

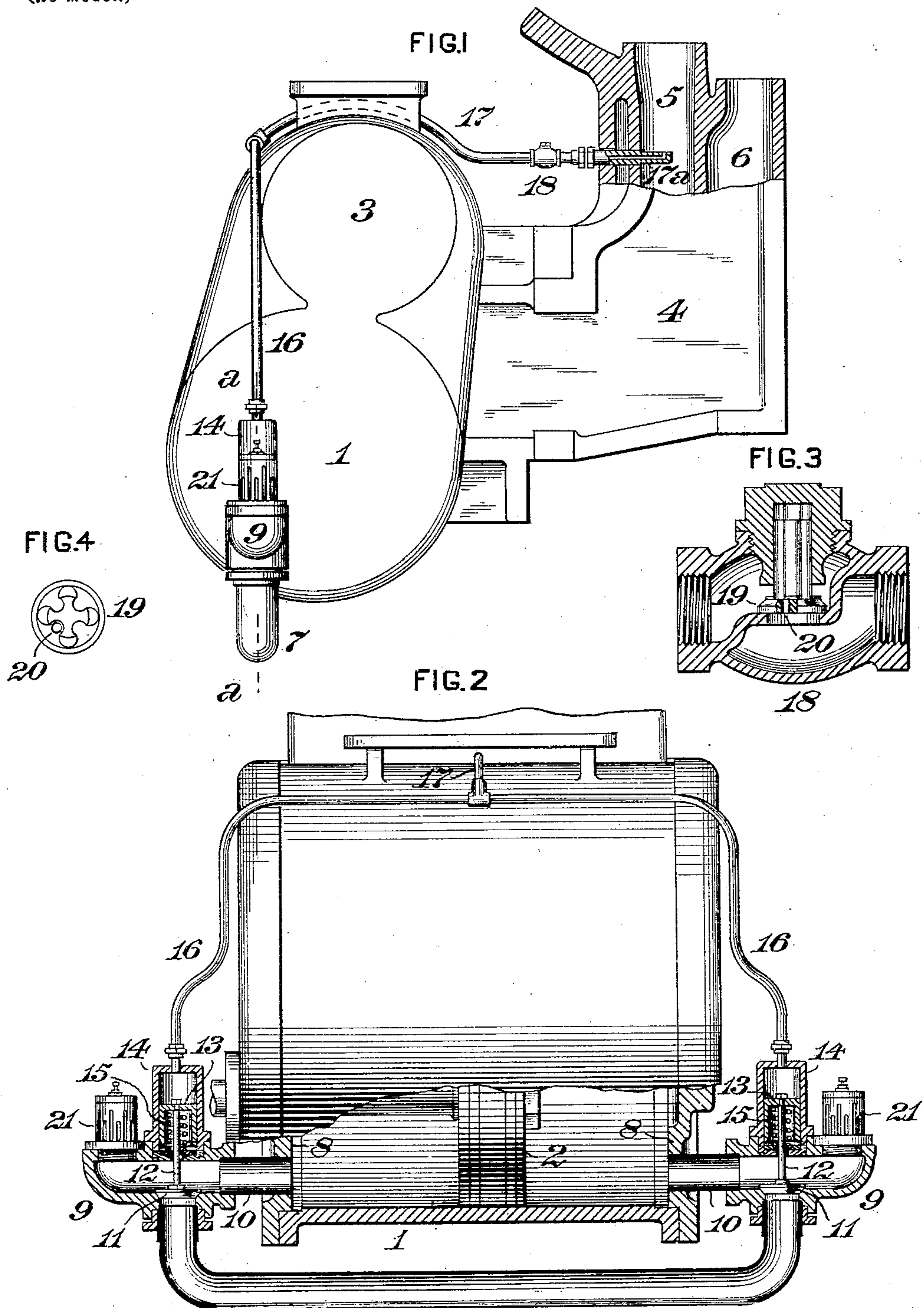
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Patented July 8, 1902.

P. SHEEDY & A. CAMPBELL.
CIRCULATOR FOR LOCOMOTIVE CYLINDERS.

(Application filed Dec. 19, 1901.)

(No Model.)



WITNESSES:

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UNITED STATES PATENT OFFICE.

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CIRCULATOR FOR LOCOMOTIVE-CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 704,130, dated July 8, 1902.

Application filed December 19, 1901. Serial No. 86,478. (No model.)

