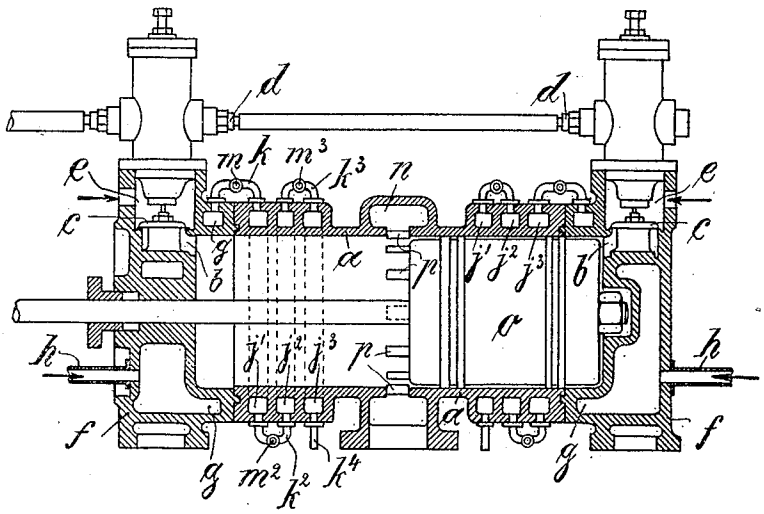
J. STUMPF.

STEAM ENGINE.

APPLICATION FILED AUG. 4, 1909.

1,042,051. Patented Oct. 22, 1912.



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UNITED STATES PATENT OFFICE.

JOHANN STUMPF, OF BERLIN, GERMANY.

STEAM-ENGINE.

1,042,051. Specification of Letters Patent. Patented Oct. 22, 1912.

Application filed August 4, 1909. Serial No. 511,126.

To all whom it may concern:

Be it known that I, JOHANN STUMPF, professor, a subject of the King of Prussia, German Emperor, and resident of 33 Kurfurstendamm, Berlin, Germany, have invented certain new and useful Improvements Relating to Steam-Engines, of which the following is a specification.

This invention relates to improvements in what are known as "uni-directional flow" or "una flow" steam engines and is a further development of the invention described in my co-pending application Serial No. 427,767, filed April 18, 1908. In that application I have described a form of hot inlet chest which acts as a heater or jacket at the end of the cylinder and which is usually provided with annular extensions which are formed in one with the end heater or jacket. This type of heater I have found specially applicable to most cases where the superheat is fairly high. With saturated steam, or only slightly superheated steam the requirements are different in order to retain the internal walls at the proper temperature conditions for efficient working.

The present invention like that described in my prior application is based primarily on the fact that the best way to prevent heat losses by surface condensation in the cylinder is to maintain the internal skin temperature of the cylinder as high or higher than the steam to which it is exposed; more accurately stated the internal skin temperature should be as high or higher than the saturation temperature of the steam to which it is exposed. It is clear that with such conditions there can be no loss of heat from the working steam to the cylinder. This result is obtained in my prior application by the combined action of an end heater and the compression of dry steam while the interior of the cylinder is kept out of communication with the cold exhaust as much as possible.

A hot end chest I have found, is not advisable for saturated or only slightly superheated steam as it is sometimes inadequate to maintain the skin temperature high enough.

According to the present invention, I propose to provide in addition to the end chest a separate heater over the cylindrical part of the cylinder and extending toward but preferably not quite up to the exhaust. This separate heater or jacket is conveniently in series with the end heater but this is not an essential. The separate heater may very conveniently be graduated so that the heating effect decreases toward the exhaust belt.

The exhaust belt acts as a comparatively cold jacket about the middle of the cylinder, and is spaced from the separate annular heater. There is thus a neutral zone or belt formed and located between the separate jacket and the cold belt. The separate jacket is in the form of an annular chamber or chambers, the inner wall of which is common with the cylinder wall.

