(No Model.) 2 Sheets—Sheet 1.

J. EVANS.

HEATING FURNACE.

No. 296,399. Patented Apr. 8, 1884.

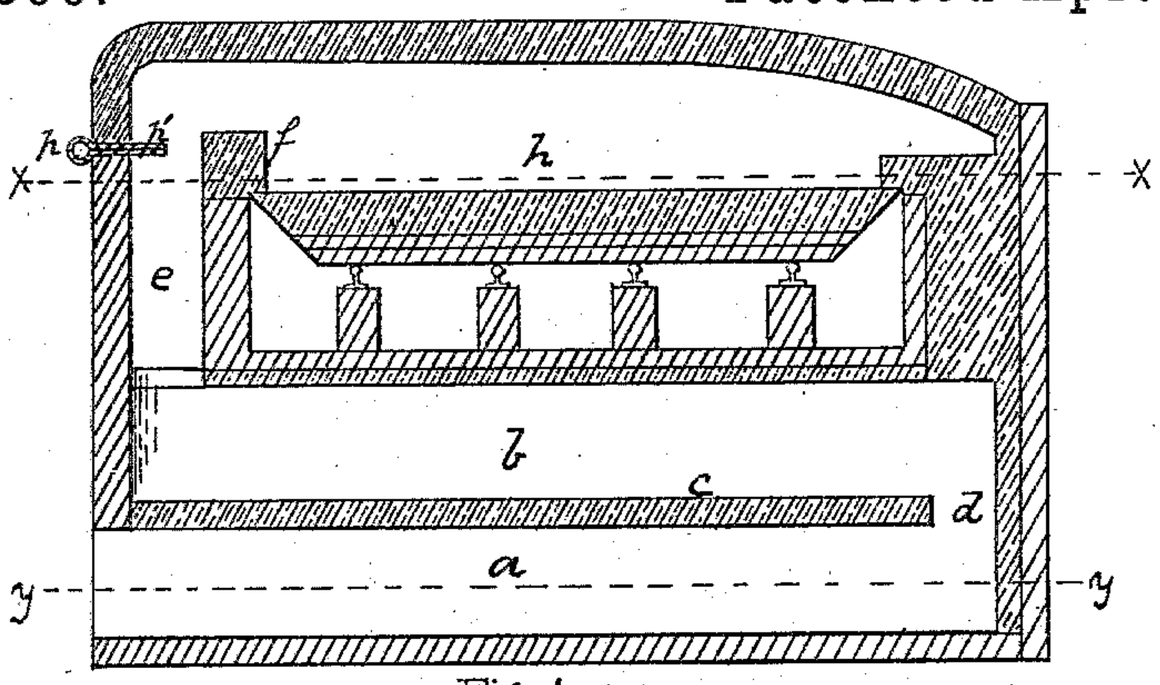

Fig. 1.

