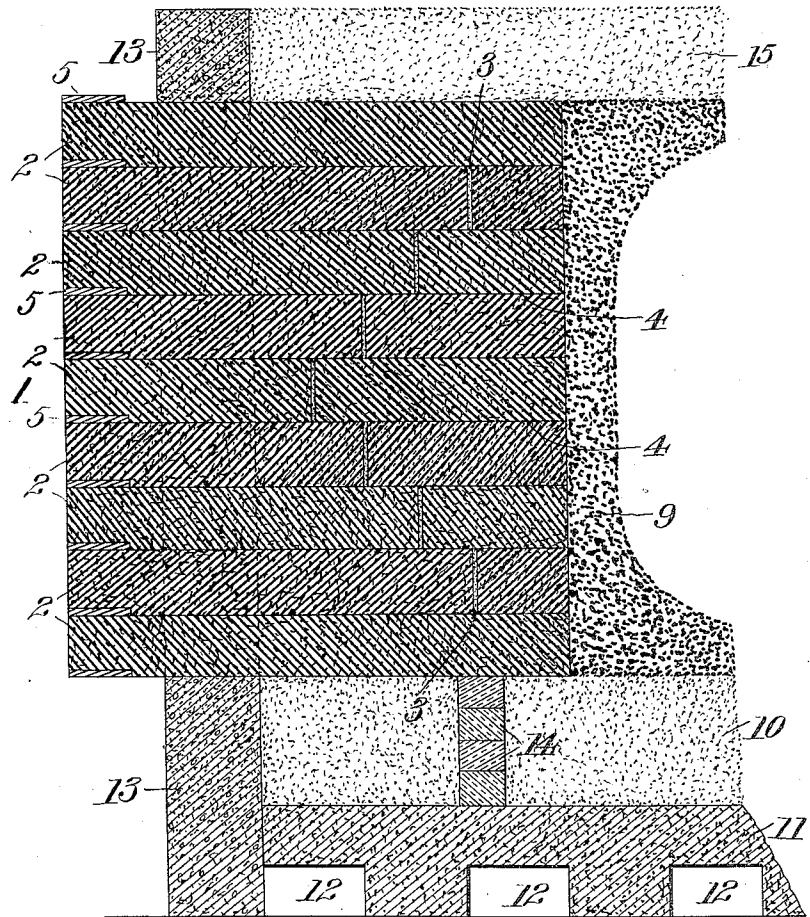


E. C. SPEIDEN.
ELECTRIC FURNACE TERMINAL.
APPLICATION FILED JUNE 17, 1909.

935,939.

Patented Oct. 5, 1909.
2 SHEETS—SHEET 1.

Fig. 1.



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Fig. 2.

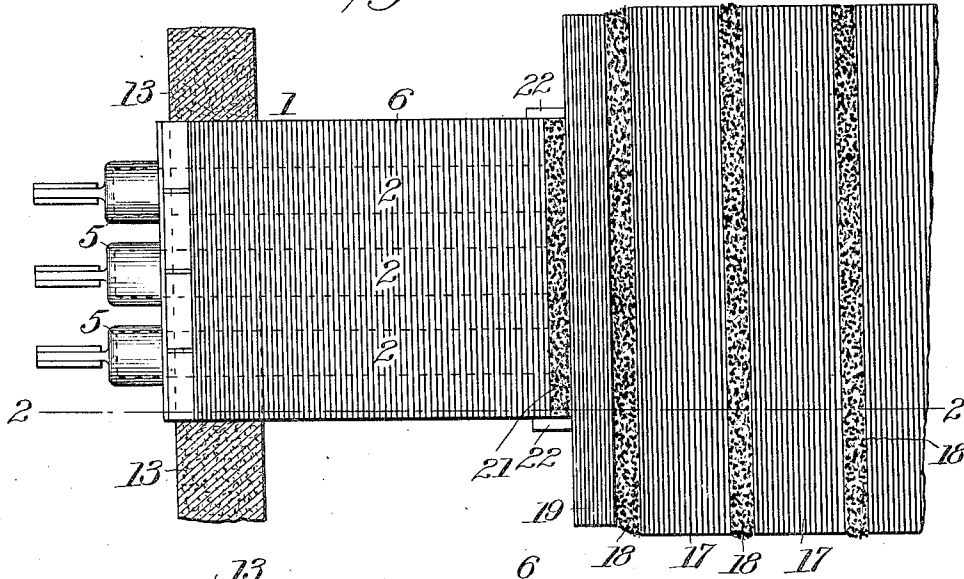
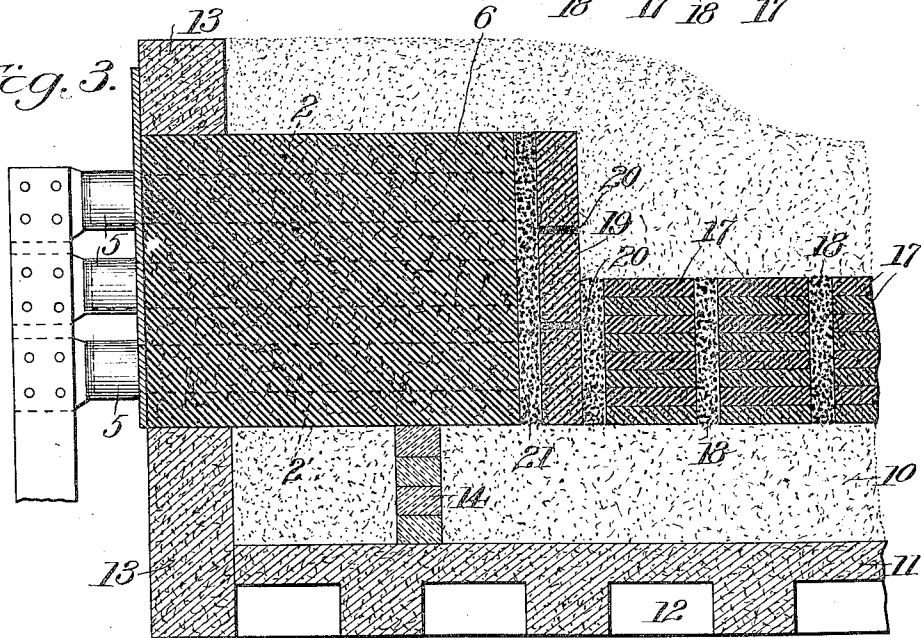


