

No. 874,039.

PATENTED DEC. 17, 1907.

A. SMALLWOOD.
MUFFLE OR FURNACE FOR ANNEALING.

APPLICATION FILED DEC. 18, 1906.

FIG. 2.

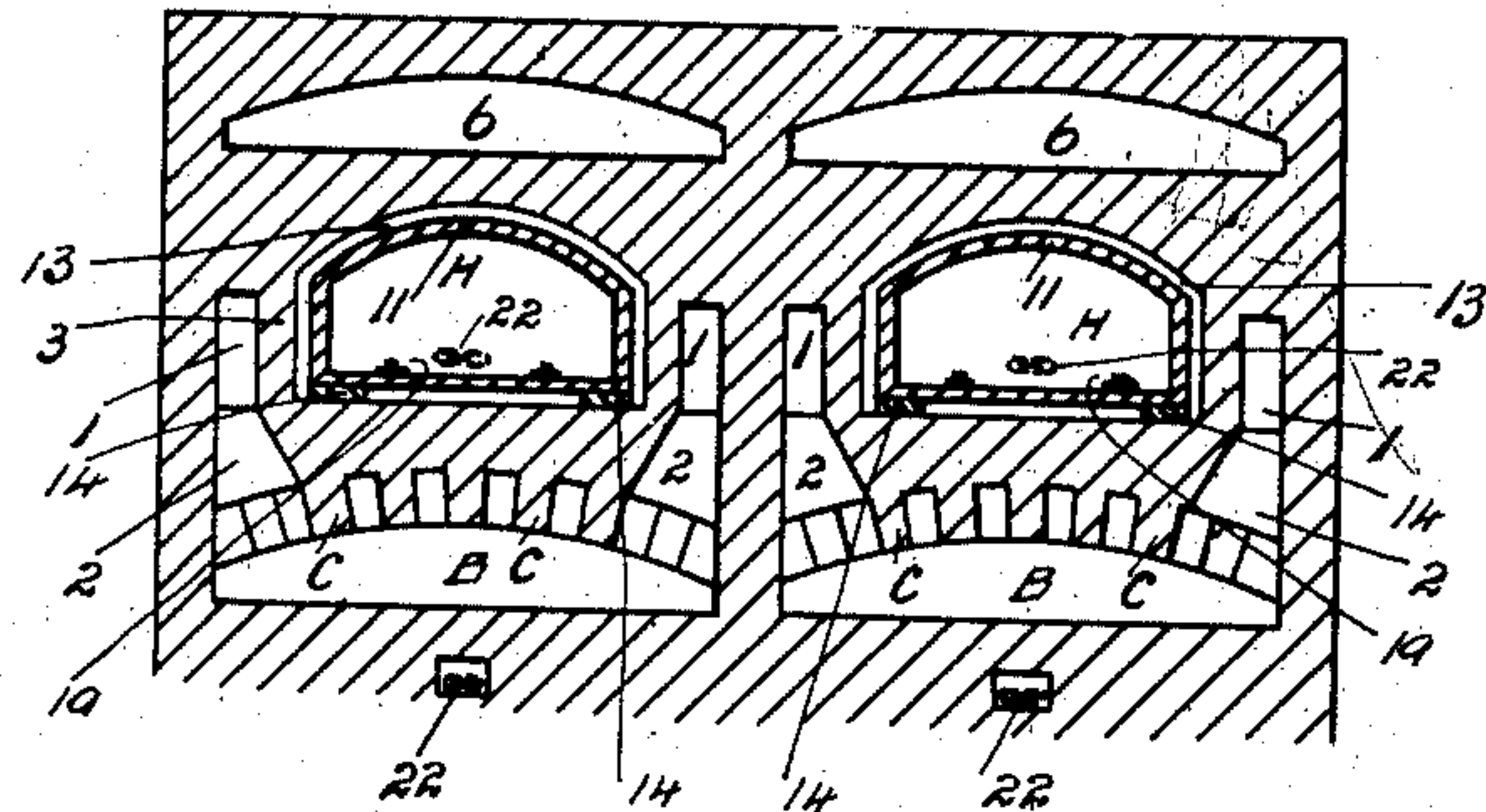


FIG. 4.