To all whom it may concern:

Be it known that we, PATRICK SHEEDY and ALEXANDER CAMPBELL, of Los Angeles, in the county of Los Angeles and State of California, have jointly invented a certain new and useful Improvement in Circulators for Locomotive-Cylinders, of which improvement the following is a specification.

The object of our invention is to provide an appliance which shall be simple and inexpensive in construction and readily applicable to locomotive-engines of any of the designs now in practical service, the employment of which will effectually obviate the detrimental results of excessive compression in locomotive-cylinders, injury to cylinder and valve surfaces and packing, and destruction of lubricant by induction from the fire-box and smoke-box and waste of fuel by unnecessary draft on fire, all of which have been experienced to a seriously objectionable extent under prior constructions when locomotive-engines are "drifting" or being moved by their own gravity and that of their train down a descending grade with steam shut off from their cylinders.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is an end view, partly in section, of a locomotive-cylinder and steam-chest casing and saddle, illustrating an application of our invention; Fig. 2, a view, partly in side elevation and partly in section, on the line *a a* of Fig. 1; Fig. 3, a longitudinal section, on an enlarged scale, through the steam-supply check-valve casing; and Fig. 4, a plan view of the steam-supply check-valve.

Our invention is herein exemplified as applied in connection with a locomotive-cylinder 1, which is fitted with a piston 2, to and from the opposite sides of which steam is supplied and exhausted by a distribution-valve of the piston type, which is not shown and which operates in the ordinary manner in a steam-chest 3, located above the cylinder. The cylinder and steam-chest are, as heretofore, cast integral with or otherwise connected to a saddle 4, having a steam-passage 5, which communicates with a dry-pipe controlled by a throttle-valve and an exhaust-passage 6.

In the practice of our invention we provide the locomotive-cylinder 1 with an avenue for the traverse of air from one side of the piston to the other during periods in which the engine is drifting or running with its throttle closed, said avenue consisting of a circulating-pipe 7, which extends longitudinally below and adjacent to the cylinder 1 and is connected at each end with an opening in the adjacent head 8 of the cylinder. The connection of the circulating-pipe with the cylinder-heads is preferably effected through the intermediation of valve-chambers 9 and short pipes or nipples 10, as shown, or the valve-chambers may be connected by flanges to the cylinder-heads. Communication between each end of the circulating-pipe and the adjacent end of the cylinder is controlled by a cut-out valve 11, which is of the puppet type and is fitted to seat on a suitable face on the inside of the valve-chamber 9 and close or open the end of the circulating-pipe thereto and to the adjacent end of the cylinder, which communicates continuously therewith, accordingly as steam from the boiler may be admitted to or shut off from the steam-chest and cylinder by the opening or the closure of the throttle-valve. Each of the cut-out valves 11 is fixed upon one end of a rod or stem 12, which passes through a properly-packed opening in the opposite wall of the valve-chamber, and is secured at its opposite end to a piston 13, fitting in a piston-chamber 14, secured to the valve-chamber 9. A spring 15 is preferably fitted around the rod 12, its ends abutting against the piston 13 and the lower wall of the piston-chamber, the action of said spring being when unopposed by a superior force to raise the piston and unseat the connected cut-out valve 11. The outer ends of the piston-chambers are connected by branch pipes 16 with a steam-supply pipe 17, leading and connected to a nipple 17^a, extending into the steam-passage 5 and having its open end facing the flow of steam through the same.

In order to retard the exhaust of steam from the piston-chambers 14, and thereby prevent blowing, which would be caused by the opening of the circulating-pipe to the cylinder before steam is wholly exhausted from the latter, a check-valve casing 18 is preferably

interposed in the line of the steam-supply pipe. The check-valve 19, which works in the valve-casing 18, is fitted to open in the direction of the piston-chambers 14 and is provided with a small discharge-passage 20, through which steam escapes from the piston-chambers when the throttle-valve is closed and the check-valve is seated.

A relief-valve 21, which may be of any suitable and preferred construction and which is loaded to any desired degree—as, say, twenty-five pounds to the square inch in excess of the normal boiler-pressure—is connected to each of the valve-chambers 9. The employment of the relief-valves, more particularly in engines equipped with piston distribution-valves, effectively guards against injury to the cylinder, piston-rod, or main connecting-rod, which might result from excessive pressure in the cylinder due to water becoming trapped therein. In the application of the improvement to compound locomotives the relief-valves prevent the accumulation of such excess of pressure in the large cylinders as would result in rupturing them. Drain-valves may be connected in any appropriate position for draining condensed water from the valve-chambers and circulating-pipes and preventing damage from freezing.

