No. 657,736. Patented Sept. 11, 1900.

W. S. HORRY.

ELECTRIC FURNACE.

(Application filed Nov. 23, 1897.)

(No Model.) 3 Sheets—Sheet 1.

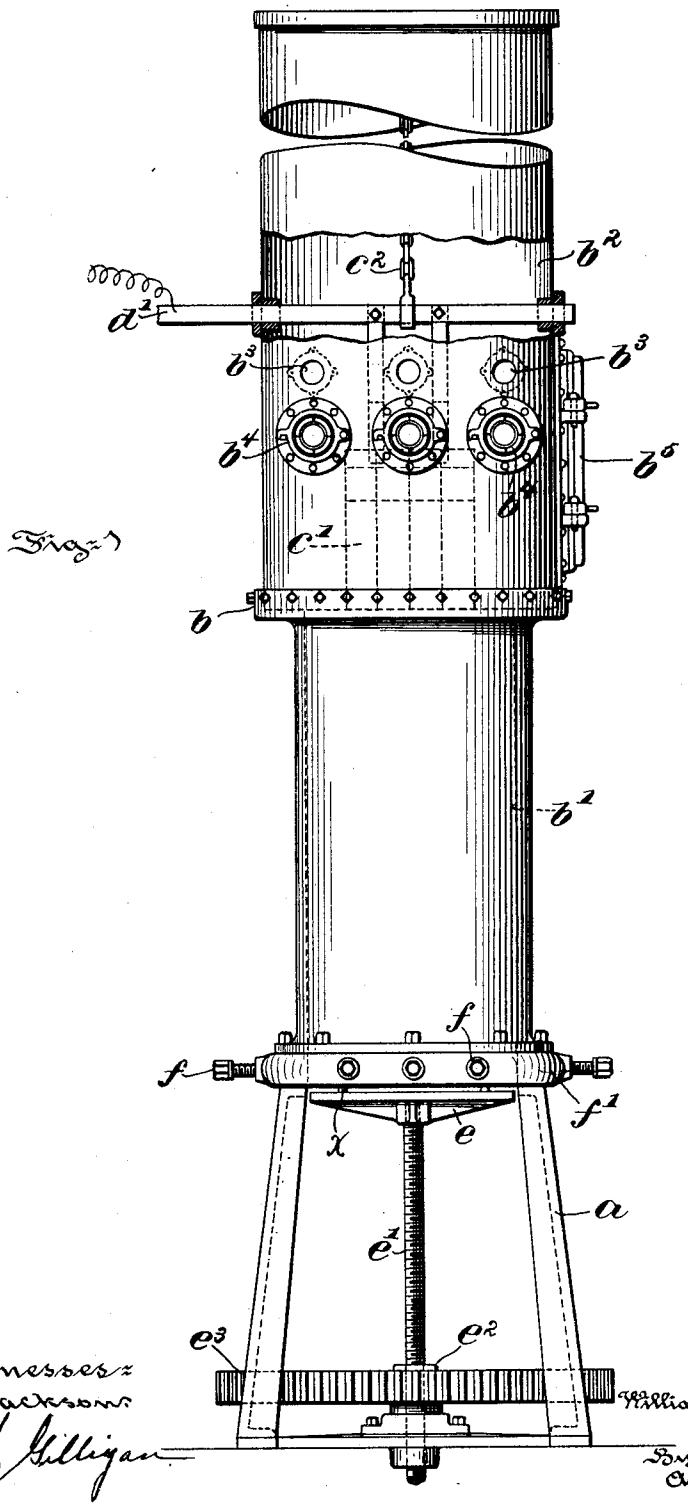


Fig. 1.

Witnesses:
W. B. Jackson.
K. A. Gilligan

Inventor:
William Smith Horry.
By
Augustus D. Shaughnessy
Attorney.