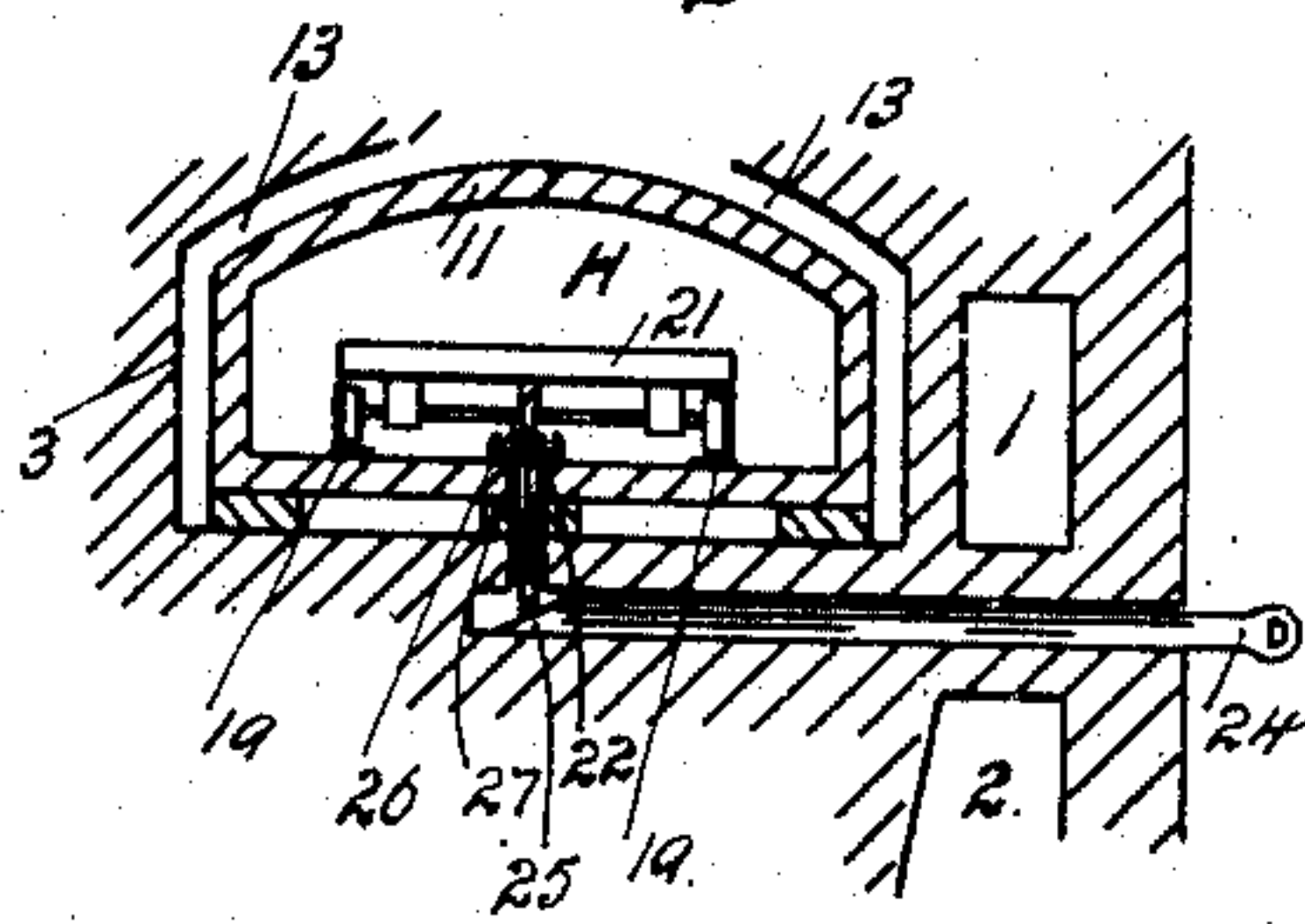


FIG. 3.

