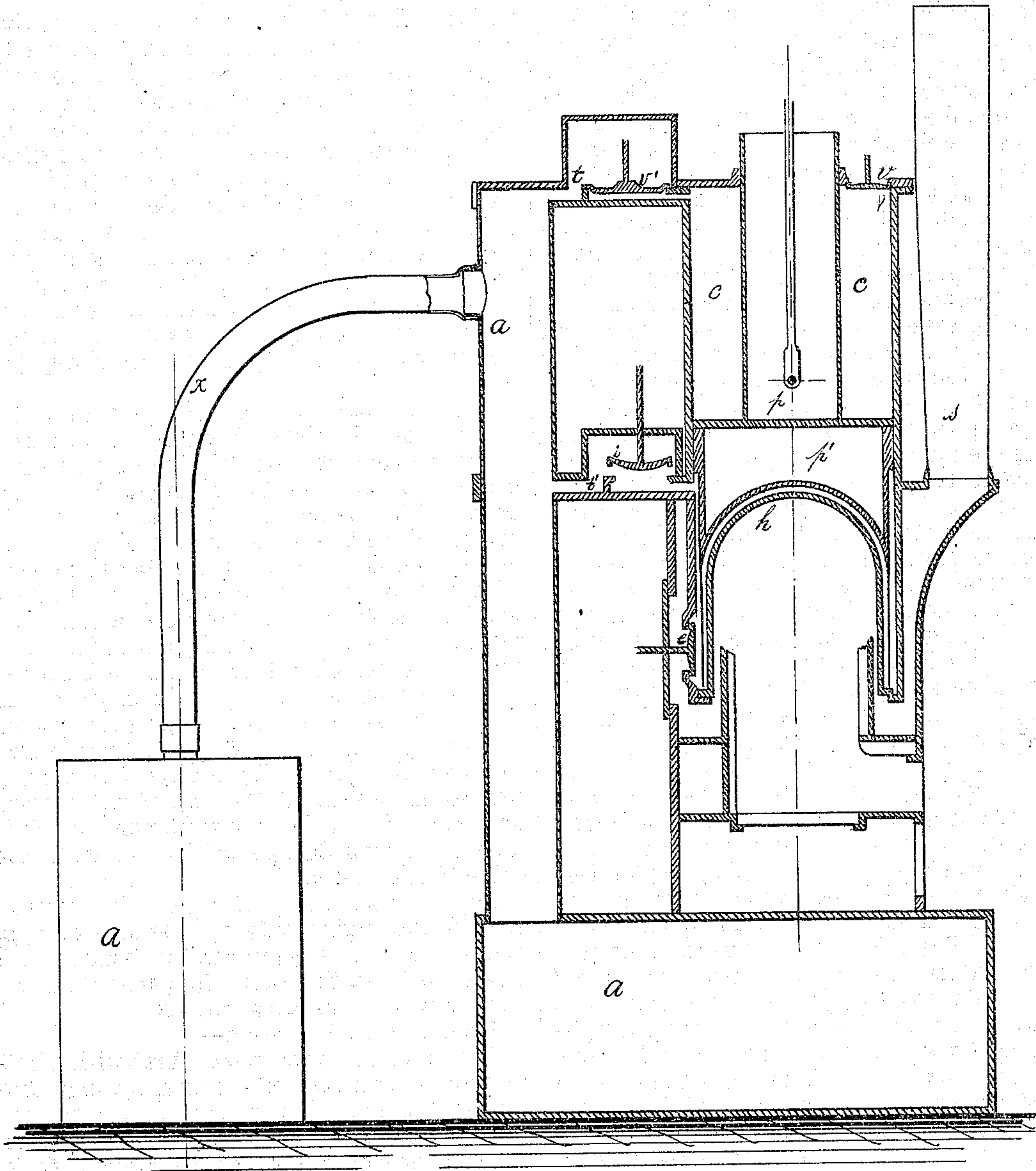


WILLIAM ALWORTH.

Improvement in Air-Engines.

No. 127,137.

Patented May 28, 1872.



— WITNESSES:—

Geo. H. Norcross.

