

J. STUMPF.
STEAM ENGINE.
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1,065,477.

Patented June 24, 1913.

Fig. 1.

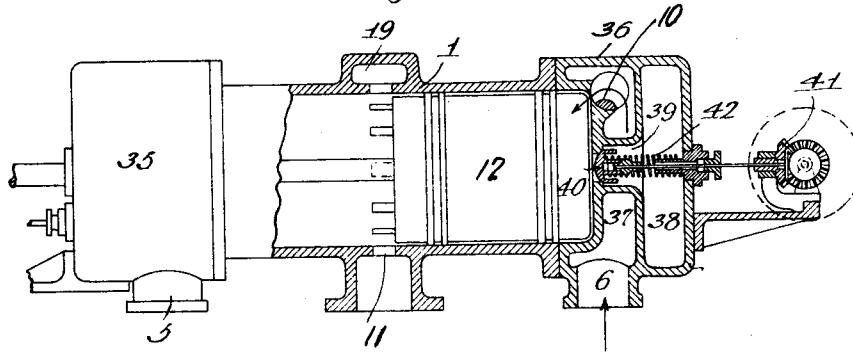


Fig. 2.

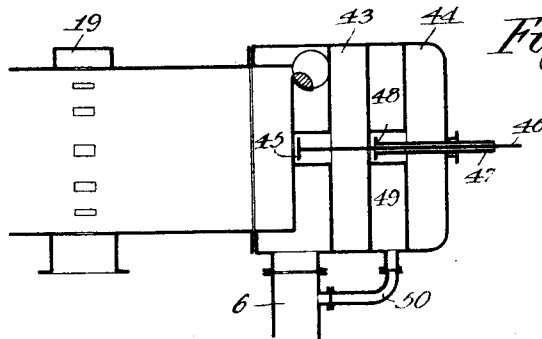
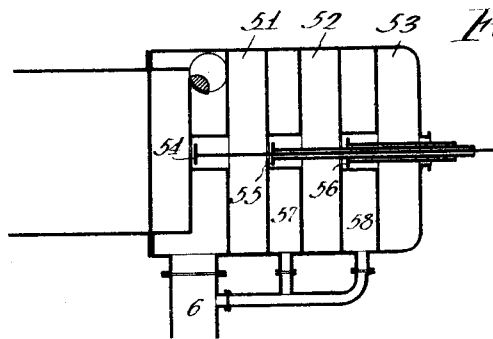


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHANN STUMPF, OF BERLIN, GERMANY.

STEAM-ENGINE.

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Specification of Letters Patent.

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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 Kurfürstendamm, Berlin, Germany, have invented new and useful Improvements Relating to Steam-Engines, of which the following is a specification.

This invention relates to improvements in engines of the uni-directional flow type, that is engines in which the steam enters the cylinder at one end and exhausts through separate ports overrun by the piston at and near its extreme outward position in its working stroke.

The object of the present invention is to enable a steam engine of the type described to efficiently operate when the back pressure at the exhaust ports is greater than the normal back pressure, the compression in the cylinder during the return stroke being decreased for this purpose when the back pressure is increased. This condition of circumstances is particularly desirable when the engine normally exhausts to a condenser but where owing to defects or other causes, it is necessary that the engine temporarily exhaust to the atmosphere.

According to the present invention one or more auxiliary chambers is or are provided on the inlet end of the cylinder and this chamber or these chambers is or are separated from the steam inlet chest or chamber. These auxiliary chambers are in direct communication with the clearance space of the cylinder and means are provided for positively closing this communication at such times as required as for instance when starting the engine or when it is desired for any reason to reduce the back pressure.

Referring to the drawings which form part of this specification and serve to illustrate one practical application of this invention, Figure 1 is a side elevation partly in section of a uni-directional flow steam engine according to this invention. Figs. 2 and 3 are diagrammatic views illustrating modifications in which a plurality of auxiliary chambers are provided.

According to the form of the invention illustrated in Fig. 1 the cylinder 1 is closed at its end by covers 35 and 36 to which steam is led by the pipes 5 and 6. Steam is admitted to the cylinder 1, past the admission valve 10 and exhausts through the ports 11, controlled by the piston 12, at and near

