

F. BILL.
CALORIC-ENGINE.

No. 175,648.

Patented April 4, 1876.

Fig. 1.

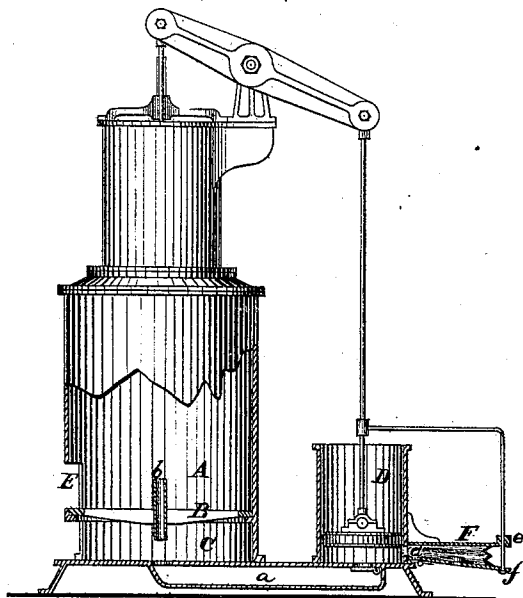
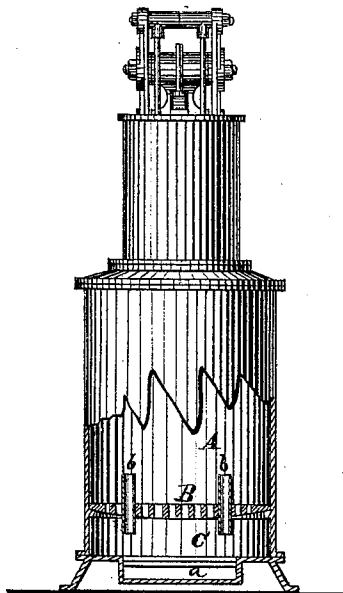


Fig. 2.



Witnesses

Otto Hufeland.

Hugo Briggemann

Inventor.

Frank Bill per

Van Santvoord & Hauff

Attorneys

UNITED STATES PATENT OFFICE.

FRANK BILL, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN CALORIC ENGINES.

Specification forming part of Letters Patent No. **175,648**, dated April 4, 1876; application filed February 19, 1876.

To all whom it may concern:

Be it known that I, FRANK BILL, of the city of Brooklyn, county of Kings and State of New York, have invented a new and useful Improvement in Caloric Engines, which improvement is fully set forth in the following specification, reference being had to the accompanying drawing, in which—

Figure 1 represents a longitudinal vertical section. Fig. 2 is a transverse section of the furnace.

Similar letters indicate corresponding parts.

This invention consists in the combination of tubular air-conductors with the grate of the furnace of a caloric engine and with the air-pump, so that the air injected by the air-pump into the chamber of the furnace beneath the grate can freely ascend through said air-conductors, where the same becomes heated, and that the full benefit of the air injected by said air-pump is obtained; also, in the combination of a pair of bellows with the air-pump of a caloric engine, said bellows being operated from the working-beam or main shaft of the engine, so that, when the plunger of the air-pump rises, the bellows inject into said air-pump a quantity of air, and thereby the effect of the air-pump and, consequently, the power of the engine are materially increased.

In the accompanying drawing I have shown my improvements as applied to what is known as "Roper's Caloric Engine," but it must be remarked that said improvements are applicable to all kinds of caloric engines which are provided with an air-pump and with a furnace for heating the air injected by said air-pump.

In said drawing, the letter A designates the furnace of a caloric engine, and B is the fire-grate, which is situated in said furnace, and below which is left a closed space, C, which communicates by a channel, *a*, with the air-pump D. The grate is made in two or more sections, so that it can be readily introduced or removed through the fire-door E, and each section of said grate is provided with one or more tubular air-conductors, *b b*, which extend up through the fuel spread on

the grate, and which are open at top and bottom, so that the air injected into the chamber C can pass up freely through said air-conductors, which, being in direct contact with the incandescent fuel, becomes highly heated, so that the air in passing through them is also heated. A portion of the air injected by the air-pump, however, passes up through the interstices of the grate, so that the fuel is always supplied with the requisite amount of oxygen to support combustion. By the air, which passes up through the air-conductors *b b*, the unconsumed combustible gases which rise from the fuel are consumed, and the effect of the caloric engine is improved. With the air-pump D is combined a pair of bellows, E, which connect with the suction opening *d* of said pump, and which are operated from the working-beam, or from the main shaft of the engine, being connected in such a manner that while the plunger of the air-pump rises, a quantity of air is injected into said air-pump, and thereby the effect of the air-pump and of the whole engine is greatly increased.

In air-pumps of the ordinary construction, the air which is sucked into the cylinder of said pump when the plunger rises produces a disagreeable noise. By the application of my bellows the noise is obviated.

The bellows F, shown in the drawing, are composed of the stationary plate *e* and the oscillating suction-plate *f*, both plates being connected by leather or other flexible material.

I do not wish to be restricted, however, to any particular kind of bellows, since bellows of different construction may be substituted for that shown in the drawing without changing the effect.

It must be remarked that the air-conductors can be made with a round or any other suitable cross-section, and that said air-conductors are inserted loosely into the grate, so that they can be renewed whenever it may be required.

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

1. The combination of tubular air-conductors with the grate of the furnace of a caloric

engine and with the air-pump D and connection *a*, substantially as and for the purpose described.

2. The combination of a pair of bellows with the air-pump D and operating mechanism, as described, and with the furnace A of a caloric engine, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 12th day of February, 1876.

FRANK BILL. [L. S.]

Witnesses:

W. HAUFF,

E. F. KASTENHUBER.