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Patented Apr. 23, 1901.

O. FRÖLICH.

TAPPING DEVICE FOR ELECTRIC FURNACES.

(Application filed May 15, 1899.)

(No Model.)

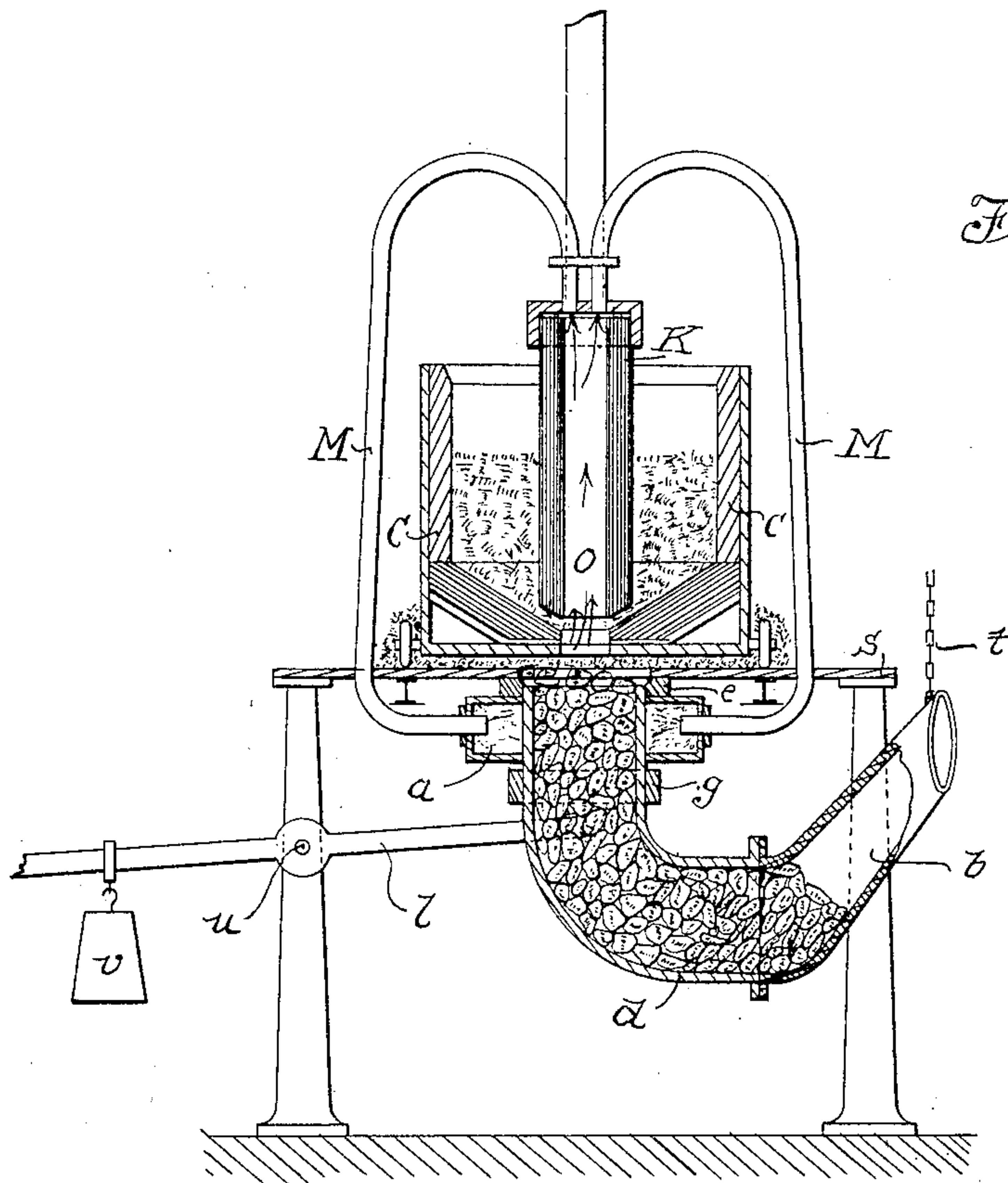


Fig. 1.