the end of its travel. In addition to the steam spaces 37 the covers 35 and 36 are provided with chambers adapted to be put into or out of communication with the clearance space of the cylinder 1. These chambers 38 are connected by the passages 39, which form outlets to the clearance space at the inlet end of the cylinder. The passages 39 may be closed or opened as desired by means of valves 40 controlled by gearing 41. When the engine is normally adapted to exhaust to a condenser, the valve 40 is closed and the engine then operates in the ordinary manner, steam entering the cylinder by way of the rotary admission valve 10 and being exhausted through the ports 11, the steam remaining in the cylinder 1 after the exhaust being compressed in the clearance space of the cylinder in the usual manner. During this operation the chamber 38 which is filled with air serves as a heat insulating medium and prevents excessive radiation of heat from the cover 36 of the cylinder. If now it is desired that the engine work against a greater back pressure, such as for example by disconnecting the condenser from the exhaust ports 11 and allowing the engine to exhaust to the atmosphere, which may for example be necessary when a defect occurs in the condenser, the valve 40 is opened by the manipulation of the gearing 41 so as to establish communication between the clearance space of the cylinder 1 and the auxiliary chamber 38. In this case the steam remaining in the cylinder after exhaust may enter the chamber 38 so that excessive compression in the cylinder is obviated. Moreover the heat imparted by the entering steam to the walls of the steam space 37 serves to heat the chamber 38 and to heat the walls of the cylinder 1, the heat being transmitted to the walls of the cylinder during the expansion of the steam therein, while the heat imparted to the walls of the chamber 38 prevents condensation of the steam therein. The valve 40 may conveniently be further controlled by a spring 42, so that the said valve may act as a relief valve when required, as for instance, when from any temporary cause there is an excessive amount of residual steam to be compressed in the clearance space of the cylinder during the compression stroke.

If desired two auxiliary chambers may be employed as shown in Fig. 2. According to this form the auxiliary chambers 43

and 44 may be successively brought into operation. This is effected by arranging the valve 45 to be controlled by a rod 46 which passes through the hollow rod 47 which controls the valve 48. Between the two clearance spaces 43 and 44 there is arranged a chamber 49 to which the steam may be led by means of a branch pipe 50. This branch pipe communicates with the steam supply pipe 6. With this construction it will be seen that practically the entire walls of the chamber 43 are heated by the live steam. In this way when the chamber 43 is alone brought into operation, the condensation surface is reduced to a minimum. It will be understood that other auxiliary chambers may be provided, for instance as shown in Fig. 3, where three auxiliary chambers 51, 52, 53 are provided controlled separately by valves 54, 55, 56. In this case also steam is led from the inlet pipe to chambers 57 and 58 arranged between the chambers.

I claim:—

1. In combination with a steam engine cylinder having an inlet port at its end and separate exhaust ports, a steam chest at said end, a piston in said cylinder adapted to overrun and control said exhaust ports at and near the end of its working stroke, an auxiliary chamber at said end, forming a closed extension of said cylinder, and means for opening communication between the piston chamber and auxiliary chamber.

2. In combination in a steam engine, a steam engine cylinder having an inlet port at its end and separate exhaust ports, a piston in said cylinder adapted to overrun and control said exhaust ports at and near the end of its working stroke, a steam inlet chamber at the inlet end of the cylinder, a closed auxiliary chamber upon that side of the inlet chamber opposite the piston chamber and forming an extension thereof, and means for at will opening communication between said extension and said cylinder, whereby said auxiliary chamber assists heat-insulating while providing against undue compression.

3. In combination with a steam cylinder having an inlet port at its end and separate exhaust ports remote therefrom, a steam chest at said end, a relatively cold exhaust chamber into which said exhaust ports open directly, an elongated piston in said cylinder and adapted to overrun and control said exhaust ports at and near the end of its stroke and to cover and protect the interior

of said cylinder adjacent to said exhaust ports during expansion and compression, an auxiliary chamber at the inlet end of said cylinder and forming a closed extension thereof, and means for opening communication between the piston chamber and said auxiliary chamber.

4. In combination with a steam cylinder having an inlet port at its end and separate exhaust ports remote therefrom, a steam chest at said end, a relatively cold exhaust chamber into which said exhaust ports open directly, an elongated piston in said cylinder and adapted to overrun and control said exhaust ports at and near the end of its stroke and to cover and protect the interior of said cylinder adjacent to said exhaust ports during expansion and compression, an auxiliary chamber at the inlet end of said cylinder and forming a closed extension thereof, said auxiliary chamber being located on the side of said inlet chest remote from said cylinder, and means for opening communication between the piston chamber and said auxiliary chamber.

5. In combination in a steam engine, a steam engine cylinder having an inlet port at its end and separate exhaust ports, a hot steam jacket over said inlet end, a piston in said cylinder adapted to overrun and control said exhaust ports at and near the end of its working stroke, a plurality of clearance chambers connected with the inlet end of said cylinder and with one another and means for placing said chambers in communication with the inlet end of said cylinder in series, as desired.

6. In combination in a steam engine, a steam engine cylinder having an inlet port at its end and separate exhaust ports, a hot steam jacket over said inlet end, a piston in said cylinder adapted to overrun and control said exhaust ports, a heating jacket over the inlet end of said cylinder, a plurality of clearance chambers arranged in series on the side of said heating jacket remote from the cylinder, and the first of said jackets communicating with the said cylinder, and a heating chamber arranged between each adjacent pair of said clearance chambers, substantially as described.

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

JOHANN STUMPF,

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.