The invention is illustrated in one convenient form in the accompanying drawing, which is a section through the cylinder of an engine according to the present invention.

According to the form illustrated, steam is admitted to the cylinder a, through ports b, controlled by a valve c, which is in turn operated by a reciprocating rod d. The valve c, is arranged in the steam chest e. The cover f, of the cylinder is formed hollow and acts as a hot chest and in the form illustrated is provided with an annular extension g. To this hollow cover f, and annular extension g, steam is supplied through a pipe h. Arranged close to one another and extending from the inlet end toward the exhaust there are a plurality of ring-shaped chambers j', j^2, j^3. These chambers are connected by pipes to establish a series. The annular extension g, of the hollow cover f, is connected by a pipe k, to the ring shaped chamber j', and this pipe is provided with a valve m. The inner walls of the annular or ring shaped chambers are common with the cylinder wall. In the form illustrated the pipe k, is arranged at the top side of the cylinder and the valve m, is conveniently in the form of an automatic reducing valve so that only steam of a predetermined pressure passes from the annular extension g, to the first chamber j', of the series. A pipe k^2, is arranged to connect the lower or bottom side of the ring-shaped chamber j', with the next chamber j^2, in the series. The pipe k^2, is provided with a valve m^2, which may conveniently be a reducing valve. The upper or top side of the ring chamber j^2 is connected by a pipe k^3, with a third chamber j^3 in the series. The pipe k^3, is provided with a valve m^3, similar to the valves m, and m^2. From the bottom of the ring-shaped chamber j^3 an

overflow or exhaust pipe k^4, is provided which leads any steam or water of condensation away from the ring-shaped chamber j^3.

For a short distance the cylinder a, is free of all jacketing up till the annular exhaust chamber n. The piston o, in its stroke is adapted to cover and uncover the ports p, which open into the annular exhaust chamber n.

It will be understood that the arrangement described is duplicated at each end of the cylinder, as can be seen from the drawing, which illustrates a double-acting engine.

With the engine hereinbefore described it will be seen that by suitably controlling the valves m, m^2, m^3, the pressure and temperature of the steam in the various ring-shaped chambers may be accurately controlled. The temperature to which the said rings heat the walls of the cylinder may, if desired, be slightly higher than the steam in the cylinder at the corresponding parts of its expansion. The unheated part of the cylinder between the ring-shaped chamber j^3 and the annular exhaust chamber m, which exercises a cooling action allow the last remaining quantities of heat in the steam to be effectively extracted. It will be seen that with a hot chest at the inlet end, a jacketing over a part of the cylindrical walls, a bare part of the cylinder, and an exhaust casing, the cycle of operations on the cylinder wall is (*a*) heating externally near and for a distance from the inlet end. (*b*) no heating on the approach to the exhaust and (*c*) cooling in the exhaust belt.

A further feature of the present invention is that the hollow cover f, is provided with a separate steam supply pipe h, as opposed to the form of engine described in the prior application Serial No. 427767, in which the hollow cover f, formed the working steam chest. By providing a separate steam supply the temperature of the working steam, preferably moderately superheated steam, is not lowered before it enters the cylinder.

I claim:

1. In combination with a steam engine having an inlet port at its end and separate exhaust ports remote therefrom, a hot steam inlet chest at the end of the cylinder, a separate annular heater about the cylinder extending from the inlet end toward the exhaust, and receiving steam from said chest, a steam connection from said chest to said heater, means for controlling the flow of fluid in said connection, and an elongated piston working in said cylinder and controlling said exhaust ports.

2. The combination with a steam engine having an inlet port at its end and separate exhaust ports remote therefrom, a hot steam inlet chest at the end of the cylinder, a separate annular heater composed of a plurality of annular chambers about the cylinder, connections uniting said chest and chambers in series, and means in each connection for controlling the flow of fluid through the same.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

JOHANN STUMPF.

Witnesses:
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