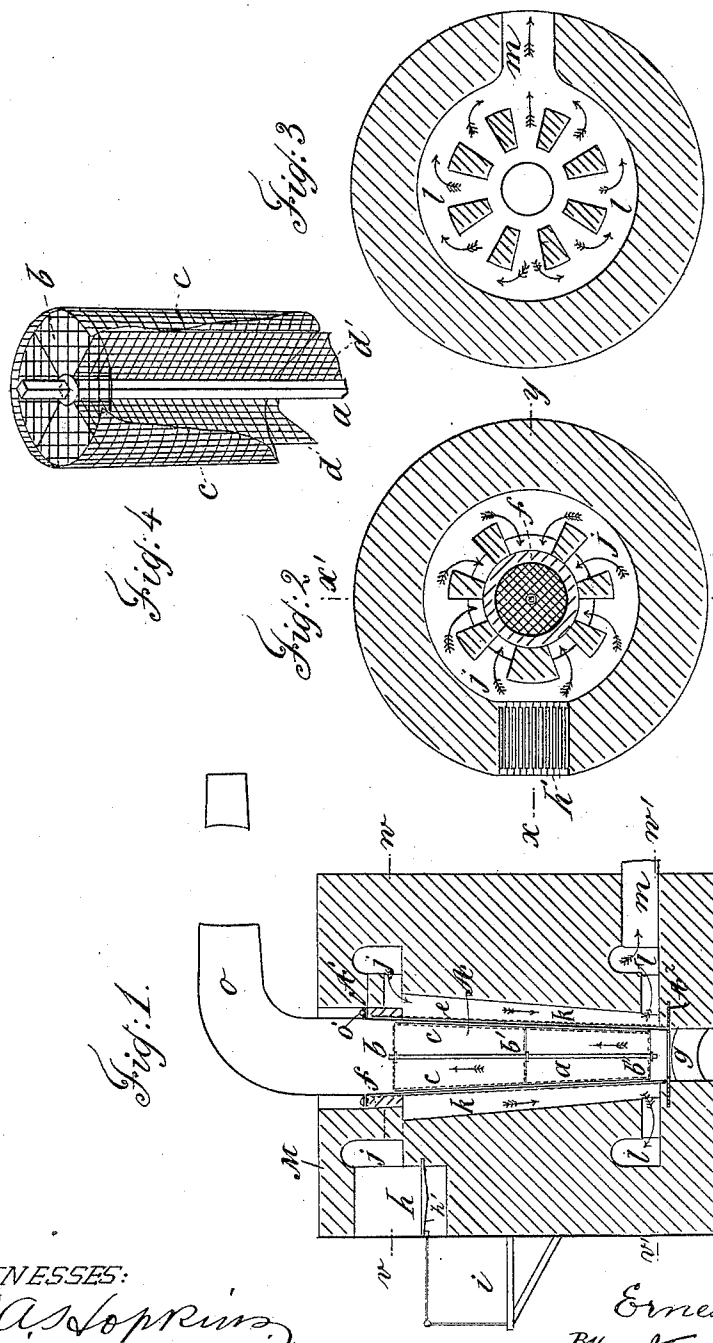
(No Model.) 2 Sheets—Sheet 1.

E. TOURANGIN.

HOT BLAST OVEN.

No. 423,357. Patented Mar. 11, 1890.



WITNESSES:
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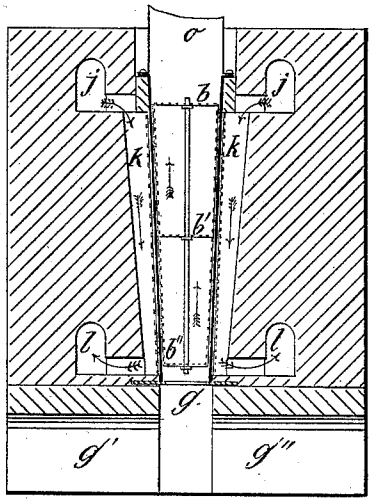
Fig: 5.



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UNITED STATES PATENT OFFICE.

ERNEST TOURANGIN, OF LA FOREST ST. FLORENT, FRANCE, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO LOUIS DURAND, OF NEW YORK, AND FREDERICK A. REID AND JOSEPH H. COLYER, OF BROOKLYN, NEW YORK.

HOT-BLAST OVEN.

SPECIFICATION forming part of Letters Patent No. 423,357, dated March 11, 1890.

Application filed February 3, 1886. Renewed September 6, 1888. Serial No. 284,763. (No model.)

To all whom it may concern:

Be it known that I, ERNEST TOURANGIN, a citizen of France, residing at La Forest St. Florent, in the Department of the Cher and Republic of France, have invented certain new and useful Improvements in Hot-Blast Ovens; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon.

My invention relates to an apparatus for heating air, and is especially adapted for use in connection with metallurgical furnaces. It is, however, also adapted and can be used to great advantage in heating dwelling-houses and large buildings. In the latter instance it would be called a "hot-air stove."

The device may also be applied to many other purposes—such, for instance, as bread-baking and clothes-drying—and, in fact, to any industrial process which does not require more than 400° or 500° centigrade.

