No. 651,916. Patented June 19, 1900.

J. ZIMMERMAN & I. S. PRENNER.

FURNACE FOR PRODUCING CALCIUM CARBID.

(Application filed June 8, 1899.)

(No Model.) 2 Sheets—Sheet 1.

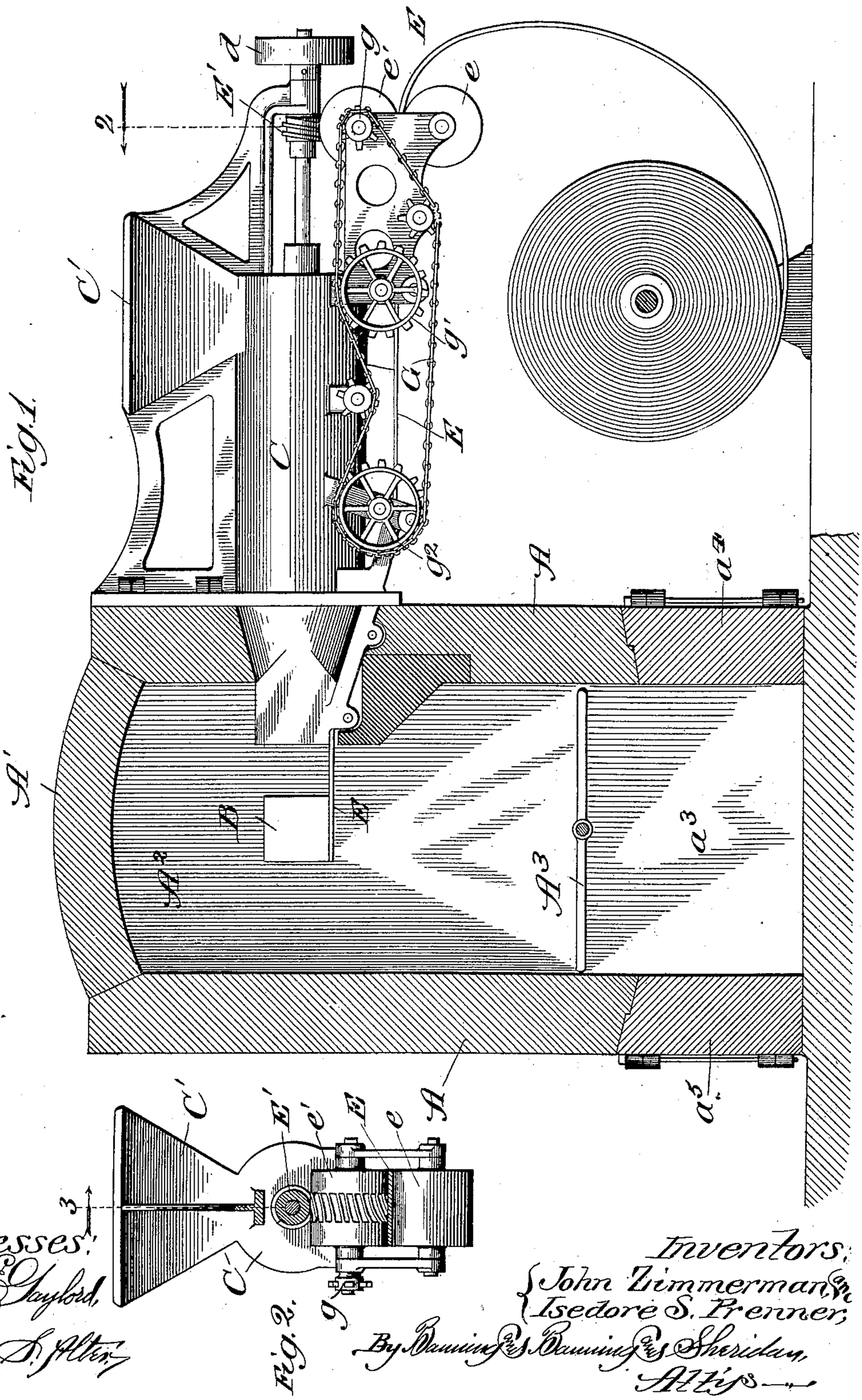


Fig. 2.

