

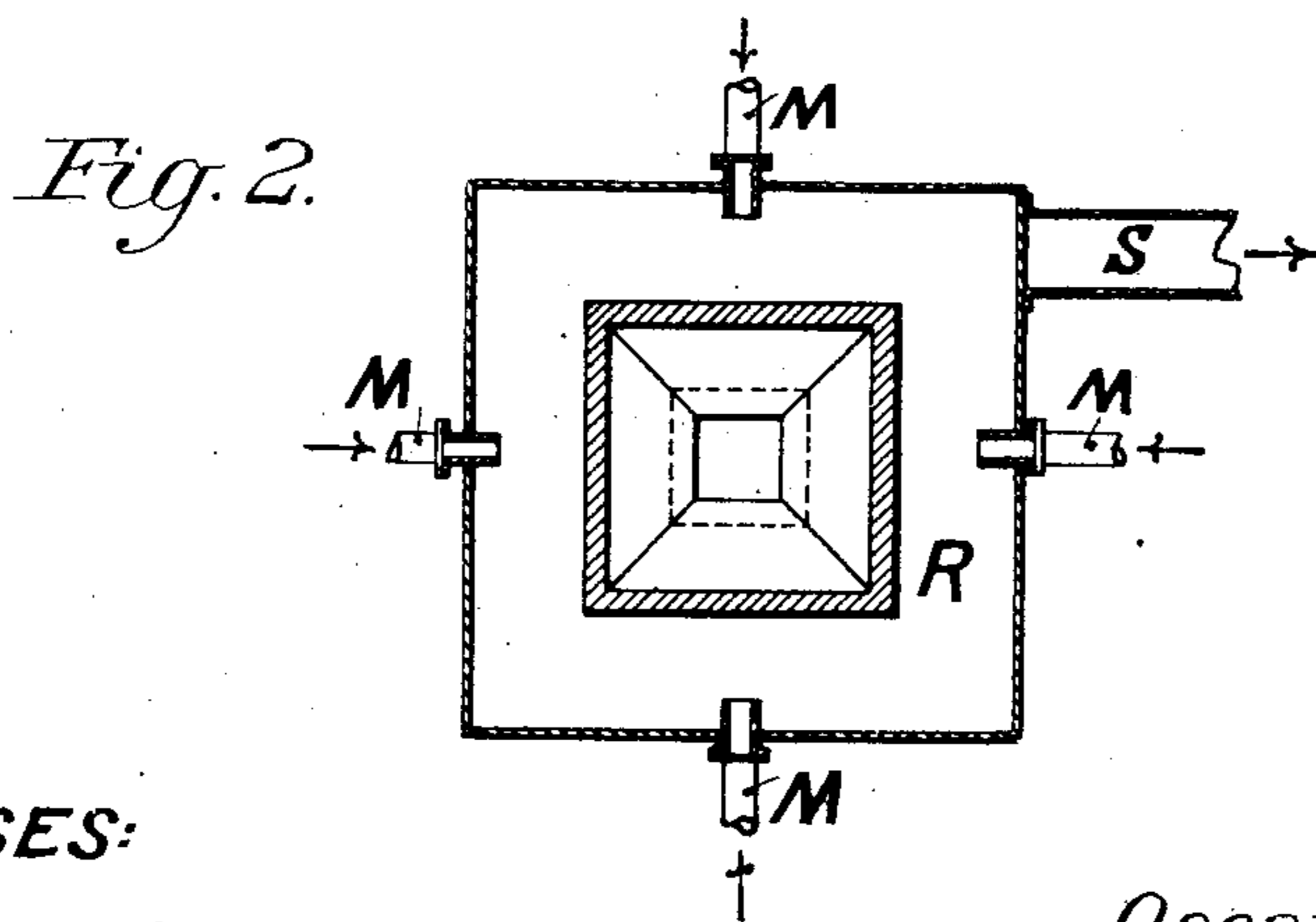
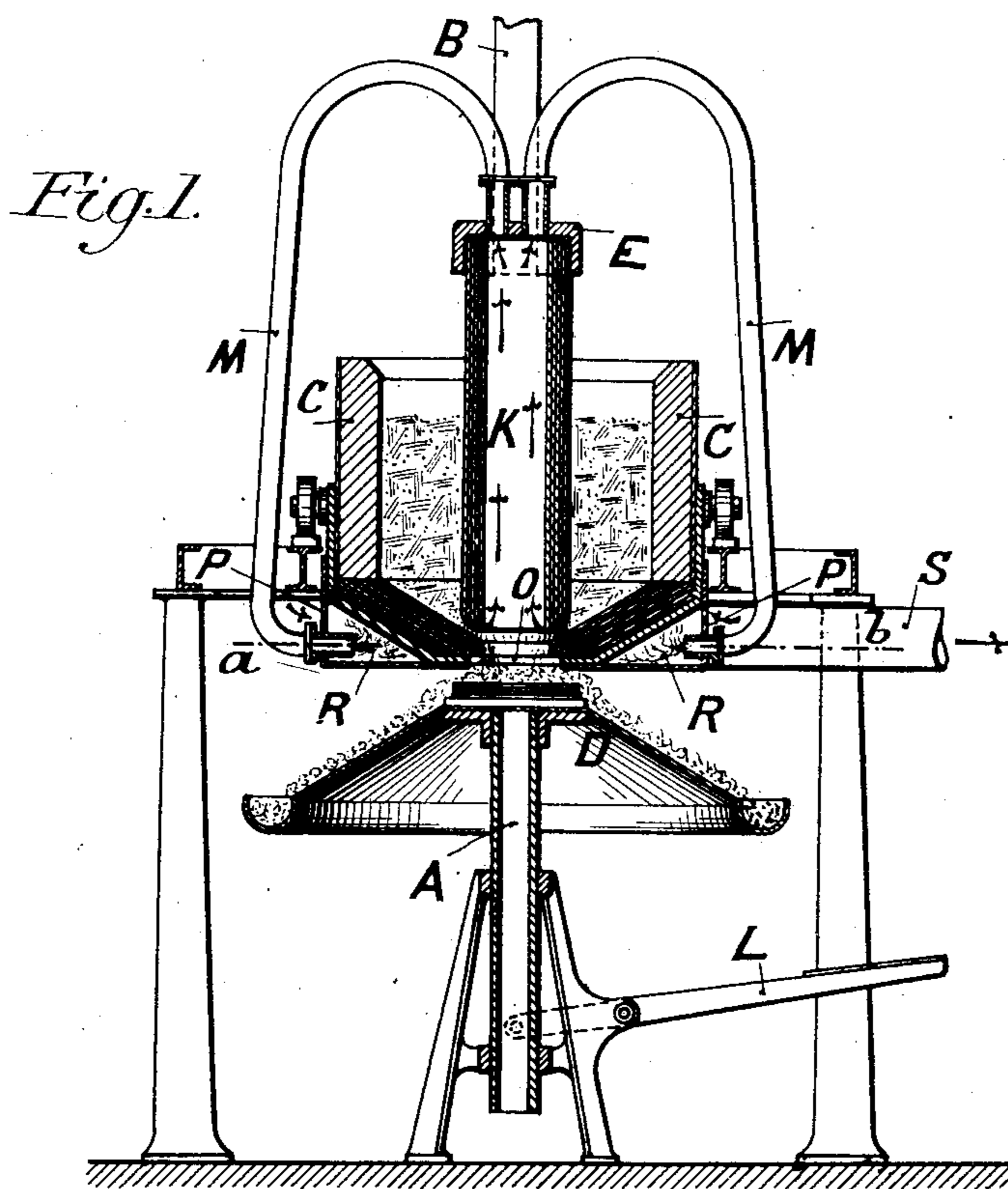
No. 685,717.

