

H. FRANK.
Regenerator-Furnaces.

No. 135,640.

Patented Feb. 11, 1873.

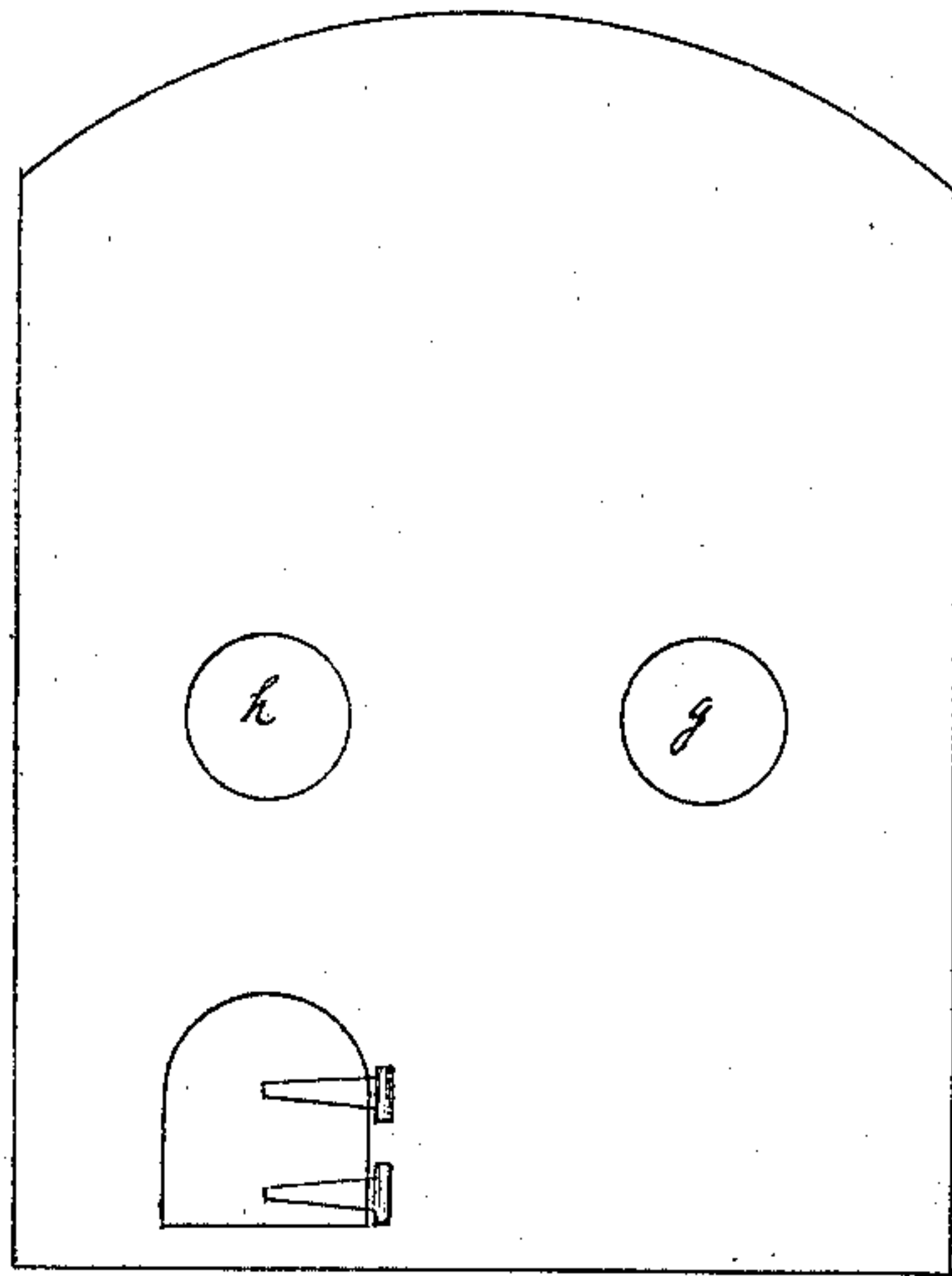


Fig. 4.