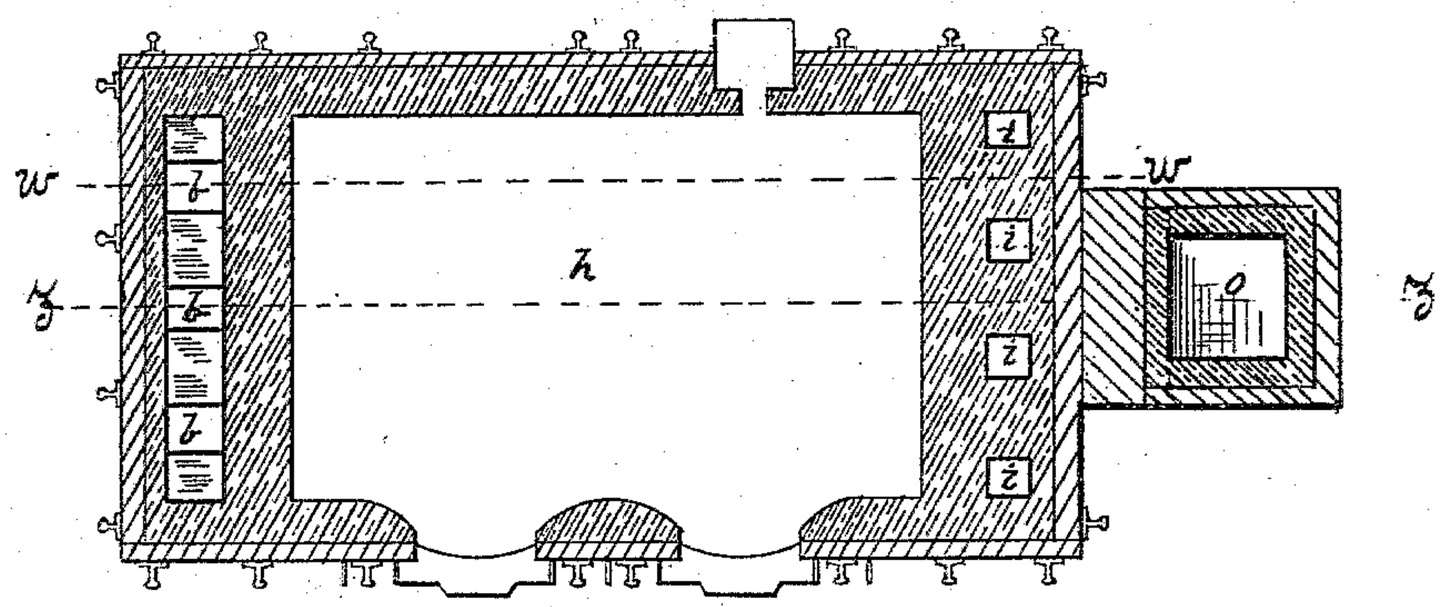

Fig. 2.

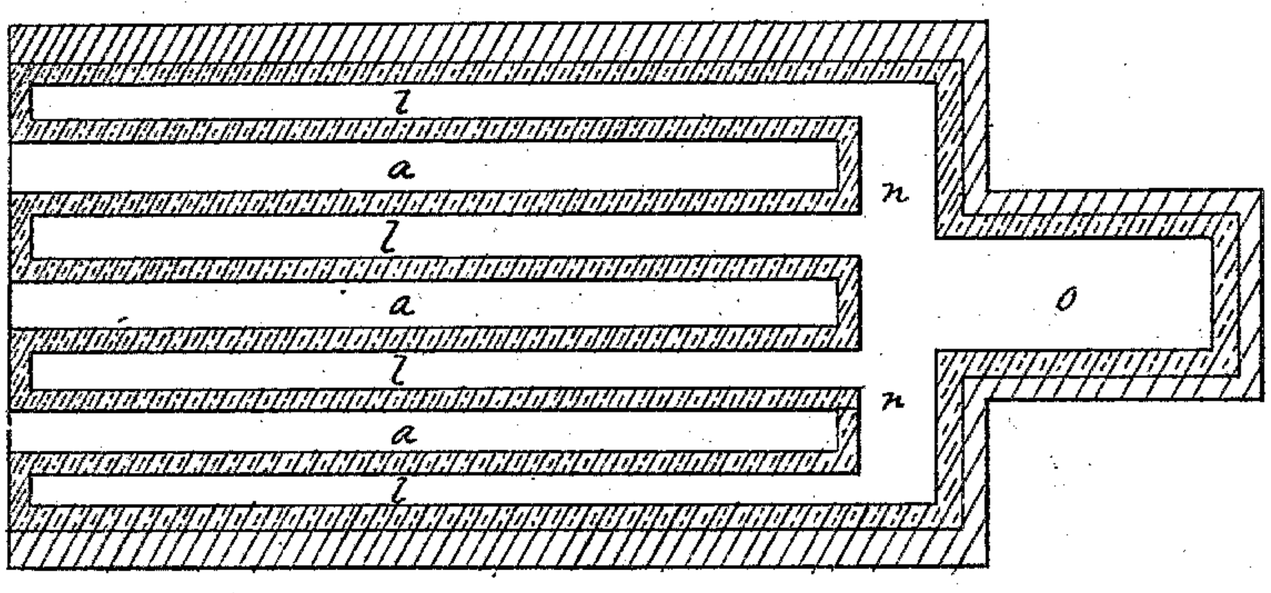

Fig. 3.

Witnesses.
F. B. Conner
J. K. Smith

Inventor.
John Evans
by his attys
Bakewell & Kerr

(No Model.) 2 Sheets—Sheet 2.

J. EVANS.

HEATING FURNACE.

No. 296,399. Patented Apr. 8, 1884.

