No. 883,916.

PATENTED APR. 7, 1908.

A. SMALLWOOD.

FURNACE.

APPLICATION FILED SEPT. 10, 1906.

5 SHEETS—SHEET 1.

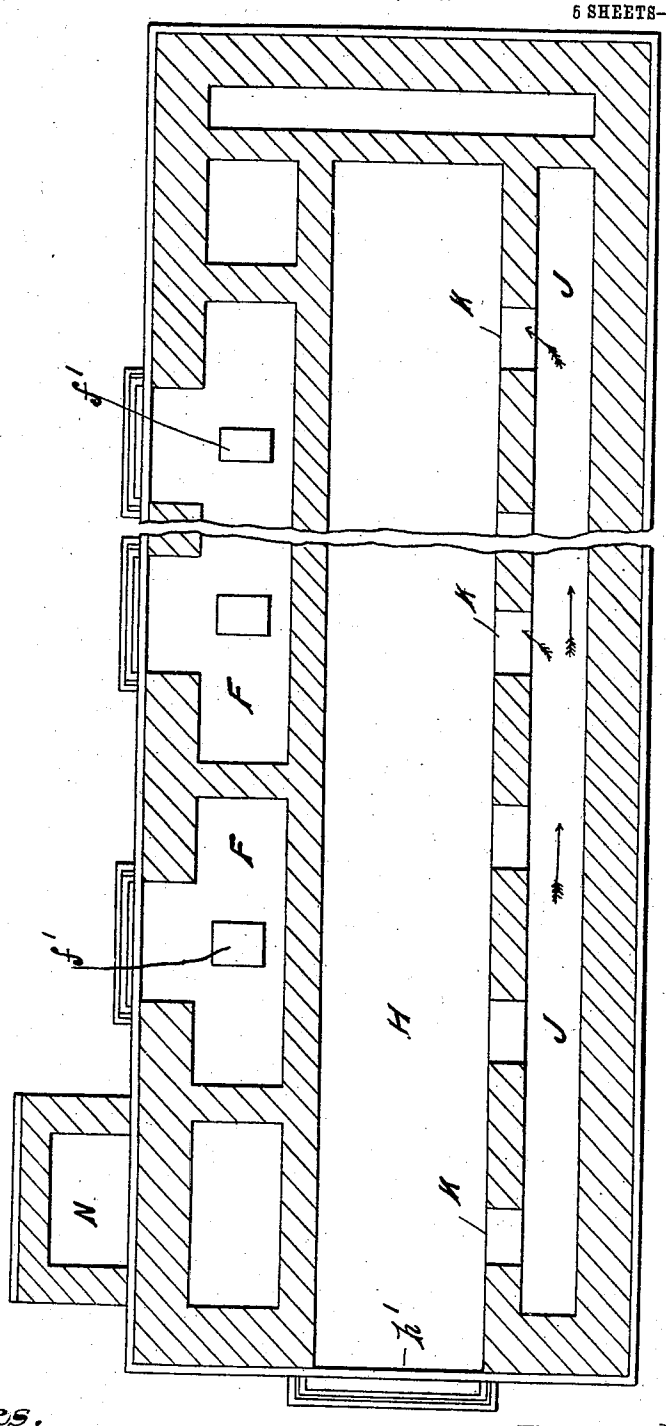

FIG. 1.

Witnesses.
H. L. Trumble
D. A. Balmain

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his attorney

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5 SHEETS—SHEET 2.

