May 2, 1933. A. G. LOBLEY 1,906,799

ELECTRIC FURNACE

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Fig. 1.

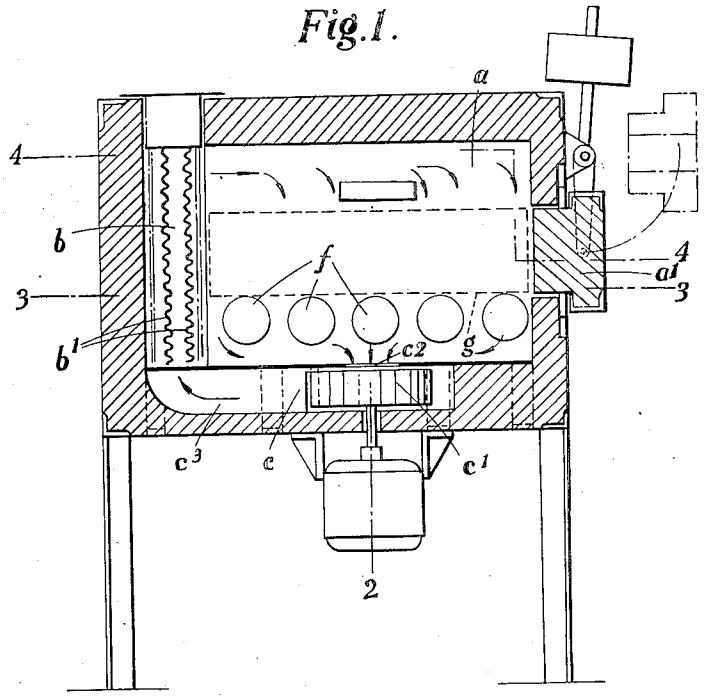
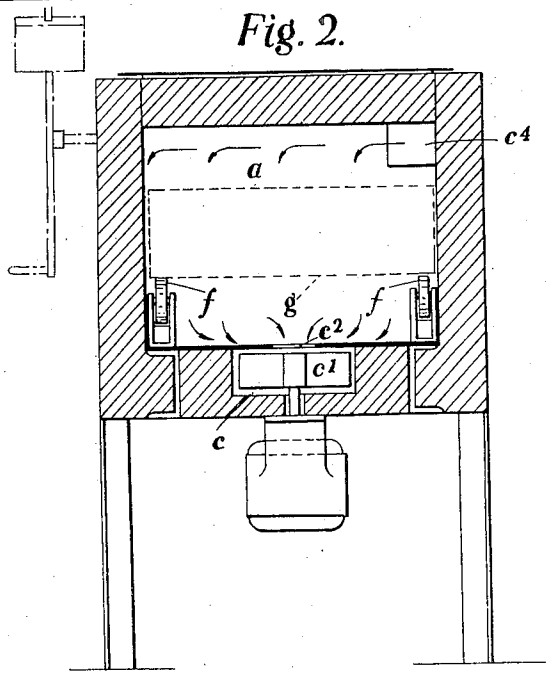


Fig. 2.



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Fig. 3.

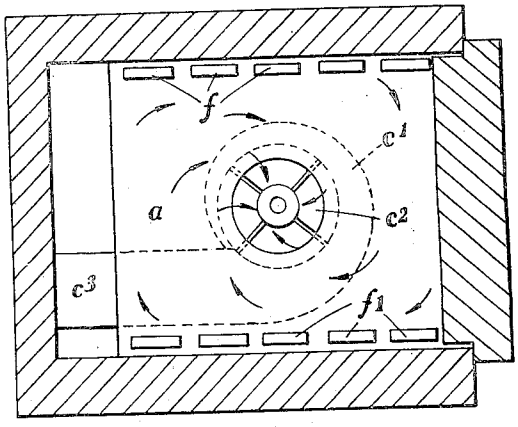


Fig. 4.