Witnesses:
Chas. E. Gaylord,
Leto D. Alter.

Inventors:
John Zimmerman, Jr.
Isedore S. Prenner,
By Banning & Banning & Sheridan,
Attys.

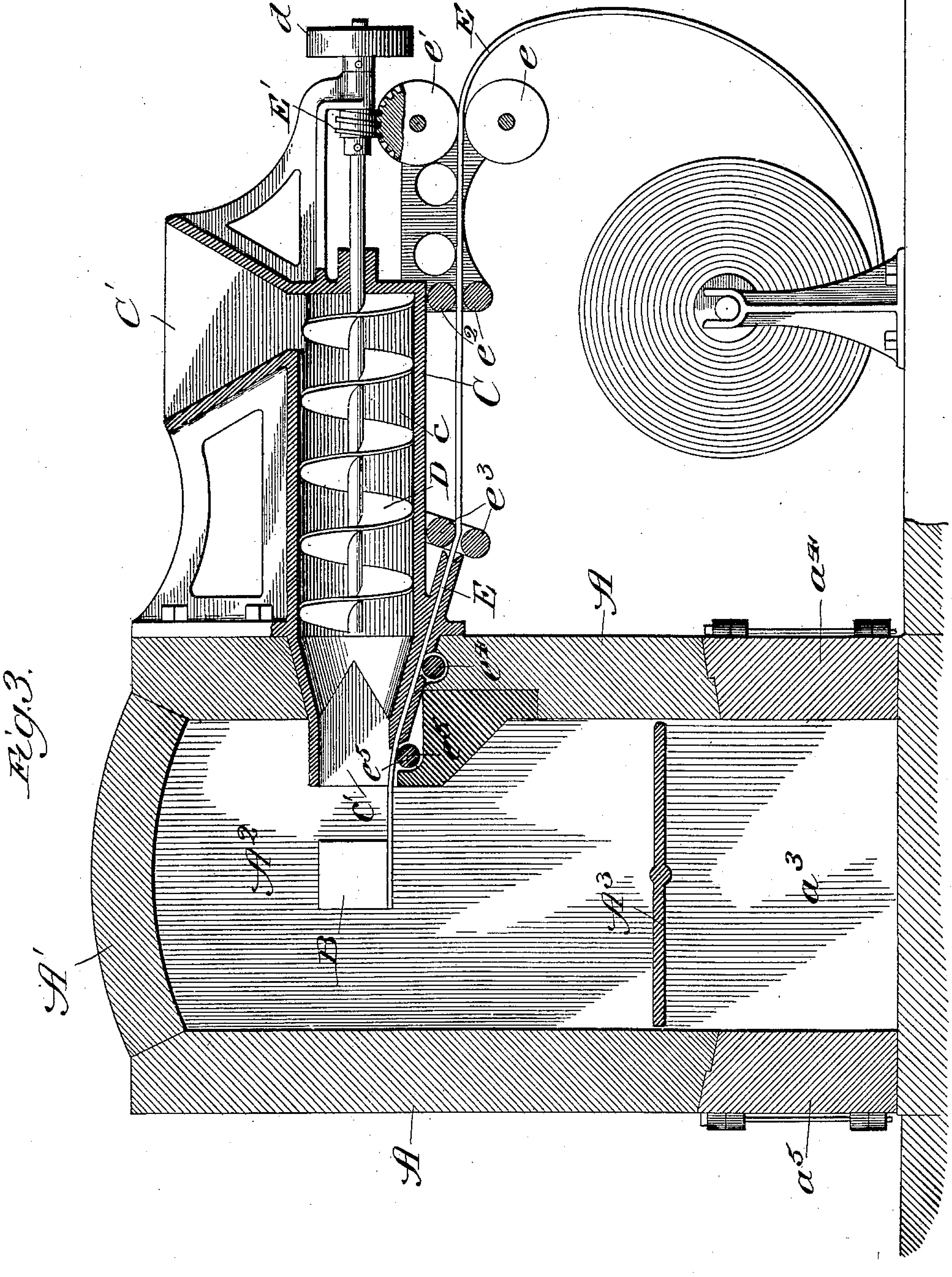
No. 651,916. Patented June 19, 1900.

