No. 676,985. Patented June 25, 1901.

H. KOLLER.

ELECTRIC SMELTING FURNACE.

(Application filed May 17, 1900.)

(No Model.) 2 Sheets—Sheet 1.

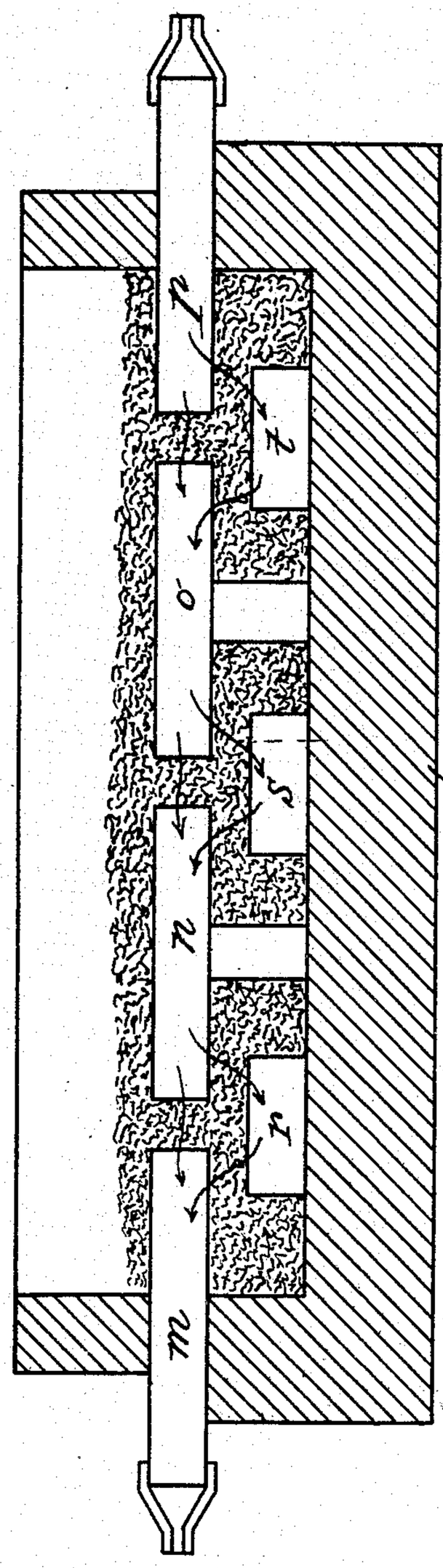

Fig. 1.

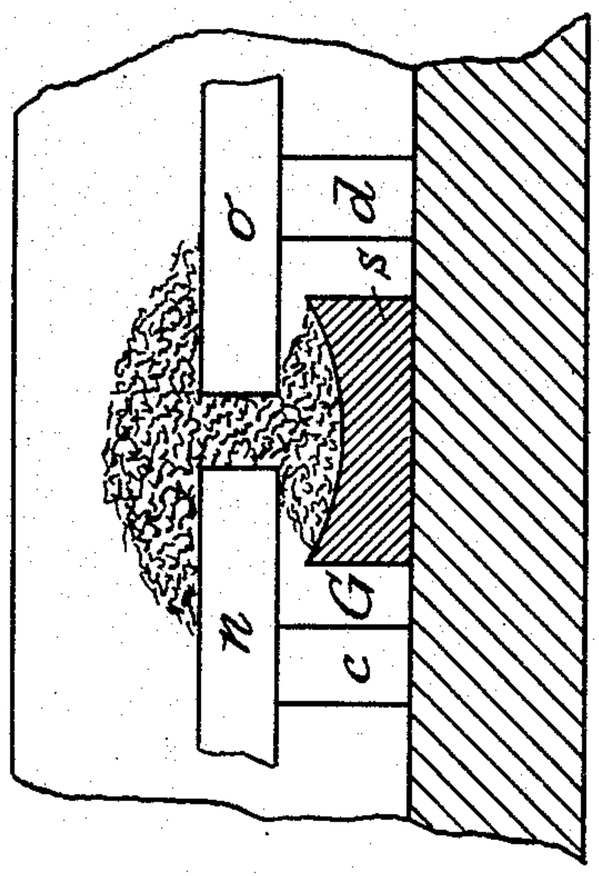

Fig. 2.

Witnesses:-
Alfred Mitchell
Hans Barbach.