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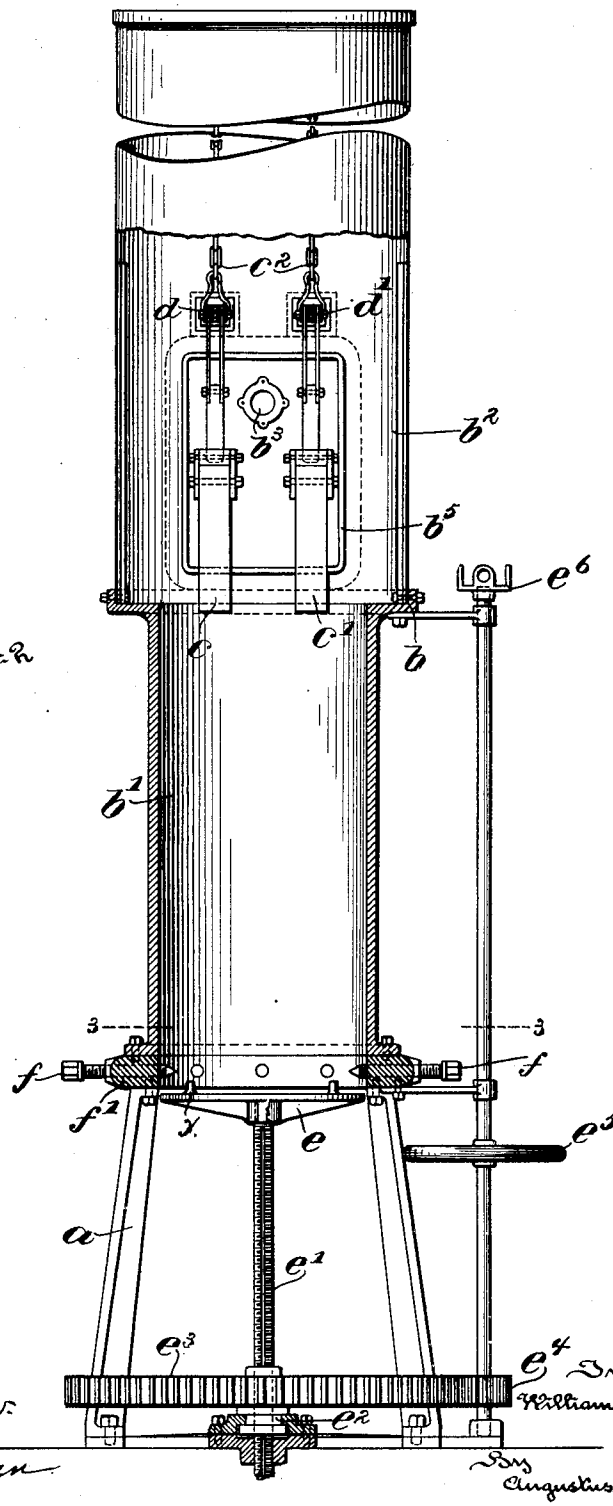
W. S. HORRY.

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Fig. 2.



Witnesses:
W. B. Jackson.
K. A. Gilligan.

Inventor:
William Smith Horry.
By Augustus B. Stoughton.
Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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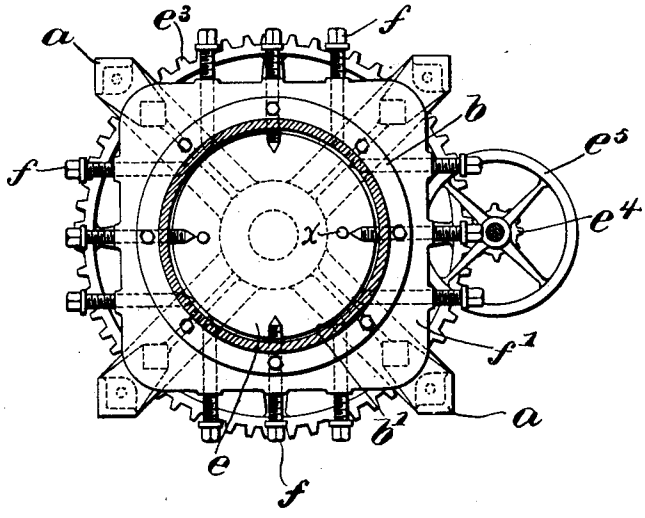
W. S. HORRY.

