

No. 618,218.

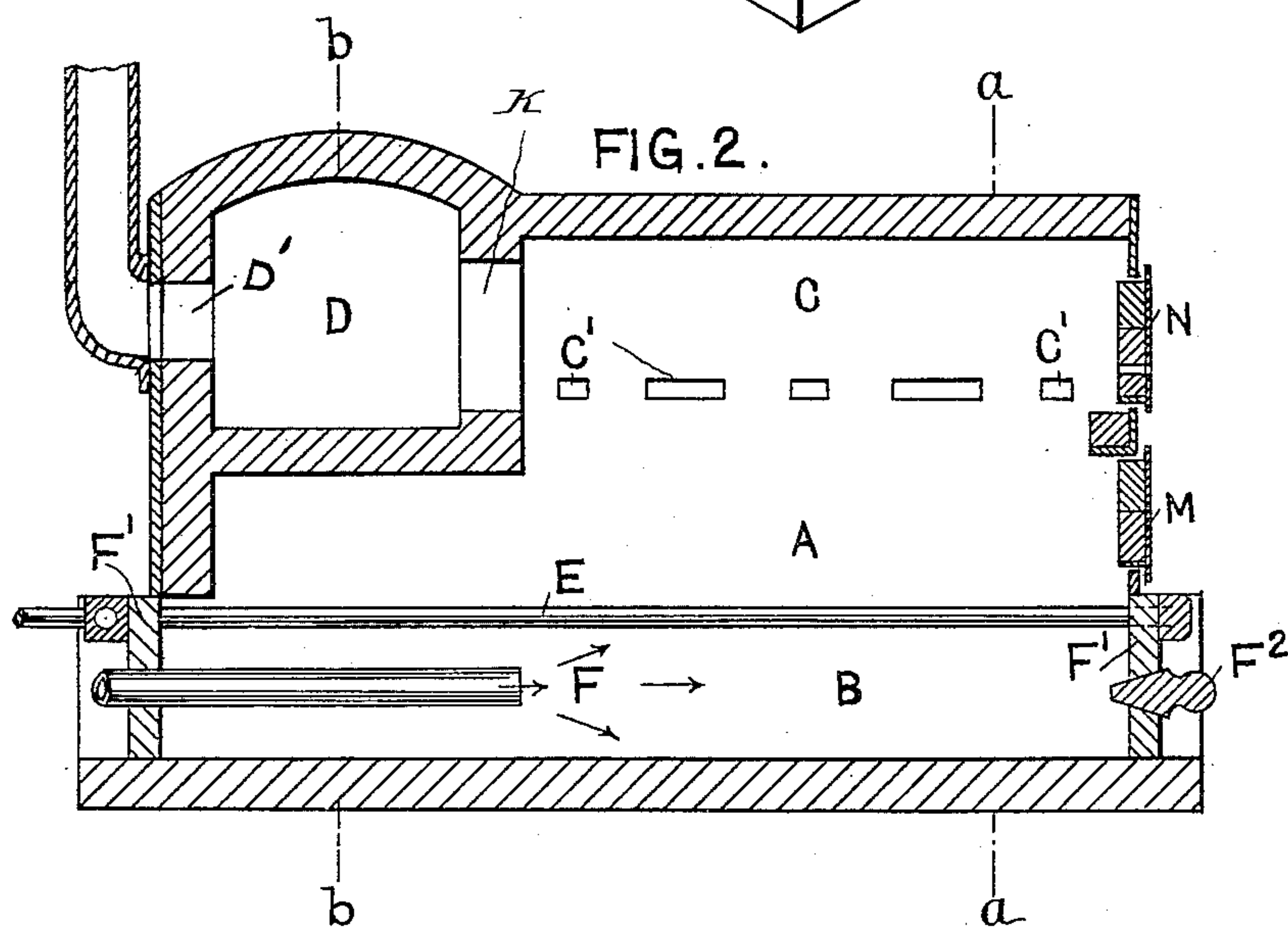
