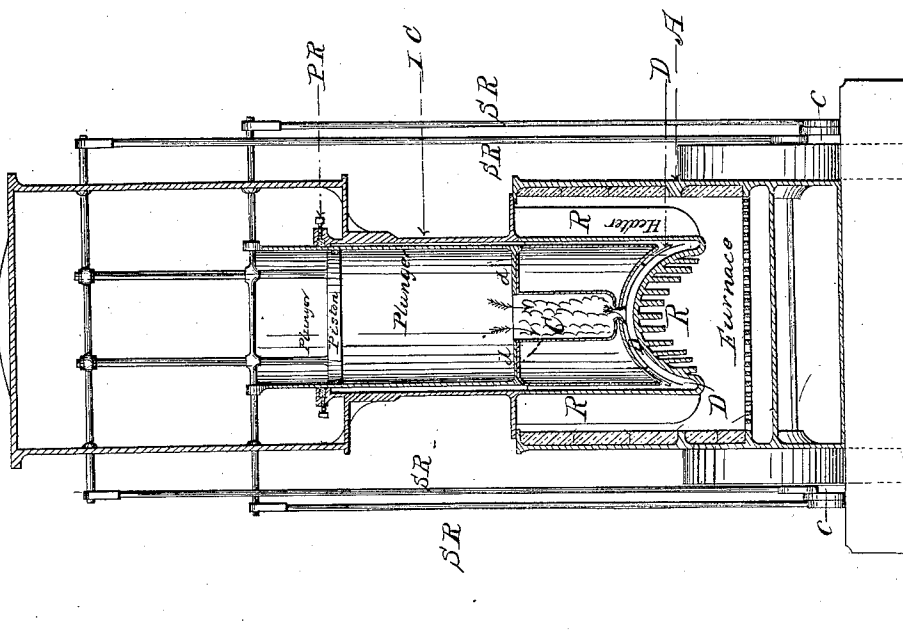


T. McDONOUGH.  
HOT AIR ENGINE.

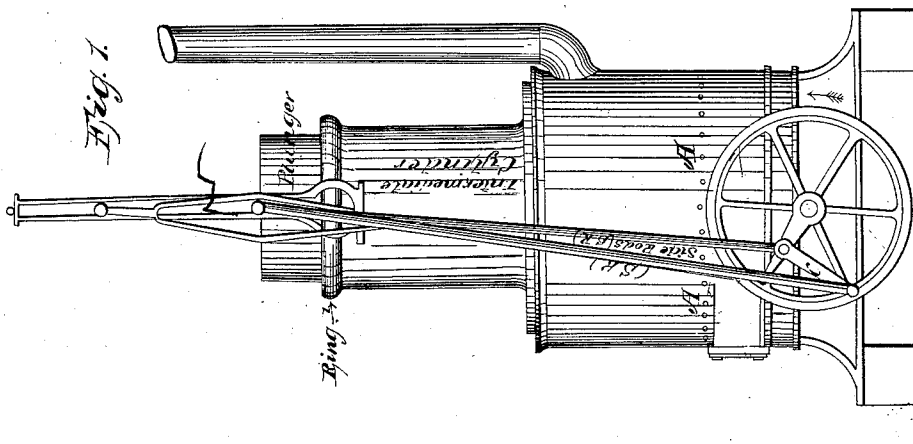
No. 34,155.

Patented Jan. 14, 1862.

*Fig. 2.*



*Fig. 1.*



Witnesses:

*N. S. Binal*  
*H. O. Cornwell*

*Inventor:*  
*Thomas McDonough*

# UNITED STATES PATENT OFFICE.

THOMAS McDONOUGH, OF MIDDLETOWN, CONNECTICUT.

## IMPROVED HOT-AIR ENGINE.

Specification forming part of Letters Patent No. 34,155, dated January 14, 1862.

*To all whom it may concern:*

Be it known that I, THOMAS McDONOUGH, of Middletown, in the county of Middlesex and State of Connecticut, have invented new and useful Improvements in Air-Engines; and I do hereby declare that the following is a full and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is an outside elevation, and Fig. 2 is a section of the elevation in a plane at right angles to the elevation as viewed in Fig. 1.

My improvements consist, essentially, in the employment of the plunger as a cylinder and a chamber to contain the wires that take up the heat while it also does the usual duty of the plunger in air-engines. The plunger consists of a cylinder turned on the inner and outer surfaces and open at the upper end. Within the lower part of it a chamber *ch* is made to contain the spiral coils of wire which absorb and impart the heat. The bottom is closed; but it has a hole through the bottom sheet, by means of which the air passes in and out of the plunger through the chamber. Upon the bottom sheet a bowl *D* is fastened at such a distance from the sheet that an opening is left between the edge of the bowl and the lower edge of the plunger equal to the area of the hole in the bottom of the plunger, in order that the air passing from the interior of the plunger between the bottom sheet and the bowl *D* may be blown with force against the sides of the heater. The chamber *ch* is filled with small wire spirals, which form passages for the movement of the air, which gives and absorbs heat to and from the spirals on its flow in and out of the plunger. A piston is placed in the upper part of the plunger and slides between the upper edge and the top of the chamber. This plunger is placed in an open cylinder *Ic*, having a packing-ring *PR* at its upper end and standing upon the top of the heater, which is made

with ribs *RR*. The piston is connected by side rods *SR* to crank-pins in the fly-wheels beneath the furnace, and the plunger is connected in a similar manner to cranks *cc*, Figs. 1 and 2, fastened upon the crank-pins. On turning the wheels either by hand or power the plunger is moved in and out of the heater, and the air within the machine being alternately heated in the heater and cooled in the plunger the difference of its volume causes a movement of the piston as follows, viz: When the plunger is pressed into the heater, the air is moved through the hole in the plunger-bottom and through the chamber *ch* into the plunger and there cooled, so as to form a partial vacuum into which the piston moves and gives the fly-wheels one-half a revolution. When the plunger is moved out of the heater, the air passing from the plunger through the chamber into the heater forces out the piston by its expansion and gives the wheels a second half-revolution. The movement is continued by means of the momentum acquired.

I am aware that pistons and plungers have been used together in the same cylinder, the plungers being closed at the ends and having a packing-ring moving with the plunger, and thus exposing the inner surface of the cylinder alternately to cool and to heated air. I disclaim all these and similar arrangements.

I claim and desire to secure by Letters Patent—

1. A plunger containing a piston and a chamber and moving through a fixed packing-ring, substantially as described.
2. The bowl *D* upon the end of the plunger, substantially as described.
3. The connection of the piston and fly-wheels by side rods, in combination with the open plunger, substantially as described.

THOMAS McDONOUGH.

Witnesses:

SILAS G. MILLER,  
CLARK ELLIOTT.