In operation when the throttle-valve is opened steam is admitted from the steam-passage of the saddle to the piston-chambers 14 through the pipes 17 and 16 and, acting upon the pistons 13, causes them to force the cut-out valves 11 to their seats and hold them seated during the period that the throttle-valve remains open. Upon the closure of the throttle-valve, as when the engine is drifting, the steam-pressure upon the outer sides of the pistons 13 is released, whereupon the pistons are raised by the springs 15 and the connected cut-out valves 11 are unseated, thereby opening communication between the opposite ends of the main cylinder 1. The communication thus established, which permits circulation of air from one end of the cylinder to the other, and thereby prevents compression in the cylinder and inward draft from front end, will remain open throughout the period of closure of the throttle-valve, upon the reopening of which it will be closed by the seating of the cut-out valves by their pistons, as above explained.

The action of the appliance is, as will be seen from the foregoing description, wholly automatic, and its application attains in regular service the substantial advantages of reduction to any desired degree of compression on the advancing sides of the main pistons and freedom from the introduction to the opposite sides of the pistons of hot gases from the fire-box and smoke and cinders from the smoke-box, which would otherwise be resultant upon the formation of a partial vacuum in the cylinders and steam-chests at certain points of the travel of the pistons. The introduction of such foreign matters acts to de-

stroy lubrication on working surfaces, to foul the valve-openings, and to gum cylinder-packing. The appliance is further advantageous in reducing consumption of fuel while drifting, during which, as is well known to those familiar with locomotive practice, the boiler can only be protected from injurious drafts of cold air by a liberal supply of fuel, which must be made even though the safety-valves are blowing off. Induction through the exhaust-nozzle induces a wasteful draft through the boiler-tubes on the fire, and such draft, together with the accompanying objectionable introduction of products of combustion from the smoke-box, is prevented by the employment of our invention. The circulation of air from one end of the cylinder to the other which it effects not only renders it unnecessary to draw upon the exhaust-nozzle for relief of vacuum resistance, but also keeps the temperature of the cylinder up to the degree which is desirable, which cannot be done if the exterior air is admitted through atmospheric relief-valves in the steam-chests or cylinder-heads. The wear on working surfaces is reduced to a minimum, and the cylinder temperature, which prior to our invention has been sufficiently high to set fire to the wooden lagging of cylinders and to melt metal used in metallic packing, is reduced to a point at which the oil used for lubricating is not burned up. The shock at the points of reversal of piston movement is relieved and the life of the engine correspondingly prolonged.

Our improvement is, so far as our knowledge and information extend, differentiated from all other devices which have been heretofore proposed for the attainment of the same end in the essential particular that the communication between the circulating-pipe and the cylinder is effected through the heads of the latter and not, as in prior constructions, through ports specially provided in the cylinder-casting. As a consequence the expense and complication of the coring of such special ports in new work are unnecessary and the improvement is readily applicable to existing cylinders of any of the known constructions without involving drilling holes in their shells or doing any other work on them. Again, the two independent cut-off valves are when closed held to their seats by live-steam pressure acting on their pistons and unopposed by oppositely-acting steam-pressure, as they are not subject on their lower sides to the fluctuations of pressure in the cylinder, which latter objectionable feature exists in prior constructions and tends to unseat the valve and cause a pounding motion, which is destructive to it and to its seat. Finally, the interposition of an independent valve between each end of the circulating-pipe and the adjacent end of the cylinder enables each valve to be located so close to the cylinder that the additional clearance-space due to the application of the improvement is

reduced to the minimum, and the waste of steam in the large clearance-spaces on opposite sides of the valve, which are necessarily present in a pipe controlled by a single valve, as in prior constructions, is entirely prevented.

The appliance will be found to be particularly beneficial in connection with the low-pressure cylinders of large compound engines. In the operation of an engine of this type having a low-pressure cylinder thirty-four inches in diameter and thirty-two inches stroke while drifting on a two-per-cent. grade a total braking power or resistance of two hundred and fifty horse-power in the low-pressure cylinder was indicated when running at a speed of thirty miles per hour. While the presence of a limited degree of compression in the cylinders of locomotives when drifting is obviously desirable in order to relieve the reciprocating parts from thrashing and jar, it is equally clear that so great a resistance as that above noted is a substantial disadvantage, particularly from the point of cost of maintenance, inasmuch as the resistance is applied in the reverse direction to that in which the engine is designed to be operated under steam.