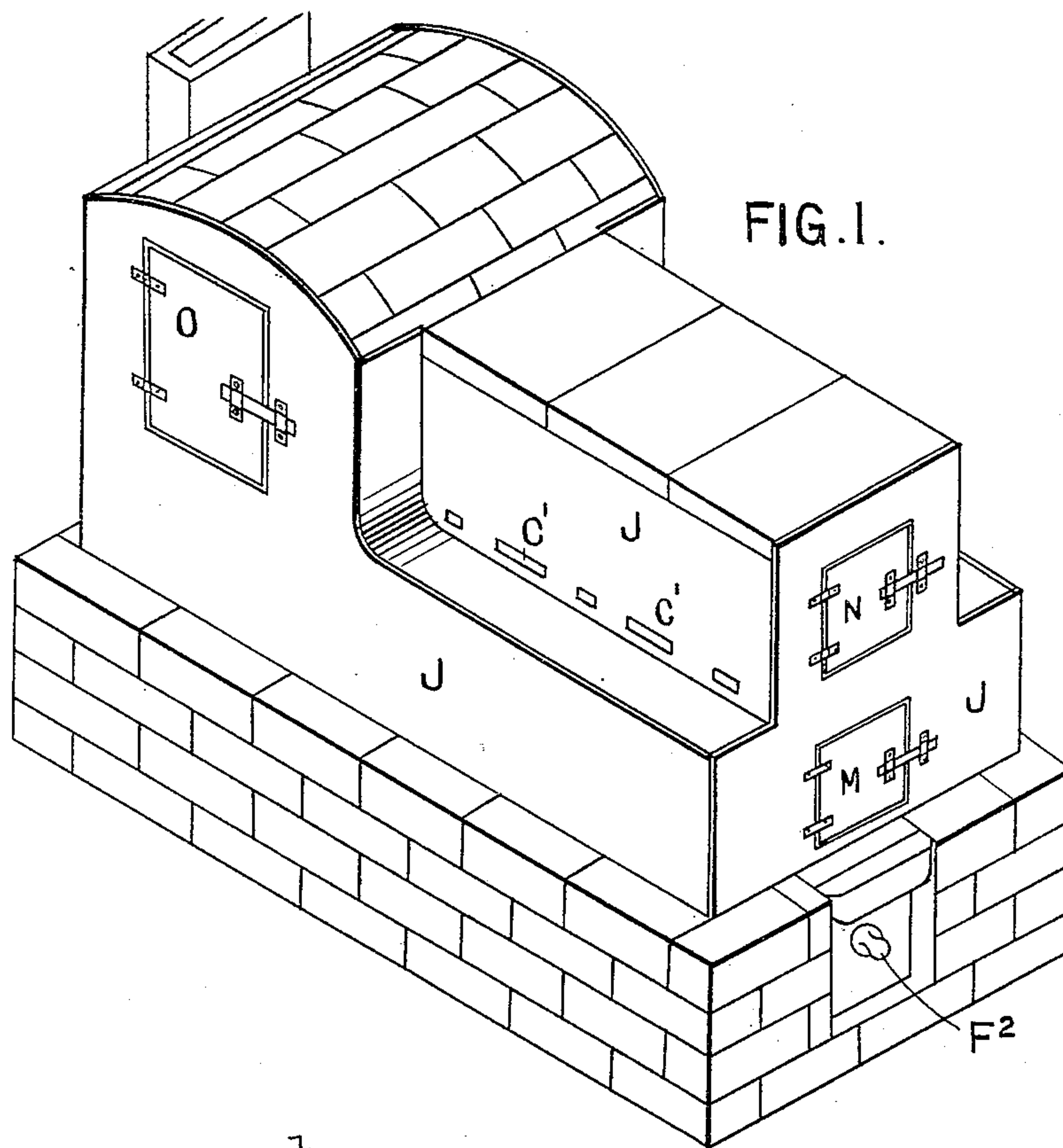
Patented Jan. 24, 1899.

