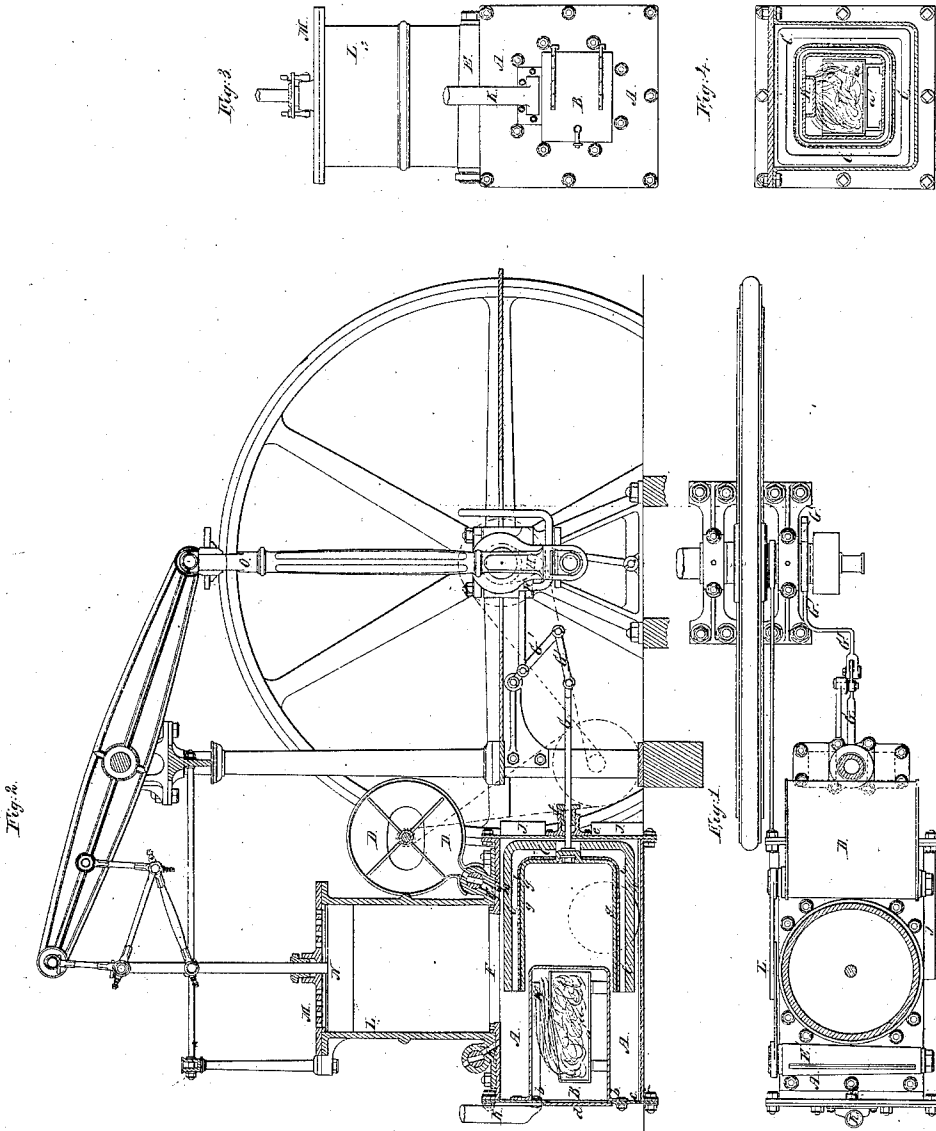


No. 6,301.

PATENTED APR. 10, 1849.

F. J. LAUBEREAU,
AIR ENGINE.



UNITED STATES PATENT OFFICE.

FRANCOIS JOS. LAUBEREAU, OF PARIS, FRANCE.

AIR-ENGINE.

Specification of Letters Patent No. 6,301, dated April 10, 1849.

To all whom it may concern:

Be it known that I, FRANCOIS JOSEPH LAUBEREAU, of Paris, in the Republic of France, have invented new and useful Improvements in the Caloric Engine Operated by the Contraction and Expansion of Atmospheric Air or other Permanently Elastic Gas, and that the following is a full, clear, and exact description of the principle or character which distinguishes my improvements from all other things before known and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a plan of my improved engine; Fig. 2, a longitudinal vertical section thereof; Fig. 3, a front elevation of the cylinder and furnace; an Fig. 4, a cross vertical section of the air dilating and contracting apparatus. The same letters indicate like parts in all the figures.

Numerous attempts have been made to employ the elastic force of atmospheric air and the other permanently elastic gases, as a motive power; but so far as I have been able to ascertain, without marked success.

It is a well established law that the permanently elastic gases are doubled in bulk and pressure by about 480 degrees of Fahrenheit's scale, and all the attempts to apply the mechanical force due to the dilation and contraction of the permanently elastic gases, of which I have any knowledge have failed for the reason that the air or other gas was not dilated and contracted with sufficient rapidity and economy to compete with steam and other motive powers.

My invention is based on the general principle of Earling's engine patented some years since in which atmospheric air is alternately dilated and contracted by absorbing and giving out caloric, the air when expanded by heat forcing up a piston in a cylinder, which is in turn forced down by the pressure of the atmosphere when the air is condensed by the abstraction of heat—the air for the alternate dilation and contraction being carried over a heating and cooling surface by the motion of a plunger in a cylinder or other formed vessel that communicates with the cylinder of the engine.