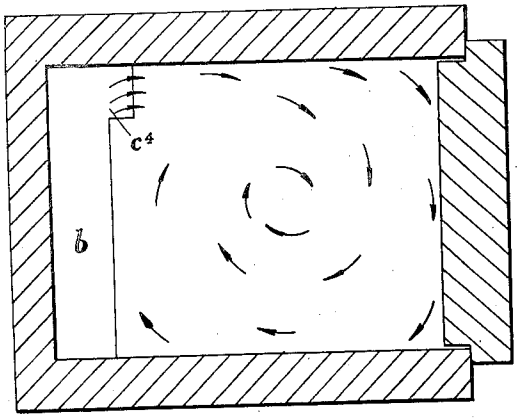
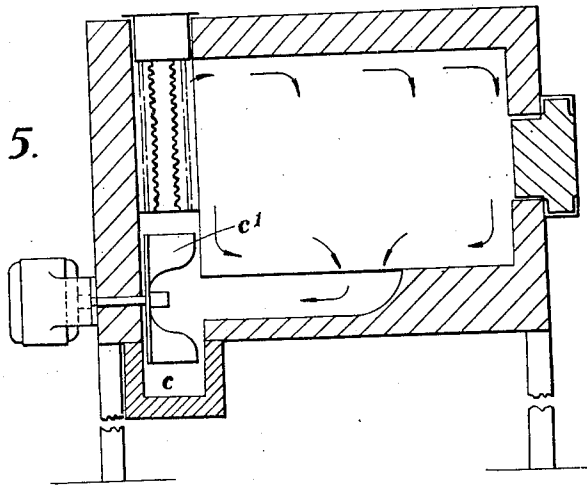


Fig. 5.



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ELECTRIC FURNACE

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Fig. 6.

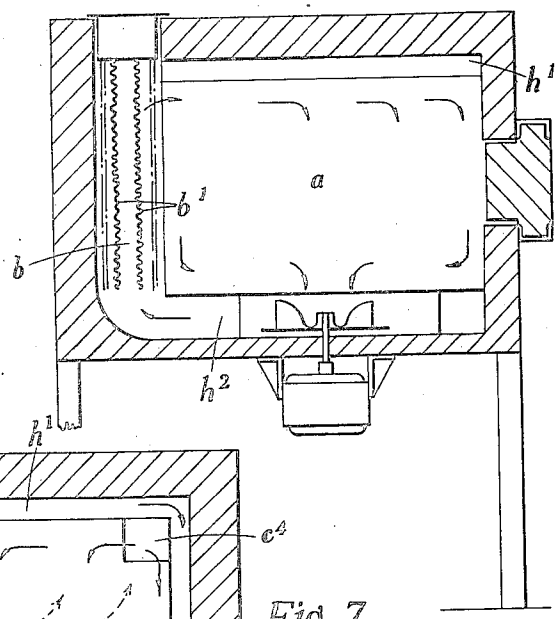


Fig. 7.

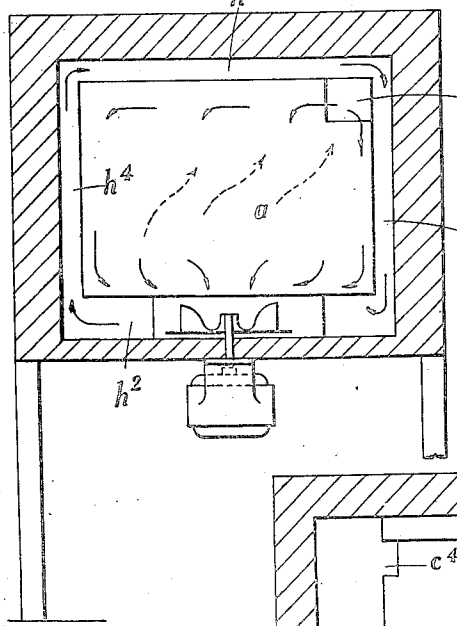
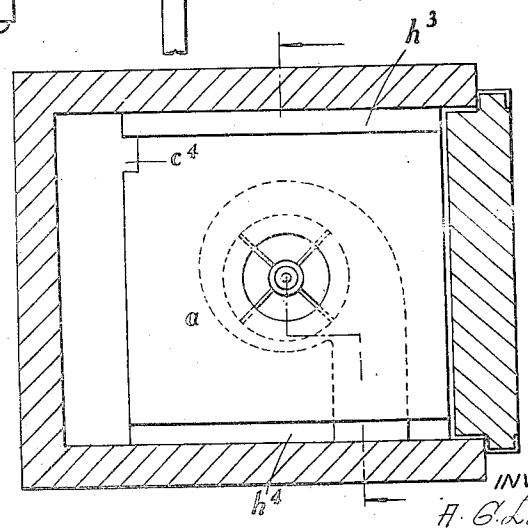