W. W. BARNES.  
HEATING FURNACE.

(Application filed July 30, 1897.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses  
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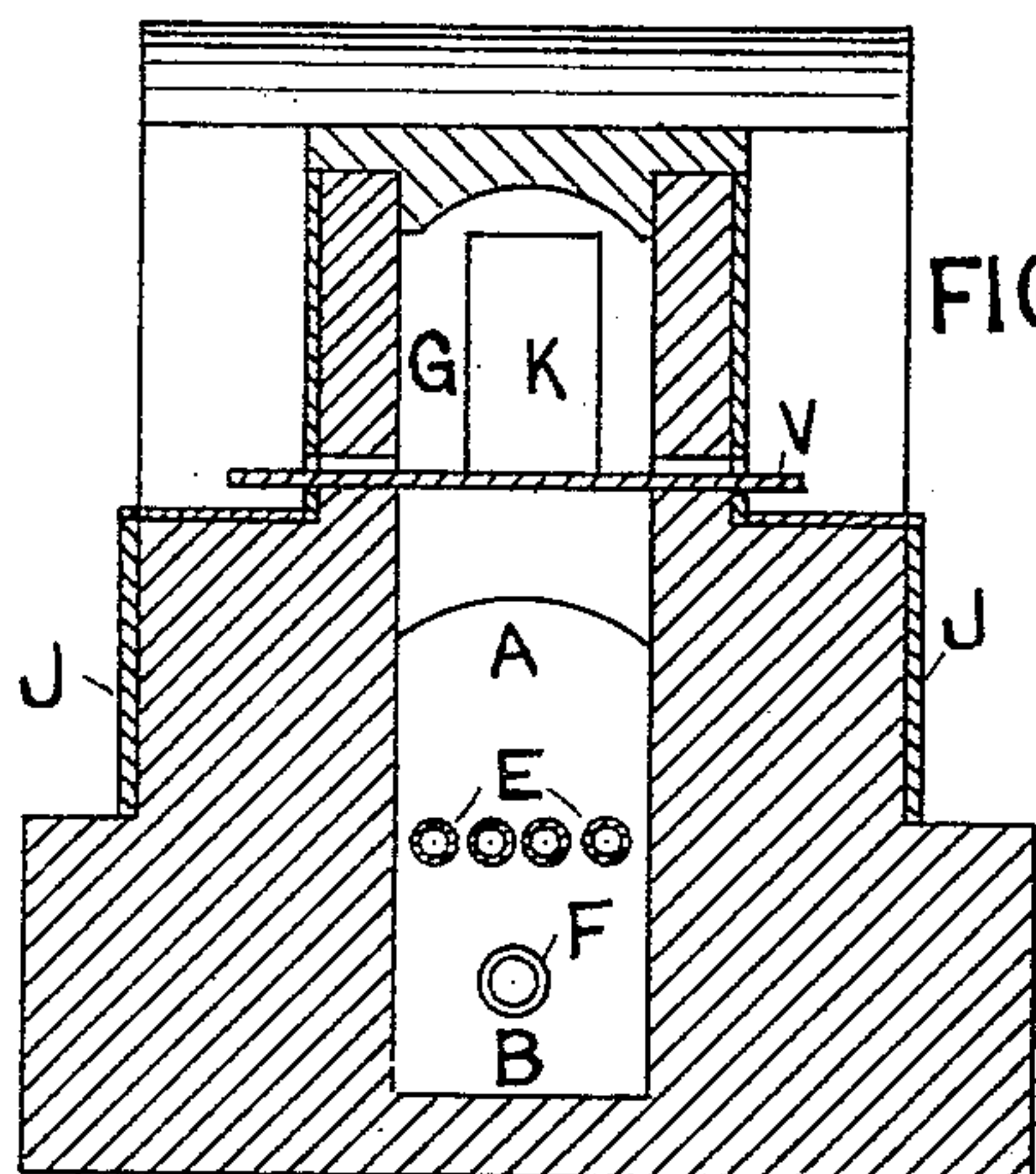


FIG. 3.