The principle or character of my invention which distinguishes it from Earling's engine and all others before known, consists in making the plunger hollow with its

external and internal surfaces made of some good conductor of caloric separated by a non-conductor, the said plunger being adapted to move within a surrounding cooling vessel and so combined with a heating vessel made of some good conductor of caloric and heated by the application of heat internally, that the said hollow plunger shall alternately cover and uncover it and thus cause the contained air alternately to pass over the heated surfaces to dilate it, and then over the cold surfaces to contract it, the said surrounding vessel being in connection with a cylinder or other vessel to which is adapted a working piston.

In the accompanying drawings (A) represents a vessel made of iron or other good conductor of caloric of a quadrangular form and with a head at each end. Inside of this and at one end is a furnace (*a*) consisting of a grate (*a'*) and flue (K) of any desired construction and surrounded by what I denominate a heater (B); and this heater is simply a hollow vessel made of sheet copper of the form of the surrounding vessel (A), but of less diameter and about half its length. It is closed at the inner end and secured by flanches (*b, b*) and screw bolts to the front head (*c*) of the surrounding case, the said head being provided with a door (*d*) for giving access to the furnace within. The other head (*e*) of the surrounding case (A) is provided with a stuffing box (*f*) through which passes a piston rod (G) the inner end of which is attached to a hollow plunger (C) which works freely within the surrounding case and over the heater (B) but without touching either. This plunger is made with its internal surface (*g*) and its external surface (*h*) of copper, iron, or other good conductor of caloric with some non-conductor of caloric interposed between the two as at (*i*). It is guided in its motions by the piston rod to which it is attached, and the bottom may be provided with guide wheels running on small rails. The length of this plunger is such that when moved in one direction it shall entirely surround the heater (B), and when moved back uncover the whole or nearly the whole surface of the heater. And the space between the heater and plunger, and between the plunger and surrounding vessel should be such as to leave a free passage for the air, yet so narrow as to cause the air to pass over the heating and cooling

surfaces in a thin film to insure the rapid absorption of caloric.

The vessel (A) is surmounted by a cylinder (L), similar to the cylinder of a steam engine except that the upper head (M) is perforated for the free access of the atmosphere, and the lower end is open, as at (F) to communicate with the inside of the vessel (A). This cylinder is provided with a piston (N) with the connections in the manner of a steam engine piston for communicating its motion to a crank shaft (O). The vessel (A) is also provided with one or two turning valves or cocks (E', E) for admitting and discharging air when desired. The end (e) of the surrounding vessel (A) is surrounded by a cooler (J) that is a hollow vessel through which cold water or other cooling fluid may be made to circulate by the rotating fan or in any desired manner.

The outer end of the piston rod (G) is connected by a joint link with a rocking arm (G') which in turn is connected with a sliding frame (P) which surrounds a cam (H) on the crank shaft, so that the rotation of this shaft, by the motion of the piston of the engine shall communicate at the appropriate time a reciprocating motion to the hollow plunger to alternately cover and uncover the heater.

The operation is as follows: Before heat is applied to the heater, air is admitted under the pressure of the atmosphere through one of the valves or cocks (E). Fire is then made in the furnace until the contained air is dilated; a portion of which is then permitted to escape through one of the valves or cocks (E) which is then closed. The heat is then continued until it has acquired sufficient elasticity to force up the piston. This communicates motion to the crank shaft, and towards the end of this upward motion of the piston the cam (H) moves the plunger until it covers the heater, and this motion of the plunger causes the air contained within it to pass between its outer surface and the inner surface of the surrounding vessel and to accumulate at the back end of the plunger, so that the heat being entirely shut in, the air is cooled by contact with the cold surface of the surrounding case and outer surface of the plunger, the air thus contracted producing a partial vacuum which permits the piston to be forced down by the pressure of the atmosphere above. As the piston ap-

proaches the end of its downward stroke, the cam moves back the plunger which transfers the cold air from the outside to the inside thus causing it to pass in a thin film over the surface of the heater and the inner and heated surface of the plunger. It is thus again dilated that by its elasticity it may again force up the piston. In this way each stroke of the plunger causes the air to pass over the heated surfaces to dilate it, and then over the cold surfaces to condense it. The plunger also having the effect to shut in the heat of the heater receiving heat therefrom in the meantime whilst its external surface is kept cold by the surrounding case, the non-conductor interposed between them preventing the heat of the internal surface from being transmitted to the external surface.

It will be obvious from the foregoing that the heater, plunger, and surrounding case may be made round, square, or any other form, provided they are so formed that the plunger may move between the other two and cause the air to pass from its inner to its outer surface. It will also be obvious that the heater may be heated in any manner desired although I prefer doing this by means of a furnace within it; and so with reference to the connection of the air dilating and contracting apparatus with the engine to be impelled and with the plunger. These connections may be made in any manner desired which will effect the purpose contemplated by me as these are not of the essence of my invention.

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

1. Combining with the surrounding cooling vessel a hollow plunger made with its external and internal surfaces of some conductor of caloric, separated by some non-conductor, substantially in the manner and for the purpose specified.

2. And I also claim the hollow plunger, substantially as herein described, in combination with the heater which it alternately covers, substantially as herein described, for alternately heating and cooling the air, as described.

F. J. LAUBEREAU.

Witnesses:

A. P. BROWNE,
M. GRANDIN.