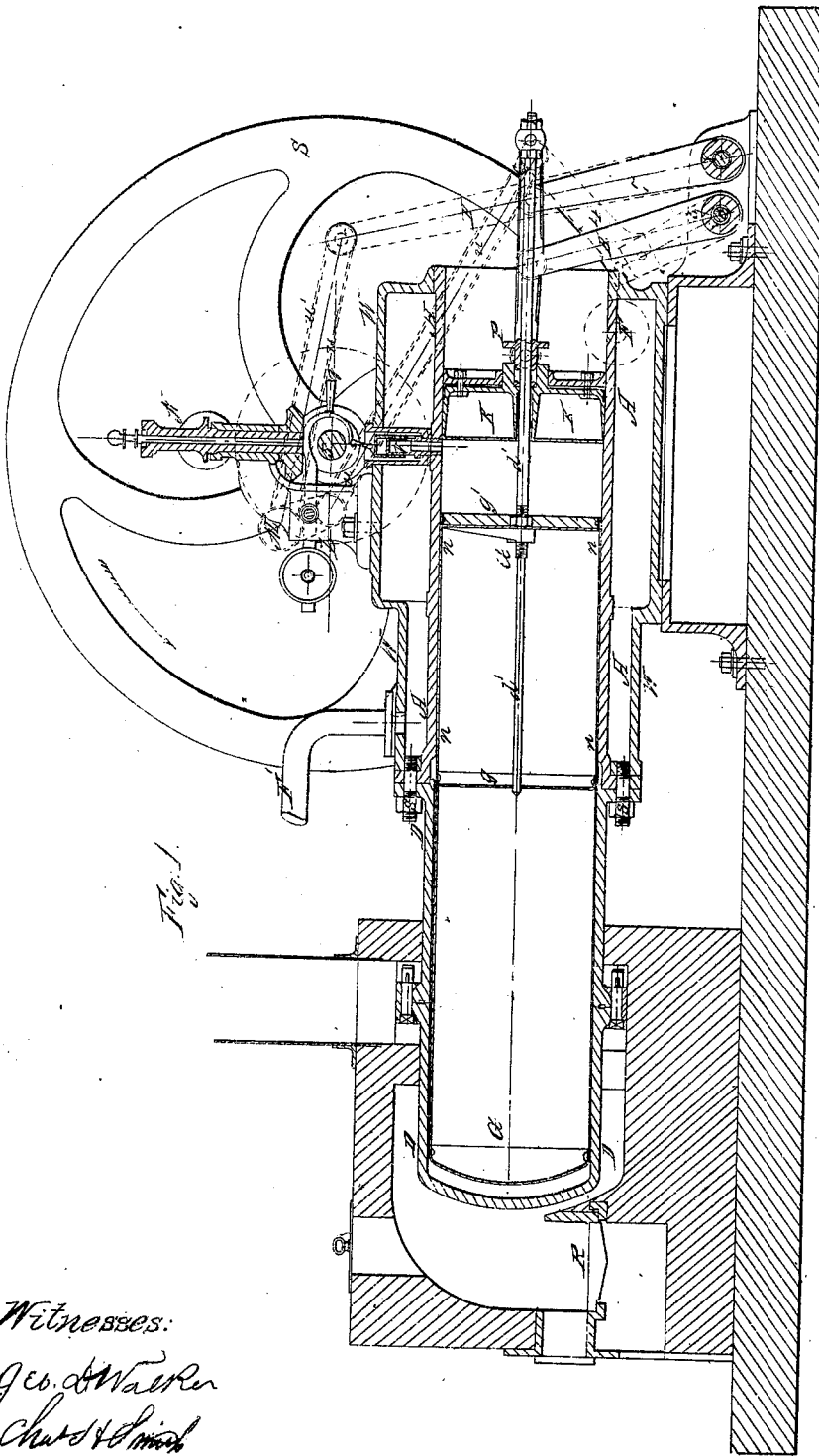


No. 91,239.

PATENTED JUNE 15, 1869.