Inventor:-
Hugo Koller
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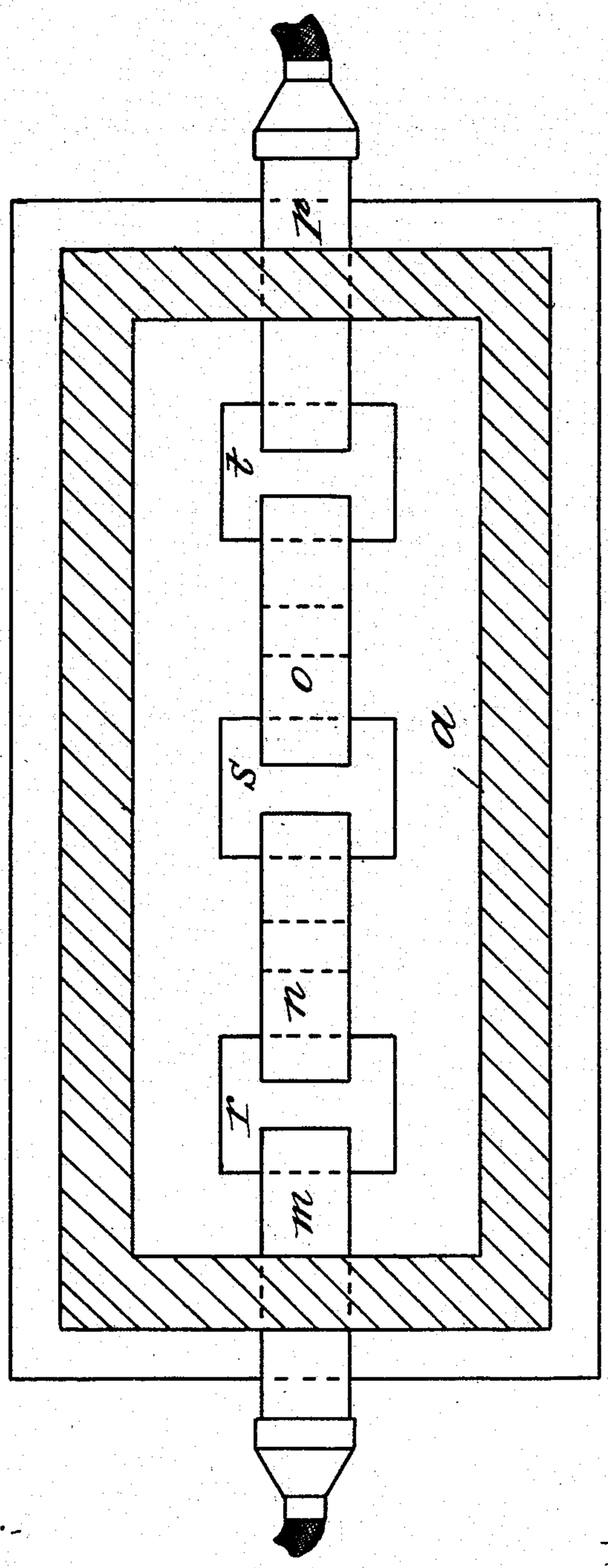

Fig. 3.

Witnesses:-
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Inventor:-
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UNITED STATES PATENT OFFICE.

HUGO KOLLER, OF NUREMBERG, GERMANY.

ELECTRIC SMELTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 676,985, dated June 25, 1901.

Application filed May 17, 1900. Serial No. 17,026. (No model.)

To all whom it may concern:

Be it known that I, HUGO KOLLER, a subject of the Emperor of Austria-Hungary, residing at Nuremberg, Bavaria, Germany, have invented certain new and useful Improvements in Electric Smelting-Furnaces, of which the following is a full, clear, and exact description.

In the larger class of electric smelting-furnaces—such, for instance, as are employed for the production of calcium carbid—considerable difficulty is experienced in feeding the current to the electrodes, owing to the high intensity of the current required to work the furnace. It is therefore advisable to restrict the number of the feed-conductors as far as possible. It is, however, hardly possible to maintain a tension of more than seventy to eighty volts between two electrodes for any considerable length of time if the intensity of the current is to remain approximately constant.

The object of the present invention is to provide a furnace having the least possible number of feed-conductors, but in which the tension limits between which the furnace works most advantageously are enlarged.

The object is attained by inserting between the two electrodes proper a series of intermediate carbon electrodes having no electrical connections thereto, which serve to conduct or assist the current from one electrode to the other.

Since the mixture of carbon or coke and limestone or chalk employed in the manufacture of calcium carbid is non-conductive at ordinary temperatures, it is advantageous in carrying out the present invention to arrange carbon blocks within the mixture between the spheres of reaction. These carbon blocks are embedded in the mixture with their longitudinal axes advantageously parallel to the direction of the lines of the current, the adjacent ends of each block being a sufficient distance apart to allow an intermediate space large enough to form a suitable reactionary sphere. This intermediate space is filled up with the mixture of coke and lime with which the electrodes themselves are entirely covered.

