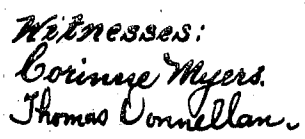


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UNITED STATES PATENT OFFICE.

JOHANN STUMPF, OF BERLIN, GERMANY.

COMPRESSOR.

1,055,239.

Specification of Letters Patent.

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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, Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Compressors, of which the following is a specification.

This invention relates to air compressors of the kind in which the air is compressed on one side of a piston and the steam pressure acts on the other side, in other words to compressors in which the motive piston is also the pumping piston. In such combined plant the disadvantage is met that the working cylinder requires to be kept hot to avoid condensation losses in the steam and further the same cylinder requires to be kept cold to avoid excessive increase of temperature of the air during compression. These antagonistic requirements are met if the steam side of the piston works on the unidirectional principle.

According to this invention a combined compressor and reciprocating engine is composed of a unidirectional flow single acting engine the piston of which acts also as the compressor piston. To enable this to take place the cylinder is closed at both ends and the piston is made of such length and so disposed that it only uncovers the steam exhaust ports at one side.

The invention also comprises in combination with a single acting compressor as above, means for balancing the pressures on the moving parts so that a uniform driving force may be obtained.

The invention is illustrated in the accompanying drawing as applied to a compound tandem compressor.

The drawing is a sectional elevation through such a compressor arranged in accordance with this invention.

Referring to the accompanying drawings steam enters the cylinder *a* past the valve *d* is cut off and expands thereby propelling the piston *b* to the right. When the piston *b* uncovers the exhaust ports *e* the expanded steam passes through these ports into the annular chamber *e'* arranged around the cylinder and forming part of the condenser. Owing to the fact that the temperature of the cylinder walls is graded downward from the hot inlet to the cold exhaust, no serious loss is encountered by arranging the cylinder and condenser with a common wall.

Furthermore the cylinder is by this means evacuated to a very high degree and thereby the region around the exhaust is cooled to a very low temperature.

The piston *b* is of such length that on its return stroke it does not uncover the ports *e* but draws in air at atmospheric pressure past the valve *f*. There is this atmospheric pressure on one side of the piston *b* and a vacuum on the other side. The air pressure thus assists the return stroke of the piston. If desired the cylinder walls to the right of the annular chamber *e'* may be water jacketed or they may be left unjacketed so as to be cooled by radiation.

The right hand end of the cylinder *a* is closed by a cover *k²* through which passes a rod *k'* connecting the piston *b* with the piston *k* of a high pressure compression cylinder *i* arranged in tandem with the cylinder *a*. An automatic stuffing box *k³* serves to pack the rod *k'*.

Air pressed out from the cylinder *a* passes the valve *g* into an intermediate cooler *h* and is drawn from the cooler *h* through the pipe *i²* into the chamber *i'* of the cylinder *i*. The air enters past the valve *h'* into the cylinder *i*, is compressed and expelled past the valves *g'* into the high pressure conduits. The chamber *i'* communicates with the front end of the piston *k*.

It will be seen in the first place that the cooling of the low pressure compressor cylinder does not interfere with the efficiency of the engine because in the first place the compressor cylinder has no part of its walls common with the steam space in the cylinder and in the second place the part of the working cylinder nearer the compressor is the cold end of the unidirectional flow steam engine. Then again owing to the atmospheric pressure acting on the piston *b* during the compression stroke in the engine and owing to the piston *k* being balanced by the connection of both its ends with the chamber *i* during the same stroke, there is a uniform load on the parts and the high compression necessarily met with in this form of unidirectional flow steam engine entirely compensates for the atmospheric pressure acting on the compressor side of the piston *b*.

I claim:—

1. In combination a cylinder having a steam inlet port at one end and exhaust ports intermediate its length, a long piston

in said cylinder arranged and proportioned to uncover said exhaust ports at one of its ends only at and near the end of its travel, air suction and discharge valves at the opposite end of said cylinder to the inlet ports, a high pressure compressor cylinder arranged co-axially with said first mentioned cylinder, a piston in said compressor cylinder, and a constantly open connection from the air discharge valve of the first mentioned cylinder to one side of the piston in said high pressure compressor.

2. In combination a cylinder having a steam inlet port at one end and exhaust ports intermediate its length, a long piston in said cylinder arranged and proportioned to uncover said exhaust ports at one of its ends only at and near the end of its travel,

a condenser chamber arranged about said exhaust ports and into which said ports open directly, air suction and discharge valves at the opposite end of said cylinder to the inlet ports, a high pressure compressor cylinder arranged co-axially with said first mentioned cylinder, a piston in said compressor cylinder and a constantly open connection from the air discharge valve of the first mentioned cylinder to one side of the piston in said high pressure compressor.

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

JOHANN STUMPF.

Witnesses:

HERMANN BOUIN,
WOLFGANG TURNWALD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."