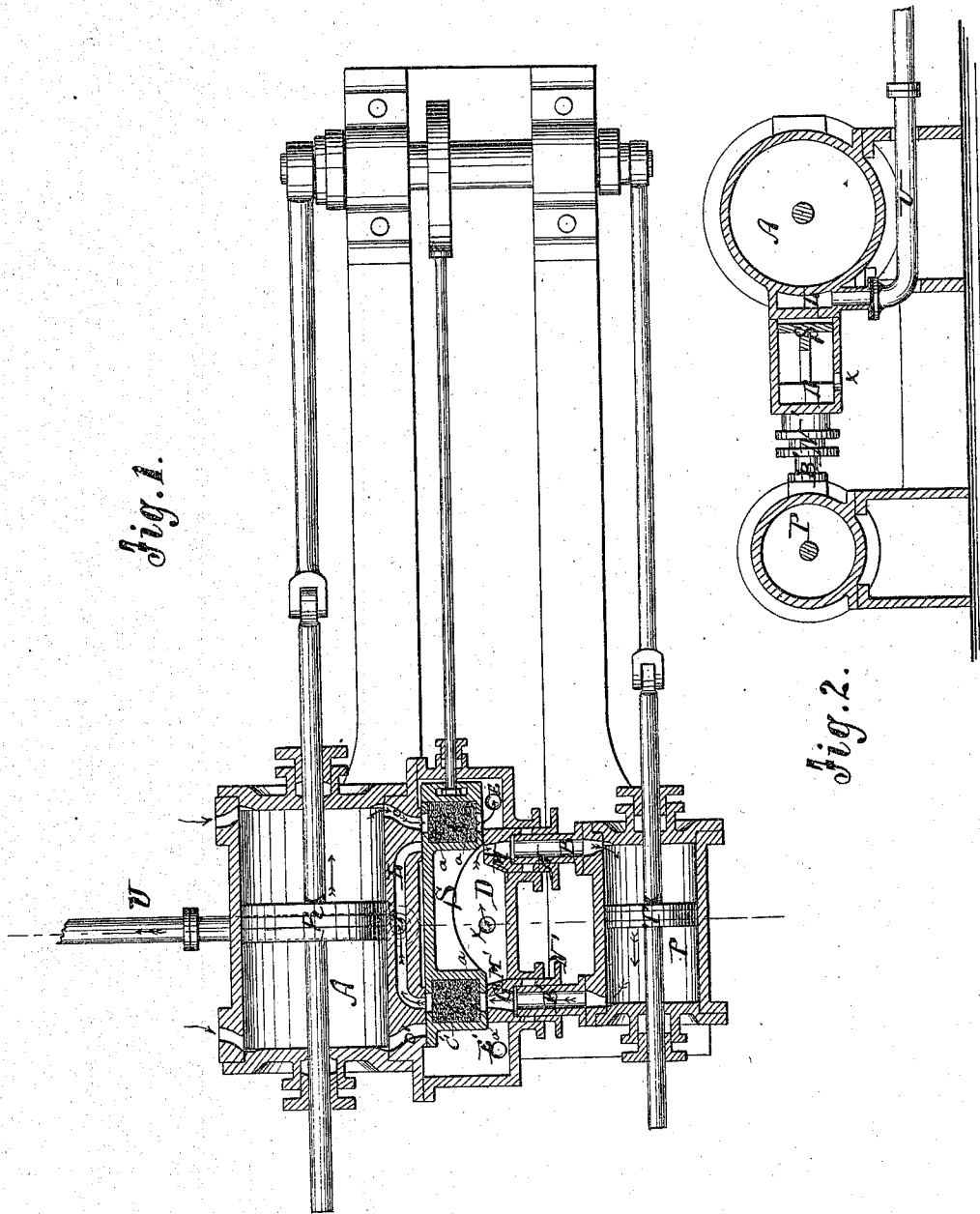


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Improvement in Steam and Air-Engines.

No. 131,736

Patented Oct. 1, 1872.



Witnesses:

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# UNITED STATES PATENT OFFICE.

ERNST L. BUCKUP, OF STAPLETON, NEW YORK.

## IMPROVEMENT IN STEAM AND AIR ENGINES.

Specification forming part of Letters Patent No. 131,736, dated October 1, 1872; antedated September 26, 1872.