W. LEHMANN.  
HOT AIR ENGINE.

3 SHEETS—SHEET 1.



Witnesses:  
Geo. A. Walker  
Chas. Schmidt

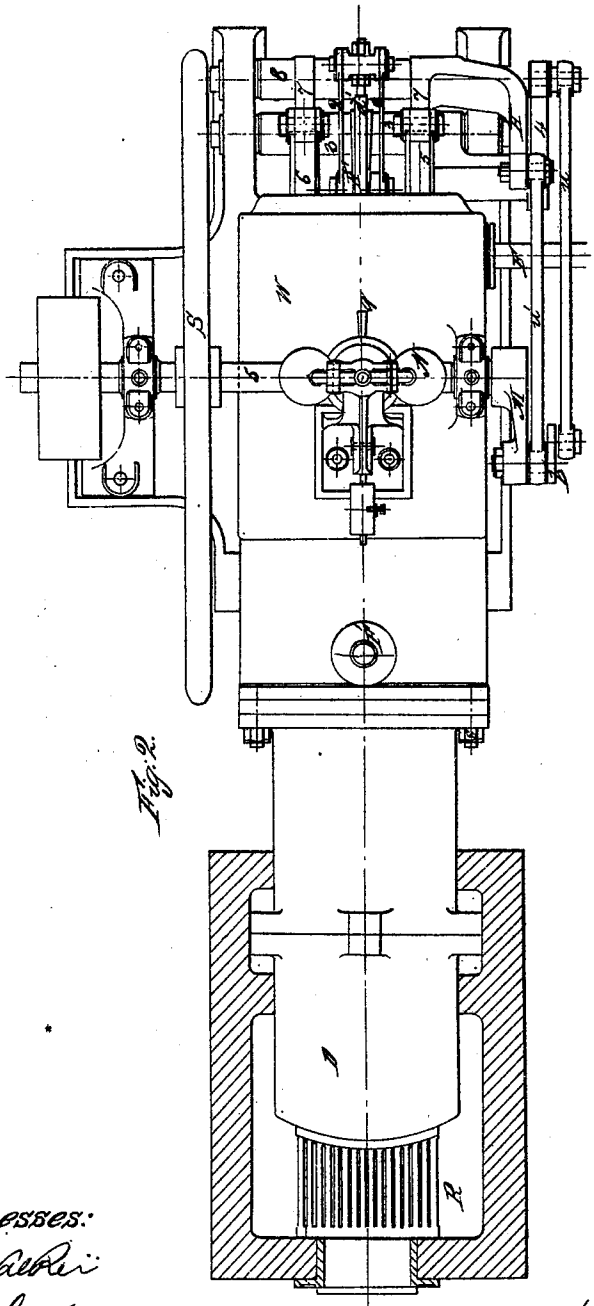
Inventor:  
W. Lehmann  
A. M. Lowell  
Atty

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HOT AIR ENGINE.

3 SHEETS—SHEET 2.



*Fig. 2.*

*Witnesses:*  
*Geo. W. Alden*  
*Chas. Smith*

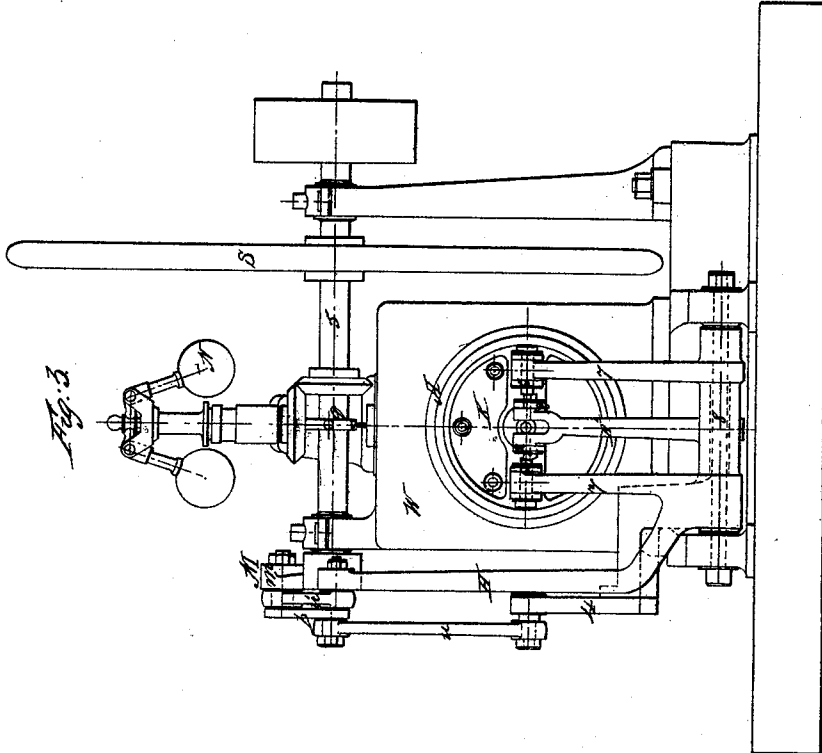
*Inventor:*  
*W. Lehmann*  
*per L. N. Snell*

No. 91,239.

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W. LEHMANN.  
HOT AIR ENGINE.

3 SHEETS—SHEET 3.



Witnesses:

*Geo. Walber*  
*Chas. Smith*

Inventor:

*L. W. Lovell*  
*att. for*  
*W. Lehmann*

# United States Patent Office.

WILHELM LEHMANN, OF NUREMBERG, GERMANY, ASSIGNOR TO HIMSELF AND STEHN & WULFING, OF NEW YORK CITY.

