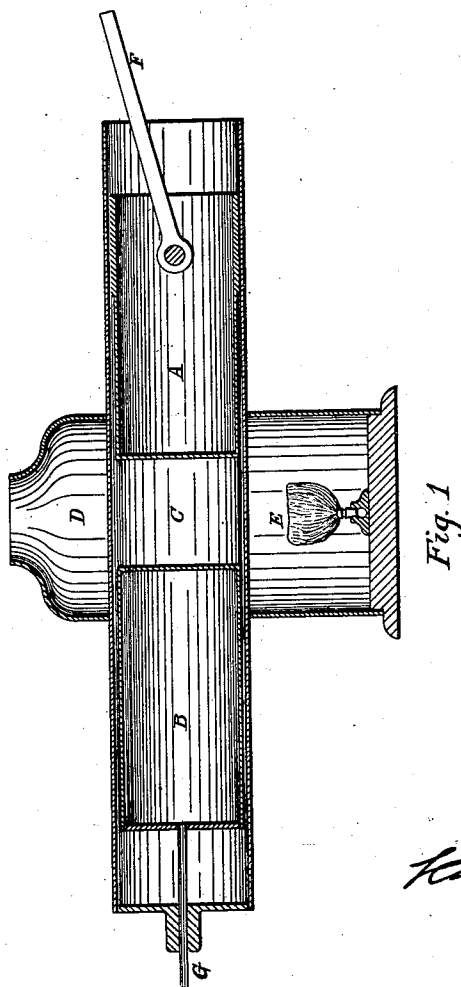
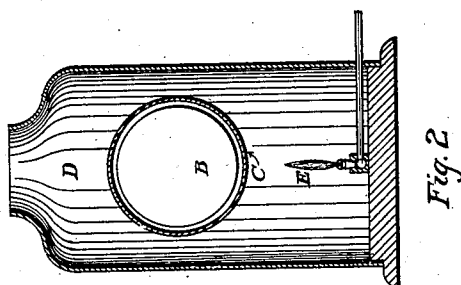
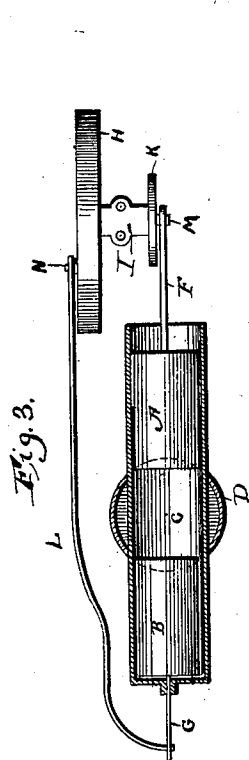


No. 723,660.

PATENTED MAR. 24, 1903.

H. ESSEX.
CALORIC ENGINE.
APPLICATION FILED FEB. 18, 1902.

NO MODEL.



Witnesses
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UNITED STATES PATENT OFFICE.

HENRY ESSEX, OF BUFFALO, NEW YORK.

CALORIC-ENGINE.

SPECIFICATION forming part of Letters Patent No. 723,660, dated March 24, 1903.

Application filed February 18, 1902. Serial No. 94,651. (No model.)

To all whom it may concern:

Be it known that I, HENRY ESSEX, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Caloric-Engine, of which the following is a specification.

My invention relates to an improvement in air-engines in which the same air is alternately heated and cooled and in which a displacer-piston and a working piston operate in the same cylinder; and the object of my improvement is to obtain a greater effective power. I attain this object by combining the cylinder, working piston, displacer-piston and furnace as illustrated in the accompanying drawings, in which—

Figure 1 is a vertical lengthwise section of these parts of a toy engine; and Fig. 2, a vertical crosswise section of the cylinder, displacer-piston, and furnace at a part of the stroke when a part of the displacer-piston is at the center of the furnace. Fig. 3 is a plan view, partly in section, of the invention, showing the connections between the pistons.

Similar letters refer to similar parts throughout the several views.

A represents the working piston fitting nearly air-tight at its front end in the cylinder C. In the same cylinder operates the displacer-piston B, but so loosely that the air passes freely between it and the cylinder.

D is the furnace, placed at the middle part of the cylinder.

E is a gas-flame; F, the connecting-rod; G, the displacer-piston rod.

In Fig. 3 the connections between the pistons are shown, H being a fly-wheel, I being the shaft carrying the same, and K a crank-disk on the shaft. The piston-rod G of the displacer-piston is connected to a crank-pin N on the fly-wheel by a link L. The crank-pin M for the connecting-rod F of the working piston is set about one-quarter turn displaced in relation to the crank-pin N of the link of the displacer-piston. By this when the displacer-piston is all the way in the working piston will be about half-way on its movement out.

The surrounding air is sufficient for cooling the ends of the cylinder in this toy engine, so no water-cooling jackets are shown. The working and displacer pistons are so connected that the displacer-piston first moves away from the furnace. The air between the pistons is then heated by the furnace. Then

the expanding air forces out the working piston. Then the displacer-piston moves toward the furnace. The air then cools. Then the contracting air allows the outside air to force the working piston in.

In other air-engines having the displacer-piston and working piston operating in the same cylinder the furnace has been placed at the end of the cylinder, and the full effect of the expanding air could not be exerted on the working piston because the air had to pass by the cool end of the displacer-piston and become cooled before it could get at the working piston, and consequently in such engines only about half as long a stroke as that of the displacer-piston could be obtained for the working piston. My improvement of placing the furnace midway of the cylinder gets the expanding hot air directly and with full effect against the working piston, and consequently makes about as long a stroke for the working piston as for the displacer-piston, thus doubling the efficiency.

I do not confine myself to any particular way of making the cylinder, the furnace, the displacer-piston, or the working piston. Obviously in larger engines packing-rings or leather packing might be necessary to make the working piston keep tight in the cylinder, and water-cooling jackets would be necessary to keep the ends of the cylinder cool.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. The combination in an air-engine, of the single cylinder C having a free interior space from end to end, the working piston A, operating in one end of the said cylinder, the coaxial displacer-piston B, operating in the other end of said cylinder, and the furnace D, placed at the middle part of said cylinder so as to heat the air in the free space between said working piston and said displacer-piston, substantially as described.

2. In combination, an upright furnace D, a cylinder extending through the same and supported thereby and a displacer and working piston operating in the opposite ends of the cylinder, the said furnace being arranged to heat the space between the pistons, substantially as described.

HENRY ESSEX.

Witnesses:

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