J. STUMPF.

STEAM ENGINE WITH PISTON CONTROLLED EXHAUST PORTS.

APPLICATION FILED FEB. 19, 1910.

982,395. Patented Jan. 24, 1911.

Fig. 1

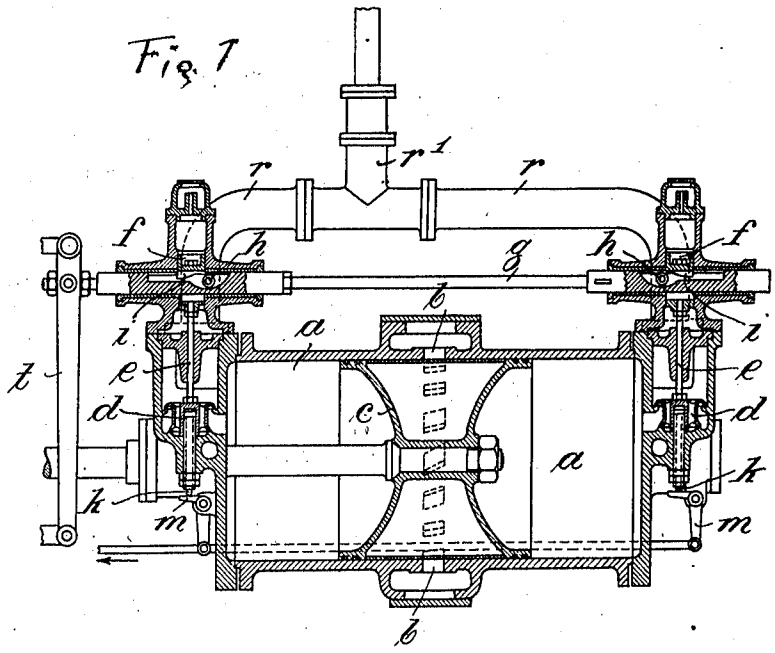


Fig. 2

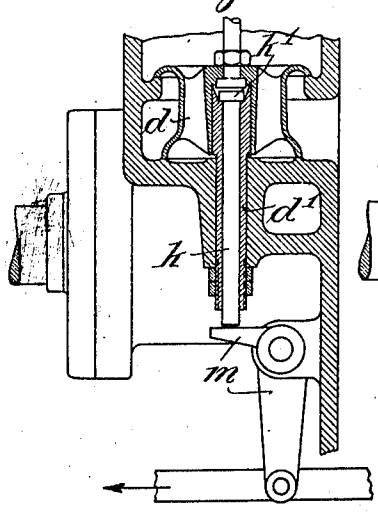
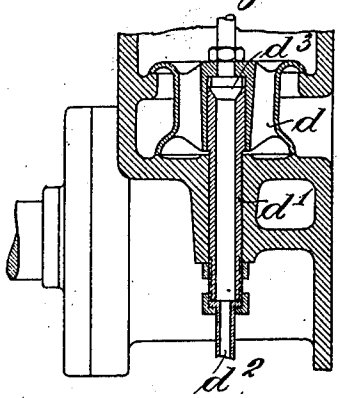


Fig. 3



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UNITED STATES PATENT OFFICE.

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STEAM-ENGINE WITH PISTON-CONTROLLED EXHAUST-PORTS.

982,395. Specification of Letters Patent. Patented Jan. 24, 1911.

Application filed February 19, 1910. Serial No. 544,733.

To all whom it may concern:

Be it known that I, JOHANN STUMPF, a subject of the King of Prussia, and resident of 33 Kurfürstendamm, Berlin, Germany, professor, have invented certain new and useful Improvements in Steam-Engines with Piston-Controlled Exhaust-Ports, of which the following is a specification.

This invention relates to steam engines and especially to those intended for locomotives, and is an improvement on that type of engine, in which the exhaust takes place through ports in the cylinder walls which are controlled by the piston while the admission takes place through separate ports controlled by valves.

In locomotive engines an important consideration as is well known, is sureness and safety in operation and for this purpose it is necessary that the working parts be loaded as little as possible.

In engines of the type above referred to the simplification of the valve mechanism by the omission of all valves for controlling the exhaust increases the safety and sureness of such engines and the valve gear is relieved to a considerable extent since only the inlet valve requires to be operated. On the other hand however the compression is great and this causes a considerable stress on the working parts. The disadvantageous effect of this stress is most objectionable when the engine is running with no load as in such a case the compression has little or no purpose.