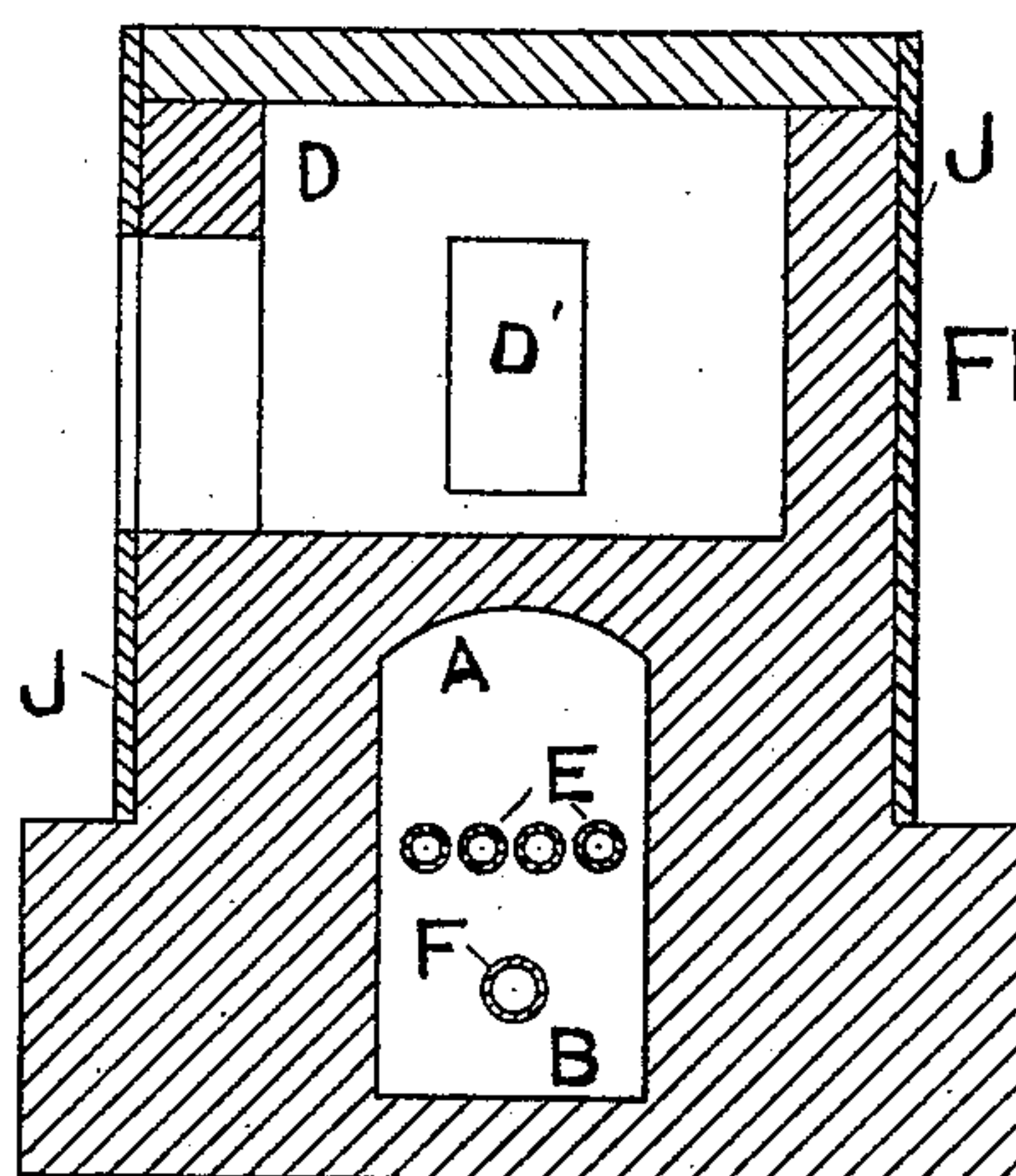


FIG. 4.

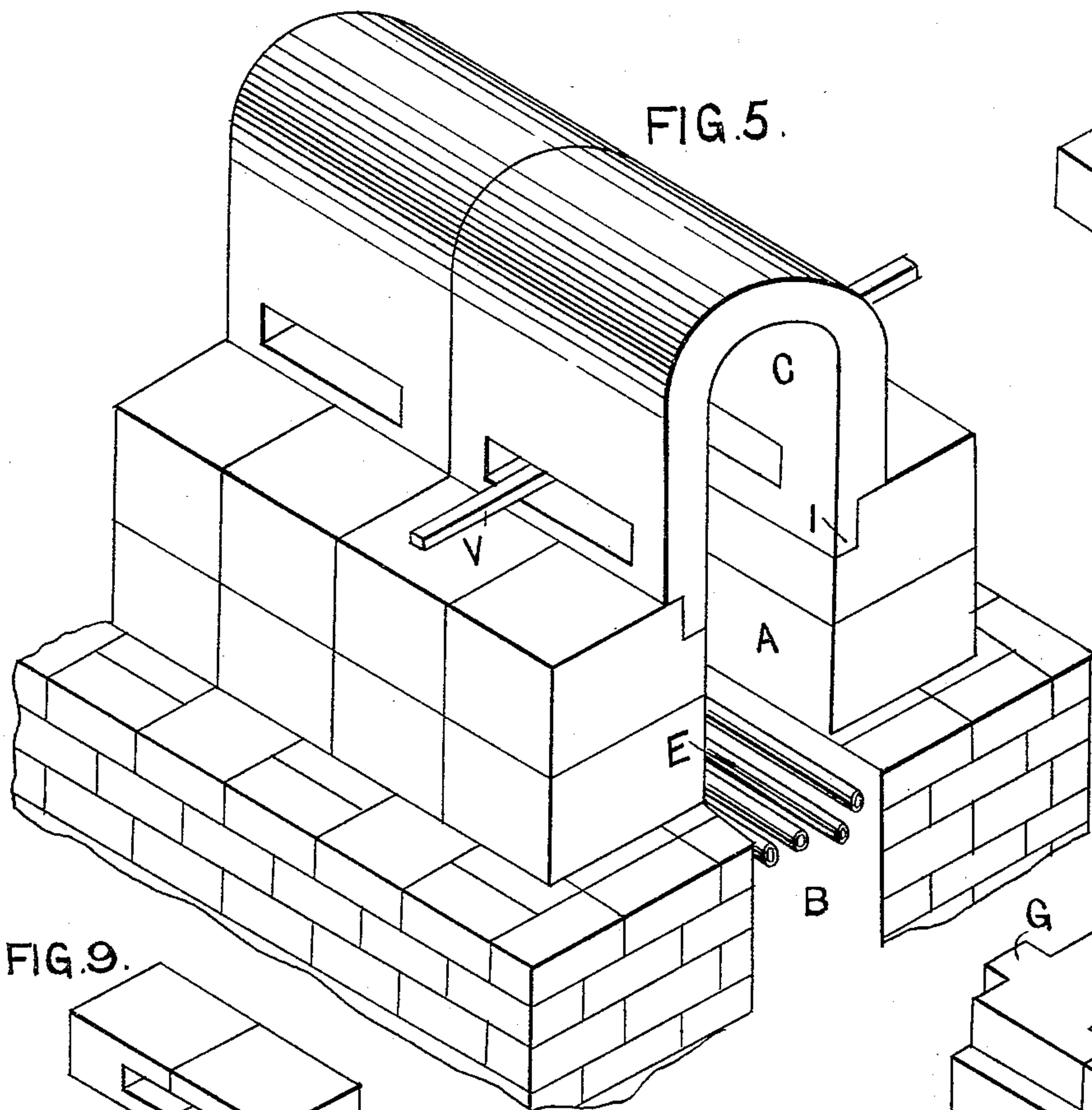


FIG. 5.