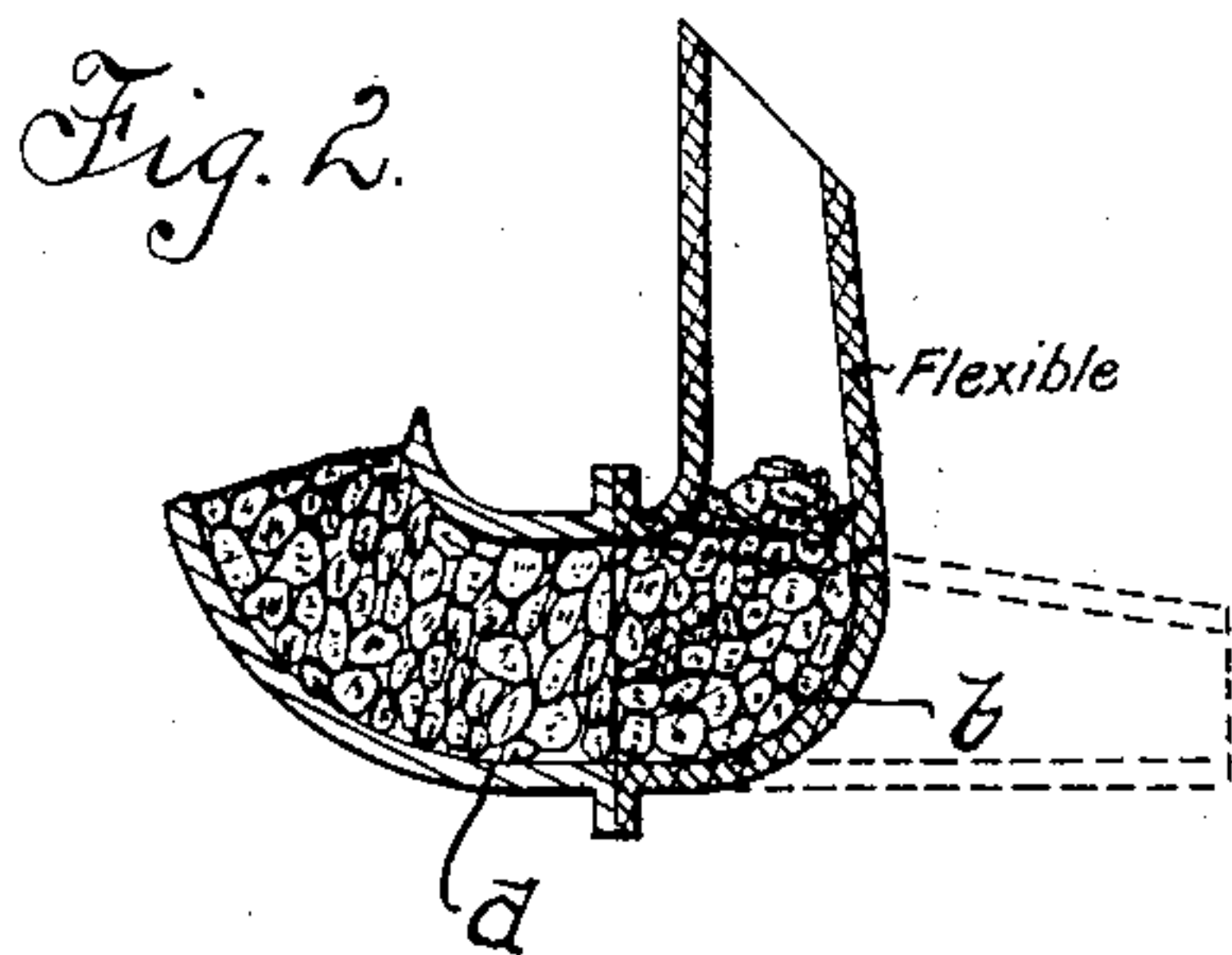


Fig. 2.

