No. 833,640. PATENTED OCT. 16, 1906.

A. SMALLWOOD.

MUFFLE OR FURNACE FOR ANNEALING.

APPLICATION FILED JAN. 19, 1905.

FIG. 2.

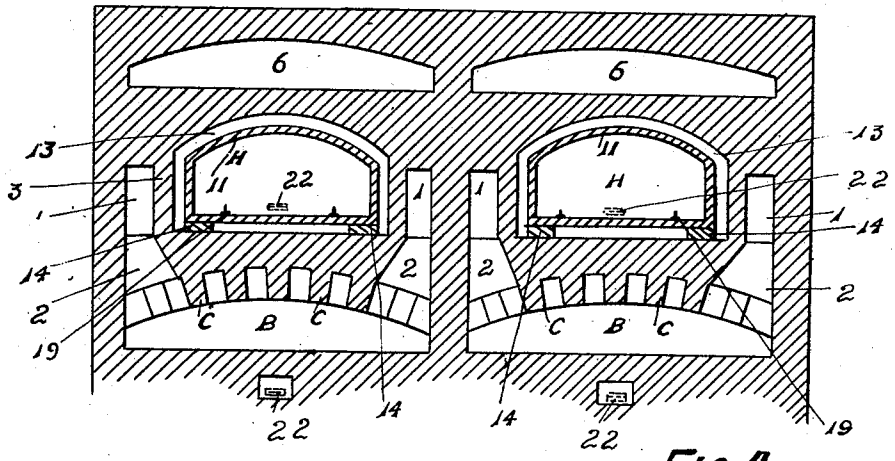


FIG. 3.

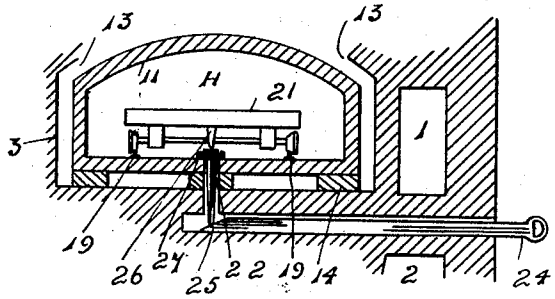


FIG. 4.

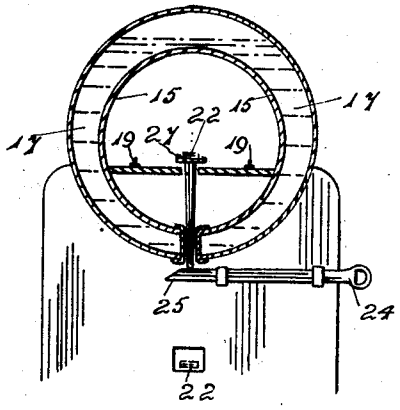
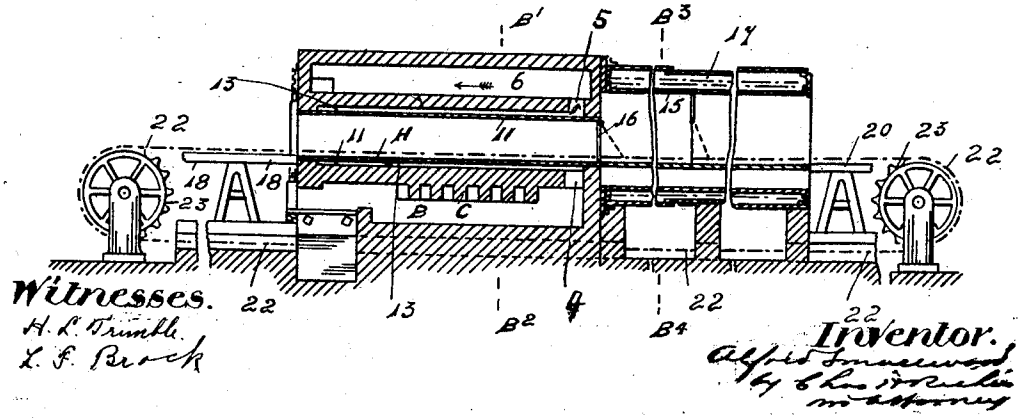


FIG. 1.



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UNITED STATES PATENT OFFICE.

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MUFFLE OR FURNACE FOR ANNEALING.