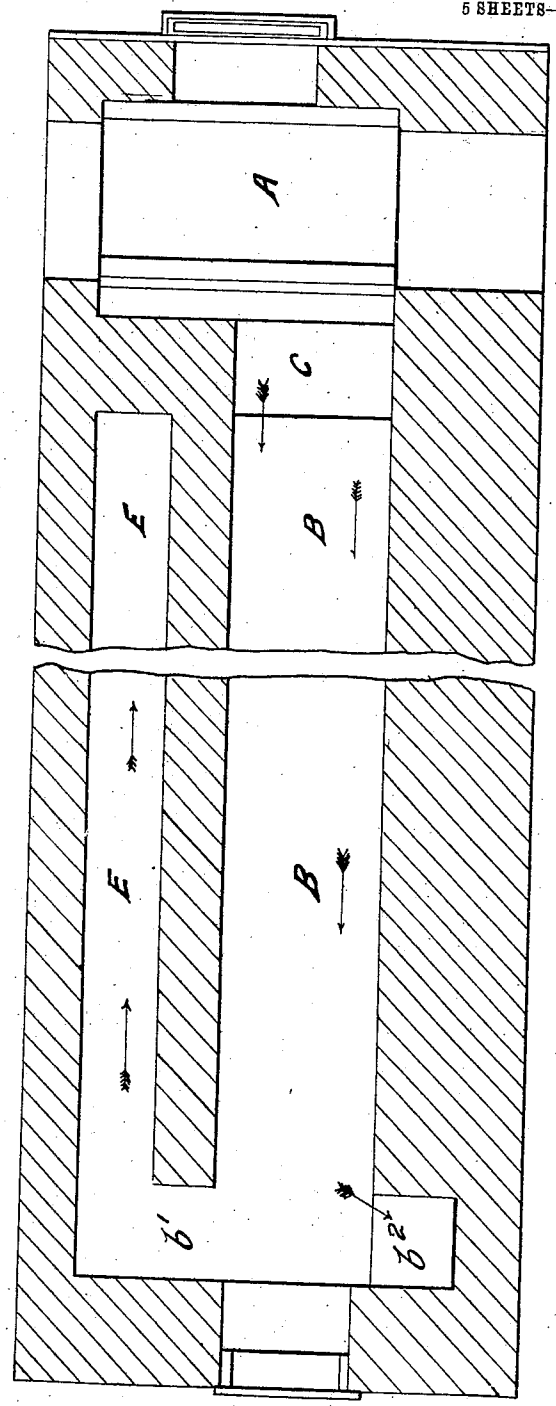

FIG. 2.

Witnesses.
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5 SHEETS—SHEET 3.