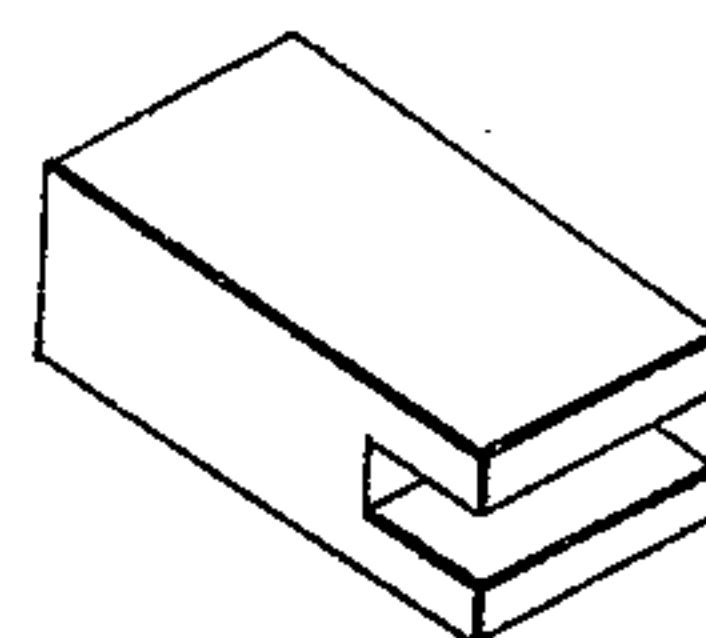


FIG. 8.

FIG. 9.

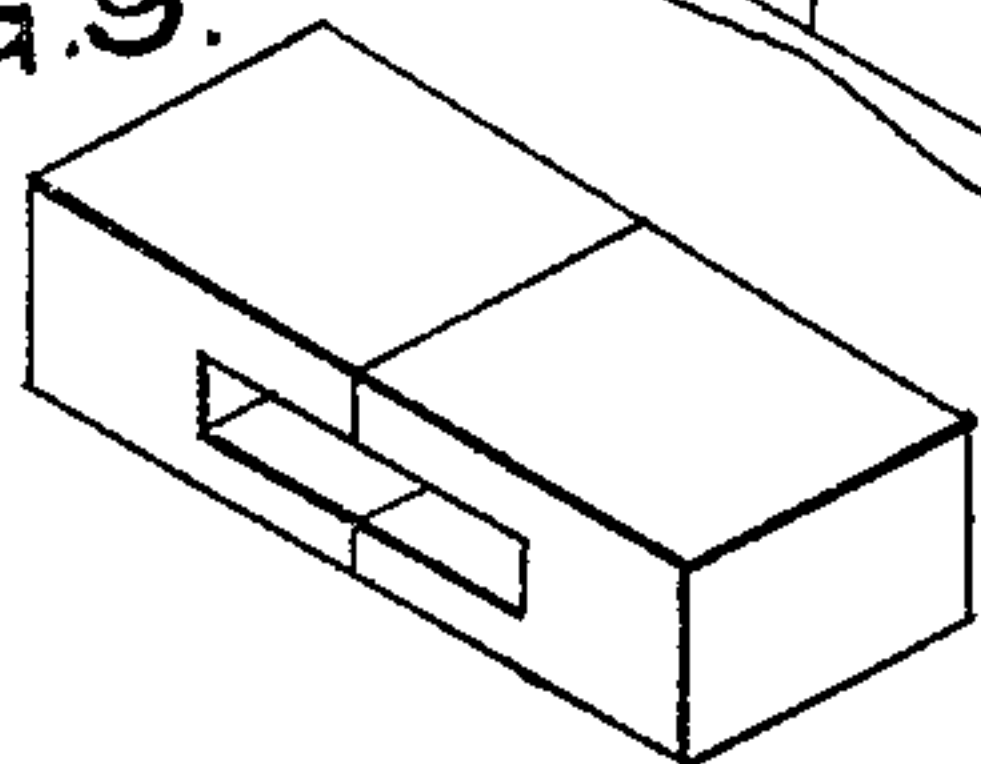


FIG. 7.

