLICATION FILED MAR. 1, 1912.

**1,047,710.** Patented Dec. 17, 1912.

Fig. 1.

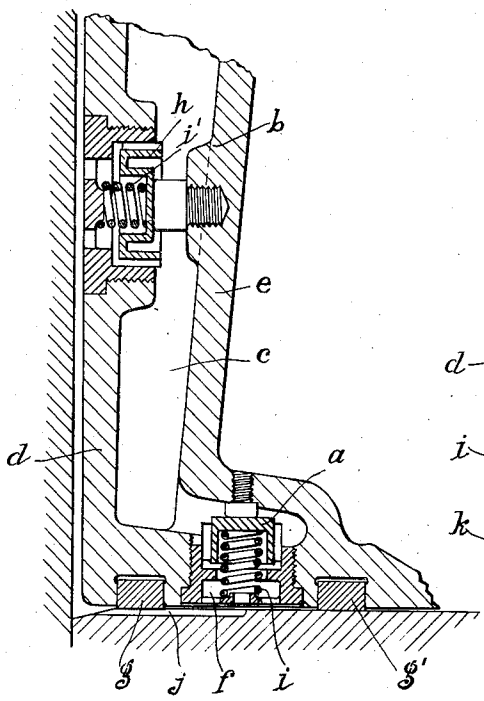
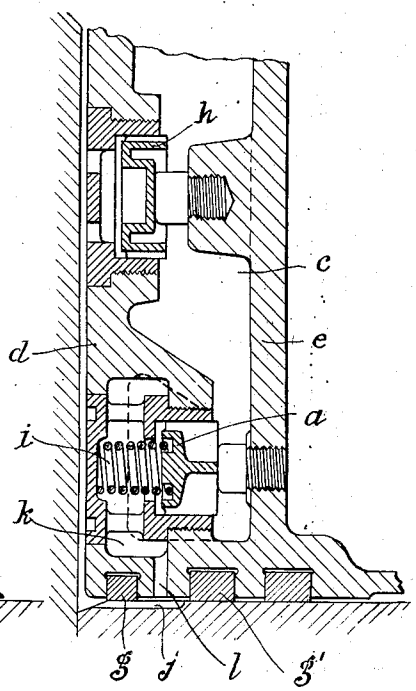



Fig. 2.




WITNESSES

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# UNITED STATES PATENT OFFICE.

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## DEVICE FOR REMOVING WATER FROM HEATED PISTONS.

1,047,710. Specification of Letters Patent. Patented Dec. 17, 1912.

Application filed March 1, 1912. Serial No. 680,922.

*To all whom it may concern:*

Be it known that I, WILHELM SCHMIDT, a subject of the King of Prussia, Emperor of Germany, residing at Wilhelmshöhe, near Cassel, Germany, have invented a new and useful Improvement in Devices for Removing Water from Heated Pistons of Steam-Engines, of which the following is a specification.

My invention relates to devices for removing water from heated steam engine pistons.

More particularly my invention relates to such devices as applied to hollow pistons provided with suitable openings.

The object of my invention is to provide in a steam engine, a piston capable of being periodically filled with charges of fresh steam as the engine is operated, thereby maintaining the body of the piston at a high temperature and limiting condensation, and in further equipping this piston and its coöperating cylinder with means by which any water which does, nevertheless, condense within the piston, may be periodically and automatically discharged.

More specifically my invention comprises a hollow piston having a discharge valve arranged in its wall adapted to open into the interior of the piston, said valve being provided with a space or valve chamber whose outlet is in the periphery of the piston, and a groove so located in the cylinder wall that when the piston is at rest just before taking fresh steam, this outlet and the inlet end of the cylinder will be connected together.

My invention will be better understood by reference to the description following and to the drawings accompanying.

In the drawings, Figure 1 represents a diametral section through one side of a piston embodying a preferred form of my invention, and through a portion of the coöperating cylinder wall and cylinder head, while Fig. 2 represents a similar section showing a modified form of my invention.

Referring to Fig. 1, a spring discharge valve *a* is inserted in the hollow piston *b* at its lowest point. This valve opens into a central chamber *c* lying between the end wall or face *d* of the piston and the conical inner wall or face *e* and is provided with an outer space or valve chamber *f* lying between two piston rings *g* and *g'*. A similar secondary valve *h*, also opening into the chamber *c*, is provided in the end wall *d* of the piston and communicates with the inlet end of the cylinder. Springs *i* and *i'* tend respectively to keep the two valves normally open, the spring *i* being more powerful than the spring *i'*. At the left hand or inlet end of the cylinder is a short groove *j* extending from the end to about the center of the valve chamber *f* when the piston is at its point of rest.