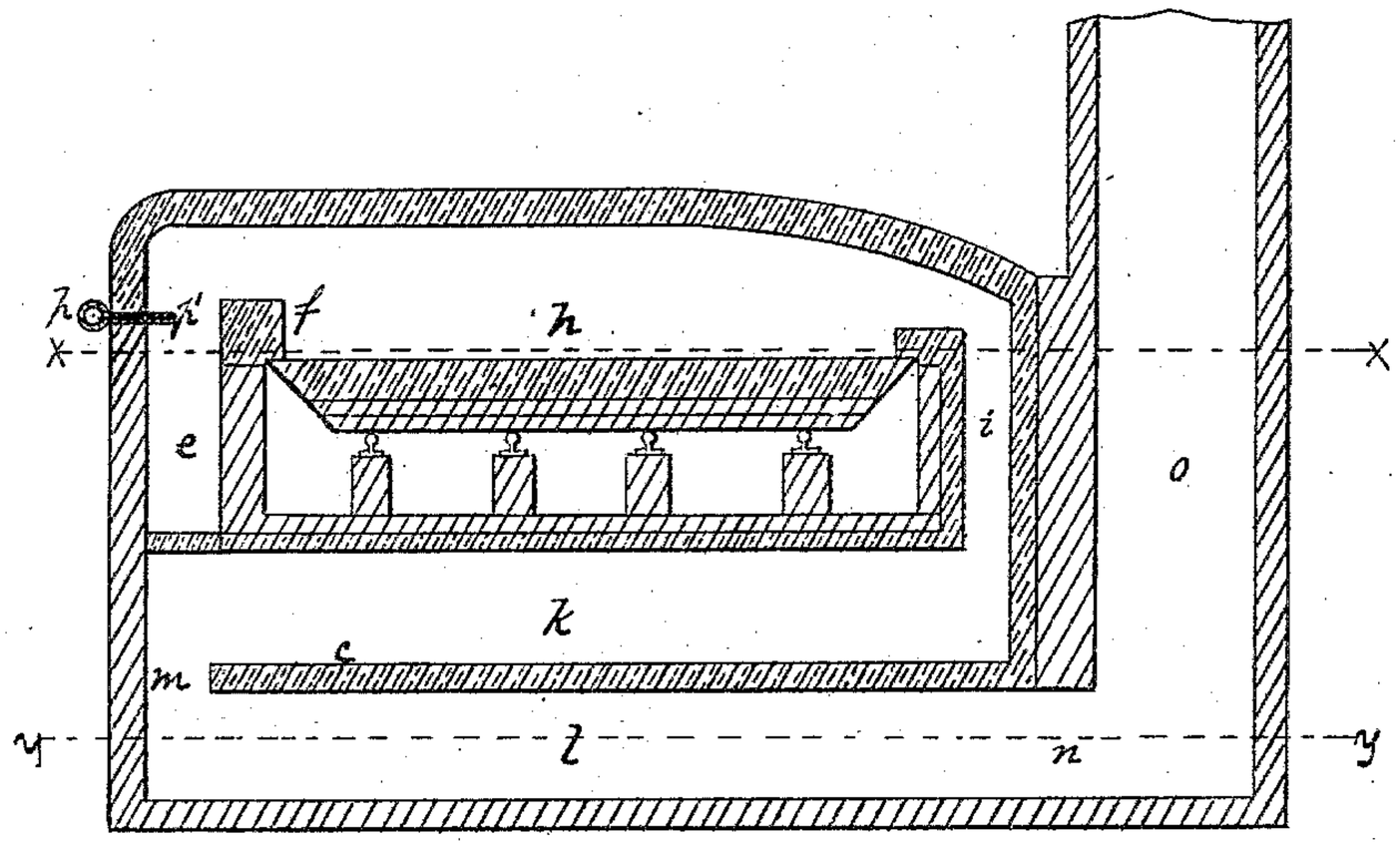

Fig. 4.

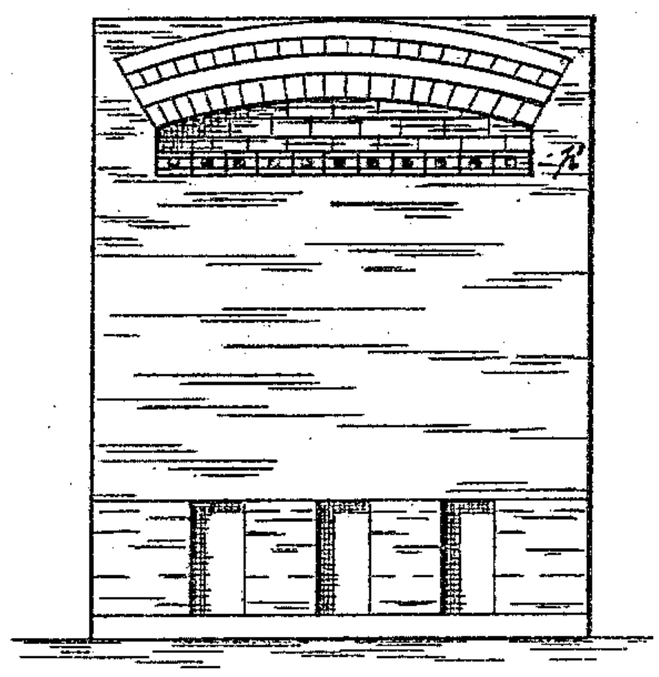

Fig. 5.