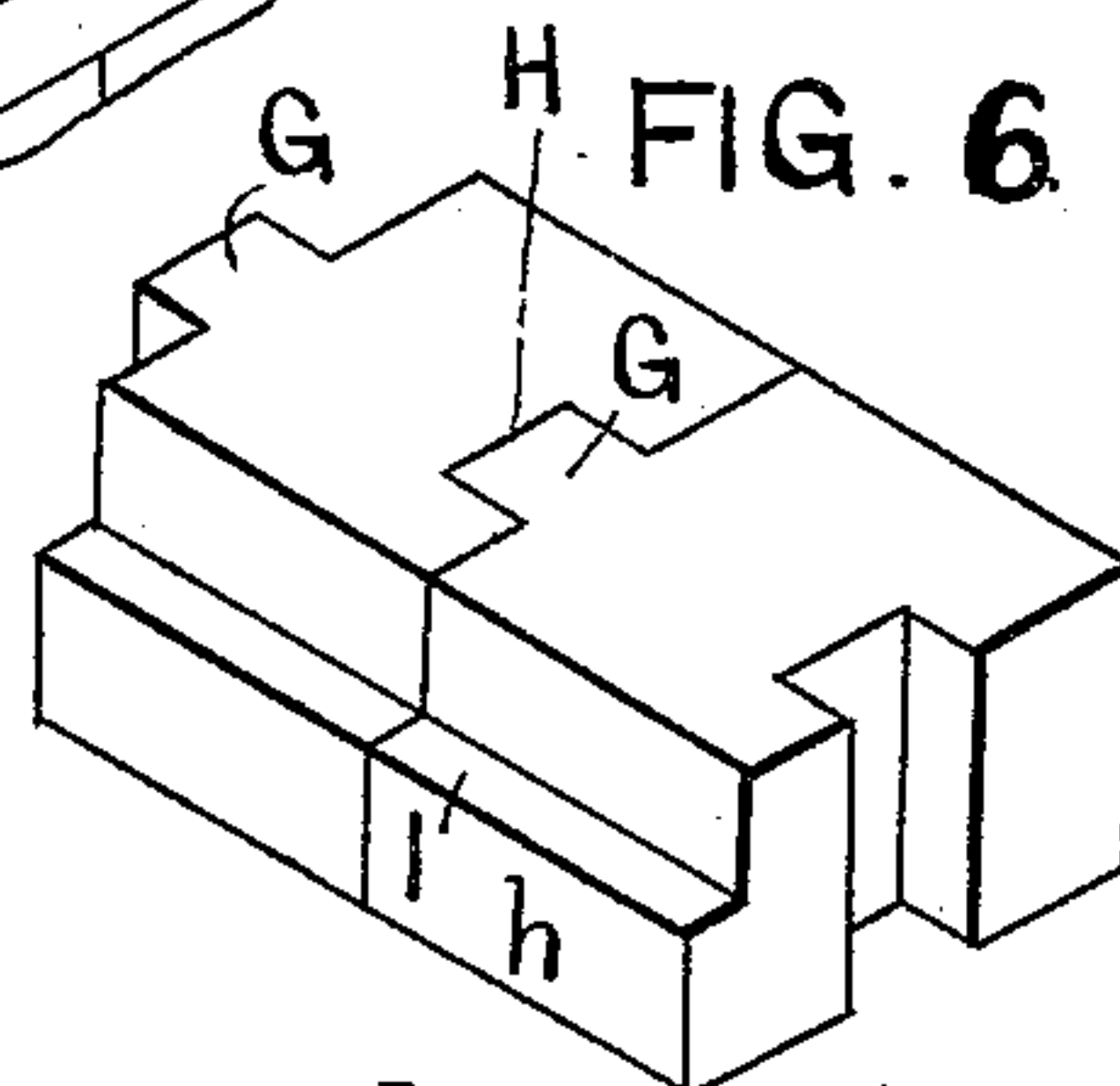
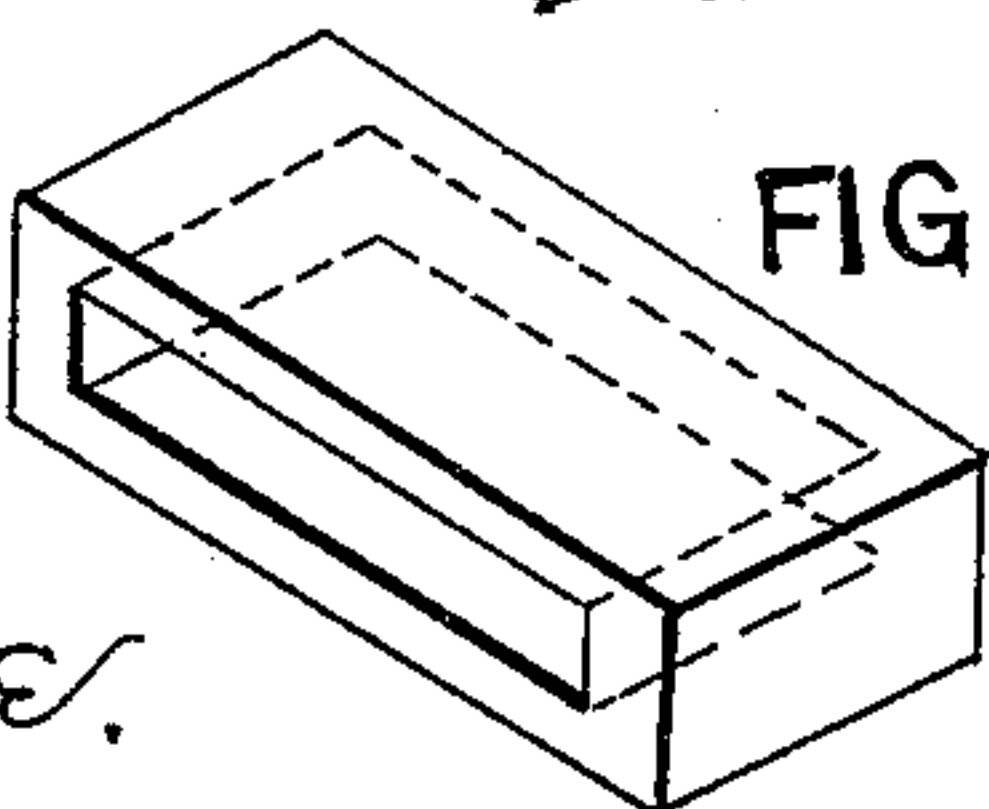