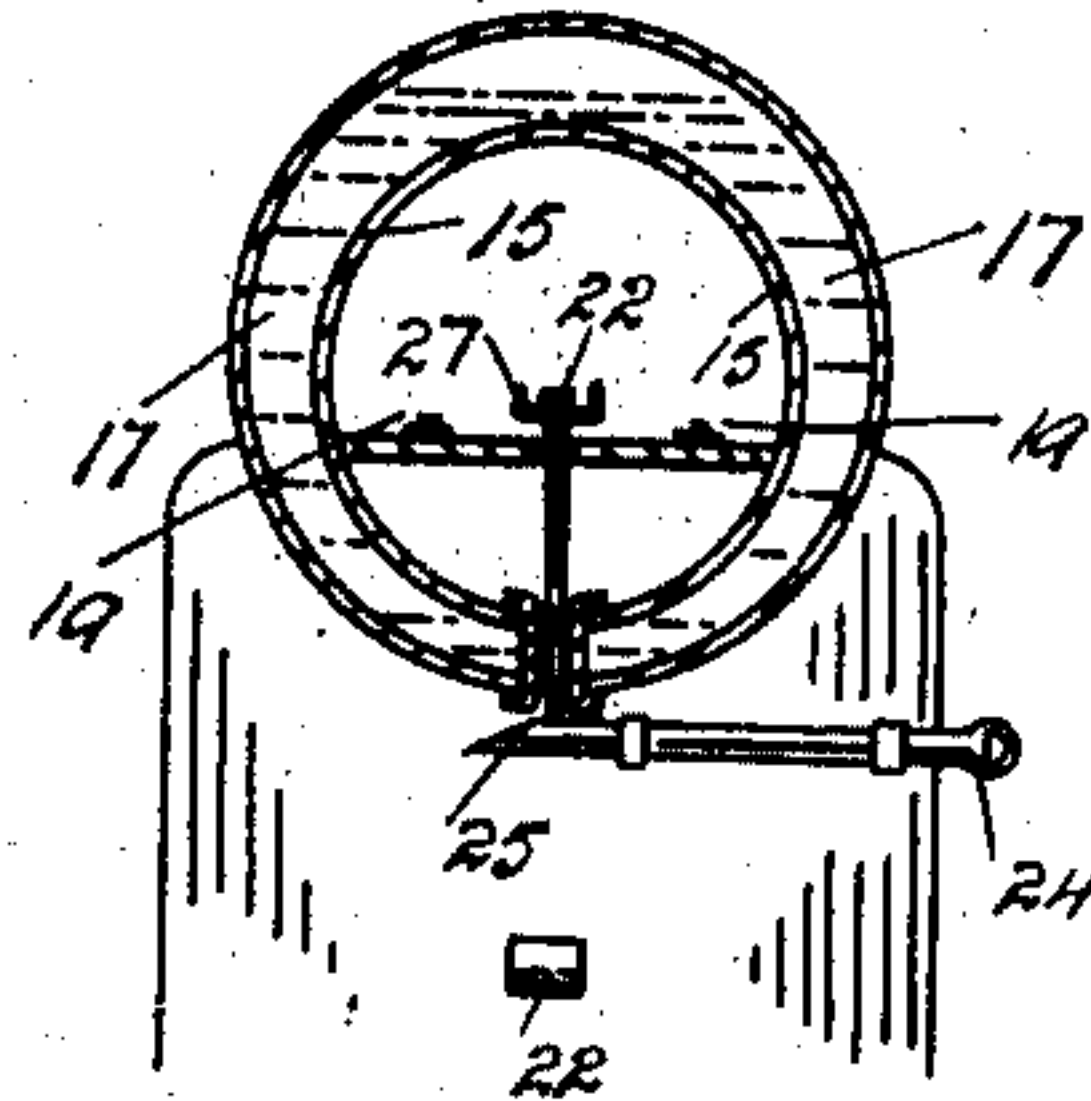