The operation of my invention is as follows: As the piston moves from the right hand or exhaust end of the cylinder toward the intake, both valves *a* and *h* will be closed owing to the pressure of the steam contained in the chamber *c* (as will be described) being higher than the pressure in the inlet end of the cylinder from which steam has just been exhausted and is now cut off. Owing to condensation the pressure in the chamber *c* will be somewhat less than that of live steam and the water of this condensation will collect at the bottom of the chamber over the valve *a*. As the piston moves toward the intake the pressure in the inlet end of the cylinder will rise owing to compression until it becomes sufficient, added to the inwardly acting pressure of the spring *i*, to overcome the pressure in chamber *c* when the valve *a* will open and permit this chamber to fill with live steam. Just before the piston reaches the inlet end of the cylinder the valve chamber *f* will reach and open into the groove *j* whereby live steam will be lead under the valve *a*, which valve will at once be raised by its spring *i*, since the pressure on each side of the valve is now equalized, so as to permit the water of condensation to pass through the valve and into the valve chamber *f*. Overflow of this water into the cylinder proper will be prevented by reason of the quickness with which the piston will be reversed so as to move toward the exhaust end. As the piston moves toward the exhaust end of the cylinder the pressure due to the charge of fresh steam, which is now being introduced, becomes less in a manner determined by the character of the governing so that the initial pressure of the live steam contained in chamber *c*, will very quickly operate to close the valve *h*. At the latest this valve *h* will close when steam is cut off from the cylinder and expansion begins, because at that time the dif-

ference in pressure between the steam in the cylinder and the steam in chamber *c* will begin to increase very rapidly. The valve *d* will remain open during the intake and expansion period since a charge of live steam will be carried along with the piston between the two rings *g* and *g'* so as to act upon the lower side of this valve. During all this time, while the piston is moving toward the exhaust end of the cylinder, the water of condensation in the chamber *c* is able to flow out into the valve chamber *f*. As soon as the piston has carried the valve *a* past the outlet opening this valve will instantly close and the water of condensation in the valve chamber *f*, which has thus far been subjected to high pressure and is now suddenly exposed to atmospheric pressure will be violently spurted from the outlet opening. As the piston reverses, the above cycle of operations will be repeated.

In the modification of Fig. 2 the valve *a* is arranged in the lower portion of the end wall *d* of the piston. This location of the valve is more advantageous than the peripheral position of Fig. 1 in that the valve may be examined without entirely removing the piston from the cylinder. In this modification the chamber *c* does not discharge into a valve chamber and then into the cylinder, but into the interior sub-chamber *k* and from thence through a passage *l* which opens into the groove *j* between the two piston rings *g* and *g'*. In this modification the valve *a* need not be provided with a spring. The operation of this form of my invention is substantially the same as that of the form shown in Fig. 1.

Instead of a single valve *a* I may, if I prefer, employ a plurality of valves without departing from the spirit of my invention.

My invention is applicable not only to engines employing horizontally operated pistons, but also for engines employing pistons operated vertically or at any desired angle with the horizontal.

Having described my invention, I claim—

1. In a steam engine provided with a hollow piston having two piston rings and a coöperating cylinder, a spring discharge valve in the wall of said piston opening toward the interior thereof and having an outlet between the piston rings into the cylinder, and a secondary valve in the wall of said piston also opening toward the interior thereof and communicates with the inlet end of the cylinder, said cylinder being further provided with a groove which communicates both with the inlet end of the cylinder and with the aforesaid discharge valve outlet when the piston is at rest at the inlet end of the cylinder.

2. In a steam engine provided with a hollow piston having two piston rings and a coöperating cylinder, a spring discharge valve in the peripheral wall of said piston adapted to be opened toward the interior thereof, and a secondary valve in the end wall of said piston also arranged to be opened toward the interior thereof and communicates with the inlet end of the cylinder, said piston being further provided with a peripheral valve chamber into which the discharge valve opens, and said cylinder being provided with a groove which extends from the inlet end of the cylinder to the valve chamber when the piston is at rest at the inlet end of the cylinder.

3. In a steam engine provided with a hollow piston having two piston rings and a coöperating cylinder, a spring discharge valve in the wall of said piston opening toward the interior thereof and having an outlet at the lowest point of said piston between the piston rings into the cylinder, and a secondary valve in the wall of said piston also opening toward the interior thereof and communicating with the inlet end of the cylinder, said cylinder being further provided with a groove which communicates both with the inlet end of the cylinder and with the aforesaid discharge valve outlet when the piston is at rest at the inlet end of the cylinder.

In testimony whereof, I have hereunto set my hand in the presence of two subscribing witnesses.

WILHELM SCHMIDT.

Witnesses:
EGMONT DOETTLOFF,
JULIUS FRANKE.