J. ZIMMERMAN & I. S. PRENNER.

FURNACE FOR PRODUCING CALCIUM CARBID.

(Application filed June 8, 1899.)

(No Model.) 2 Sheets—Sheet 2.



Witnesses:
Chas. E. Gaylord,
Lute S. Alter.

Inventors:
John Zimmerman and
Isedore S. Prenner,
By Banning & Banning & Sheridan,
Att'ys.

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

UNITED STATES PATENT OFFICE.

JOHN ZIMMERMAN AND ISEDORE S. PRENNER, OF CHICAGO, ILLINOIS.

FURNACE FOR PRODUCING CALCIUM CARBID.

SPECIFICATION forming part of Letters Patent No. 651,916, dated June 19, 1900.

Application filed June 8, 1899. Serial No. 719,789. (No model.)

To all whom it may concern:

Be it known that we, JOHN ZIMMERMAN and ISEDORE S. PRENNER, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnaces for Producing Calcium Carbid, of which the following is a specification.

Our invention relates to that class of furnaces known as "electric smelting-furnaces" and which are provided with apparatus for automatically feeding a mixture of lime and carbon to the arc of the furnace for the purpose of melting the same and forming a gas-producing material, such as calcium carbid.

The principal object of our invention is to provide a simple, economical, and efficient electrosmelting-furnace for the production of calcium carbid.

A further object of our invention is to provide an electric smelting-furnace with mechanism for automatically feeding in a mixture of lime and carbon continuously into position between two electrodes and into the arc created by the electrodes, so as to enable the same to be melted continuously, all of which will more fully hereinafter appear.

The invention consists principally in the combination of an electric furnace having an electric arc and means, such as stiff paper, for feeding a supply of lime and carbon continuously to the arc.

The invention consists, further and finally, in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical sectional elevation of an electric smelting-furnace constructed in accordance with our improvements and showing our improved automatic feeding mechanism in elevation and attached thereto in position for use; Fig. 2, a transverse sectional view taken on line 2 of Fig. 1; and Fig. 3, a sectional elevation similar to Fig. 1, taken through the combined furnace and feeding mechanism on line 3 of Fig. 2.

In the production of calcium carbid by the electric smelting process it is well known that there are various objections and disadvantages attending the same, the principal one being the waste of heat due to the fact that the process has to be carried on intermittently and that therefore the entire heat of the arc cannot be utilized. Further, the old type of furnace was always accessible, so that considerable waste of heat was entailed in its use owing to the loss of radiant energy. The principal object of our invention therefore is to provide an electric smelting-furnace which will remove the above-noted objections and provide it with means for feeding the mixture of lime and carbon automatically into position between the electrodes and also with means by which the resultant product may be withdrawn without interfering in any way with the carrying on of the process, all of which will more fully hereinafter appear.

In constructing an apparatus in accordance with our improvements we provide a furnace having inclosing side walls and roof A and A′, made of any desired kind of refractory material, though we prefer for such purpose a well-burned fire-brick. Introduced through openings in the end walls A^2 of the furnace—one only of which is shown in the drawings—and preferably near the upper portion thereof are two electrodes B, arranged so as to form an arc between them at about the central point of the furnace, into which a mixture of lime and carbon may be fed. We have not shown means for supplying a current to the electrodes to form the necessary arc, as this is well known by those skilled in the art and if illustrated and described herein would only tend to prolixity and confusion.