We are aware that prior to our invention circulating-pipes have been proposed each of which form two clearance-spaces of substantial volume and continuously open to the opposite ends of a steam-cylinder, communication between which clearance-spaces was controlled by a single valve, and we do not, therefore, broadly claim a valve-governed pipe connecting the ends of a locomotive-cylinder.

We claim as our invention and desire to secure by Letters Patent—

1. The combination, with a locomotive-cylinder, of a circulating-pipe, cut-out valves, each seating at one end of said pipe and subject to steam-pressure in closing direction only, and controlling communication between said end of said pipe and the adjacent end of the cylinder, pistons, each fitting in a piston-chamber and connected to one of the cut-out valves, steam-supply pipes leading from the piston-chambers to a connection with the steam-supply passage of the cylinder, and means for automatically unseating the cut-out valves when pressure is relieved in the steam-supply passage.

2. The combination, with a locomotive-cylinder, of a circulating-pipe, cut-out valves, each seating at one end of said pipe and subject to steam-pressure in closing direction only, and controlling communication between said end of said pipe and the adjacent end of the cylinder, pistons, each fitting in a piston-chamber and connected to one of the cut-out valves, springs bearing on said pistons in direction to unseat the cut-out valves, and steam-supply pipes leading from the piston-chambers, on the sides of the pistons oppo-

site the springs, to a connection with the steam-supply passage of the cylinder.

3. The combination, with a locomotive-cylinder, of a circulating-pipe, cut-out valves, each controlling communication between one end of said pipe and the adjacent end of the cylinder, pistons, each fitting in a piston-chamber and connected to one of the cut-out valves, steam-supply pipes leading from the piston-chambers to a connection with the steam-supply passage of the cylinder, and a check-valve controlling the flow of steam through said supply-pipes, said check-valve opening in the direction of the piston-chambers and having a discharge-passage for the exhaust of steam therefrom.

4. The combination, with a locomotive-cylinder, of a circulating-pipe, cut-out valves, each controlling communication between one end of said pipe and the adjacent end of the cylinder, pistons, each fitting in a piston-chamber and connected to one of the cut-out valves, a tubular connection leading into the steam-supply passage of the cylinder and having its open end therein facing the flow of steam through said passage, and steam-supply pipes leading from said tubular connection to the piston-chambers.

5. The combination, with a locomotive-cylinder, of two valve-chambers, each connected to and open into one end of said cylinder, a circulating-pipe connected, at its opposite ends, to said valve-chambers, cut-out valves, each seating at one end of the circulating-pipe and subject to steam-pressure in closing direction only, and controlling communication between said end of said pipe and the connected valve-chamber, piston-chambers, each connected to one of the valve-chambers, pistons, each fitting in one of the valve-chambers and connected to a cut-out valve, steam-supply pipes leading from the piston-chambers to a connection with the steam-supply passage of the cylinder, and means for automatically unseating the cut-out valves when pressure is relieved in the steam-supply passage.

6. The combination of a locomotive-cylinder, cylinder-heads secured removably to and closing the ends thereof, two valve-chambers, each connected to one of the cylinder-heads and open to the cylinder through the same, a circulating-pipe connected, at its opposite ends, to said valve-chambers, cut-out valves, each seating at one end of the circulating-pipe and subject to steam-pressure in closing direction only, and controlling communication between said end of said pipe and the connected valve-chamber, piston-chambers, each connected to one of the valve-chambers, pistons, each fitting in one of the valve-chambers and connected to a cut-out valve, steam-supply pipes leading from the piston-chambers to a connection with the steam-supply passage of the cylinder, and means for automatically unseating the cut-out valves when

pressure is relieved in the steam-supply passage.

7. The combination, with a locomotive-cylinder, of two valve-chambers, each connected to and communicating with one end of said cylinder; a circulating-pipe connected, at its opposite ends, to said valve-chambers, cut-out valves, each controlling communication between one end of the circulating-pipe and the connected valve-chamber, piston-chambers, each connected to one of the valve-chambers, pistons, each fitting in one of the

piston-chambers and connected to a cut-out valve, steam-supply pipes leading from the piston-chambers to a connection with the steam-supply passage of the cylinder, and atmospheric relief-valves each connected to one of the valve-chambers.

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