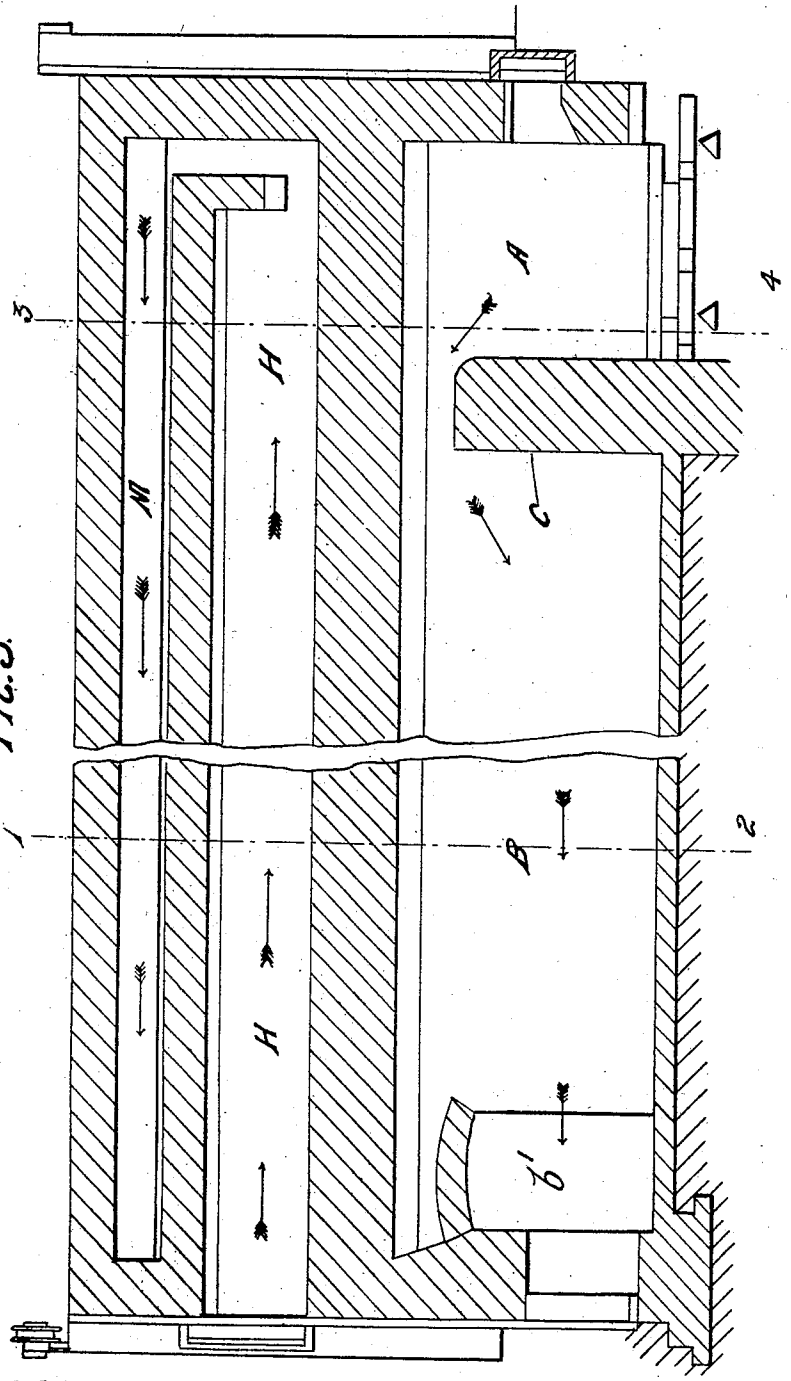

FIG. 3.

Witnesses.
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O. A. Balentine.

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his Attorney

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A. SMALLWOOD.

FURNACE.

APPLICATION FILED SEPT. 10, 1906.

5 SHEETS—SHEET 4.

FIG. 5.

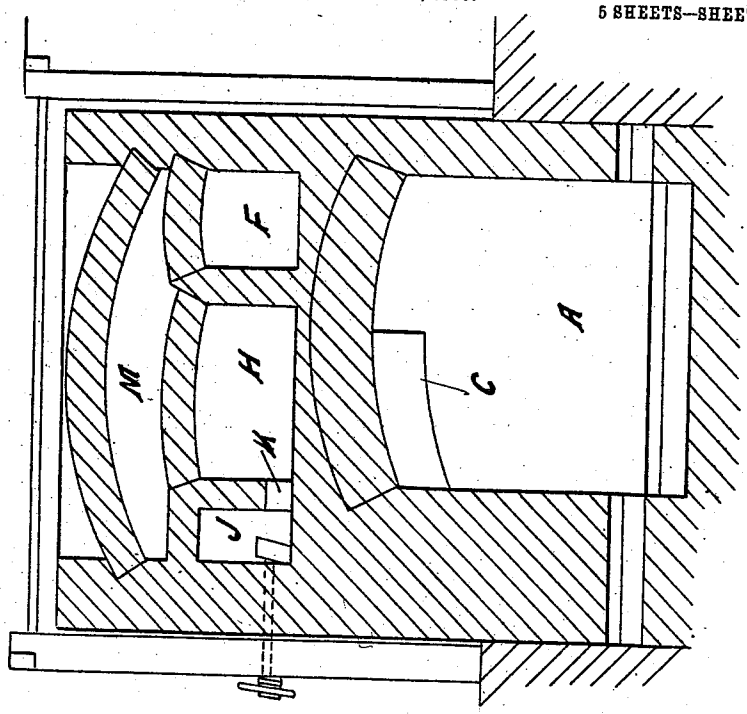
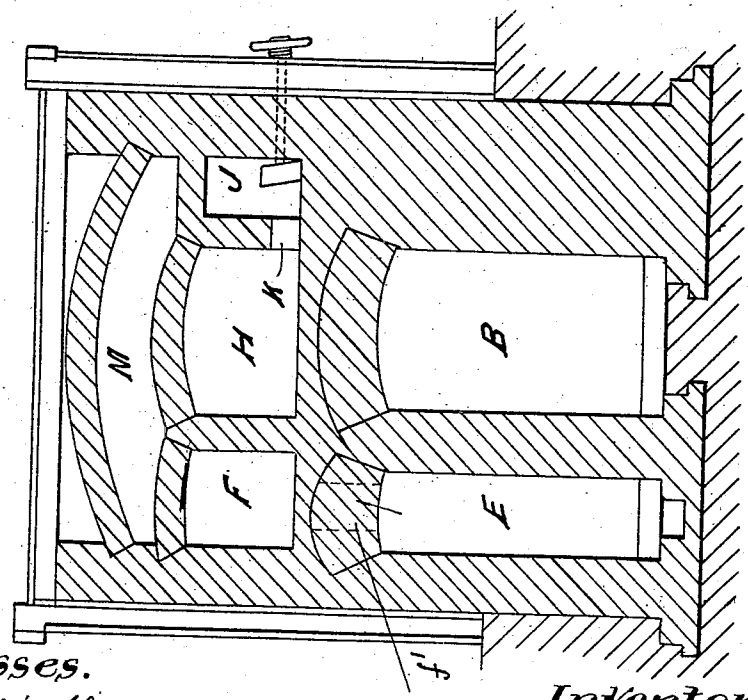