The furnace is advantageously started by inserting a small resistance—such, for instance, as a short carbon—between the adjacent ends of the intermediate carbon blocks. These carbons will serve to heat the surrounding material sufficiently to render the same conductive as soon as the current is turned on. Thus the whole furnace will be divided, according to the resistance at various points, into two sets of spheres, viz: first, reactionary spheres of a very high temperature between the ends of the electrodes and intermediate electrodes for the calcium carbid, and, second, relatively cooler spheres at the body of the carbon electrodes. Even after long working periods the spaces between the ends of the carbon electrodes in the direction of the current-lines will show the greatest degree of heat, while along the body of the electrodes the temperature of the mixture under treatment, at least that lying above the electrodes, remains so low that the mass is hardly conductive. In order, however, to protect the bottom of the furnace, which remains by no means so cool as the upper part of the mass, special arrangements have to be made, as hereinafter described.

No fireproof material, with the exception of carbon, is capable of withstanding the high temperature of the sphere of formation of calcium carbid. If the electrodes are arranged horizontally, they may not be simply laid down on the bottom of the furnace, but must be supported by a bridge of fireproof material at about their center—*i. e.*, in the relatively cool zone—so that the ends only of each electrode project into the sphere of maximum heat. It is furthermore advantageous to close or cover up the bottom of the furnace at the reactionary sphere between the adjacent ends of each electrode and intermediate electrode by or with protecting carbon slabs or plates, which should be mounted at a suitable distance from the previously-mentioned electrodes and may also serve as intermediate electrodes.

In order to render the present specification easily intelligible, reference is had to the accompanying drawings, in which similar letters of reference denote similar parts throughout the several views.

Figure 1 is a diagram showing in longitudinal sectional elevation one method of embodying the present invention; Fig. 2, a part-

sectional longitudinal elevation showing a particular form of the lower intermediate electrodes, and Fig. 3 is a plan of Fig. 1.

Above the fireproof flooring *a* of the furnace the electrodes are mounted in two superposed rows, one of which, *r s t*, lies on the floor *a* of the furnace, while each member of the other is mounted on a suitable carrier-block *c* or *d*, said electrodes *m n o p* being arranged alternately as regards those of the lower row.

Current is fed to the furnace through the electrodes *m* and *p*, the electrodes *n* and *o* serving as intermediate ones.

The whole furnace is filled up with the mixture of coke and lime high enough to cover all the electrodes. On starting the furnace the current passes in the direction indicated by the arrows and heats everything it passes, with the exception of the carbon, to a white glow heat. The calcium carbid obtained may be taken out of the furnace through any suitable openings.

In the course of time it is possible that a bridge of semimolten material might be formed between two electrodes, which would take up a part of the current and, increasing the sphere of reaction, would tend to deconcentrate the heat. This disadvantage is obviated by hollowing out the lower electrodes *r*, *s*, and *t*, which will then serve as troughs to catch the molten mass flowing thereinto from between the ends of the electrodes of the upper row. These troughs are advantageously so formed that the thick fluid mass flowing into the same from between the ends of the electrodes of the upper row cannot flow over the edges. These troughs also serve to collect the finished product. One form of these troughs is illustrated in Fig. 2. Between and below the electrodes *n* and *q* the lower electrode *s* is arranged, the upper part of which is hollowed out to form the trough which collects the finished product heaped up therein. A further advantage of the trough construction consists in the fact that the molten mass will be caught up by the said trough and will be prevented from flowing onto the bottom of the furnace, in which case there is a possibility that the molten mass, which is a good conductor, might deviate the current from its proper path. As will be seen from Fig. 2, the molten mass will not enter the space G, and consequently will not touch the floor or the walls or supports *c* and *d*, so that the formation of slag is effectually prevented.

I claim as my invention—

1. In an electric smelting-furnace the combination of end electrodes and a series of intermediate disconnected electrodes, means for supporting the latter at a suitable distance from the bottom of the furnace, the adjacent ends of the electrodes being a suitable distance apart and in a position to be embedded in the mass being treated in the manner and for the purpose substantially as described.

2. In an electric smelting-furnace the combination of two end electrodes, and means for supporting the same above the bottom of the furnace, and a disconnected intermediate electrode, having means for supporting the same intermediate of and approximately in the same level as the end electrodes, and a series of disconnected electrodes on the bottom of the furnace intermediate of the ends of the raised electrodes substantially as described.

3. In an electric smelting-furnace the combination of end electrodes raised above the bottom of the furnace, intermediate disconnected electrodes and means for supporting the same between the said end electrodes, a series of disconnected lower electrodes mounted beneath the adjacent ends of the said raised electrodes and having their upper surfaces recessed to form troughs in the manner and for the purpose substantially as described.

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

HUGO KOLLER.

Witnesses:

HENRY HASPER,

WOLDEMAR HAUPT.