Letters Patent No. 91,239, dated June 15, 1869.

## IMPROVEMENT IN HOT-AIR ENGINE.

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

To all whom it may concern:

Be it known that I, WILHELM LEHMANN, of Nuremberg, Bavaria, Germany, have invented and made a new and useful Improvement in Caloric-Engines; and I do hereby declare the following to be a full, clear, and exact description of the said invention, reference being had to the annexed drawing, making part of this specification, wherein—

Figure 1 is a longitudinal section of said caloric-engine;

Figure 2 is a plan of the same; and

Figure 3 is a front elevation.

Similar letters denote the same parts.

The object of this invention is to protect the packings and working-parts from injury by the heat, dust, and friction usual in hot-air engines, and that the oil, or lubricating-material, can be used without being charred.

In consequence of my peculiar construction, high speed and increased power can be obtained in proportion to the size of the engine.

There is no unpleasant smell from the oil. The volume of air employed is confined in the engine, and but little inconvenience is experienced from these engines, even in warm weather.

Any character of fuel may be employed. There is no danger of explosions, and the engine is simple in its construction, can be attended by an ordinary mechanic, and can be very easily kept in repair.

My invention consists in an air-heating vessel, or "hat," with a closed end, placed in a furnace and connected with the engine-cylinder, in combination with a main piston and a displacement-cylinder, and a water-jacket surrounding the main cylinder.

By this construction the air between the displacement-cylinder and piston is forced into the space between the displacement-cylinder and hat. There it is heated, and acts to move the displacement-cylinder. Then the further movement of the parts causes the air to pass between the displacement-cylinder and the main cylinder, so that it is cooled and its bulk lessened, allowing of the reverse movement of the engine.

In the drawing—

A is the main cylinder, to which is united, by the bolts *s*, the air-heating vessel D, the end of which is shaped somewhat like a hat, and is to be introduced within any suitable furnace or heating-apparatus.

I have shown a furnace, R.

The end-portion of this air-heating vessel D is removable, so as to be changed in case of being burned out.

Around the cylinder A is a water-jacket, W, with an inlet at F, and an escape-pipe, F'.

These are to be connected with a reservoir, and the water should circulate through the jacket so as to be kept cool, and, where the body of water is sufficient to diffuse the caloric, it will not be necessary to replenish the same on account of becoming warm.

The cylinders A and D contain the displacing-cylinder G, that is made of sheet-metal, riveted firmly, so as to be air-tight, and within it is a head, *g*, and, at the end next the piston K, is a head, *g'*.

This cylinder G is fitted to slide freely, in brass or other guides, attached to the inside of the cylinder A, as at *n*, there being an air-passage between the cylinders G and A.

The piston-rod *d* is connected to the heads *g g'*, and passes through a stuffing-box in the piston K, and connects, by slings 2 2, with the crank H', on a rock-shaft, 3, an arm, 4, from which connects, by the rod *u*, with the crank *b*, on crank M of the shaft 5 of the fly-wheel S.

The piston K is connected, by the links 6, to the crank-arms 7, on the rock-shaft 8, and, from the arm H, a link, *u'*, connects to the crank M.

A valve, V, is provided, that can be operated by the handle *q*, or by the governor N, to let air into the engine, or allow air to pass out, if necessary.

The governor N is of any usual character, and forms no part of this invention.

It will be understood, upon reference to fig. 1, that the fly-wheel S, moving in the direction shown by the arrow, the displacement-cylinder G moves toward K, and that the piston K, for a short distance, moves toward *g'*.

The cranks H H' are so placed that this movement takes place to expel the air from between *g'* and K, and send it into the hat D.

There it is heated, and acts, by its expansion, against the end of G, to complete the stroke and carry the crank M past its dead-point, so that both the pistons K and cylinder G will be moving in the same direction as the air expands.

The crank *b*, turning the centre before the crank M, causes the distance between *g'* and K to increase, transferring the air from the hat D to the cylinder A, where it is cooled, to produce a minus pressure, that causes a reaction on the parts moving the piston K in the other direction, the crank M having by this time turned its dead-centre, and the operations are repeated.

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

The air-heating cylinder, or "hat," D, the cylinder A, with water-jacket W, in combination with the displacement-cylinder G, piston K, and connections to the fly-wheel shaft, substantially in the manner set forth.

In testimony whereof, I have hereunto set my name, in presence of two subscribing witnesses, this 1st day of February, A. D. 1869.

W. LEHMANN.

Witnesses:

PHILIP GEISSE,  
NICOLL HALSEY.