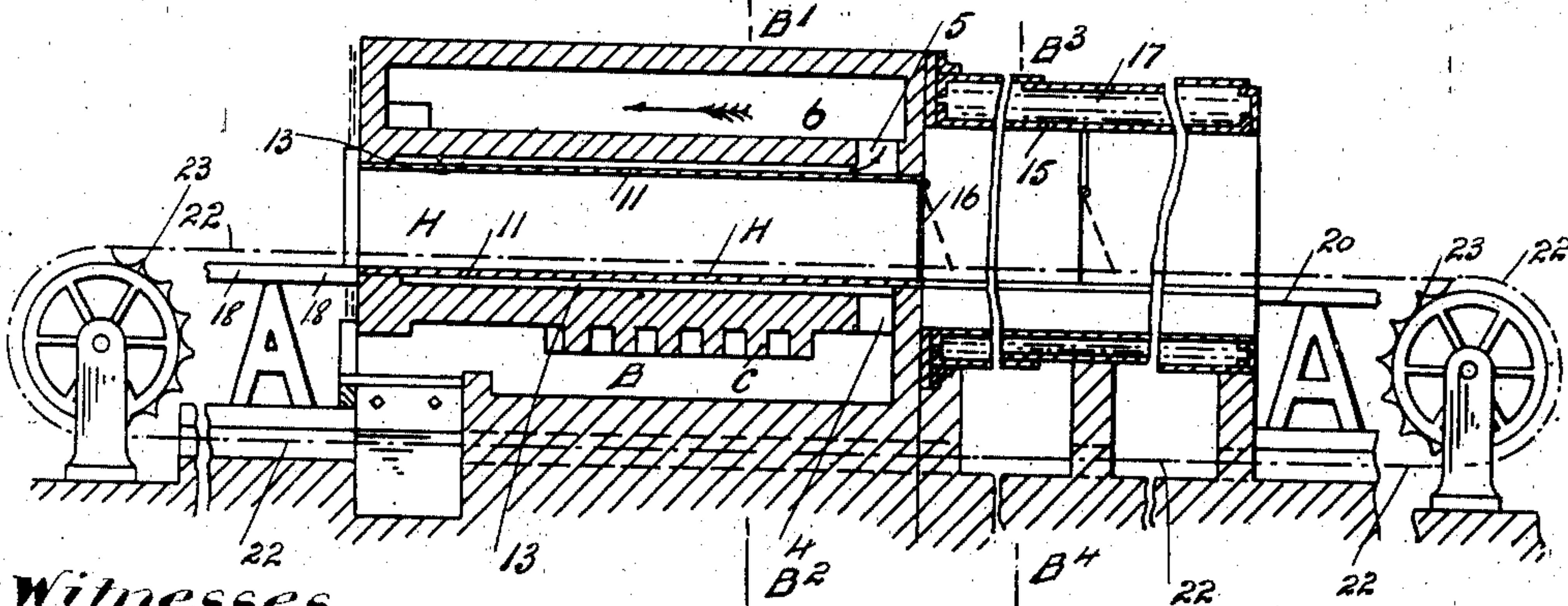