ELECTRIC FURNACE.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 3



Witnesses:
W. B. Jackson.
K. H. Gilligan.

Inventor:
William Smith Horry.
By
Augustus B. Stoughton.
Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM SMITH HORRY, OF SAULT STE. MARIE, MICHIGAN, ASSIGNOR TO THE UNION CARBIDE COMPANY, OF CHICAGO, ILLINOIS.

ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 657,736, dated September 11, 1900.

Application filed November 23, 1897. Serial No. 659,543. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SMITH HORRY, a subject of Her Majesty the Queen of England, residing at Sault Ste. Marie, Michigan, have invented certain new and useful Improvements in Electric Furnaces, of which the following is a specification.

One object of my invention is to cheapen the production of carbid of calcium.

Another object of my invention is to produce carbid of calcium of good and uniform quality; and to these and other ends my invention comprises the furnace hereinafter described and claimed.

The nature, characteristic features, and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1 is an elevational view, with parts broken away, of a furnace embodying features of my invention. Fig. 2 is a view, principally in central section, of the same; and Fig. 3 is a sectional view taken on the line 3 3 of Fig. 2.

Upon a suitable framework or base *a* is supported a furnace *b*, which may be of any cross-section; but from the following description it will appear that certain advantages are obtained by making it of circular cross-section. Intermediate of the ends of this furnace *b* are electrodes, as *c* and *c'*, so that beneath the electrodes is a carbid-chamber *b'*, and above the electrodes is a kiln-chamber b^2. Adjacent to the electrodes and in the walls of the furnace may be provided suitable peep and stoke holes b^3 and b^4, as well as a suitable door b^5. The electrodes *c* and *c'* or "pencils," as they are sometimes called, are arranged parallel with the axis of the furnace and with the direction of travel of the material through it and in such a way as to clear the side walls of the furnace. They are suspended, as shown, by means of chains c^2, which are secured in any convenient manner at or near the open top of the furnace and which afford some latitude of movement to the electrodes. The current is conveyed to these electrodes or pencils by way of conductors *d* and *d'*, led in through and insulated from the walls of the furnace and supported, if need be, as by the chains c^2. Underneath the furnace there is an elevator, lift, or movable furnace-bottom *e*, which may be raised and lowered by suitable mechanism. As shown, this is accomplished by means of a threaded shaft *e'*, rotary nut e^2, held against endwise motion, spur-wheel e^3, connected with said nut, pinion e^4, and hand-wheel e^5, or capstan-head e^6. Of course other mechanism may be employed for operating the lift. At the base of the furnace and at a suitable distance below the electrodes and above the lowest position of the lift or elevator are provided nipping and supporting devices. The pointed screws *f* are such devices and are mounted in a suitable yoke or support, as *f'*.

Instead of coke and lime the described furnace will use charcoal and limestone, although coke and lime may be employed; but I believe that under certain conditions a material economy may be effected by the use of charcoal and limestone. The employment of carbonate rather than oxid as raw material involves the expenditure of an unnecessary amount of current, since an additional heat-consuming reaction is thereby introduced; but this may be advantageous under certain conditions—such, for example, as the presence of inexpensive current and of a convenient source of carbonate of lime and the absence of facilities for obtaining oxid. By constructing an electrical furnace that is absolutely closed, as described, except at the top, and by burying the arc deeply in the material a very efficient furnace is obtained because of the regenerative action of the furnace, the heat in escaping being compelled to traverse the incoming materials, and thus prepare them for the melting process. Such waste heat traversing limestone fed in at the top burns it, and thereby converts it into lime. The gases evolved from the top of the furnace give off most of their heat previous to their escape, and they consist very largely of carbon dioxid, a non-combustible gas, so that flames are not evolved from the furnace to the same extent as in other furnaces. In consequence of the absence of flames spurting from the furnace and of the fact that the arc is deeply buried it follows that materials are

not blown from the furnace, whereby waste is avoided and the absence of dust is insured. Since the electrodes are parallel with the line of gravitation of the material through the furnace, gases following them do not spurt out, but are directed toward the incoming material. The process practiced by means of the described furnace may be continuous in the sense that the fusing action is continuous and the delivery is interrupted for such comparatively-short intervals of time as do not destroy the continuity of the fusing action, as will be hereinafter described. Moreover, the furnace is comparatively inexpensive to build and takes up relatively a small amount of space. It requires very little stoking and when filled up with raw material will run for many hours without refilling. Obviously this is advantageous. By making the furnace round in cross-section or cylindrical the calcium carbid will also be cylindrical and pieces of it can be advantageously operated upon by a machine resembling a lathe for the removal of outside shell or scale.

