No. 656,930. Patented Aug. 28, 1900.

W. BORCHERS.

ELECTRIC FURNACE.

(Application filed Apr. 12, 1900.)

(No Model.)

Fig. 3.

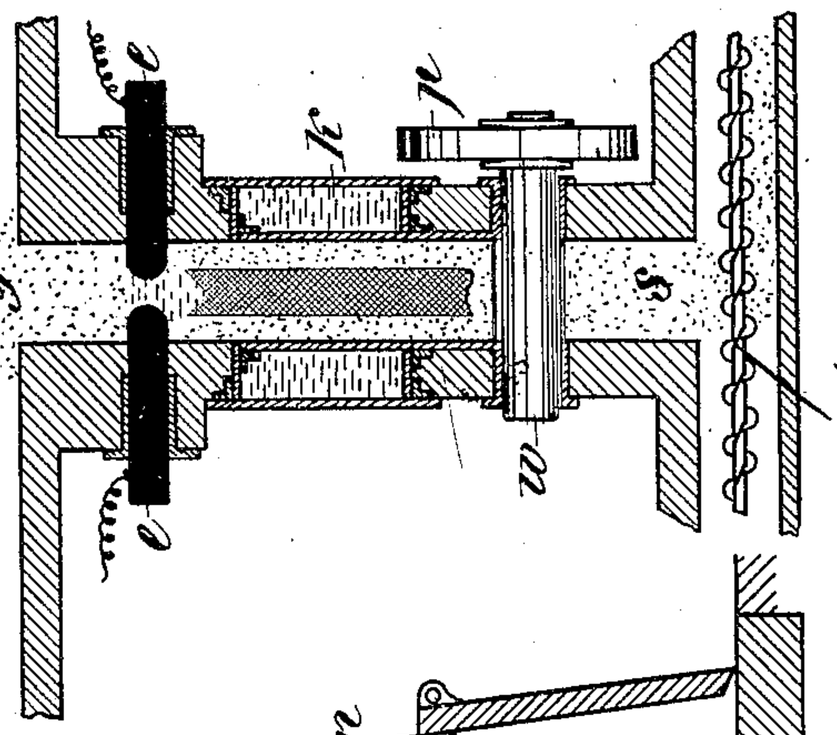

Fig. 2.

