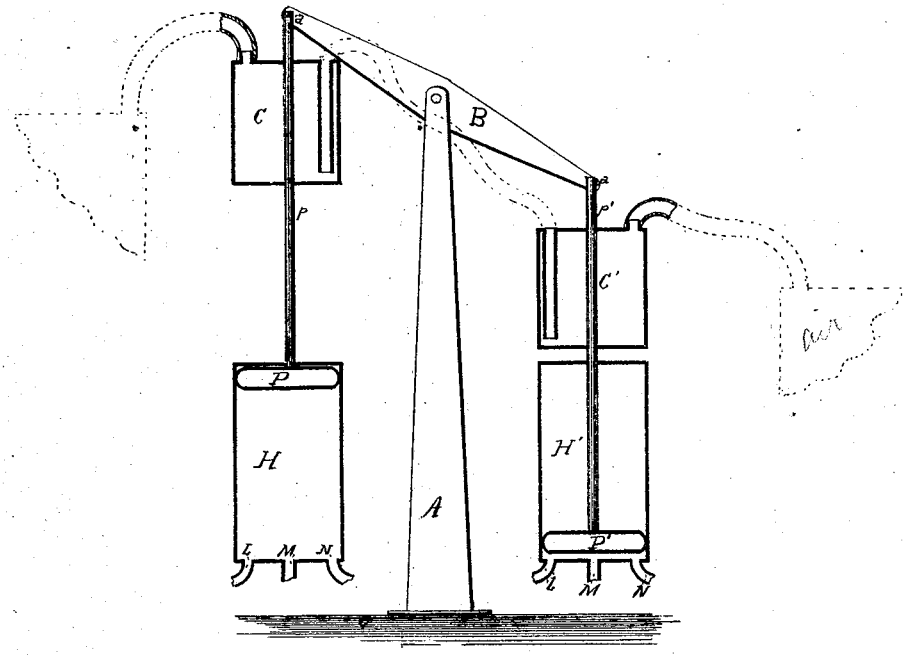
J. W. MIDDLETON.

Steam-Engine.

No. 160,218. Patented Feb. 23, 1875.



WITNESSES.

J. Wm. Garner.

F. F. Lehmann.

INVENTOR.

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per F. A. Lehmann

atty

UNITED STATES PATENT OFFICE.

JOHN W. MIDDLETON, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **160,218**, dated February 23, 1875; application filed November 3, 1874.

To all whom it may concern:

Be it known that I, JOHN W. MIDDLETON, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in steam and atmospheric engines; and consists in the application of steam in power sufficient to displace atmospheric air, and to make this steam a power, with the assistance of atmospheric pressure, to do the work now obtained from other steam-engines, making it a non-explosive steam and atmospheric engine of unlimited power.

The accompanying drawing represents my invention.

A represents a standard, upon which the beam B is balanced at its center, to keep up the alternate action, having piston-rods *p* pivoted to its ends, at *a*, which rods have on their other extremities the piston P in the cylinders H H′. These cylinders are provided at their bottoms with the usual openings for the admission of steam, for the egress of condensed steam, and for the introduction of a jet of water. The piston-rods *p* pass through the vessels or cylinders C C′, attached to them near the beam; and these vessels, connected by elastic tubes with air-vessels, have also a pipe issuing at the top, and reaching to the bottom, so that, when they are connected together with flexible hose, the expanded air displaces the water to the other vessel, to make use of the liquid's gravity.

The gravity-vessels C are connected with the air-vessel, so that both ends of the cylinders can have the application of powerless steam, if desired, and then the vessels may be continued or discontinued during working.

The steam having been introduced into the cylinder H′ under the piston, the expanded air, from any suitable reservoir, is at the same time, or a little before, admitted into the gravity-vessel C′, so as to force the water contained therein over into the other vessel C. As the steam presses upward against the piston P′, so as to start it, the weight of the transferred water assists to continue the motion. Just as the piston P′ has finished its stroke a jet of water is introduced into the cylinder, so as to condense the steam, and thus form a vacuum at the same time that the steam is being introduced into the other cylinder.

The atmospheric-engine cylinders H H′ should be lined with as good a non-conductor as is practicable, so that no more powerless steam be condensed than is unavoidable, until a jet of cold water from the hydrant is forced in.

The advantages I obtain from the use of steam in the low condition heretofore described are so striking that it is only necessary to allude to them to be appreciated.

I can use the heat from the stack to expand the air in the air-vessels; but if the supply of exhaust steam is more than enough, I use the heat of said steam to expand air and get the gravity of a liquid. It will by this combination do more work, in this application, than the high-pressure engine from which it escapes. Hence a great saving of fuel, and a removal of all danger of explosions, by which so many valuable lives have been lost, and immense amount of property has been destroyed.

Owing to the low condition of steam, which might be generated almost in an open vessel, two degrees above boiling-point being sufficient, no explosion can possibly take place, and nothing is to be feared from a collapse.

For forcing the water from one tank, C C′, to the other, I use either the mechanism shown in my previous patent or any other that may be preferred.

Having described my invention, I claim—

The combination of cylinders H H′, provided with suitable pipes L M N, pistons P P′, piston-rods *p p′*, vessels C C′, and beam A, with a mechanism for forcing the water from one vessel, C C′, to the other, the parts being arranged for operation as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand this 28th day of October, 1874.

JOHN W. MIDDLETON.

Witnesses:

J. PLANKINTON,

HENRY SCHELL.