FIG. 1.



Witnesses.

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UNITED STATES PATENT OFFICE.

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MUFFLE OR FURNACE FOR ANNEALING.

No. 874,039.

Specification of Letters Patent.

Patented Dec. 17, 1907.

Original application filed January 19, 1905, Serial No. 241,904. Divided and this application filed December 18, 1906, Serial No. 348,494.

To all whom it may concern:

Be it known that I, ALFRED SMALLWOOD, of 24 Coleman street, London, in the county of Middlesex, England, formerly of 52 Gracechurch street, London, have invented certain new and useful Improvements in Muffles or Furnaces for Annealing; and I hereby declare that the following is a full, clear, and exact description of the same, this being a division of application, Serial No. 241,904, filed January 19, 1905, which matured into Patent Number 833,640, dated the 16th of October, 1906.

In the case of furnaces for annealing tubes, sheets, rods and other metal articles, and which furnaces are applicable for use in connection with glass, pottery and various other classes of articles, such furnaces consist of an annealing chamber with a combustion chamber which is arranged intermediately between the fire grate and the annealing chamber with a fire brick, fire clay or other suitable partition between the two which in work becomes incandescent throughout, and which assists in igniting the uncombusted gases as they pass from the fire grate through the combustion chamber to the annealing chamber, the object being to distribute those parts of the furnace which require to be in a state of incandescence so as to obtain a more rapid ignition of the gases in proportion to the size of the combustion chamber, and at the same time render most of the surrounding lining of the annealing chamber incandescent throughout, by which a more effective distribution of the heat is obtained. By this arrangement the heated gases, less the amount absorbed by the articles under process of annealing, can be conveyed to a second, and even a third annealing chamber thereby saving the fuel which would otherwise be required for heating the one or two successive chambers.

The combustion chamber is placed under the annealing chamber with the firegrate arranged at the rear or side of the combustion chamber so as to be furthest removed from the heat exit, the roof or division between the two chambers being constructed with fire bricks, fire clay or other material of a kind which is suitable for becoming incandescent under heat, the lower side of the roof of the combustion chamber being so designed and constructed as to increase its power of acting as an accumulator and retarder of heat which

has been generated in the combustion chamber and otherwise to form a means whereby practically complete combustion can be assisted.

In order to form the heat accumulator and obtain the desired result the roof is designed and constructed as to increase the area of the lower side thereof by corrugated, draft-board or other surface extensions, projections or excrescences which extend or project into the combustion chamber sufficiently to assist in breaking up, mixing and circulating the uncombusted material and gases and render them more amenable in their combustion with the oxygen.

In furnaces for annealing certain articles including some classes of tubes for the prevention of oxidation it is necessary that they should not be exposed or in any way subjected to the external atmosphere, either when under the process of annealing or during the various stages of cooling, and this invention enables the articles to be placed in the furnace or muffle, also transferred therefrom into one or two cooling chambers in succession and finally removed from the last cooling chamber without being exposed to the external atmosphere during any intermediate change between entering the muffle and leaving the last cooling chamber, while at the same time the muffle and succeeding cooling chambers can all be in use at the same time.

In the drawings:—Figure 1 is a section of one of the muffles or annealing furnaces. Fig. 2 is an enlarged transverse section through Fig. 1 on the line B' B'' showing a pair of such furnaces side by side. Fig. 3 is an enlarged transverse section through Fig. 1 on the lines B³, B⁴. Fig. 4 is an enlargement of one of the annealing chambers shown in Fig. 2 to further illustrate the means of moving the goods from the chamber without opening it to the atmosphere.

Like numerals and letters of reference refer to like parts throughout the specification and drawings.

According to this invention a cavity 1 is provided in the side walls of the annealing chamber, and such cavity is extended down to the combustion chamber at the several points where support is not required for the floor of the annealing chamber and in some cases above the arch of the annealing chamber, the lower part of the cavity in the roof

of the combustion chamber B being enlarged at the mouth 2 so as to readily admit of the heated gases rising up into and flowing through to the cavities for the purpose of rendering the lining of the annealing chamber incandescent throughout a number of fire bricks or blocks of suitable material in some cases being built into the lining so as to project at intervals across the cavity to assist in conducting the heat to the lining 3.

For facilitating the conversion of the furnace from one for open annealing to one for close annealing in which the chamber is hermetically sealed during the annealing of the articles the heat exit from the combustion chamber B is effected by one or more vertical flues 4 arranged to convey the heat from the combustion chamber B around the annealing chamber H and one or more vertical flues 5 connected with the flue 6 above the annealing chamber H.