FIG. 4.



Witnesses.

H. L. Trimble.

O. A. Bateman

Inventor.

Alfred Smallwood

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his Attorney

No. 883,916.

A. SMALLWOOD.

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FURNACE.

APPLICATION FILED SEPT. 10, 1906.

5 SHEETS—SHEET 5.

FIG. 6.

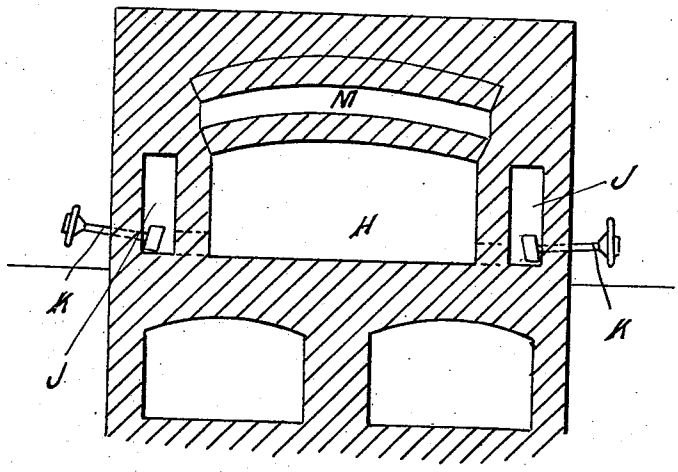
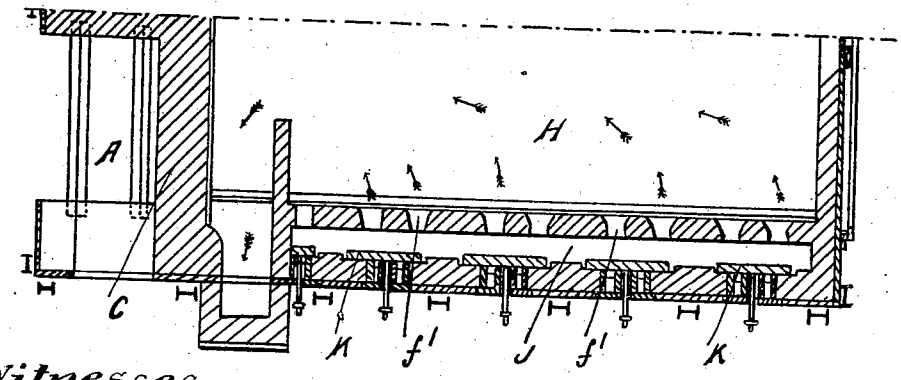


FIG. 7.



Witnesses.
H. L. Trimble.
O. A. Bateman.