Heretofore the common way of heating air has been to pass it through several metallic tubes which are heated externally from a furnace. It is well known that air is a very poor conductor of heat, from whence it results that the inner or central molecules or particles receive less heat than the outer, or those which are in direct contact with the walls of the pipes. The heat conveyed from molecule to molecule decreases very rapidly as it recedes from the hot metal and disappears almost altogether in the center of the fluid of the mass, especially where the tubes are of a large diameter.

To avoid the drawbacks above enumerated, I take a tube, preferably cylindrical and conical in form and of any suitable dimensions—say thirty-six centimeters diameter and one meter and sixty centimeters in length—the smaller end or opening being below and the larger end or opening above. When the tube is in conical form, I may make the smaller end thirty centimeters in diameter and the larger end forty centimeters. The atmospheric air is introduced through the smaller opening at the base and makes its exit through the larger opening above. The object of the conical form of arrangement is to compensate for the increase of volume due to the expansion caused by heat, thus avoiding the resistance arising from this. Within this tube I place metallic wires arranged in the form of frames, the wires employed being about one millimeter in diameter. This construction will enormously increase the heating-surface of the metal and will serve to establish an equalizing effect, as the air will flow through the meshes of the wires.

Referring to the accompanying drawings, Figure 1 represents a vertical section of my apparatus. Fig. 2 is a horizonal section on the lines *v w*, Fig. 1. Fig. 3 is a similar view on the lines *v' w'*, Fig. 1. Fig. 4 is a detail view of the wire-cloth frame removed from the tube; and Fig. 5 is a vertical section on the line *x' y'*, Fig. 2.

In the drawings, A represents the tube, preferably conical in form, as shown, the smaller end below and the larger end and opening above. It is provided with exterior flanges A' A^2, which rest on the masonry or brick-work of the apparatus.

The upper part or elbow of the tube is represented by O. This portion is also provided with a flange O', which seats upon the upper flange of the tube proper.

Within the tube A, I place a vertical rod or bar *a*, to which I attach the perforated diaphragms or frames of wire-cloth *b b' b''*. These latter are of size equal to the cross-section of the tube A at the points where they are placed. Between these different frames *b b' b''*, I stretch other and vertical wires *d d'*, connecting them to the wires of the horizontal frames. Surrounding the horizontal frames of wire are the cylindrically-shaped wires *c*, which fit exactly against the inner walls of the tube A. On the exterior of the cylinder is another metallic wire frame *e*, constructed to exactly fit over the outside of the tube A, and forms an envelope for the same. To give the most satisfactory results in the different frames described, the wires are arranged about one centimeter apart.

M represents the inclosing masonry or brick-work of the apparatus.

h is the fire-box, provided with a grate *h'*.

i is a platform on which the operator stands.

The draft of air flows through the station *i* and under the grate-bars *h'* and into the fire-box *h*, and from thence to the annular chambers *j k l*, issuing at *m*. The air to be heated enters at *n* and passes out at *o*.

I am aware that furnaces for heating air have been shown and described in previous Letters Patent of the United States which employ wire netting or gauze for conveying the heat, (see patent of Mootry, No. 13,728, and patent to Tuttle, No. 311,152;) but no previous patent has shown or described this wire-cloth arranged within the tube, the said tube being externally heated.

I claim as my invention—

1. The combination, in an air-heating apparatus, of a fire-place, a chamber communicating therewith, and a metallic tube or conduit located within the chamber and provided with a cylindrical filling of wire, the outer wall being in direct contact throughout its entire surface with the inner wall of the conduit, and the branching or radiating sections of wire-cloth extending from the center to the outer wall, whereby the air is evenly heated throughout the entire tube or conduit, substantially as set forth.

2. In an air-heating apparatus, the combination of the tube having a filling of wire situated within the same, the envelope of wire-cloth surrounding the tube, and an inclosing-chamber provided with a fire-place, all arranged substantially as shown and described.

3. The combination of the tube having the wire-filling situated within the same, with the envelope of wire-cloth surrounding the tube, the said wire-filled tube and envelope being inclosed in a heating-chamber, substantially as shown and described.

4. The combination, substantially as hereinbefore described, of the masonry or brick-work M, having the fire-place and grate *h h'*, the tube A, having the flanges A' and A^2 at or near its ends, the annular chamber *j*, the vertical chamber *k*, the lower chamber *l*, and the escape-flue *m*, said fire-places being in communication with said chambers.

5. The combination, substantially as hereinbefore described, of the fire-place, a chamber communicating therewith, the tube A, having the wire-gauze frames set within it, and a casing or envelope of the same material with the opening and exit *n* and *o* for the air to be heated, and the flues *j* and *l*, substantially as shown, and for the purposes set forth.

6. An air-heating apparatus consisting of a tube or conduit, means for heating the same externally, a filling of wire-cloth extending around the inside of the tube or conduit in direct metallic contact with the inner wall of the same, and one or more perforated diaphragms extending between and attached to the said wire-cloth filling, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ERNEST TOURANGIN.

Witnesses:

ROBT. M. HOOPER,

A. C. WATKINS.