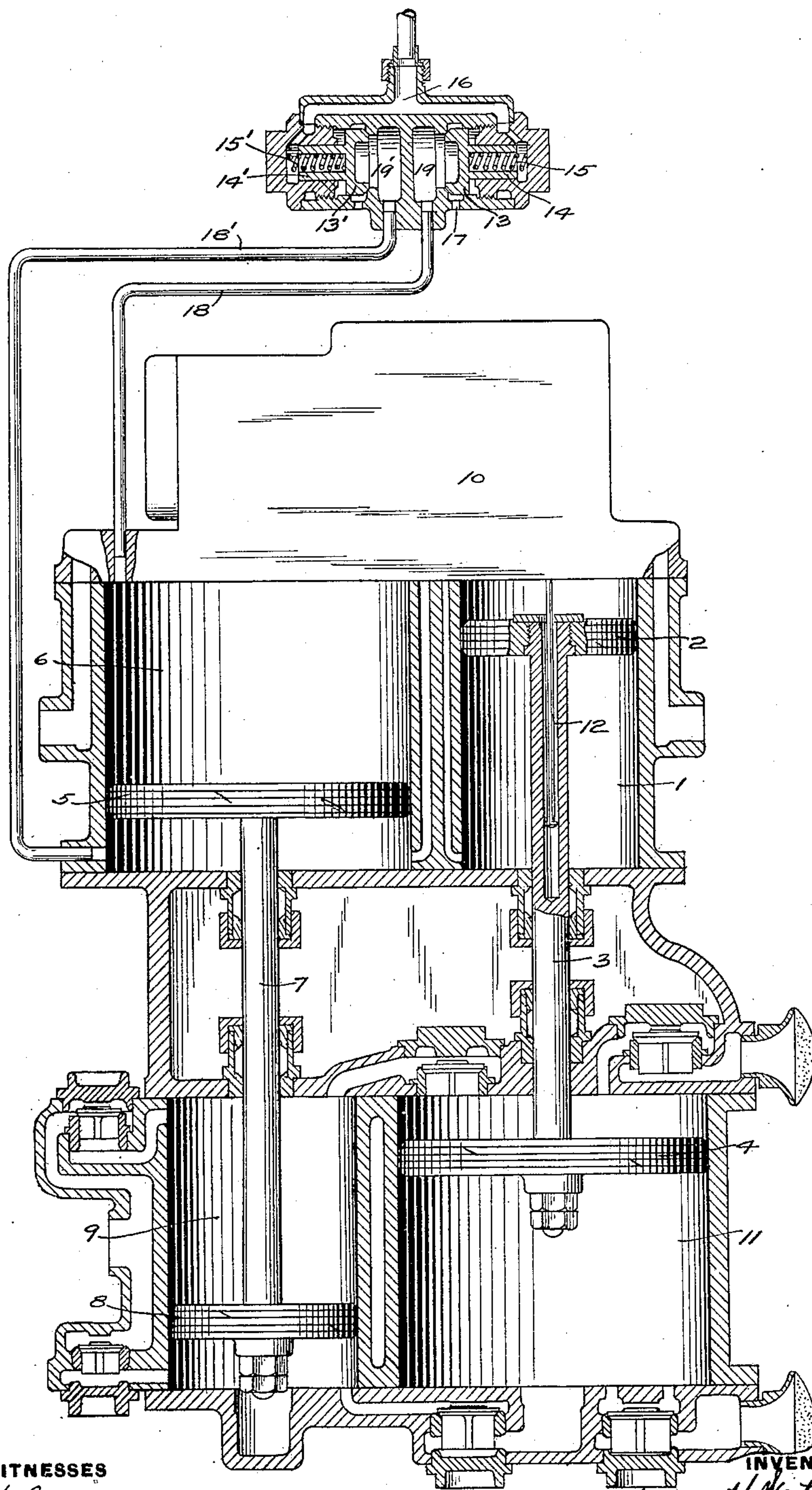


H. H. WESTINGHOUSE.
RELIEF VALVE FOR COMPOUND STEAM PUMPS.
APPLICATION FILED SEPT. 16, 1907.

917,215.

Patented Apr. 6, 1909.



WITNESSES

J. Custer
E. B. Macdonald

INVENTOR

Henry H. Westinghouse
by E. Knight

Att'y.

UNITED STATES PATENT OFFICE.

HENRY H. WESTINGHOUSE, OF NEW YORK, N. Y., ASSIGNOR TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

RELIEF-VALVE FOR COMPOUND STEAM-PUMPS.

No. 917,215.

Specification of Letters Patent.

Patented April 6, 1909.

Application filed September 16, 1907. Serial No. 393,188.

To all whom it may concern:

Be it known that I, HENRY H. WESTINGHOUSE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Relief-Valves for Compound Steam-Pumps, of which the following is a specification.