To supply the mixture of lime and carbon to the arc and preferably in a rectangular form, we provide what we term a "feeding-chamber" *c*, formed in the receptacle C and which is preferably arranged at or near the center of the furnace and in line with the arc, so that the material may be fed in on about the same horizontal plane with the arc. We prefer that the mixture should be formed in a pasty condition, with or without a binder, which may be any of the well-known binders—such as borax, graphite and iron, or molasses; but from experimental use we have found that the mixture can be formed and used without a binder, though we do not desire to be limited in any manner to the use or non-use of a binder. The discharge *c′* of this

feeding-chamber is smaller in diameter than the main portion and is also rectangular or square in cross-section and of substantially the same size as the desired arc, so that as the feed and compressing screw D is rotated in the direction against the hands of a watch the material is fed inwardly and compressed as it passes through the discharge-opening. This screw is rotated by means of the pulley *d*, which is on the extending end of the screw-shaft. The feeding and compressing chamber is provided with a hopper C′, into which the material is dumped preparatory to being compressed and fed into the arc, and while, as above stated, we prefer to use the material in a pasty condition it will be seen after reading the entire specification and comparing it with the drawings that dry granulated material may be smelted economically in our furnace.

In order to efficiently support the material and convey it after it leaves the compressing-opening to the arc, we provide a roll of stiff paper or cardboard E adjacent to the feeding mechanism and carry the free end of the same over and between the feeding-rolls *e e′* and guiding supporting-rolls e^2, e^3, e^4, and e^5, which feed and support this sheet of paper and cardboard into proximity with the arc. This cardboard is stiff enough to support the weight of the compressed mixture from the discharge end of the feeding-chamber to the arc and to withstand the ordinary heat, but to fuse, burn, or dissipate in the intense heat of the arc, permitting the resultant product to fall down on the bottom portion A^3. Rotation is given to the feeding-rolls *e e′* by means of the worm E′, which engages with the worm-gear on the roll *e′*. A sprocket-chain G engages with suitable sprocket-wheels *g* on the feed-roll *e′* and other sprocket-wheels *g′* and g^2 on the upper ones of the other supporting guiding-rolls, so that as the shaft of the helical screw is rotated movement is also imparted to the supporting guiding-rolls to feed the strip of paper into the arc.

When it is desired to withdraw the resultant product of calcium carbid, the bottom part of the furnace A^3 is tilted on its axis to dump it into the receiving-chamber a^3, when it may be rotated or again tilted back into position, as shown in the drawings, to receive a fresh supply of carbid. The product may then be removed through the openings closed by the doors a^4 or a^5, as may seem desirable or necessary.

We claim—

1. In an apparatus of the class described, the combination of a furnace-chamber, electrodes in the chamber having an arcing space between them, a flat strip of combustible flexible material projected horizontally into the furnace-chamber in line with the arcing space and having a forward feed, means for continuously introducing a supply of carbid-producing material thereon, and means for projecting and feeding the strip horizontally forward and delivering the material continuously into the arcing space, substantially as described.

2. In an apparatus of the class described, the combination of a furnace, two electrodes extending through the walls of the furnace into the furnace-chamber and providing an arcing space between them, a flat strip of stiff flexible material projected horizontally into the furnace-chamber and into the arcing space, means for continuously introducing a supply of carbid-producing material thereon, and means for projecting and feeding the strip forward with the material thereon for delivering the material into the arcing space, substantially as described.

3. In an apparatus of the class described, the combination of an electric smelting-furnace provided with two electrodes extending through the walls thereof so as to form an electric arc therein, mechanism for feeding and compressing a supply of mixed carbon and lime continuously into the furnace, and a sheet or strip of flexible material—such as paper—arranged underneath the compressing mechanism to receive the mixture and carry it into the arcing space, substantially as described.