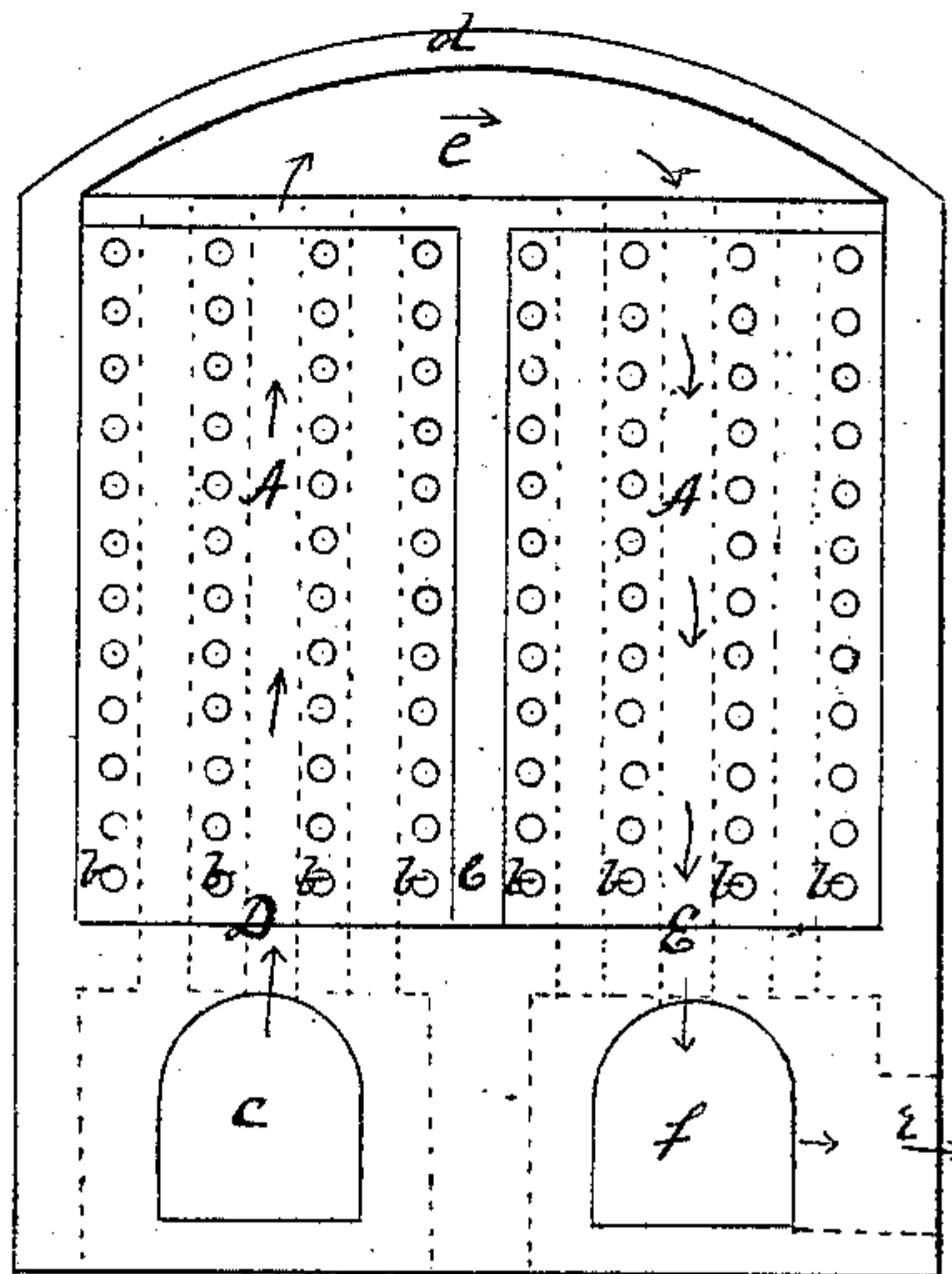


Fig. 1.