The mode of operation of the described furnace may be stated as follows: The lift, elevator, or furnace-bottom *e* is brought into elevated position and fine coke is put into the top of the cylinder in sufficient quantity to short-circuit the pencils or electrodes *c c'* and start the arc. Materials which may be either lime and coke or limestone and charcoal are fed into the top of the furnace until the arc is buried, for example, some three or four feet, more or less. As the carbid of calcium is formed it reduces the resistance of the furnace, causing the amperage of the circuit to rise, which fact may be noted by reference to an ampere-meter. The attendant observing this slowly lowers the elevator or furnace-bottom *e*, for example, by means of the hand-wheel e^5 and described mechanism. Of course the lowering of the elevator or furnace-bottom may be performed in a variety of ways, although the means described are the best known to me at this time for accomplishing that purpose. This goes on until the furnace-bottom or elevator has reached its lowest position and the carbid protrudes below the furnace proper. During this operation limestone, if used, is burned in the kiln portion b^2 of the furnace to lime by otherwise waste heat. The material passes through the furnace under the influence of gravity in a direction parallel with the longer axes of the electrodes, thus not unduly injuring them, and the carbid descends through the carbid-chamber *b'*, whose form it takes and is cooled therein as well as in its passage between the standards *a*, that support the whole apparatus. When the carbid protrudes for a sufficient distance below the furnace, it is broken off by the nipping devices, as shown, by setting up the pointed screws *f*. The stick or piece thus broken off is removed from the elevator *e* and is cylindrical, if such was the form of the furnace. During this time the contents of the furnace are held in position by the described supporting devices. In the present instance the screws *f* serve to support the solid contents of the carbid-chamber *b'*, which in turn support the contents of the superstructure or kiln, the current operating to fuse material which of course is fed in from time to time and at appropriate intervals from the top of the furnace. After the removal of the stick of carbid thus cut off the elevator is again run up and the supporting and nipping devices *f* are returned to their original positions, so as to clear it and release the contents of the carbid-chamber *b'*, which then rest on the elevator. The described steps are repeated as often as necessary and the operation carried on indefinitely.

It will be obvious to those skilled in the art to which my invention appertains that modifications may be made in details without departing from the spirit thereof. Hence I do not limit myself to the precise construction and arrangement of parts hereinabove set forth and illustrated in the accompanying drawings; but,

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with an electric furnace constructed for the continuous delivery of carbid, of pointed clamp-screws mounted outside of the furnace and movable inward to nip off the finished product as it is delivered from the furnace, and a movable furnace-bottom constructed and arranged to support the weight of the contents of the furnace and of the product from underneath and to carry the product and present it between the points of the screws, substantially as described.

2. The combination with an electric furnace constructed for the continuous delivery of carbid, of, a movable furnace-bottom constructed and arranged to support the weight of the contents of the furnace and of the product from underneath and to carry the product, and devices constructed and arranged to cut off the finished product as it is delivered from the furnace, substantially as described.

3. An electric furnace comprising the combination of a framework, a carbid-chamber mounted on the framework, a furnace proper mounted on the carbid-chamber, a kiln-chamber mounted on the furnace proper, electrodes located in and having their axes parallel with the axis of the furnace proper, a movable furnace-bottom, lift or elevator, and clamping devices coöperating with said elevator and furnace, substantially as described.

In testimony whereof I have hereunto signed my name.

WILLIAM SMITH HORRY.

In presence of—
C. A. HALL,
J. M. MOREHEAD.