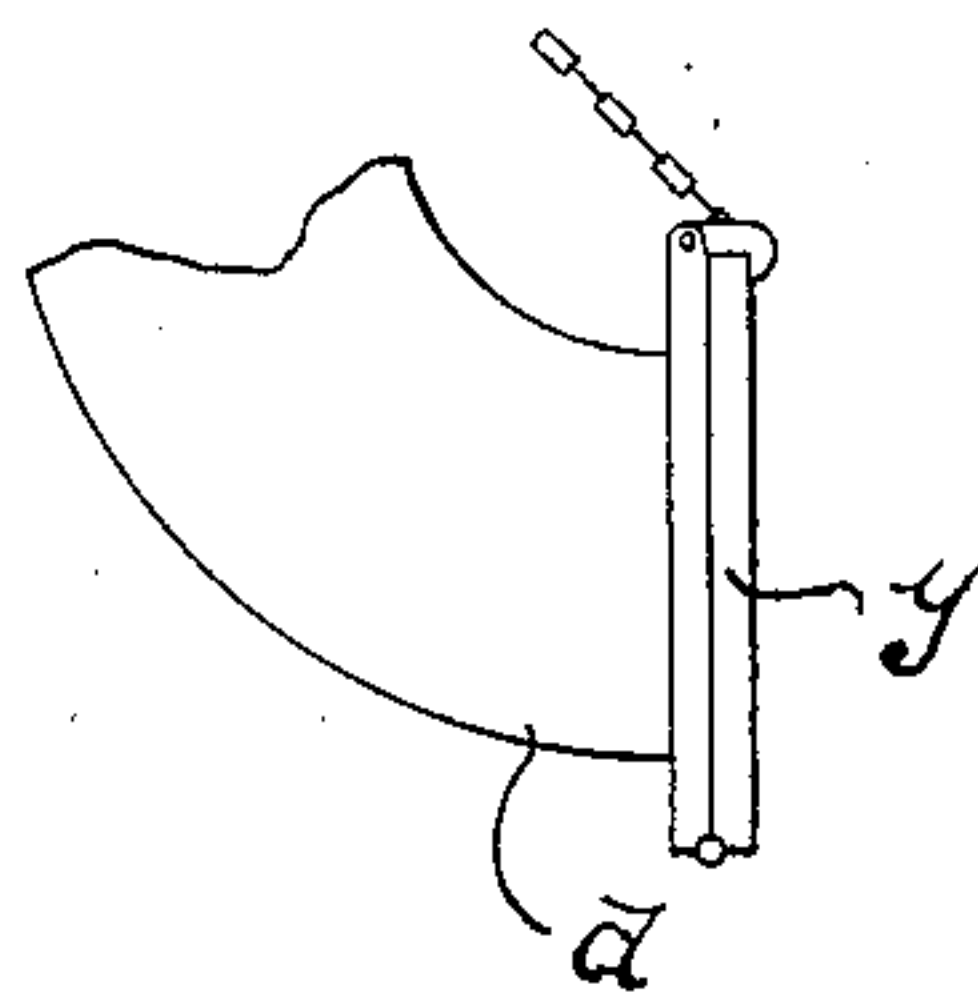


Fig. 3.

Witnesses:  
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# UNITED STATES PATENT OFFICE.

OSCAR FRÖLICH, OF STEGLITZ, NEAR BERLIN, GERMANY.

## TAPPING DEVICE FOR ELECTRIC FURNACES.

SPECIFICATION forming part of Letters Patent No. 672,601, dated April 23, 1901.

Application filed May 15, 1899. Serial No. 716,953. (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, Germany, have invented a certain new and useful Improvement in Tapping Devices for Electric Furnaces, (Case No. 3,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to tapping devices for electric furnaces.

In a former application for Letters Patent—*i. e.*, Serial No. 691,974, filed September 27, 1898—I have described an electric furnace specially adapted for the production of calcium carbide and similar substances and consisting of a tube-shaped upper carbon dipping into a crucible filled with the material that is to be subjected to the action of the arc in a pulverized state, said crucible having a tapping-hole at its lowest point, closed by a removable platform shaped like a roof.

The object of my present invention is to replace and supersede this tapping arrangement. The same consists of an elbow-shaped removable tube fitted onto the tap-hole and a flexible tube fixed on the free end of said elbow and of means for raising and lowering it, as will be hereinafter described.

Though in the following specification I have described and in the annexed drawings shown my improved tapping device in combination with my electric furnace claimed in the above-cited former application, I would have it understood that this arrangement can be usefully employed with any other electric furnace in which the product is drawn off at the bottom.

In the accompanying drawings, Figure 1 is a vertical section of my herein-described tapping arrangement shown, by way of an example, in connection with a furnace built according to my above-mentioned former application. Fig. 2 is a view showing a flexible eduction-pipe, forming part of the apparatus, bent into position to act as a closure for a product-discharge pipe. Fig. 3 illustrates a modified form of closure, comprising a trap-door which replaces the flexible closure-pipe illustrated in Figs. 1 and 2.

C is the crucible, lined with refractory material and containing the pulverized raw material.

K is the movable upper carbon, which is hollowed out, so as to form a tube.

O is the tapping-hole at the bottom of the crucible.

M M are pipes adapted to lead the gaseous products issuing through the upper carbon to some place where the heat created by their combustion can be utilized, as will be described in detail hereinafter.

s is a framework on which the furnace is supported and on which is pivoted at *u* a lever *l*. The said lever carries at its end a ring or sleeve *g*, which is fastened around and supports an elbow-shaped piece of tube *d*. This elbow-piece *d*, constructed of iron or any suitable material, registers with the tapping-hole O and constitutes an important part of my present device. It is prevented from dropping away from the tapping-hole O by the counterweight *v*, hung onto the free end of the lever *l*.

To insure the exclusion of the atmospheric air at the point of junction between the elbow-piece *d* and the edges of the tapping-hole O, I provide the former with an annular rim *e*, which is filled with pulverized raw material. Moreover, the upper part of the elbow-piece *d* is surrounded by a ring-shaped box *a*, into which I preferably conduct the tubes M M in order to keep the upper end of the tube *d* heated by the combustion of the gaseous products produced in the furnace, and thus to prevent a too-sudden transition of temperature from the arc toward the tapping arrangement.