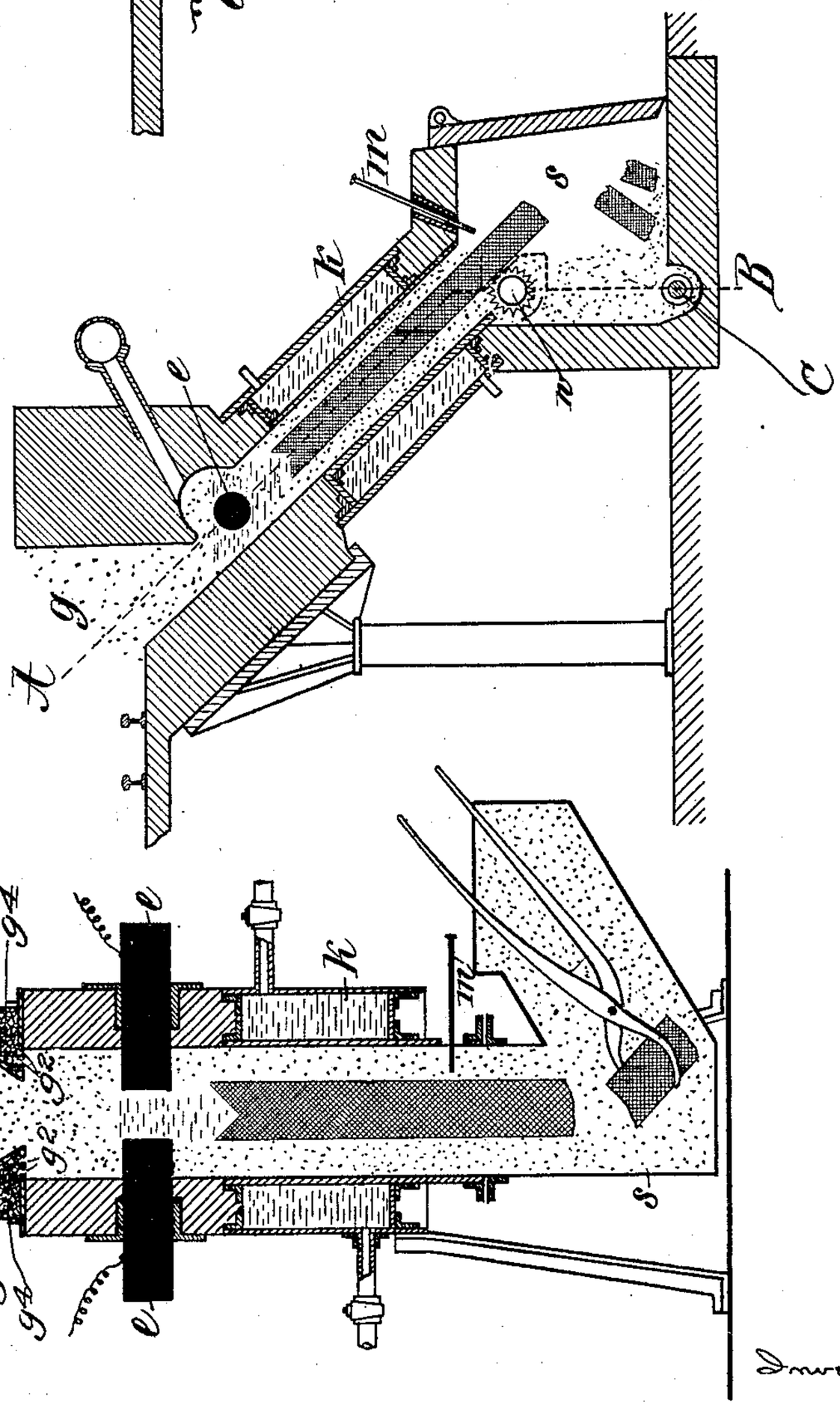

Fig. 1.

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ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 656,930, dated August 28, 1900.

Application filed April 12, 1900. Serial No. 12,625. (No model.)

To all whom it may concern:

Be it known that I, WILHELM BORCHERS, professor of metallurgy, residing at 15 Ludwigs Allee, Aix-la-Chapelle, in the German Empire, have invented Improvements in Electric Furnaces; and I do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement, reference being had to the accompanying drawings and to the letters marked thereon.

This invention relates to improvements in electric furnaces.

In the manufacture of calcium carbid and other products in an electric furnace requiring high temperatures the following difficulties have been met with: The mixture to be heated partly escapes decomposition when passing the region of the electric current, while another part is whirled out of the furnace with the gases arising during the electrochemical and thermochemical reactions. These gases as well as the combustible dust particles leaving together the furnace will burn away in the flues and stacks without any use, in some cases even causing damage or endangering at least buildings and other structures in the vicinity by the hot and glowing flue-dust. That part of the furnace charge which passes the electric-heating region undecomposed, together with a part of the manufactured product, will in many cases suffer damage by combustion, because it cannot be prevented from leaving the furnace in too hot a condition. By my present invention I cannot prevent and do not intend to avoid that a moderate part of the furnace charge passes the electric-heating region undecomposed, because by allowing a part of the furnace charge to pass the furnace undecomposed this part will not only help to protect the furnace-walls against the action of the electrically-heated products, but it will also greatly help in keeping up the necessary isolations; yet all other difficulties enumerated above will be done away with by my present invention. As will be seen from the accompanying drawings, the object in view has been reached by means of very simple appliances which at the same time permit an almost continuous charging and discharging of the furnace.

Referring to the accompanying drawings, Figure 1 is a vertical central section of an upright furnace designed to be discharged by hand. Fig. 2 is a similar view of an inclined furnace provided with discharging mechanism. Fig. 3 is a section thereof on the line A B of Fig. 2.

In the figures, *g* designates the entrance for the furnace charge; *e*, the electrodes; *k*, the cooling-jacket; *s*, the space for collecting the products to be carried out of the furnace. No further explanation will be necessary as to the purpose of the parts of the furnace designated with *g e s*.