4. In an apparatus of the class described, the combination of an electric smelting-furnace provided with two electrodes extending through the walls thereof so as to form an electric arc therein, mechanism for feeding and compressing a supply of mixed carbon and lime continuously into the furnace, a sheet or strip of flexible material—such as paper—arranged underneath the compressing mechanism to receive the mixture and carry it into the arcing space, and roll mechanism for supporting, guiding and feeding the strip of paper into the arcing space, substantially as described.

5. In an electric furnace, the combination of two electrodes laterally projected into the furnace-chamber through the walls thereof to lie in a horizontal plane and form an arcing space between them, a feeding mechanism forcing the material horizontally toward the electrodes in line with the arcing space, and a traveling support of flexible and consumable material passing beneath the discharge of the feed and beneath the electrodes and means for advancing the support coincident with the feed of the material carrying the material to and between the electrodes into the arcing space, substantially as described.

6. In an electric furnace, the combination of two electrodes laterally projected into the furnace-chamber to lie in the same horizontal plane and form an arcing space between them, a horizontal feeding device lying in the same horizontal plane as the arcing space of the electrodes for feeding the material discharged therefrom into the arcing space, a support traveling in a horizontal plane toward the electrodes and beneath the feed-discharge

and the electrodes and formed of flexible material and means for advancing the support coincident with the feed carrying the material to and between the electrodes into the arcing space, substantially as described.

7. In an electric furnace, the combination of two horizontal electrodes, a feed-cylinder for the material having a discharge or mouth in a horizontal plane in line with the arcing space of the horizontal electrodes, means for forcing the material through the feed-cylinder, a strip of flexible material forming a traveling support for the material from the feed-cylinder between the mouth or discharge of such cylinder and the electrodes, and means for advancing flexible strip to pass beneath the electrodes and carry the material into the arcing space, substantially as described.

8. In an electric furnace, the combination of a feed-cylinder having a discharge or mouth in a horizontal plane in line with the arcing space of two laterally-standing electrodes, means for forcing the material from the feed-cylinder, a guide slot or passage in the body of the feed-cylinder leading from the exterior thereof to the mouth or discharge, a strip of flexible material passing through the slot or passage of the feed-cylinder and out at the mouth or discharge and along the bottom of such mouth or discharge forming a traveling support carrying the material from the mouth or discharge of the feed-cylinder to and between the electrodes into the arcing space and means for advancing the strip of flexible material coincident with the feed of the cylinder to pass beneath the feed-discharge and the electrodes, substantially as described.

9. In an electric furnace, the combination of a feed-cylinder having a discharge or mouth in a horizontal plane in line with the arcing space of two electrodes standing laterally, means for forcing material through such feed-cylinder, a guide slot or passage in the body of the feed-cylinder leading from the outside thereof into the mouth or discharge, guide and carrying rollers coacting with the slot or passage, a strip of flexible material passing through the slot or passage and over the rollers and out at the mouth or discharge along the bottom thereof forming a traveling support carrying the material fed from the mouth or discharge of the feed-cylinder to and between the electrodes into the arcing space, and feed-rollers for advancing the strip of flexible material, substantially as described.

10. In an electric furnace, the combination of a feed-cylinder having a discharge or mouth in a horizontal plane in line with the arcing space of two electrodes standing laterally, means for forcing material through such feed-cylinder, a guide slot or passage in the body of the cylinder leading from the outside thereof to its mouth or discharge, guide and carrying rollers coacting with the slot or passage, a strip of flexible material leading through the slot or passage, a roller carrying the strip of continuous flexible material and feed-rollers acting on the flexible material for advancing such material through the slot or passage coincident with the feed of the cylinder for carrying the discharged material from the feed-cylinder into the arcing space between two electrodes, substantially as described.

JOHN ZIMMERMAN.
ISEDORE S. PRENNER.

Witnesses:
THOMAS F. SHERIDAN,
THOMAS B. MCGREGOR.