Fig. 3.



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ELECTRIC-FURNACE TERMINAL.

935,939.

Specification of Letters Patent.

Patented Oct. 5, 1909.

Application filed June 17, 1909. Serial No. 502,824.

To all whom it may concern:

Be it known that I, EBEN C. SPEIDEN, a citizen of the United States, residing at Niagara Falls, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Electric-Furnace Terminals, of which the following is a specification.

The object of this invention is the provision in an electric furnace of means for reducing the heat losses through the electrodes, said means also adapted, in certain embodiments of the invention, to effect a proper distribution of current between the charge and terminal of an electric furnace.

The invention, while capable of use in various relations, is particularly advantageous in connection with furnaces of the resistance type having fixed terminals, such for example as the furnaces employed for the production of graphite, graphite articles, silicid of carbon, etc.

The invention will be described by reference to furnaces of this character, it being however pointed out that it is not restricted to this particular application.

For a full understanding of the invention reference is made to the accompanying drawing, illustrating certain embodiments thereof.

In said drawings:—Figure 1 is a vertical sectional view through one end of a furnace having a terminal embodying the invention; Fig. 2 is a plan view of one form of extension head; and Fig. 3 is a vertical section of the same on line 2—2 of Fig. 2.

In furnaces having terminals of relatively large cross-section and employing currents of very high amperage, the terminals become highly heated and conduct considerable quantities of heat from the adjacent portion of the charge, this resulting not only in a waste of heat and therefore of current, but at times in the injury of the outer or exposed portion of the terminal by oxidation. According to the present invention such losses are reduced by providing in the current path a zone or section of comparatively low heat-conductivity, whereby an obstruction is offered to the flow of heat from the furnace. This obstruction may comprise merely a joint or imperfect contact, a section of re-

duced cross-sectional area, or preferably a filling or mass interposed in the current path through the electrode or terminal and consisting of a material of suitable electrical conductivity but of low heat conductivity as compared with the material of which the terminal is composed, which in practice is usually graphite. A suitable filling material for most purposes consists of carbon or graphite in subdivided form. In certain cases the filling may be agglomerated into a solid mass by means of a suitable binder, as a hydrocarbon, pitch, tar, molasses, etc.

One mode of assembly of bars into a fixed terminal is shown in Fig. 1, wherein 1 represents a terminal composed of carbon or graphite members 2, the interior members being transversely divided either wholly or in part as indicated at 3. The several members 2 are laterally in conductive relation and are preferably laid in a highly conductive graphitic paste filling the joints 4. 5 represents the metallic connection to the bus-bars at the outer end of the terminal. The transverse divisions 3 are such as to offer a certain resistance to the passage of the electric current, whereby an increased proportion of the total current passes through the exterior members; but they also offer a very considerable resistance to the outward flow of heat from the furnace, the joints being of relatively low heat conductivity. The joints or transverse divisions may be variously modified; thus they may comprise merely contacts such as are obtainable between juxtaposed graphite members. It is preferred however to provide between the members in the direction of flow of the current a filling of material of relatively low heat conductivity, such as subdivided graphite or a graphitic cement. In this figure 9 represents the furnace charge in contact with the terminal and resting upon a suitable refractory fill 10, the nature of which will depend upon the character of the charge. This fill is carried by the concrete or firebrick base 11 of the furnace, which may be provided with transverse flues for the circulation of air. The terminal 1 is illustrated as mounted in a concrete furnace head 13, and is supported at its inner end by a wall 14 of firebrick or other refractory

material. Above the charge 9 and extending over the terminal 1 is a refractory filling 15 for excluding the air and retaining the heat.