In the application of this invention to furnaces for annealing certain articles including some classes of tubes which for the prevention of oxidation it is necessary should not be exposed or in any way subjected to the external atmosphere either when under the process of annealing or during the various stages of cooling, the annealing oven consists preferably of a chamber 11 of firebrick, fireclay, metal or other material suitable for the particular articles to be annealed and which is built in the annealing chamber so as to form a clear passage therethrough from front to rear of the furnace and also leave a space 13 extending all round between the outside of the annealing oven and the inside of the annealing chamber with the exception of the parts 14 upon which the annealing oven is supported.

Cylinders 15 are provided at the rear of the furnace in continuation of the annealing oven for the purpose of forming two or more cooling chambers in succession, while the annealing chamber H and each of the cooling chambers formed by the cylinders 15 are divided by a partition door 16 which is preferably hung upon pivots to swing in one direction only, by which means each chamber is hermetically sealed both from the adjoining chamber and from the external atmosphere. The cylinder 15 may be surrounded by a jacket of water 17 which absorbs the heat during the cooling process and admits of the jacket being used for generating steam for various purposes.

A platform 18 of similar length to that of the annealing chamber is provided at the front of the furnace and a tramway 19 extends from the front end of the platform through the annealing oven and cooling chambers 8 and 15 and upon a similar length of platform 20 at the rear, and upon this tramway the trucks such as 21 for conveying the articles to be annealed are arranged to

travel. An endless chain 22 or other suitable means of imparting motion is arranged along the track of the tramway and in the case of a chain engages with a sprocket 23 which is mounted at the extreme end of each platform, and by means of the rear one of which the chain is drawn, the lower or return part of the chain 22 being allowed to hang loose. That portion of the track upon which the chain rests is formed of a channel trough or other strip 27 and is mounted in sections; the platform of each chamber having a separate section, each section being capable of being separately raised by means of a rod 24 with an incline 25 which is operated from the outside of the chamber, while an inverted projection 26 is provided upon each of the tracks which engages with a link of the chain when the chain and platform or trough are raised, but which is clear of the chain when the platform or trough is in the normal position. By these means any truck can be moved from one chamber H to another without affecting any truck which may be in another chamber, and without the necessity of opening any external door, as the moving truck 21 will raise or open the door 16 required in the course of its travel from one chamber to another, the door closing by its own gravity immediately the truck has passed, while the chain 22 being free to travel independently of the trucks can be so moved prior to engaging with any particular truck that the portion of heated chain in the annealing oven is removed to the lower return, in which no strain is required, the cold part of the chain being then in position for conveying the loaded trucks as required.

It will readily be seen that the particular form of engaging mechanism between the conveyer and the trucks may be varied so long as the independent transferring movement of any truck from one chamber to another can be effected without opening any or either of the chambers to the external atmosphere.

In any of the aforementioned cases the heat which remains after passing around the annealing oven can be utilized by passing it under a second annealing oven which may be arranged at the side of the first annealing chamber as illustrated by Fig. 2, the cavities 1 and 2 in the side walls of the second furnace being connected with the oven flues of the first chamber in a similar manner to that previously described with regard to the combustion chamber, and in some cases the heat remaining after passing the second chamber may be passed to a third annealing chamber in the same manner.

Having thus fully described my invention what I claim as new and desire to secure by Letters Patent is:—

1. An annealing furnace comprising a

combustion chamber, and an annealing chamber arranged above the combustion chamber, a horizontal partition separating the combustion chamber from the annealing chamber capable of becoming incandescent and forming the floor of the annealing chamber; in combination with one or more cooling chambers communicating by doors with the annealing chamber, and means whereby the articles being annealed can be conveyed from one chamber to another without the necessity of opening any or either of the chambers to the external atmosphere.

2. An annealing furnace comprising a combustion chamber, an annealing chamber arranged above the combustion chamber, a horizontal partition separating the combustion chamber from the annealing chamber capable of becoming incandescent and forming the floor of the annealing chamber, surface extensions forming part of the horizontal partition and of the same material and projecting into the combustion chamber in the path of the gases passing therethrough, one or more cooling chambers communicating by doors with the annealing chamber, and a carrying means whereby the articles can be conveyed from one chamber to another without the necessity of opening any of the chambers to the external atmosphere.