FIG. 6.

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# UNITED STATES PATENT OFFICE.

WILLIAM WILSON BARNES, OF HARRINGTON, ENGLAND.

## HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 618,218, dated January 24, 1899.

Application filed July 30, 1897. Serial No. 646,468. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM WILSON BARNES, a subject of the Queen of Great Britain, residing at Harrington, in the county of Cumberland, England, have invented certain new and useful Improvements in Heating-Furnaces, of which the following is a specification.

This invention has for its object to construct a furnace which will be applicable for various purposes where high temperature is required—such, for example, as for smiths' use in heating bars, for heating, working, or tempering drills, jumpers, picks, or other tools, implements, or articles of iron or steel, and for melting metals or ores in crucibles or melting-pots.

To this end I make and construct the furnace in the manner set forth in the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a general isometric view of one form of furnace specially suitable for heating and tempering drills, jumpers, picks, and other tools and for curving rails; Fig. 2, a longitudinal section of the same; Fig. 3, a vertical section on the line *a a*, Fig. 2; Fig. 4, a vertical section on the line *b b*, Fig. 2; Fig. 5, a fragmentary view of a slightly-modified form of the furnace, showing details of construction; Fig. 6, a detail view of the bricks of which the furnace may be built; Figs. 7, 8, and 9, detail views of special fire-clay bricks with orifices for admitting the articles to be heated.

In place of fires on open hearths, such as are used by smiths to fashion or otherwise work iron or steel by the aid of heat, I build the hearths in such a manner as to confine the fire in an inclosed space, so as to better obtain the required heat, effect a saving of fuel, and prevent the articles coming in actual contact with the fuel.

The general outward appearance of one form of my furnace is depicted in Fig. 1, and in Figs. 2, 3, and 4 sectional views of said furnace are shown, in which A designates the fire-chamber or hearth, in which the fuel is placed, constructed with thick side walls to resist the heat; B, the ash-pit; C, a heating or reverberatory chamber immediately above the hearth, in which the articles to be raised

to the required heat are located, and D an arched soaking chamber or oven also placed so as to be heated by the fire. The chamber C is perforated at the sides at C' C' to permit of the insertion into the chamber C of the articles to be heated, forged, or tempered. The grate is of hollow bars or pipes E, with spaces between to permit of the blast being introduced from below. Through these pipes water circulates, with the objects of keeping the bars from melting, heating the water in the pipes, which may be used for boiler-feeding or for other purposes, and preventing the formation of clinker between the pipes. The grate, however, may be formed with the pipes laid transversely instead of longitudinally, if preferred. The ash-pit B below the grate A is closed by the doors F', and through the door at the chimney or flue end I introduce an air-blast pipe F, the air being ejected through jets or otherwise and passing through the grate to augment combustion. The door at the front end of furnace is fitted with a plug F<sup>2</sup>. To clean the ash-pit, the plug is withdrawn and full blast applied through the ash-pit B, thus blowing out the ashes. The doors are lined with tiles or fire-bricks. The air-blast may be derived from an air-forcing engine or from any other suitable equivalent motive power and the supply-pipe provided with a valve to regulate the blast.

