

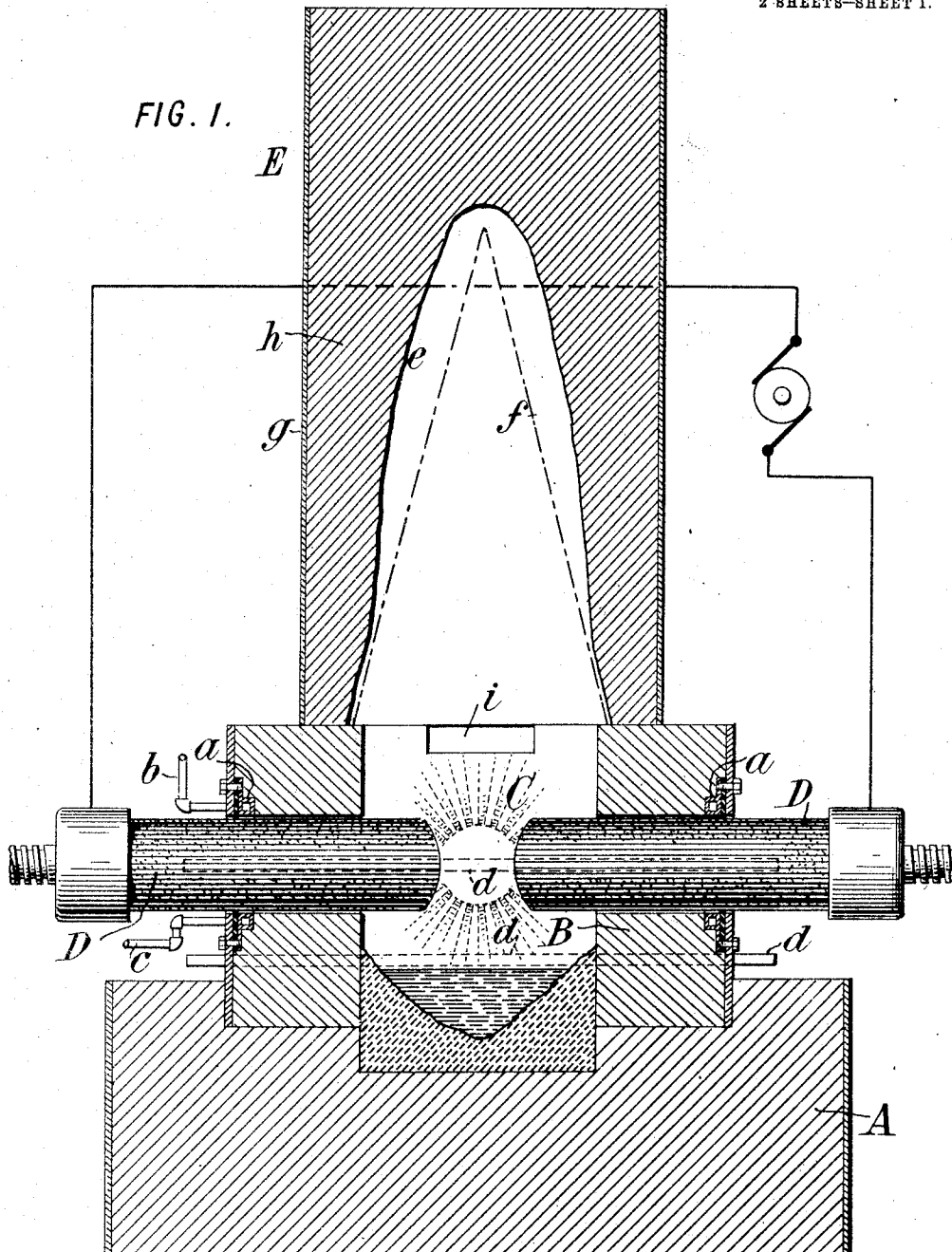
F. VON KÜGELGEN & G. O. SEWARD.  
ELECTRIC FURNACE.

APPLICATION FILED DEC. 18, 1907.

978,171.

Patented Dec. 13, 1910.