Witnesses.
W. B. Corwin
J. K. Smith

Inventor.
John Evans
by his attys
Bakewell & Kerr

UNITED STATES PATENT OFFICE.

JOHN EVANS, OF ETNA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO GEORGE A. CHALFANT, OF SAME PLACE.

HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 296,399, dated April 8, 1884.

Application filed June 1, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN EVANS, of Etna, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Heating-Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to an improvement in heating-furnaces in which hydrocarbon gas is used as fuel; and it has for its object the perfect combustion of the gas, so as to generate an intense heat in the heating-chamber of the furnace, and the utilization of the waste heat which passes from the heating-chamber through the flues leading to the stack, for the purpose of heating the inflowing air, so that combustion shall take place as soon as the air and gas meet.

I will now describe my invention, so that others skilled in the art may manufacture and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view through one of the air-flues on line *w w*, Fig. 2. Fig. 2 is a horizontal sectional view through the line *x x*, Figs. 1 and 4. Fig. 3 is a horizontal sectional view through the line *y y*, Figs. 1 and 4. Fig. 4 is a vertical sectional view through one of the smoke-flues on line *z z*, Fig. 2. Fig. 5 is a view of the front furnace.

Like letters of reference indicate like parts wherever they occur.

In the drawings, *a* represents the air-flues, (three in number,) which extend from the front to the rear of the furnace under the bed. Above these flues *a* are other flues, *b*, which are separated from the flues *a* by a partition-wall, *c*, excepting at the rear end, where they communicate with the flues *a* through the openings *d*.

At the forward end of the flue *b* is a vertical flue or chamber, *e*, between the bridge-wall *f* and the closed front of the furnace. Behind the bridge-wall is the heating-chamber *h*, and at the rear end of the heating-chamber are four openings, *i*, leading into the smoke-flues *k*, which extend on both sides of and between the air-flues *b* forward to the front wall of the furnace.

Below the smoke-flues *k* are other smoke-flues, *l*, which are separated from the flues *k* by a partition-wall, *c*, excepting at the front end of the furnace, where they communicate with the flues *k* through the openings *m*. These flues *l* extend to the rear end of the furnace on each side of and between the air-flues *a*, where they discharge into the lateral flue *n*, which communicates with the stack *o*.

Set in the front wall of the furnace, and extending across the same, is a gas-pipe, *p*, having openings provided with branch pipes *p'*, which discharge through the front wall into the vertical air flue or chamber *e* at or near the level of the top of the bridge-wall *f*.

The front of my improved furnace is without openings or doors, excepting the openings of the air-flues *a* at the base, so that it has a closed front—that is, one not admitting any cold air. The air passing through the air-flues *a* and *b* into the vertical chamber *e* is heated by the hot walls of the waste-flues *k* and *l*, and unites with the gas in chamber *e*, which ignites and is consumed in the heating-chamber *h*. The products of combustion, passing from the heating-chamber through the openings *i* and flues *k* and *l*, heat the partition-walls between the smoke-flues and air-flues, and thereby the temperature of the air which passes through the air-flues *a b* is raised to a high degree before it enters the heating-chamber.

The advantages of my invention consist in preventing the gas from coming in contact with any but thoroughly-heated air by excluding the entrance of any air except through the air-heating flues, the thorough mingling of the air and gas in a special chamber in front of the bridge, and the utilization of the waste heat of the furnace to bring the air to condition for proper union with the hydrocarbon gas.

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

1. In a heating-furnace, the combination of the following elements, viz: return air-flues extending under the bed, and having the receiving and delivery ports at the front end of the furnace, a vertical chamber in front of the bridge-wall communicating with the air-flues, waste or smoke flues extending forward under the bed, and then back to the stack at the

sides of the air-flues, and having the receiving and delivery ports at the rear end of the furnace, said air and waste-product flues being arranged alternately and in vertical planes, and a gas-main having branches which discharge the gas into the vertical air-chamber at or near the bridge-wall, substantially as and for the purposes described.

2. In combination with the bed of a heating-furnace, a regenerator-chamber arranged beneath the same, said chamber composed of a series of air and waste-product flues constructed in the form of return-flues, as specified, the air-flues having their receiving and delivery ports at the front of the furnace, the waste-product flues having their receiving and discharge ports at the opposite or rear end of the furnace, and the air and waste-product flues arranged parallel and alternating, whereby the air and waste products travel in reverse direction, and the air travels progressively from the coolest to the hottest part of the furnace, substantially as specified.

In testimony whereof I have hereunto set my hand this 31st day of May, A. D. 1883.

JOHN EVANS.

Witnesses:
W. B. CORWIN,
T. B. KERR.