Inventor
Alfred Smallwood.
by Chas. H. Riches
his attorney

UNITED STATES PATENT OFFICE.

ALFRED SMALLWOOD, OF LONDON, ENGLAND.

FURNACE.

No. 883,916. Specification of Letters Patent. Patented April 7, 1908.

Application filed September 10, 1906. Serial No. 333,909.

To all whom it may concern:

Be it known that I, ALFRED SMALLWOOD, a subject of the King of Great Britain, residing at 24 Coleman street, London, E. C., in the county of Middlesex, England, formerly of 34 Old Broad street, London, have invented certain new and useful Improvements in Furnaces; and I hereby declare that the following is a full, clear, and exact description of the same.

This invention relates to smelting, crucible, heating, annealing and like furnaces and in kilns for burning and glazing pottery and for other like purposes in which a grate, a combustion chamber and heat distributing passages are combined and has for its object a self contained furnace whereby the heat is generated and a number of crucibles or articles may be heated from one furnace grate, and by which only that portion of the heated gases which is required for the number of crucibles or articles being heated is used, the heat remaining being utilized for the crucibles in work or for annealing purposes, that is to say, supposing the furnace to be constructed to heat five crucibles or other articles and only three were being worked the heat for the two crucibles not being worked is utilized as far as necessary by those in work, while the heat remaining is utilized for annealing purposes or in some cases and when desirable, a required proportion of the heat generated from the one grate may be located to the heating of the crucibles or reheating of various articles, the remaining portions of the heat generated being utilized for annealing purposes or in some cases the whole of the heat generated may be utilized either for the heating process or for the annealing, while the fire grate, the means for the combustion of the unconsumed gases and the various chambers for heating the crucibles or other articles and for the annealing process are all self contained in one furnace, in such a manner that the damping off or adjustment of the supply of heat to any one of the heating divisions or annealing chamber or chambers can be easily and quickly effected. By means of these improvements a more complete utilization of the heat generated is obtained with a consequent considerable reduction of the fuel required in proportion to the quantity of work accomplished, while at the same time a large amount of labor is saved by the necessity of only having one furnace grate to stoke instead of a number as heretofore. Such furnaces, which may be worked by ordinary draft or under pressure from a forced draft into a closed ashpit or grate, also occupy considerable less space and are far less costly to construct than those of a group which are separately and independently erected.

In order that this invention may be clearly understood and more easily carried into practice, I have appended hereunto five sheets of drawings upon which I have illustrated the nature of my said improvements.

Figure 1 is a sectional plan taken through the heating crucible and annealing chambers, of a combined furnace for heating crucibles and the like and for annealing purposes. Fig. 2 is also a sectional plan of the furnace illustrated by Fig. 1 but taken through the grate and combustion chambers. Fig. 3 is a longitudinal vertical section through Figs. 1 and 2. Fig. 4 is a vertical cross section through Fig. 3 on the line 1—2. Fig. 5 is a vertical cross section through Fig. 3 taken on the line 3—4. Fig. 6 is a vertical section illustrating the application of these improvements to a separate furnace for annealing or other like purposes. Fig. 7 is a sectional plan through the heating and annealing chambers of the furnace illustrated by Fig. 6.

In carrying this invention into effect as shown in Fig. 5 the fire grate A is arranged at the one end of the furnace and is divided by a bridge C from a spacious combustion chamber B which extends the whole length of the furnace, and the two exits b' and b^2 of which are arranged at the reverse end of the chamber to that of the grate as hereafter more fully described.

At the one side of the combustion chamber a horizontal heat chamber E is provided which is connected at the one end with the exit b' of the combustion chamber, and above this second chamber the series of divisions or chambers F are formed in which the crucibles or other articles to be heated are placed a vertical aperture f' being formed between the horizontal chamber and each of the heating chambers or divisions for enabling the access of the heat being obtained.