2 SHEETS—SHEET 1.



WITNESSES:  
*Ired White*  
*Rene Guine*

INVENTORS:  
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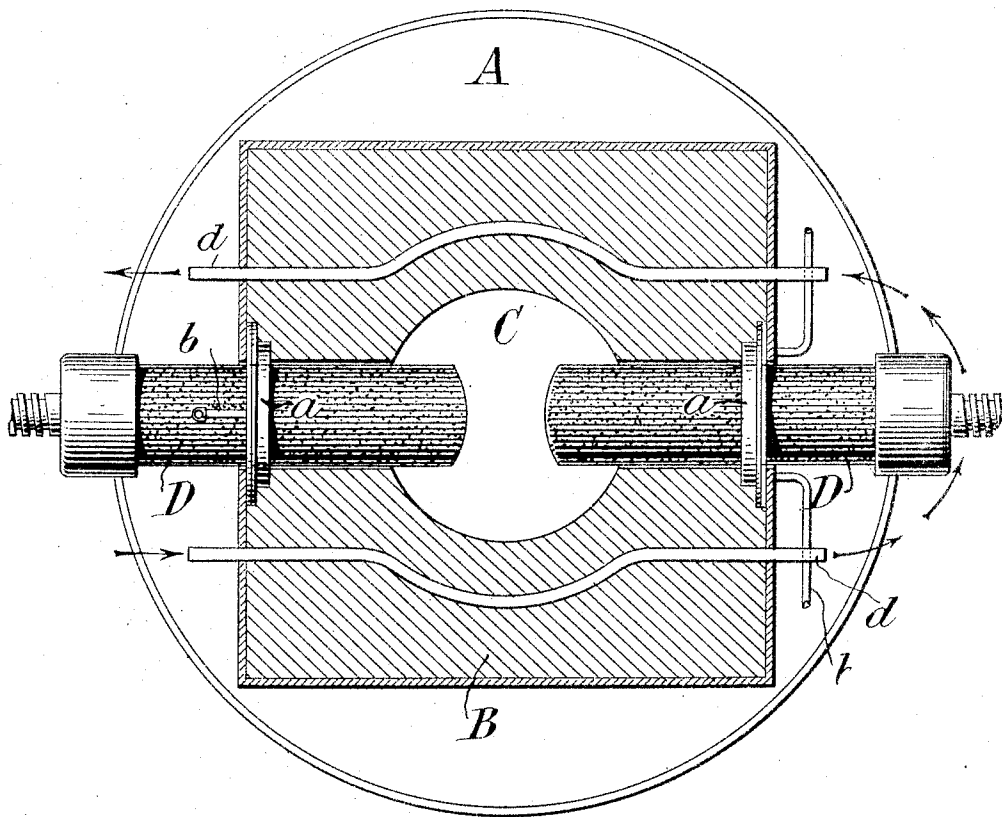
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FIG. 2.



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# UNITED STATES PATENT OFFICE

FRANZ VON KÜGELGEN, OF HOLCOMBS ROCK, VIRGINIA, AND GEORGE O. SEWARD, OF EAST ORANGE, NEW JERSEY, ASSIGNORS TO VIRGINIA LABORATORY COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## ELECTRIC FURNACE.

978,171.

Specification of Letters Patent. Patented Dec. 13, 1910.

Application filed December 18, 1907. Serial No. 407,019.

*To all whom it may concern:*

Be it known that we, FRANZ VON KÜGELGEN, a subject of the German Emperor, residing in Holcombs Rock, Bedford county, State of Virginia, and GEORGE O. SEWARD, a citizen of the United States, residing in East Orange, Essex county, State of New Jersey, have jointly invented certain new and useful Improvements in Electric Furnaces, of which the following is a specification.

For certain purposes it is desirable to use an electric furnace wherein the material under treatment shall be acted upon by radiated heat alone and without bringing it into contact with either the carbon electrodes or with the arc. For this purpose reverberatory electric furnaces have been used wherein the arc springs between horizontally opposed pencils or electrodes entirely above the material under treatment, and a solid cover is provided for reflecting the radiated heat downward against the material beneath. Such furnaces are impractical by reason of the liability of the solid material or lining of the cover to be fused by the arc and enter and contaminate the material under treatment.

Our invention provides a reverberatory electric furnace which is free from liability of thus contaminating the material under treatment.

According to our invention we provide, in lieu of the approximately flat or horizontal cover heretofore used, a hood which is mounted over the furnace chamber in which the arc plays, this hood being carried to such height that its inner surface or lining is so remote from the arc as to be free from liability of being melted down by the heat therefrom. The deep hollow or cavity within the hood confines a body of approximately quiescent or stagnant air or other gases, which constitutes a gaseous lining or shield which serves the purpose of protecting the solid lining above from the extreme heat radiated upwardly from the arc, and appears to serve also as a mirror or reflector for directing downwardly a large proportion of the heat rays. Experience proves that this form of cover has a reverberatory efficiency fully equal to that of a solid flat cover while, being itself practically indestructible.

Our invention will be best understood by reference to the accompanying drawing, wherein,—

Figure 1 is a vertical mid-section of a furnace embodying our invention. Fig. 2 is a horizontal section thereof in the plane of the carbon pencils.

Referring to the drawings, A designates the base of the furnace, B the central body thereof forming the arc chamber C, D D the carbon or graphite pencils, and E the hood. The parts A and B may be constructed as usual of a metal shell filled with a plastic refractory filling or lining to a suitable thickness. The chamber C may extend down into the base A, as shown, or be confined within the body B. The pencils or electrodes D D are best arranged horizontally, passing freely and adjustably through opposite openings in the body B and having any suitable holders and adjusting means for regulating the arc. Preferably a water-jacketed stuffing box *a* surrounds each pencil in which water circulates, being introduced through a pipe *b* and discharged through a pipe *c*. Preferably also the lining of the body B is protected by a circulation of water through cooling pipes *d d* embedded in the lining, as best shown in Fig. 2. The details of construction of these parts of the furnace, however, form no part of our invention, and may be varied according to the skill or judgment of the constructor or operator and according to the purpose for which the furnace is to be used.