Fig. 8.



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Patented May 2, 1933 1,906,799

UNITED STATES PATENT OFFICE

ALFRED GLYNNE LOBLEY, OF PARADE, BIRMINGHAM, ENGLAND, ASSIGNOR OF ONE-HALF TO BIRMINGHAM ELECTRIC FURNACES LIMITED, OF BIRMINGHAM, ENGLAND, A COMPANY OF GREAT BRITAIN

ELECTRIC FURNACE

Application filed September 10, 1930, Serial No. 481,002, and in Great Britain September 19, 1929.

The invention has reference to electric furnaces for the annealing or other treatment of metals at relatively low temperatures by the forced circulation of air over a system of electrical resistance and through the work container in such a manner that the treatment heat is conveyed to the said charge by the circulating air currents.

The object of the said invention is to construct and provide a furnace that will enable rapid and uniform treatment of work charges by continuous or unidirectional circulating currents.

To attain this object, it is proposed so to construct the furnace as to provide for a tangential or indirect delivery or injection of the hot air stream therein, such as by locating the air-inlet in one corner or in one side of the said chamber and remote from the air outlet. It is also proposed to arrange for the location of the work carriers within the treatment chamber in a location intermediate the air-inlet and air-outlet so that the said work in itself assists in the setting up of the eddying or whirling air-currents.

A tempering furnace adapted to realize the object of the said invention is shown diagrammatically in Figures 1 to 4 of the accompanying drawings, where

Figure 1 shows a longitudinal vertical section of the structure, with a work-container (indicated by dotted lines) in position in the treatment chamber.

Figure 2 is a cross section on the dotted line 2, Figure 1.

Figure 3 is a sectional plan on the dotted line 3, Figure 1, where the arrows indicate the direction of the eddying air flow in the bottom of the treatment chamber, and

Figure 4 is a horizontal sectional plan on the dotted line 4, Figure 1, where the arrows show the air flow in the top of the chamber.

Fig. 5 is a longitudinal vertical section of an alternative construction.

An alternative construction is diagrammatically illustrated in Figs. 6, 7 and 8, of which:

Fig. 6 is a longitudinal vertical section of the furnace,

Fig. 7 is a transverse vertical section, and

Fig. 8 is a sectional plan view.

Referring in detail to Figs. 1 to 4 this structure comprises a treatment chamber a having a charging aperture at a^1, a resistance chamber b containing the heating resistors b^1, and a fan-chamber c of voluted form which is located outside the chamber a and contains a fan c^1 of the centrifugal type. The top of the fan chamber has communication with the treatment chamber through a port or aperture c^2 in the bottom of the said chamber, and an air-passage c^3 leads from the said fan-chamber to the bottom of the resistance-chamber, whose upper part is formed with a port or aperture at c^4 opening (as shown at Figure 2) into the treatment chamber at the top right-hand corner of the latter. This system of inter-communicating ports and passages provides a closed circuit for the circulation of air from the fan chamber c through the passage c^3 to the resistance chamber b, and from the top of the latter through the port c^4 into the top of the treatment chamber, and back again through the bottom port c^2 into the fan-chamber.