An annealing chamber H is formed over the combustion chamber B and adjoining the series of heating chambers F, while upon the opposite side of the annealing chamber a horizontal heat chamber J is provided which is connected with the other exit b^2 of the combustion chamber and which is at the same

time connected with the annealing chamber by apertures K at various intervals in its length. Both the horizontal heat chamber J and the annealing chamber H itself are connected at the fire-grate end 3 by a vertical flue H′ (Fig. 3) to a horizontal jacket flue M which extends over the whole of the heating chambers, the annealing chamber and the flue to the latter, and which is connected at the reverse end with the stack or chimney N.

In the case of any of the heating chambers F not being required for use, the apertures f' of those particular chambers are closed by fire brick slabs while in the case of the annealing chamber not being required the various apertures can be closed in a similar manner from the outside by dampers such as k' or the points of entrance of the heat into the annealing chamber can be varied by such damper and the heat distributed so as to direct the heated gases to any required point or points in its length, or such fire brick slabs may be moved into or out of the closed position through the entrance h' to the chamber which is arranged at the reverse end of the furnace to that of the fire grate A.

In some cases the apertures f' may be so arranged as to transmit the heat into the heating chambers F from the sides and in the case of the apertures K into the annealing chamber H from the top if so desired and in such a manner as to provide a sheet of heat of even temperature all over the annealing chamber H or in some cases for articles which are more massive at one part than another the application of the heat can be proportionately varied by opening or closing one or more of the apertures K as before described. Such furnaces may be worked with a natural draft or in some cases by a forced draft introduced into the ash pit or grate which is shut off from the atmosphere and by means of which in combination with suitable dampers for adjusting the size of the various exit flues, the combustion, heating and annealing chambers may be worked under pressure of the heated gases.

In the application of these improvements to kilns for burning and glazing pottery and for other like purposes, the kiln is provided with a fire grate A, a combustion chamber or chambers such as B and a heat chamber or chambers J, the latter of which is connected at various points with the chamber or chambers which contain the articles to be burned or glazed in a somewhat similar manner to the arrangement hereinbefore described with regard to the annealing chambers H.

Having now described my invention I declare that what I claim is:—

1. A smelting, crucible heating, and annealing furnace, comprising a fire grate, a horizontal combustion chamber in communication therewith, a heat chamber situated above the combustion chamber and communicating with the latter at the end remote from the fire grate, an annealing chamber situated adjacent the heat chamber and having a plurality of apertures through one of its walls, and means for selectively opening and closing the apertures of the annealing chamber.

2. A smelting, crucible heating, and annealing furnace comprising a fire grate, a horizontal combustion chamber communicating with the fire grate, a horizontal heat chamber in the same plane as the combustion chamber communicating with the latter at the end remote from the fire grate, a plurality of heating chambers separate from one another and situated above the heat chamber, apertures being formed in the floors of the heating chambers communicating with the heat chamber, means for closing the apertures of the heating chambers when desired, a second heat chamber situated in a plane above that of the combustion chamber, a passage connecting the second mentioned heat chamber with the combustion chamber, an annealing chamber situated adjacent the second mentioned heat chamber having apertures in one of its sides communicating with the heat chamber, and means for selectively opening and closing the apertures of the annealing chamber.

3. A smelting, crucible heating, and annealing furnace comprising a fire grate, a horizontal combustion chamber communicating with the fire grate, a horizontal heat chamber in the same plane as the combustion chamber communicating with the latter at the end remote from the fire grate, a plurality of heating chambers separate from one another and situated above the heat chamber, apertures being formed in the floors of the heating chamber communicating with the heat chamber, means for closing the apertures of the heating chambers when desired, a second heat chamber situated in a plane above that of the combustion chamber, a passage connecting the second mentioned heat chamber with the combustion chamber, an annealing chamber situated adjacent the second mentioned heat chamber having apertures in one of its sides communicating with the heat chamber, means for selectively opening and closing the apertures of the annealing chamber, and a horizontal jacket flue situated in a plane above that of the annealing chamber and communicating with the annealing chamber at the fire grate end of the same.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ALFRED SMALLWOOD.

Witnesses:

WALTER H. E. BARTLAM,
SAMUEL SMITH.