Figs. 2, 3, illustrate the invention as applied to the distribution of current to a charge differing in cross-section from the terminal. In these figures the terminal 1 comprises a number of carbon or graphite members 2, which may be either integral or transversely divided as above described: these terminals are embedded in a body 6 which may consist of agglomerated carbon or graphite. The terminal may however be assembled as described with reference to Fig. 1 or in any other suitable manner. The charge is illustrated by way of example as comprising carbon electrodes 17 to be graphitized, these being arranged in piles separated by a granular material 18 of relatively low electrical conductivity, as granular carbon. The charge as shown extends laterally beyond the terminals, and in order that the sectional area of the core may not be unduly increased, the articles comprising the charge are arranged in comparatively low piles as shown. If a charge of this form were arranged in direct contact with the terminal an unequal heating of the latter would result, an excessive proportion of the current being carried by the lower portion of the terminal or that in direct contact with the charge. It is necessary therefore to effect a proper current distribution through the terminal, and this is accomplished by the provision of so-called "extension heads," comprising in the form shown a series of graphite or carbon plates or bars constituting a head 19, the members of which are in electrically conductive relation with each other, as for example through a graphitic cement 20. This head 19 is in contact with the charge and as illustrated extends to the full width of the charge and to the full height of the terminal and serves therefore to distribute the current between the terminal and the charge. The head 19 should be in effective electrical contact with the terminal: such contact may be provided in numerous ways, as for example by an interposed filling of granular or subdivided graphite or a graphitic cement 21, retained by lateral supports consisting of carbon bars 22. Obviously the head 19 may comprise a single plate or block of graphite or carbon, or plates or blocks vertically disposed, it being essential only that the head be adapted to perform its function of properly distributing the current between the terminal and the charge. In addition to this function it performs the further function of very effectively checking the loss of heat by conduction between the charge and the terminal, by virtue of the relatively high heat resistance of the joint or connection 21. The

blocks 19 are laterally in excellent electrical contact, and are of sufficient size and thickness effectively to distribute the current.

I claim:

1. In an electric furnace, a terminal comprising a plurality of graphite members assembled in electrical connection, one or more of said members divided transversely of the current path.

2. In an electric furnace, a terminal comprising graphite members spaced in the direction of the current flow, and an interposed electrically conductive material of relatively low heat-conductivity.

3. In an electric furnace, a terminal comprising graphite members spaced in the direction of the current flow, and an interposed filling of granular, electrically conductive material of relatively low heat-conductivity.

4. In an electric furnace, a terminal comprising graphite members spaced in the direction of the current flow, and an interposed filling of graphite in subdivided form.

5. In an electric furnace, a terminal comprising a plurality of parallel, electrically conductive members, assembled in close proximity and in electrically conductive relation to each other, one or more of said members divided transversely to the current path.

6. In an electric furnace, a terminal comprising a plurality of parallel, electrically conductive members, assembled in close proximity and in electrically conductive relation to each other, one or more of said members divided transversely to the current path, and a filling of electrically conductive material between the ends of said members.

7. In an electric furnace, a terminal comprising graphite members spaced in the direction of current flow, and an interposed filling of electrically conductive material of relatively low heat-conductivity.

8. In an electric furnace, a terminal comprising graphite members spaced in the direction of current flow, and an interposed granular filling of electrically conductive material of relatively low heat-conductivity.

9. In an electric furnace, a terminal comprising solid members spaced in the direction of current flow, and an interposed filling of graphite in subdivided form.

10. In an electric furnace, an extension head adapted for contact with the charge, a terminal spaced from said head, and an electrically conductive filling of relatively low heat conductivity between said head and terminal.

11. In an electric furnace, an extension head adapted for contact with the charge, a terminal spaced from said head and differing therefrom in cross-section, and an electrically conductive filling of relatively low heat-conductivity between said head and terminal.

12. In an electric furnace, an extension head adapted for contact with the charge, a graphite terminal spaced from said head, and an electrically conductive filling of relatively low heat-conductivity between said head and terminal.

13. In an electric furnace a graphite electrode having intermediate its ends an elec-

trically conductive section of relatively low heat-conductivity.

In testimony whereof, I affix my signature in presence of two witnesses.

EBEN C. SPEIDEN.

Witnesses:

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