In construction the furnace is built up of ordinary bricks lined with infusible materials, by preference fire bricks or blocks. In order to secure durability, the bricks or blocks may be made to interlock with each other, so that they are firmly held in place by being locked together; but this is not absolutely necessary, as ordinary bricks will do if the shell or iron plates hereinafter described for keeping the bricks in position are used. These bricks are shown in detail in Fig. 6. Each block interlocks with the adjacent blocks by means of projections or dovetails G in the one engaging square or dovetailed depressions H in the next, and by these means all the blocks firmly interlock, so that they cannot separate. I build into the sides of the chamber C special bricks or blocks, such as are set forth by way of example in Figs. 7, 8, and 9, for forming the side holes through which the tools, jumpers, and other articles to be heated can be



passed. A course of these are laid in each side of the chamber C, the holes in the bricks being all of one size or of different sizes to allow articles of different shapes to pass. In an alternate arrangement, however, set forth in Fig. 5 the chamber is formed of fire-clay arches in sections side by side, the said figure showing two sections as an example with holes through which the articles to be heated are passed. The arches interlock with the bricks of the fire-chamber, as shown at I, Fig. 5. The furnace built up in the manner described is incased or surrounded externally by cast-iron plates J, bolted together, or it may be strengthened by iron hoops or bars.

An opening K is made from the chamber C into the soaking-chamber D, through which the heat and flames on their passage to the chimney can pass directly from the chamber C, and there may be openings D' in D, leading to the chimney. The fire-chamber A has one opening—namely the fire-door M, through which the fuel is fed to the fire. The chamber C is closed in front by a suitable door N, and this door and the intercommunicating opening K into the soaking-chamber D serve to permit of the introduction of the article longitudinally through the chamber and oven. Thus in the case of a bar of iron V, a tool, or other not very long article it is passed transversely into the chamber C, its ends resting in the holes in the side walls of said chamber. In the case of a longer article, such as a railway-rail, it is passed longitudinally through the door N and opening K, so that it occupies the length of both the chambers C and D, or if it be a melting-pot it is inserted through the door O into the chamber D. The flames and gases from the fire pass directly into the chamber C and soon heat to a red, white, or welding heat, as may be required, the articles which have been placed therein, then pass through the intercommunicating orifice K into the chamber D, and thence to the chimney. The flames and furnace-gases also pass directly under the chamber D to heat the same without coming into direct contact with the contents.

The advantages gained by this furnace, among others, are that the fire being confined in an inclosed space heat of the required intensity is obtained and regulated by controlling the blast, and, furthermore, instead of there being a great waste of heat, as in the case of open fires, all the heat is utilized for the work of the furnace. The combustion-chamber can be charged at intervals without interfering with the working of the furnace and all the operations for enabling smiths, engineers, and other workmen to advantageously heat their materials and tools may be effected in a far better manner than by the methods in use heretofore.

I declare that what I claim is—

1. The combination in a heating and forge

furnace, with a fire-chamber, of an open-bottomed heating or reverberatory chamber and a soaking pit or oven, the latter provided with a bottom, both situated directly over the fire-chamber and in substantially the same horizontal plane, in position to form a continuation one of the other, and also in position to be acted upon simultaneously by the heat from the fire-chamber, substantially as described.

2. The combination in a heating and forge furnace, with a fire-chamber, of an open-bottomed heating or reverberatory chamber situated directly over the same and having its side walls perforated to admit of the insertion of the articles to be heated, and a soaking pit or oven provided with a bottom and also situated directly over the fire-chamber in substantially the same horizontal plane with the heating-chamber, in position to form a continuation of the same, and also in position to be acted upon simultaneously therewith by the heat from the fire-chamber, substantially as described.

3. The combination in a heating and forge furnace, with a fire-chamber, of an open-bottomed heating or reverberatory chamber situated directly over the same and having its side walls perforated to admit of the insertion of the articles to be heated, and a soaking pit or oven provided with a bottom, and also situated directly over the fire-chamber in substantially the same horizontal plane with the heating-chamber, in position to form a continuation of the same, and also in position to be acted upon simultaneously therewith by the heat from the fire-chamber, said soaking-pit provided with an opening communicating with the heating-chamber and a second opening leading to the exterior of the furnace, substantially as described.

4. The combination in a heating and forge furnace, with an ash-pit, of a fire-chamber situated directly over the same and provided with a door M, an open-bottomed heating or reverberatory chamber situated above the fire-chamber and provided with a door N and having its side walls perforated to admit of the insertion of the articles to be heated, and a soaking pit or oven provided with a bottom and also situated directly over the fire-chamber at the rear of the heating-chamber, in a position to be acted upon simultaneously therewith by the heat from the fire-chamber, said soaking-pit being provided with an opening K communicating with the heating-chamber and a door O leading to the exterior of the furnace, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

W. WILSON BARNES.

Witnesses:

G. C. DYMOND,  
W. H. BEESTON.