In locomotive engines it is known that when running down hill or running with no load the compression above referred to is not only objectionable but the inlet valves are operated by the valve gear without producing any effect on the engine.

According to the present invention the arrangement is such that during "no-load" running the inlet valves are retained open so that both ends of the cylinder are freely connected and the air or steam in the cylinder merely flows back and forth from one end of the cylinder to the other while no great compression occurs. The parts are not therefore stressed and in addition the inlet valves which are retained open, are not at all affected by the valve gear. The life of the engine is naturally very much increased by relieving the parts of the stresses above referred to and also by placing the valves out of operation during down hill running. The advantage of placing the valves out of operation will be readily appreciated when it is taken into consideration that during down hill running the speed is usually very considerable.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a sectional elevation through the cylinder of an engine provided with means for retaining the inlet valves open according to the present invention, Fig. 2 is an enlarged detail of the valve and the operating mechanism for opening it and retaining it open as desired. Fig. 3 illustrates a modified construction.

The engine cylinder *a* is provided with exhaust ports *b* which are controlled by the piston *c* in its travel. The steam admission is controlled by valves *d* having rods *e* adapted to be operated by rollers *h* which coact with curved cam-pieces *i* carried by the sliding shoes *f* on the rods *e*. The rollers *h* are carried by a rod *g* adapted to be reciprocated by means of any suitable gear of which one link *t* is illustrated. Steam is supplied through a pipe r^1 and this pipe is provided with branches *r* which lead to the valve chests at each end of the cylinder *a*. It will be understood that the stop valve for opening and closing the supply of steam to the engine should be arranged on the boiler side of the T-piece r'.

The valve *d* is shown as a balanced valve guided on a central sleeve *d'* (see Fig. 2). Within the sleeve *d'* there is arranged a pin *k* having a part *k'* which when the pin *k* is raised by the finger lever *m*, raises the valve *d*. When the valve *d* is raised, the cam piece *i* in Fig. 1 is also raised out of the path of the roller *h* so that the reciprocation of the rod *g* does not produce any effect upon the valve *d*. It will be seen now that when the valves *d d* at each end of the cylinder have been raised by operating the levers *m*, the steam or air in the cylinder *a* will pass back and forth from end to end, past the valves *d* and through the pipe *r*. In former constructions when the valves were not retained opened as described, there was apt to be formed in the cylinder a partial vacuum when the exhaust ports *b* were opened. Thus the compression of the steam in the cylinder *a* caused condensation, which, when the compression was relieved, involved a certain fall in pressure in the cylinder, so that there was a suction action through the ports *b*. As is well known the ports *b* in

locomotives open into the chimney draft pipe, so that this suction action was apt to suck soot or grit into the cylinder. By the arrangement according to the present invention no such suction can take place especially if the pipe r is of sufficient cross section.

Instead of opening the valve d by means of a lever it may be opened by steam pressure for instance in the manner illustrated in Fig. 3. In this case a steam pipe d^2 leads to the sleeve d' in which there works a piston d^3. When pressure steam is supplied through the pipe d^2, the piston or plunger d^3 is raised and the valve d of course also raised.

It will be understood that many other modifications might be made in the arrangement of the device illustrated. In the forms shown in Figs. 2 and 3 it will be seen that the weight of the valve is not in any way increased by the addition of the pin k or plunger d^3.

I claim:—

1. In combination, a cylinder having exhaust ports midway in the length thereof, a working piston in said cylinder arranged to over-run and control said exhaust ports at and near each end of its travel, a steam chest at each end of said cylinder, a connection between said chests, a steam supply pipe, a stop valve interposed between said steam supply pipe and said connection between the chests, a valve in each steam chest, means for opening and closing said valves alternately, and additional means for holding said valves open simultaneously and independently of the first mentioned opening and closing means.

2. In combination, a cylinder having exhaust ports midway in the length thereof, a working piston in said cylinder arranged to over-run and control said exhaust ports at and near each end of its travel, a steam chest at each end of said cylinder and having an inlet port leading to the cylinder, a connection between said steam chests, a steam supply pipe, a stop valve between said connection and steam supply pipe, an inlet valve in each stem chest and controlling said inlet ports, a stem on said valve extending in both directions therefrom, means coöperating with one end of each of said stems to open said valves alternately, and additional means coöperating with the other ends of each of said stems to maintain both valves open simultaneously and independently of said first mentioned means.

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

JOHANN STUMPF.

Witnesses:

EDWARD MASSION,

KARL HANSEN.