This invention relates to compound steam pumps and more particularly to the direct acting type in which the respective steam pistons are directly connected to the corresponding pistons in the compressor cylinders. In pumps of this character wherein the exhaust steam from the high pressure cylinder expands into the low pressure cylinder to actuate its piston, some difficulty has been experienced when the parts have become worn, on account of excessive leakage which occurs into the cylinder on the exhaust side of the high pressure steam piston, or what amounts to the same thing, into the low pressure steam cylinders on the corresponding side of its piston, whereby such an excessive pressure accumulates as to greatly reduce the differential of pressures acting upon opposite sides of the piston and cause a very undesirable slowing down of the pump. In pumps of this class, and particularly those employed for compressing air as in an air brake system, it is highly desirable that the pump should operate at a normally rapid rate of speed in order to efficiently compress air into the main reservoir under the high degree of pressure required to operate such a system, and it will be observed that the slowing down of the pump, due to this objectionable leakage, serves to aggravate the difficulty, since it increases the time required for each stroke of the pistons and thereby lengthens the period during which this leakage may occur.

The principal object of my present invention is to maintain a desired differential of pressures acting upon opposite sides of the piston, whereby the pump may still continue to operate at a desired rate of speed, even in case of excessive leakage, and to this end it comprises improved valve means for automatically relieving such piston chamber or cylinder of the objectionable pressure due to such leakage.

Another feature of my improvement comprises means whereby the relief valve mech-

anism operates under varying conditions of steam or boiler pressure to maintain a desired differential.

In the accompanying drawing the figure shows, in vertical section, a compound steam pump with one form of my improvement applied thereto.

According to this construction the air pump shown is of the type wherein the high pressure steam cylinder 1 contains piston 2 connected by rod 3 with the piston 4 in the low pressure air cylinder 11, and the low pressure steam piston 5 in cylinder 6 is connected by rod 7 with the piston 8 of the high pressure air cylinder 9, the pump valve mechanism in casing 10 being controlled by the reversing rod 12 actuated by the movement of the high pressure steam piston. My invention is not, however, restricted to any particular form of compound pump, since it may be applied to any ordinary or preferred pump construction and having any suitable design of valve mechanism.

The specific form of my improvement shown in the drawing comprises a relief valve 13, which is subject on its face to the pressure in chamber 19, communicating by passage or pipe 18 with one end of the low pressure steam cylinder 6, and operating to control an outlet or discharge port 17. The valve may be loaded by a spring 15, and in order that the load tending to hold the valve to its seat may be automatically adjusted to varying conditions and different degrees of steam pressure, the valve is preferably provided with a reduced extension 14, which is subject on its rear side to the live steam or boiler pressure admitted through passage 16. This provides differential areas exposed to steam pressure upon opposite sides of the relief valve, and the same is normally held closed by the live steam pressure acting on the extension 14, and the pressure of spring 15, which is made of a suitable strength to hold the valve closed under the desired conditions, but to permit the valve to open and relieve the pressure in the steam cylinder when the same increases above a desired maximum degree. A duplicate valve device 13', 14', 15' and 19' may be connected by passage or pipe 18' with the opposite end of the steam cylinder.

It will now be apparent that with my improvement, if there is an excessive leakage

of steam to the exhaust side of the high pressure piston, or to the corresponding side of the low pressure piston, causing an undesirable increase in the pressure acting on the face of the relief valve, said valve will be raised from its seat and discharge such excess pressure through the outlet port 17. In this manner the desired differential in the steam pressures will be maintained and the pump pistons will move at the required speed and operate to efficiently compress the air or other fluid acted upon. It is also evident that, should there be any change in the conditions of the boiler or live steam pressure, the load on the relief valve will be automatically adjusted to a corresponding degree, so that the same desired differential of steam pressures acting upon the engine pistons will be maintained regardless of varying conditions of the live steam pressure.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. The combination with a compound steam pump having high and low pressure cylinders and pistons, of means for relieving the pressure accumulating by leakage upon either side of the said pistons.

2. The combination with a compound steam pump having high and low pressure cylinders and pistons, of a relief valve for

discharging pressure accumulating by leakage to one side of the low pressure piston.

3. The combination with a compound steam pump having high and low pressure cylinders and pistons, of a relief valve device for limiting the pressure upon either side of the low pressure piston.

4. The combination with a compound steam pump having high and low pressure cylinders and pistons, of a loaded relief valve governed by fluid pressure for limiting the pressure upon one side of the low pressure piston.

5. The combination with a compound steam pump having high and low pressure cylinders and pistons, of a relief valve device governed by live steam pressure for limiting the pressure upon either side of the low pressure piston.

6. The combination with a compound steam pump having high and low pressure cylinders and pistons, of a relief valve device governed by live steam pressure for limiting the pressure upon either side of the low pressure piston to a predetermined degree.

In testimony whereof I have hereunto set my hand.

HENRY H. WESTINGHOUSE.

Witnesses:

ROBERT MCLEOD JACKSON,
E. A. WRIGHT.