### *To all whom it may concern:*

Be it known that I, ERNST L. BUCKUP, of Stapleton, in the county of Richmond and State of New York, have invented a new and useful Improvement in Steam-Engines, of which the following is a specification:

The nature of my invention consists in applying to the exhaust-ports of an engine driven by steam, air, or both combined, an apparatus for taking up the heat contained in such steam or air when leaving the engine, and in forcing cold air again through the apparatus to take up such heat and conduct a large portion of it back to the boiler or other source of power.

In all engines as at present constructed the heat in the exhaust is totally lost, being thrown out into the open air or destroyed in the condenser. In my engine, on the contrary, nearly all the heat that produced the power is conducted back again to the boiler with comparatively small loss of power.

Figure 1 represents a horizontal section of an engine provided with my improvement. Fig. 2 is a vertical transverse section of the same.

Similar letters of reference indicate corresponding parts.

I cause the steam, air, or both combined, when it exhausts from the driving-cylinder A of an engine, to pass through chambers C and C', which are filled with transverse partitions *a a* of wire-gauze that will take up the heat contained in such exhaust. The water produced by the condensing of the steam may remain in the interstices of the wire-gauze in minute particles. I then force a current of cold air, compressed by a piston, T, in an air-pump, P, through said chambers C C' and wire-gauze alternately. In doing so the air will expand by taking up the heat contained in the wire-gauze, and at the same time convert into steam a large portion of the water it meets. This heated air and steam are then conducted back into the boiler through a passage, L, check-valve F, and pipe V. The cylinder A draws its supply from a boiler in the same way as other engines, the piston R driving the engine in suitable manner. The air-pump cylinder P has a piston, T, driven in suitable way, preferably in the opposite direction to the piston R. Under certain conditions, however,

both pistons can be made to move in the same directions. The exhaust-chambers C C' above referred to are most conveniently arranged in the slide-valve S, which is moved by eccentric, or otherwise, in such a way that when the engine exhausts through C air is forced through C' in the opposite direction by the air-pump P. As soon as the engine passes the center the eccentric moves the slide-valve S to make the opposite connections. In this manner, while the port O of the cylinder A is opposite chamber C, exhausting through it and out through opening E, the port G of the cylinder P is open, drawing in a supply of air through an aperture, *x'*, and at the same time the port O' is closed by the slide-valve, and the piston T forces air through the part G' and chamber C' into the passage L which connects with the boiler. Although the opening and closing of the parts have thus been shown to be brought about by the motion of the slide-valve S, the same may be accomplished by means of other valves having a lifting or a rotary motion. The air-pump P requires no other valves, since the slide-valve S opens and shuts the required passages. To prevent the pressure in the boiler from reacting against the piston T at the time the pressure in the air-pump P is less than the boiler pressure, a check-valve, F, is placed in the passage L where the same leaves the cylinder A. Instead of only one check-valve two may be used, in which case the passage L would be branched.

The valve-chest D and slide-valve S may be placed on one side of the cylinders A and P, instead of being between them. Each cylinder has in that case a face for the slide-valve to work on, and the cylinders are placed closer together, and the joints with the slide-valve are made by means of springs or set-screws, or both.

When the two pistons R and T are made to move in the same instead of opposite directions the air must be conducted from where it leaves the inside of cylinder P through passages cast into the body of said cylinder, or otherwise, to their respective opposite ends before entering the exhaust-chambers C and C'.

The cylinder A and slide-valve S may also be so arranged that the engine receives the steam or air, or both, through the same open-

ings O and O' through which it exhausts. The slide-valve has in that case additional openings for connecting the ports O and O' with the inlet-pipes. Such an arrangement would be best suited for small engines, being more simple than to have separate valve or valves for letting the steam into the cylinder, as represented in Fig. 1.

I do not mean to confine myself, in the construction of these engines, to any particular position of the two cylinders A and P toward each other—whether they are side by side or one in front or above the other, and whether they are connected with different cranks or both with one only—as long as the operation of the slide-valve S, or its substitutes of valves, and pump P, is substantially the same in reference to main cylinder A.

The heated air leaving the chambers C C' may be used for other suitable purpose, and not only for further use in the boiler.

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

1. The combination of an air-compressing pump and two chambers filled with wire-gauze with an ordinary steam or air engine, driven so that the gauze shall absorb the heat from the exhaust and return it to the air forced through it by said pump, to be used again in the boiler or for other purpose, as set forth.

2. The slide-valve S containing the exhaust-chambers C C' filled with wire-gauze, substantially as and for the purpose herein shown and described.

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Witnesses:

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