The hood E is made of considerable height, its lower end being of such size and shape as to suitably fit upon the body B. The hood is best constructed of sheet-metal or other suitable cylindrical shell in which is molded a refractory lining which may be of lime, magnesia, or any other suitable material. The best shape for the inner surface of the lining is approximately a conoid, as indicated approximately by the outline *e* in Fig. 1. A convenient way of constructing the hood is to insert within it a sheet-metal cone of approximately the shape shown in dotted lines at *f*; then to mold between this and the outer shell *g* the refractory lining *h*; then when this is solidified to place the hood over the body and start the furnace so that the heat of the arc will first melt out the temporary lining cone *f* and then will

fuse down such portions of the lining *h* as approach too closely to the arc, it being found that after a sufficient exposure to the heat of the arc, the lining, having fused back to approximately the outline *c*, resists further fusion. The hood is then ready for use.

The hood is imperforate, so that there is no circulation of air or gases into or out of it. The expansion of gases may be provided for by venting through the feed-hole or around the carbons. A feed-hole is shown at *i* through which to introduce the material for treatment, and this hole may be either left open or only partially closed so as to enable the expansion or contraction of gases to take place through the vent thus formed.

Practical use of this furnace proves that when the refractory lining in the hood has been fused back to a sufficient distance from the arc, it becomes practically indestructible. This result is believed to be due to the presence beneath it and within the hollow of the hood of a mass or body of stagnant or quiescent gases which constitutes a thermic shield or non-heat-conducting protector which is effective to intercept so large a proportion of the heat rays that those which do penetrate to the lining are incapable of fusing it. This confined body of quiescent gas is believed to serve also as a reflector which is as effective for directing the heat rays downwardly as if the cover were solid. The stagnant air or gas in effect replaces a portion of the cover which constitutes the hollow or cavity in the hood, and its reverberatory effect appears to be equal to that of a reverberatory furnace with a solid cover.

Although it is practically preferable to construct the hood *E* separately from the furnace body *B*, it must be understood that our invention is not limited to this mechanical construction. Any construction or arrangement whereby the furnace chamber is prolonged upward to a sufficient height to inclose and retain a substantially inert gaseous shield of such thickness as to insure that the refractory walls inclosing this shield shall be protected from fusion, will answer the purpose. The height to which such upward extension of the furnace chamber, or the interior of the hood if a separable hood is used, must be carried, will depend upon the nature of the refractory lining used relatively to the heat generating capacity of the furnace, and to the efficiency of the cooling means employed; that is to say, whether the exterior be cooled solely by radiation to the air, or by a circulation of cold air against its exterior, or by a circulation of cooling liquid, all of which methods are well understood in the art.

Our invention is to be distinguished from those electric furnaces in which the furnace chamber is closed over by a roof or plate, the function of which is to transmit waste heat from the chamber to preheat the material to be treated in the furnace. The effect of the body of inert air or gas in our furnace is to so effectually intercept the heat rays that the lining of the furnace top or hood is effectually protected against fusion and no effective heat passes through the non-conducting lining which confines this gaseous body. Thus our invention, instead of utilizing heat which traverses the furnace top, aims to effectually prevent the transmission of heat through this top, and to this end uses not only the non-conducting gaseous body, but also a lining which constitutes as effective a non-conductor as possible.

We claim as our invention:—

1. A reverberatory electric furnace having a closed top and non-conducting lining adapted to inclose and retain a substantially inert gaseous body of sufficient thickness to protect the lining beyond it from fusion.

2. A reverberatory electric furnace comprising electrodes and a furnace chamber, with a closed top and a non-conducting lining having an upwardly extending cavity of sufficient height to inclose and retain a substantially inert gaseous body of such thickness as to protect the lining of said cavity from fusion.

3. A reverberatory electric furnace comprising a furnace chamber and electrodes, and a removable top consisting of a hollow hood covering said chamber having a refractory lining sufficiently remote from the source of heat to avoid fusion thereby, and adapted to inclose a substantially inert gaseous body serving as a heat shield.

4. A reverberatory electric furnace comprising a furnace chamber and electrodes, the top of said chamber being extended upwardly, having a refractory lining, and being imperforate so as to inclose a substantially inert gaseous body, and being of such height that the refractory lining is protected by said gaseous body from fusion.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

FRANZ VON KÜGELGEN.

Witnesses:

F. VON BIDLER,

JNO. M. OTER.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

GEORGE O. SEWARD.

Witnesses:

GEO. F. SEWARD,

JUSTIN C. WATERS.