The cooling-jacket *k* is to cool the products of the furnace, as well as the undecomposed part, of the charge below their kindling temperature in order to prevent such losses as are unavoidable when the products of the electric furnace leave the furnace hot as they are and come into contact with air. This is not only important for the ready product, but especially for the undecomposed part of the furnace charge, which in most cases consists of oxids and carbon. Coming out too hot the carbon will catch fire and burn away from the mixture, which in order to be used again will have to be mixed with a fresh portion of carbon before being returned to the furnace. Every batch of carbon, however, contains a certain amount of ashes, as in practice the carbon is added in the shape of charcoal or coke, and the greater the amount of ashes that enters the furnace charge the greater will be the damage to the quality and quantity of the product, not to speak of the loss of energy used for heating worthless and damaging substances. If the undecomposed part of the furnace charge comes out cool, it can immediately be returned to the furnace, together with fresh charges. The chief product itself will not suffer the slightest deterioration if after completion of the originating reaction it is sufficiently cooled inside the furnace. The heat taken up by the cooling-water may be utilized. As it is necessary to cool the furnace-discharges below 400° Celsius, the water-jacket may be utilized as a

steam-generator to produce high-pressure steam for running a steam-engine. For continuously running the furnace the discharging may be carried out by hand or mechanically.

Fig. 1 shows a furnace for hand-discharge. The collecting-space should be kept filled with granulated coke or other suitable material from the start. While the upper part is being kept filled with the regular furnace charge, a sufficient quantity of the lower filling should be regularly pulled out to allow the molten products to sink down. They will solidify to solid lumps while passing the water-jacket, which if too large may be broken up by chisels *m*. As shown, the chisels pass through the wall of the discharge end of the furnace and are movable endwise or adapted to be reciprocated therein to break up the solid lumps of carbid before they reach the discharge end of the furnace. If mechanical or automatic appliances for discharging the furnace are employed, their function is restricted to regulating the sliding down of the furnace contents, as shown in Figs. 2 and 3. For this purpose the body of the furnace is built up at such an angle that the contents would easily slide down but for the toothed roller *w*, which operates to retard and regulate the sliding movement and which is driven by means of a pulley *p*.

As shown in Figs. 2 and 3, mechanical means are employed for positively discharging the carbid, consisting of a worm-conveyer C. As shown in said figures, the chisels *m* are arranged in close proximity to the roller *w*, so as to break up the carbid as it leaves the roller and before it reaches the conveyer. For small furnaces it will be necessary to control the roller by some motor, while in large furnaces it may do to balance the roller by counterweights or springs in such a way that the accelerating movement of the sliding masses will be transformed into a uniform movement.

As will be seen from the figures, the furnace may be run with an electric arc between the electrodes or with the charge forming an incandescent resistance if it is conductive itself.

Surrounding the feed-hopper *g* is a gas flue or chamber *g'*, having a perforated or foraminous bottom g^2, on which is supported a layer of filtering material g^4—such as peat, for example. The gases escape from the reaction-chamber through the perforated or foraminous bottom g^2 into the gas flue or chamber *g'*, and escape from the latter through the pipe g^3.

Having thus particularly described and ascertained the nature of my 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 the furnace and the oppositely-disposed electrodes arranged therein, of the water-jacket on the discharge end of the furnace, and a chisel movably arranged transversely in the wall of the furnace opposite the discharge end of the water-jacket, substantially as described and for the purpose specified.

2. In an electric furnace, the combination with the downwardly-extending furnace and the oppositely-disposed electrodes arranged therein, of the water-jacket on the discharge end of the furnace, a toothed roller arranged transversely to the discharge end of the water-jacket, a conveyer for conveying off the products fed thereto by the toothed roller and a chisel movably arranged transversely in the wall of the furnace for breaking up the carbid after it leaves the roller and before it is discharged by the conveyer, substantially as described.

3. In an electric furnace, the combination with the inclined furnace and the oppositely-disposed electrodes arranged laterally in the walls of the furnace, of the water-jacket on the discharge end of the furnace, a toothed roller arranged transversely to the discharge end of the water-jacket, and means for controlling the movement of the roller, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

WILHELM BORCHERS.

Witnesses:
E. M. BRUNDAGE,
G. SCOTT.