WITNESSES
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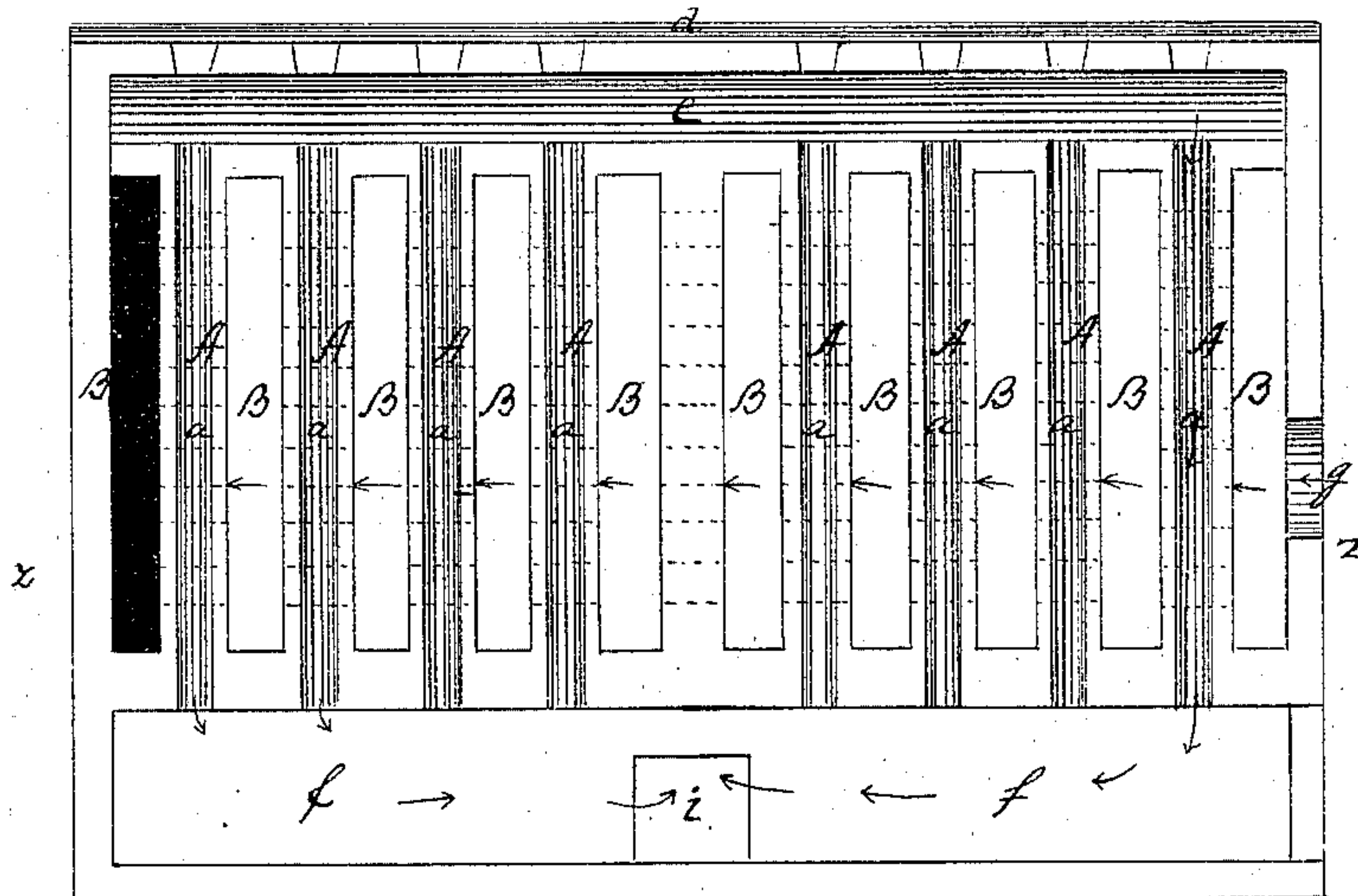


Fig. 2.