The interior of the treatment chamber is provided with a series of rollers f or equivalent means for supporting a tray-like work-container or open-topped charger g which are perforated or of a lattice-like construction to enable access of air to the whole of the contents. The container is located in a plane (as shown in Figure 2) intermediate the hot-air intake port c^4 in the upper corner of the said chamber and outlet port c^2 in the bottom thereof, and thus interposes a baffle or obstruction between the said ports c^4, c^2, which, in conjunction with the disposition of the port c^4, causes the tangentially-delivered air to swirl or eddy over and above and below the work in the container, and into all parts (including the corners) of the chamber as indicated by the arrows in the several figures.

If desired, baffles may be fixed within the chamber in any suitable relation to, the hot-air intake port (such as by suspending the same from the chamber roof) to assist or

promote the eddying or swirling of the air over and around the work.

Another furnace construction adapted for realizing the object of the invention is shown in Figure 5 which, however, only differs from that shown in Figures 1 to 4 by the provision of a chamber c for a paddle-type or centrifugal fan c^1 which is arranged below the resistance chamber instead of underneath the treatment chamber.

The construction shown in Figs. 6 to 8 substantially conforms to that of the furnace already described with reference to Figures 1 to 4, but provision is made for the circulation of air around the outside of the treatment chamber prior to its delivery into the resistance chamber. To enable this, the treatment chamber is separated at top, bottom and sides from the outer walls of the structure by inter-communicating spaces h^1, h^2, h^3, h^4, that constitute or provide an air-jacket surrounding the said treatment chamber, this jacket having communication, on the one hand, with the fan-chamber and, on the other hand, with the lower end of the resistance chamber, which latter again has the corner-port c^4 in its upper part wherethrough the hot air is delivered into the treatment chamber. This arrangement enabling air to be exhausted from the treatment chamber and to be impelled from the fan-chamber, around the working chamber, thence into the resistance chamber by a port located at or near the lower end of the latter, and finally the injection of the heated air by way of the port c^4 into the treatment chamber.

The provision for the air-jacketing of the treatment chamber enables indications to be obtained as to when the charge is soaked by the use of two pyrometers, one of which is arranged in the air-circuit at or near the hot-air entry into the treatment chamber and the other at or near the air-exit from the said chamber. The instruments thus arranged give identical or substantially identical readings when the temperatures at the inlet and outlet are equal and the charge in the chamber is no longer absorbing heat.

Indication as to when the work is no longer absorbing heat, or has attained a predetermined temperature, may be obtained by a recording pyrometer arranged to work alternately on the air-entry and exit sides of the treatment chamber, which, at the commencement of a treatment, records a wavy line, the waviness of which is reduced to a definite minimum when the heat-absorption is complete.

The pyrometer at the hot-air entry side may be used to operate a temperature control switch for automatically regulating the current-supply to the heating resistors.

Having described my invention, what I claim and desire to secure by Letters Patent is:—

1. An electric furnace of the class referred to, comprising a treatment chamber haivng an air-intake orifice and an air-extraction orifice located at remote ends of the said chamber, a voluted fan-chamber formed within the furnace structure and communicating with the extraction orifice, a resistance chamber fitted with a system of air-heating resistance elements and communicating on the one hand with the fan-chamber and on the other hand with the air-intake orifice of the treatment chamber, means for supporting work-charges in the region intermediate the air-intake and air-extraction orifices of the treatment chamber, and a centrifugal-type fan housed in the fan-chamber and adapted continuously to impel the resistance-heated air in one direction through the system for ensuring rapid transference of heat from the resistances to the work.

2. An electric furnace according to claim 1 wherein the air-intake orifice is disposed tangentially with respect to the treatment chamber to produce a cyclonic circulation of air within said chamber.

In witness whereof he hereunto affixes his signature.

A. GLYNNE LOBLEY.