Patented Oct. 29, 1901.

O. FRÖLICH.  
ELECTRIC FURNACE.

(Application filed Sept. 27, 1898.)

(No Model.)



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 685,717, dated October 29, 1901.

Application filed September 27, 1898. Serial No. 691,974. (No model.)

*To all whom it may concern:*

Be it known that I, OSCAR FRÖLICH, a citizen of the Swiss Republic, residing at Steglitz, near Berlin, German Empire, have invented a certain new and useful Improvement in Electric Furnaces, (Case No. 1,) of which the following is a full, clear, concise, and exact description.

My invention relates to electric furnaces preferably for the production of carbid of calcium.

The invention consists in employing in such furnaces a tube-shaped electrode which passes through a layer of pulverized material by means of which its interior is hermetically separated from the atmospheric air.

Of the accompanying drawings, Figure 1 is a vertical section showing the arrangement of my furnace, and Fig. 2 is a horizontal section on line *a b* in Fig. 1.

C is an iron box or crucible lined inside with a thick layer of refractory bricks in order to make it fireproof and having a bottom shaped like an inverted cone or pyramid and provided with an opening O in the center thereof, which serves for tapping off the products of the reaction.

D is a table likewise preferably made of iron and lined with refractory carbon and being shaped like an upright cone or pyramid with the point cut off. The table D is supported by a central prop or pillar A, which can be raised or lowered by means of the lever L, so as to either close or open the opening O in the crucible C.

K is a tube made of carbon and serving as the one electrode, the interior diameter of said tube being so dimensioned as to be not appreciably smaller than the opening O in the bottom of the crucible. The carbon K is suspended from an iron rod B and can be raised or lowered by means of the latter, so as to regulate the length of the arc.