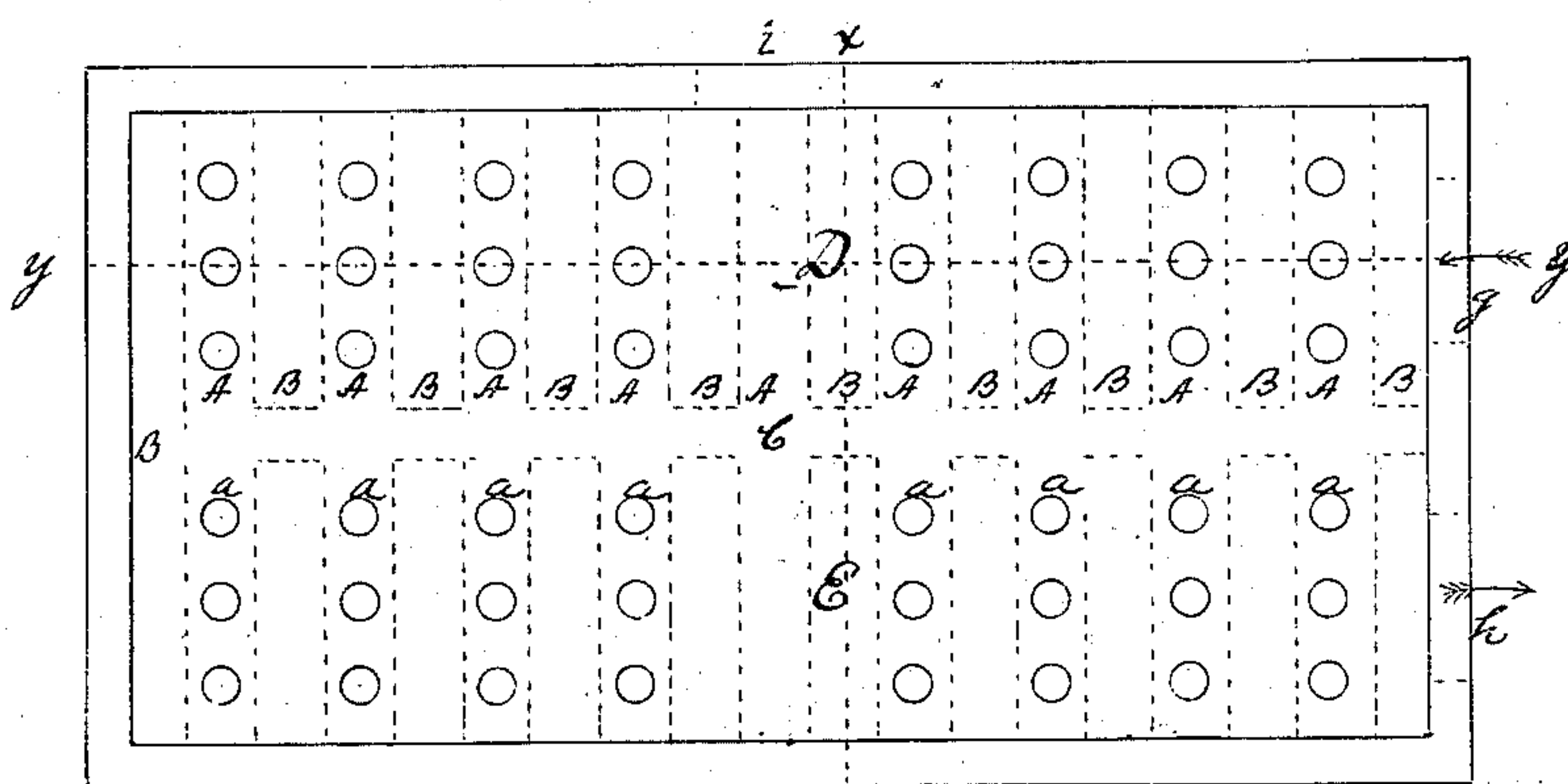


Fig. 3.

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UNITED STATES PATENT OFFICE.

HIMAN FRANK, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN REGENERATOR-FURNACES.

Specification forming part of Letters Patent No. 135,640, dated February 11, 1873.

To all whom it may concern:

Be it known that I, HIMAN FRANK, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Hot-Blast Furnace; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing forming a part of this specification, in which—

Figure 1 is a vertical cross-section of my improved hot-blast through the line *x x*, Fig. 3; Fig. 2 is a vertical longitudinal section through *y y*, Fig. 3; Fig. 3 is a horizontal section through *z z*, Fig. 2; and Fig. 4 is a front elevation of the same.

