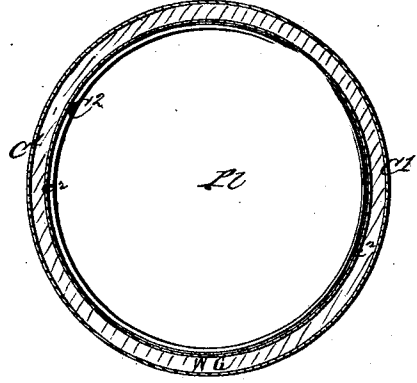
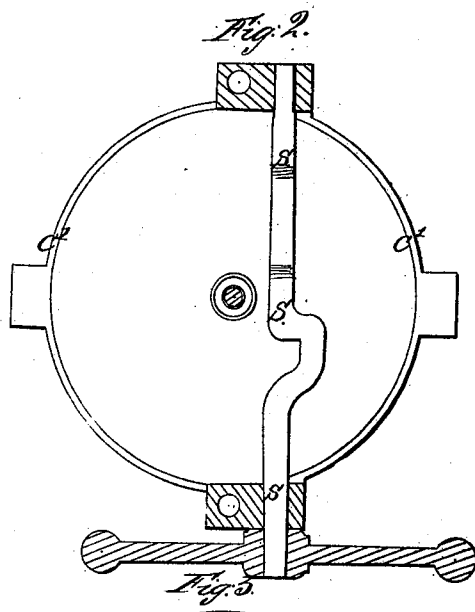
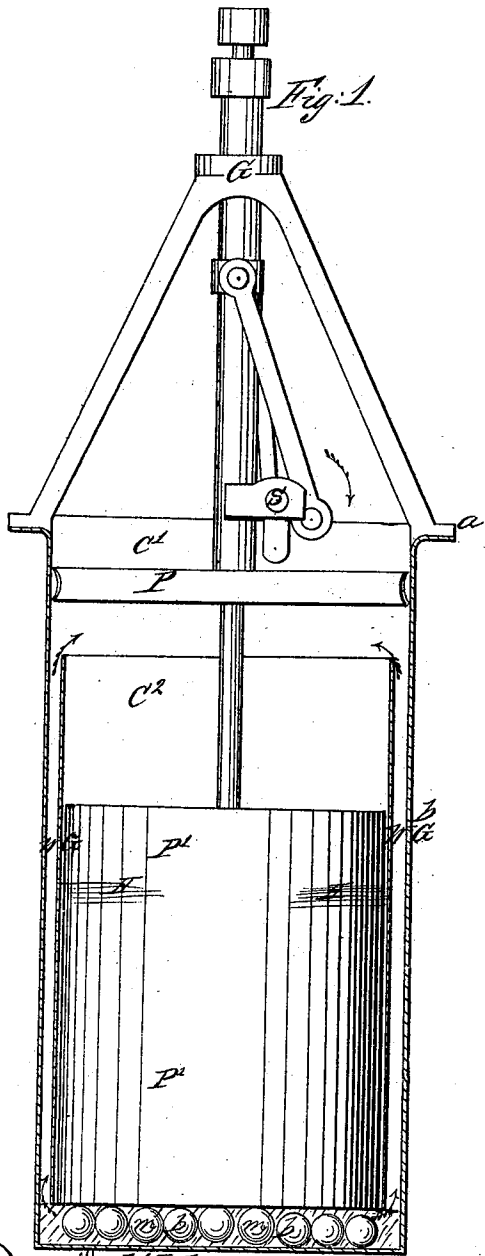


T. M. Donough.
Hot-Air Engine

N^o 96,335.

Patented Nov. 2, 1869.



Witnesses:
Geo. L. Cox

Inventor:

Thomas M. Donough

United States Patent Office.

THOMAS McDONOUGH, OF NEWBURG, NEW YORK.

Letters Patent No. 96,335, dated November 2, 1869.

IMPROVEMENT IN HOT-AIR ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

Be it known that I, THOMAS McDONOUGH, of Newburg, in the county of Orange, and State of New York, have invented a new and useful Improvement on the Air-Engine; and I do hereby declare that the following is a full, clear, 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 a longitudinal elevation in section;

Figure 2 is a transverse section at the part marked *a* in fig. 1; and

Figure 3, also a transverse section at *b* in fig. 1.

I make a cylinder, *c*¹, either of sheet or cast-iron, closed air-tight at the bottom, and open at the top.

Within this I put a thin sheet-iron cylinder, *c*², open at both ends, and shorter than the external cylinder *c*¹.

This is cut with openings around its lower edge, so as to touch the bottom of *c*¹ in but few places.

The space between the two cylinders is filled with wire gauze *W G*.

Within the inner cylinder *c*², I place a plunger, *p*¹, which has hemp packing *H H* wrapped around it, near its upper end, so that it may slide nearly air-tight in *c*².

A piston, *P*, with ordinary packing, slides in the upper or open end of *c*¹, with a hollow piston-rod running through a guide above it.

The plunger-rod runs through this piston-rod, and each of the rods is connected to one of two cranks on a shaft, *S*, placed across *c*¹, as near the centre as the piston-rod will allow.

A fly-wheel is fastened on this shaft.

Small metal balls *m b* are dropped into the inner cylinder, so as to lie on the bottom of the outer cylinder.

The machine is then stood upon a small furnace or over a gas-jet, till the bottom is heated.

The contained air that is below the piston, having no communication with the external air, on moving the wheel in the direction indicated by the arrow near the shaft in fig. 1, the plunger, in rising, moves the air that is between its top and the piston, down through the wire gauze and the balls.

By its heating and expansion, this air moves up the piston.

By continuing to turn the wheel, and moving the plunger down, the air is forced back through the wire gauze, and parting with its heat, is left cool between the plunger and piston.

The external air now presses the piston down into this partial vacuum, caused by the air being cooled, and the machine completes one revolution, after which it will continue to act, increasing its speed to two hundred revolutions per minute, and furnishes power sufficient to drive sewing-machines or other light work.

The machine may be stopped either by pressure against the wheel, or by opening a cock at any part below the piston, so as to communicate with the external air.

I claim, and desire to secure by Letters Patent—

1. The arrangement of the shaft directly over the cylinder, substantially as described.

2. The combination of the two cylinders with the balls and shaft, to form an air-engine, substantially as described.

THOMAS McDONOUGH.

Witnesses:

DARWIN W. ESMOND,
JNO. C. NOE.