No. 833,640. Specification of Letters Patent. Patented Oct. 16, 1906.

Application filed January 19, 1905. Serial No. 241,904.

To all whom it may concern:

Be it known that I, ALFRED SMALLWOOD, of 52 Gracechurch street, in the city of London, in the county of Middlesex, England, 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.

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 incombusted gases as they pass from the fire-grate through the combustion-chamber to the heating or 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, while at the same time either or any of such annealing-chambers can be more readily converted so as to be applicable for either "close" or "open" annealing, as may be required.

The combustion-chamber is placed under the annealing-chamber, with the fire-grate arranged at the rear or side of the combustion-chamber so as to be farthest 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 so constructed as to increase the area of the lower side thereof by corrugated, draught-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 incombusted material and gases.

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 $B' B^2$, showing a pair of such furnaces side by side. Fig. 3 is an enlarged transverse section through Fig. 1 on the lines $B^3 B^4$. 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.

In applying this invention to annealing-chambers a cavity 1 is provided in the side walls of the annealing-chamber 13, and such cavity is extended down to the combustion-chamber B at the several points where not required for the support of floor B' of the annealing-chamber 13, as shown in Figs. 2 and 4, and in some cases above the arch of the an-

nealing-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 are 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 is effected by one or more vertical flues, arranged to convey the heat from the combustion-chamber around the annealing-chamber H, and one or more vertical flues, connected with the flue above the annealing-chamber, as shown and described in the drawings and specification of my concurrent application, Serial No. 280,940.

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 close-annealing chamber H consists, preferably, of a cylinder 11, of fire-brick, fire-clay, metal, or other material suitable for the particular articles to be annealed, and which is built in a heating-chamber, so as to form a clear passage through the annealing-chamber from front to rear of the furnace and also leave a space extending all round between the outside of the annealing-chamber H and the inside of the heating-chamber 13, with the exception of the parts 14, upon which the annealing-chamber H is supported.

Cylinders 15 are provided at the rear of the furnace in continuation of the annealing-chamber for the purpose of forming one, 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 and cooling chambers H 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 trucks 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, 15, 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-chamber 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 through or around the annealing-chamber H, as may by reason of the open or close annealing hereinafter described, is utilized by passing it under a second annealing-chamber, which may be arranged at the side of the first chamber, as illustrated by Fig. 2, the cavities 1 and 2 in the side walls of the second furnace, which are connected with the overflues 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. A muffle or 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, vertical linings connected to the roof of the annealing-chamber and to the horizontal partition, 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 said vertical linings, the lower end of said extensions of the combustion-chamber being enlarged to freely admit the gases in the combustion-chamber into said extensions.

2. A muffle or 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, vertical linings connected to the roof of the annealing-chamber and to the horizontal partition, 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 said vertical linings, the lower end of said extensions of the combustion-chamber being enlarged to freely admit the gases in the combustion-chamber into said extensions, and a closed receptacle within the annealing-chamber and located above the floor thereof with a clear passage between the walls of the annealing-chamber and said receptacle.

3. A muffle or 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, vertical linings connected to the roof of the annealing-chamber and to the horizontal partition, 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 said vertical linings, the lower end of said extensions of the combustion-chamber being enlarged to freely admit the gases in the combustion-chamber into said extensions, and a closed receptacle within the annealing-chamber and located above the floor thereof with a clear passage between the walls of the annealing-chamber and said receptacle, track-rails within said receptacle, a chain-trough within said receptacle between said track-rails, and means for raising said chain-trough.

4. A muffle or 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, vertical linings connected to the roof of the annealing-chamber and to the horizontal partition, 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 said vertical linings, the lower end of said extensions of the combustion-chamber being enlarged to freely admit the gases in the combustion-chamber into said extensions, and a closed receptacle within the annealing-chamber and located above the floor thereof with a clear passage between the walls of the annealing-chamber and said receptacle, track-rails within said receptacle, a chain-trough within said receptacle between said track-rails, means for raising said chain-trough consisting of a vertically-movable standard connected to the chain-trough, a horizontally-movable lever extending through the wall of the annealing-furnace and having an inclined end to engage the end of said standard, and a hinged door to cover the entrance to the annealing-chamber arranged to be automatically opened by the trucks traveling upon the track-rails.

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

ALFRED SMALLWOOD.

Witnesses:

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ROWLAND L. GOOLD.