Like letters of reference indicate like parts in each.

My invention consists in the construction of a hot-blast furnace, of bricks or tile, having both vertical and transverse openings or passages, so arranged that the hot gases or products of combustion from the combustion-chamber shall be caused to pass in one direction through one set of passages, and the air to be heated, entering at a point distant from the combustion-chamber, is caused to pass through the other set of passages in a transverse direction to the place of exit—a point at or near the combustion-chamber—in its passage having traversed the walls and chambers heated by the current of hot gases from the combustion-chamber. It will therefore be seen that the cold air, entering at a point nearest to the stack or place of exit of the heated products of combustion, and proceeding from thence toward the combustion-chamber, is constantly rising in temperature by means of the accretions of heat taken up in its progress through walls of successively-increased temperature; and that the products of combustion from the combustion-chamber, meeting, in their passage to the stack, a current of air of decreasing temperature, gradually lose their heat until they have parted with a maximum quantity. Thus a large quantity of heat otherwise "waste" is utilized for this purpose.

To enable others skilled in the art to construct and use my invention, I will describe it more specifically.

The walls *A* are built of bricks or tile, made of a refractory material, having vertical flues

or passages *a a*, and transverse flues or passages *b b*. In the lower part of one side or section, *D*, of the furnace is the combustion-chamber *c*, from which the flue leads back the entire length of the furnace, and above which is a series of walls, *A*; and chambers *B* are constructed throughout the length of the furnace. The passages *a* lead from the combustion-chamber *c* up to the arched roof *d*, which forms a chamber, *e*, which extends across the center wall *C* over both sections *D* and *E* of the furnace. The two sides *D* and *E* of the furnace are constructed alike. The passages *a* lead down from the chamber *e* to the flue *f*, which leads by the opening *i* to the stack. The chambers *B* are closed at the top and bottom, but are in communication with each other by means of the passages *b*. Air is admitted to the furnace through the opening *g*, which is designed to be controlled by suitable dampers, and passes out at the exit *h*, from whence it is conducted to any desired point by suitable flues or conductors.

The operation is as follows: The heated products of combustion from the chamber *c* pass up through the passages *a* to the chamber *e*; thence down through the passages *a* to the flue *f*; thence by the opening *i* to the stack. During this passage all, or nearly all, of the heat of the products of combustion is imparted to the walls of the furnace. The cold air, being admitted at the opening *g* into the first chamber *B*, passes directly back through the walls *A A*, by means of the passages *b*, to the last chamber *B*, by means of which it crosses to the other section *D*, and passes forward, by the passages, *b*, to the front chamber *B*, and from thence through the exit *h*. The heat which is acquired by the walls *A* from the heated products of combustion is transmitted through them and given off to the inflowing current of cold air, which is thereby heated.

In hot-blasts used in connection with blast-furnaces the vertical flues are liable to become clogged with deposits from lime, &c., which must be removed by mechanical means. In order to accomplish this I make an opening, *n*, in the roof, closed by a plug, above each flue. By means of a brush inserted through this opening the flue may be cleaned of all deposits.

By this construction I secure a very superior furnace, cheap of construction, and thorough and simple in operation.

The bricks of which the walls A are built should be made large, so that but few would be required in constructing the walls, as thereby a multiplicity of joints is avoided, which is a desideratum, as the joints are liable to leak and permit the intermixture of the air and gas. Each wall may be made in one piece, and thereby entirely avoid joints.

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

1. The walls A, constructed, as described, with vertical passages *a* and transverse passages *b*, such passages being made through the brick or tile which compose the walls.

2. The heating-chamber constructed with alternate walls A and chambers B, the former having vertical passages *a* extending between the chamber *c* and the fire-chamber and stack for the passage of the heated gases, and transverse passages *b* extending between the chambers B for the passage of the air to be heated, such passages being made through the brick or tile which compose the walls, substantially as described.

In testimony whereof I, the said HIMAN FRANK, have hereunto set my hand.

HIMAN FRANK.

Witnesses:

A. S. NICHOLSON,
THOS. B. KERR.