3. An annealing furnace comprising a combustion chamber, an annealing chamber arranged above the combustion chamber, a horizontal partition separating the combustion chamber from the annealing chamber capable of becoming incandescent and forming the floor of the annealing chamber, surface extensions forming part of the horizontal partition and of the same material thereas and projecting into the combustion chamber in the path of the gases passing therethrough, and extensions of the combustion chamber at the sides of the annealing chamber, the lower end of said extensions of the combustion chamber being enlarged to freely admit the gases in the combustion chamber into said extensions, in combination with, one or more cooling chambers communicating by doors with the annealing chamber and means whereby the articles being annealed can be conveyed from one chamber to another without the necessity of opening any or either of the chambers to the external atmosphere.

4. An annealing furnace comprising a combustion chamber, an annealing chamber arranged above the combustion chamber, a horizontal partition separating the combustion chamber from the heating chamber capable of becoming incandescent and forming the floor of the annealing chamber, surface extensions forming part of the horizontal partition and of the same material thereas and projecting into the combustion chamber in the path of the gases passing therethrough,

and extensions of the combustion chamber at the sides of the annealing chamber, the lower end of said extensions of the combustion chamber being enlarged to freely admit the gases in the combustion chamber into said extensions, in combination with a plurality of successive cooling chambers communicating by doors with one another and with the annealing chamber, and means whereby the articles being annealed may be conveyed from one chamber to that succeeding it without the necessity of opening any or either of the chambers to the external atmosphere.

5. An annealing furnace comprising a combustion chamber, and an annealing chamber arranged above the combustion chamber, a horizontal partition separating the combustion chamber from the annealing chamber capable of becoming incandescent and forming the floor of the annealing chamber, in combination with an annealing oven contained in the annealing chamber with a space between its walls and the wall of the annealing chamber, a plurality of successive cooling chambers, communicating by doors with one another and with the annealing oven and means whereby the articles being annealed may be conveyed from one chamber to that succeeding it without the necessity of opening any or either of the chambers to the external atmosphere.

6. An annealing furnace comprising a combustion chamber, and an annealing chamber arranged above the combustion chamber, a horizontal partition separating the combustion chamber from the annealing chamber capable of becoming incandescent and forming the floor of the heating chamber, in combination with an annealing oven contained in the annealing chamber with a space left between its walls and the wall of the annealing chamber, a plurality of successive cooling chambers communicating by doors with one another and with the annealing oven, rotatable sprocket wheels external to the furnace at each end of the same, an endless chain engaging the sprocket wheels, the upper part of the chain passing through the annealing oven and cooling chambers, carriages in the annealing oven, and means for bringing the chain into engagement with the carriages to move them from one chamber to the other without the necessity of opening any or either of the chambers to the external atmosphere.

7. An annealing furnace comprising a combustion chamber and an annealing chamber arranged above the combustion chamber, a horizontal partition separating the combustion chamber from the annealing chamber, capable of becoming incandescent and forming the floor of the annealing chamber, in combination with an annealing oven contained in the annealing chamber with a space left between its walls and the wall of the an-

nealing chamber, a plurality of successive cooling chambers communicating by doors with one another and with the annealing oven, carriages in the annealing oven having
5 downwardly projecting fingers on their under surfaces, rails for the carriages, rotatable sprocket wheels external to the furnace, an endless chain engaging the sprocket wheels; the upper part of the chain passing through
10 the annealing oven and cooling chambers, channel sections for containing the endless chain and means for selectively raising the

channel sections to allow of the selective movement of the carriages from one chamber to the other without the necessity of
opening any or either of the chambers to the
external atmosphere. 15

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

ALFRED SMALLWOOD.

Witnesses:

WALTER H. E. BARTLAM,
ROWLAND L. GOOLD.