The lower end of the elbow-piece *d* can be closed by a simple trap-door; but I prefer to fasten onto it a flexible piece of hose made of refractory material, such as asbestos. This flexible tube is represented by *b* in the drawings. Its free end is prevented from hanging downward by the chain *t*.

It is a well-known difficulty that the most products obtained in electrical furnaces are highly oxidizable in a heated state, and it is therefore desirable to prevent their contact with the atmospheric air before they have cooled. This object is obtained by my here-



in-described tapping arrangement, the operation of which is as follows: When the work is to begin, the flexible tube *b* is drawn up as high as possible, and the whole apparatus is filled with the material that is to be worked. When the operation has been carried on a certain length of time and a certain amount of the product has collected, the flexible tube *b* is slightly lowered, and in consequence the material contained in the tube *d* slips downward a certain length. This operation is repeated from time to time until the asbestos tube has reached a nearly horizontal position, when the material nearest the opening is removed with a shovel.

In Fig. 3 I have illustrated a modification of the closure for the elbow-pipe, comprising a trap-door *y*, hinged at its lower edge to the outlet-opening of the elbow-pipe and removably secured by a latch at its upper edge to the upper marginal portion of the said elbow-opening. Thus the product is obtained in a practically cold condition, and as it issues from the furnace it is effectually prevented from coming into contact with the air and is surrounded by the raw material from which it has been formed. This is an important feature, because it is a well-known fact that in the manufacture of some of the products obtained in electrical furnaces, and especially of calcium carbide, quite an appreciable quantity is formed after the product has left the immediate neighborhood of the arc if it remains in contact with raw material and is prevented from cooling too quickly.

When instead of the described flexible tube a trap-door is provided to close the lower opening of the elbow-piece *d*, it is periodically opened and the material collected near the outlet is shoveled out.

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

1. In electrical furnaces provided with a tapping-hole at their lowest point a tapping arrangement which consists of an elbow-shaped tube fitted onto said tapping-hole and means for preventing the access of air to the material in said tube substantially as and for the purpose described.

2. In electrical furnaces having a tap-hole at their lower end a tapping arrangement which consists of an elbow-shaped tube fitted onto and thereby closing said tap-hole and means for closing the lower opening of said elbow-tube substantially as and for the purpose described.

3. The combination with an electric furnace provided with a bottom opening or tap-hole, of a curved or elbow-shaped tube registering with said opening, and a delivery tube or part adapted to be raised and prevent the

access of air to the material in the tube, substantially as described.

4. In electric furnaces having a tap-hole at the lower end thereof a tapping arrangement which consists of an elbow-shaped piece of tube fitted onto and closing said tap-hole and of a flexible tube made of refractory material such as asbestos fastened onto the lower open end of said elbow-piece and of means for raising and lowering said flexible tube substantially as and for the purpose described.

5. In electric furnaces having a tap-hole at the bottom thereof a tapping arrangement which consists of a rigid elbow-shaped tube fitting said tap-hole, means for raising and lowering said elbow-piece, means for heating the upper end of said elbow-piece, a flexible tube made of refractory material such as asbestos fastened onto the lower end of said elbow-piece and means for raising and lowering the free end of said flexible tube substantially as and for the purpose described.

6. In an electrical furnace having a tapping-hole at its lowest point a tapping arrangement consisting of a rigid elbow-shaped tube fitting onto said tapping-hole, means for hermetically sealing the joint between said elbow and the edge of said tap-hole, means for heating the upper end of said elbow, a flexible tube of refractory material fixed onto the free end of said elbow and means for raising and lowering the free end of said flexible tube substantially as and for the purpose described.

7. In an electrical furnace having a tapping-hole at its lowest point a tapping arrangement consisting of an elbow-shaped piece of rigid tube provided at its upper end with a hollow rim fitting the edge of said tapping-hole, means for heating the upper end of said elbow-piece, an asbestos hose fixed onto the lower end of said elbow-piece and of means for lowering and raising the free end of said hose substantially as and for the purpose described.

8. In electrical furnaces having a tap-hole at their lowest point a tapping arrangement which consists of an elbow-shaped piece of rigid tube provided with a hollow rim fitting onto the edge of said tap-hole a ring-shaped box surrounding the upper end of said elbow-piece, tubes conveying combustible gas and leading into said ring-shaped box a flexible tube fastened onto the lower end of said elbow-piece and of means for raising and lowering the free end of the latter substantially as and for the purpose described.

In witness whereof I hereunto subscribe my name this 22d day of April, A. D. 1899.

OSCAR FRÖLICH.

Witnesses:

WOLDEMAR HAUPT,  
HENRY HASPER.