J. E. Brown.

INVENTOR:—

William Alworth, by.

Geo. E. Brown, atty.

UNITED STATES PATENT OFFICE.

WILLIAM ALWORTH, OF SCRANTON, PENNSYLVANIA.

IMPROVEMENT IN AIR-ENGINES.

Specification forming part of Letters Patent No. 127,137, dated May 28, 1872.

Specification describing an Improved Air-Engine, invented by WILLIAM ALWORTH, of Scranton, Luzerne county, Pennsylvania.

This invention consists in a cold-air chamber combined with a hot-air engine, in the manner hereinafter described, the two having communication controlled by valves; the function of the former being to receive and store compressed cold air from the latter at each outward stroke of the piston, and to return such compressed air, intermediately heated, to the cylinder in order to move the piston, the compressed air in the chamber being the source of a uniform pressure on the inner side of the piston from the beginning to the end of the stroke.

The figure is a longitudinal vertical section. *c* is the cylinder aforesaid, and *p* the piston, the same having a tube, *p'*, open at the bottom, attached to its under side, which tube, when the piston is at its lowest position, incloses the heater *h*, which is directly over the fire-box and receives the air heated thereby. The first stroke of the piston must be produced by external force, and, during its course, the cold air in the cylinder above the piston becomes compressed until it acquires strength enough to lift the valve *v'*, situated in the trunk *t*, connecting the cylinder with the cold-air chamber *a* aforesaid. The valve *v'* being thus lifted, the compressed air escapes out of the cylinder *c* into the chamber *a*, whence a portion of it passes through the lower trunk *t'*, the valve *v* of the same being kept raised for this purpose during the ascent of the piston, to the outside of the drum *h*, where it is heated. When the piston arrives at or near the end of its outward movement, the valve *v'* falls by its own weight, and the valve *i* is closed by means of appropriate machinery—the same by which it is opened. At the same time the valve *e*, which controls the communication between the cylinder *c* and the smoke-pipe *s*, is opened, so that, as the piston descends, a part of the hot air beneath is allowed to pass off freely into the atmosphere. In the meantime the space in the cylinder above the piston is again filled with cold air, which passes through the induction-port at the top of the cylinder, the valve *v* of said port being forced open by external pressure, and being closed by a spring as soon as such pressure becomes less than the force of the

spring. The valves *i v'* remain closed, so that the cold air in the chamber *a* retains the degree of compression received by it from the piston. The piston having reached the end of its inward throw, the valve *i* is opened and cold air from the chamber *a* led into contact with the drum *h*, whereby it is expanded with heat and made capable of effecting the next up-stroke of the piston without external assistance. As the piston again rises it again compresses the cold air above it, forcing the air past the valve *v'* into the chamber *a*, and, as the piston descends the next time, it expels the warm air beneath it into the smoke-pipe, as before.

It is obvious that as soon as a sufficient quantity of cold air has been thus compressed into the chamber *a* to drive the piston when heated, inasmuch as the driving air has an inexhaustible elastic mass behind it, a nearly uniform force is exerted on the working side of the piston from the beginning to the end of the stroke, thereby giving to the engine a much greater working power and a more uniform movement than it could have if the cold air were forced directly from the condenser to the heater, as is done in other engines. In the latter case the piston begins its upward movement with the minimum of propulsive force, which is gradually increased as the piston ascends, until, at the end of the upward movement, it reaches the maximum, which is no greater than that gained by the use of the cold-air chamber *a*.

The chamber *a* may, if desired, be connected with the engine only by a flexible tube, *x*, and be placed in any practicable location with reference to it, the same pipe alternately receiving and discharging cold air.

I claim as my invention—

A cold-air chamber, *a*, combined with a hot-air engine by means of a trunk, *t*, which conducts cold air, under pressure, from the engine to the said chamber, wherein it is retained in its compressed condition, and a trunk, *t'*, which discharges compressed air from the said chamber to the heater *h* with uniform force from the beginning to the end of the stroke, all as specified.

WM. ALWORTH.

Witnesses:

J. A. PRICE,
A. B. JONES.