The tube-shaped carbon K is hermetically closed at the top by means of the lid E, and a suitable number of flexible pipes M M are inserted in said lid which lead to a gas-furnace R, fitted below the crucible C. Air-inlets P are provided in the sides of R to allow the combustion of the gas that is admitted by the tubes M M. The furnace R is also

provided with a suitable flue S, adapted to carry off the products of combustion.

My electric furnace is preferably adapted for the production of carbid of calcium and is operated as follows: It is known that when carbon and lime are allowed to react upon one another in the electric furnace not only carbid of calcium is formed, but also a part of the carbon combines with the oxygen of the lime and forms monoxid of carbon. The latter gas generally is allowed to make its way through the raw material that is heaped up around the upper carbon of the furnace and frequently creates serious difficulties by causing sudden and sometimes violent eruptions, which form flames as soon as the hot gas comes into contact with the air at the surface or in the interior of the material. By such flames the surface of the upper carbon is seriously injured, and consequently its durability much impaired. It is the object of my invention to overcome these difficulties by carrying off the monoxid gas in an unburned state from the reaction and leading it to a place where the heat caused by its combustion can be usefully employed for promoting the operation of the furnace or for other purposes. If the upper carbon of an electric furnace is made hollow, the gases produced by the reaction going on in the arc do not voluntarily escape through the interior of the tube, because they preferably form at the outer lower edge of the latter and there would find a more easy exit along the outside of the tube if no means were provided to prevent them from freely escaping. Now I have found that if the raw material that is to be subjected to the action of the arc—*i. e.*, in the case of calcium carbid the mixture of carbon and lime—is pulverized to a sufficient fineness and heaped up about the exterior of the tube-shaped carbon it will form a perfectly gas-tight inclosure around the arc, thus compelling the monoxid of carbon formed in the latter to take its way through the interior of the tube-shaped carbon. By this simple means a double advantage is obtained—namely, that the disturbing eruptions of the gas are totally avoided, and, secondly, that no air is admitted to the arc, the result being that the consumption of the carbon electrode

is considerably diminished. When a sufficient quantity of carbid has been formed, the table D can be lowered and the product, which forms itself in the furnace in a liquid or solid state, can be allowed to run off or to be taken away by iron tools. If it should not appear essential to save all the heat obtainable from the material that is being operated upon, the tube K can be crowned by a number of vertical tubes of such dimensions that the flames burning at the top of these tubes cannot descend into the interior of the large tube K. However, ordinarily I prefer to lead it into the furnace R by means of flexible tubes M M and by burning it under the crucible C to heat the latter and the material therein, and thus save electrical energy which would otherwise be consumed in raising the temperature of the raw material that is continuously being fed into the arc. It will be seen that though by the herein-described arrangement the air is perfectly excluded from the arc, nevertheless the upper carbon remains accessible, and, what is of still greater importance, the crucible can be refilled continuously without interrupting the operation.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an electric furnace, the combination with a crucible forming one electrode, of a centrally-disposed tubular carbon electrode movably mounted within said crucible between the side walls of which and the said electrode the material to be treated is packed to surround the lower portion of said electrode and form a gas-tight envelop therefor, and an opening in the bottom of the crucible normally closed by a movable part, said opening being approximately the same size as the bore of the tubular electrode, substantially as described.

2. In an electric furnace, the combination

with a crucible, of a carbon electrode having a bore extending lengthwise through the same, and means for directing generated gas through the hollow electrode to a point near the exterior of the crucible where the gas may be burned to furnish heat for the operation of the crucible, substantially as described.

3. In an electric furnace, the combination with a crucible forming one electrode, of a tubular carbon electrode movably mounted therein and extending approximately to the bottom of said crucible, the said furnace being constructed to provide a free space between the side walls of the crucible and carbon electrode, wherein the material to be treated is disposed to form a gas-tight envelop adapting the furnace for continuous operation, a tube or tubes leading from the bore of the tubular electrode, a gas-furnace connected therewith, and a normally closed opening in the bottom of the crucible through which the furnace product is removed, substantially as described.

4. In an electric furnace preferably for the production of carbid of calcium the combination with a crucible having a central opening at the bottom a centrally-introduced movable tube-shaped upper carbon the said crucible being adapted to be filled with pulverized raw material to such a height as to exclude the air from the arc of a lid hermetically closing the upper end of said tube-shaped carbon and containing pipes adapted to carry off the gaseous products issuing from the arc, said pipes leading to a gas-furnace arranged below said crucible substantially as and for the purpose described.

In witness whereof I have hereunto subscribed my name this 6th day of September, A. D. 1898.

OSCAR FRÖLICH.

Witnesses:

C. H. DAY,  
HENRY HASPER.