No. 805,502. PATENTED NOV. 28, 1905.

E. R. TAYLOR.

METHOD OF PRODUCING CHEMICALS IN ELECTRIC FURNACES.

APPLICATION FILED JUNE 9, 1902. RENEWED FEB. 8, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

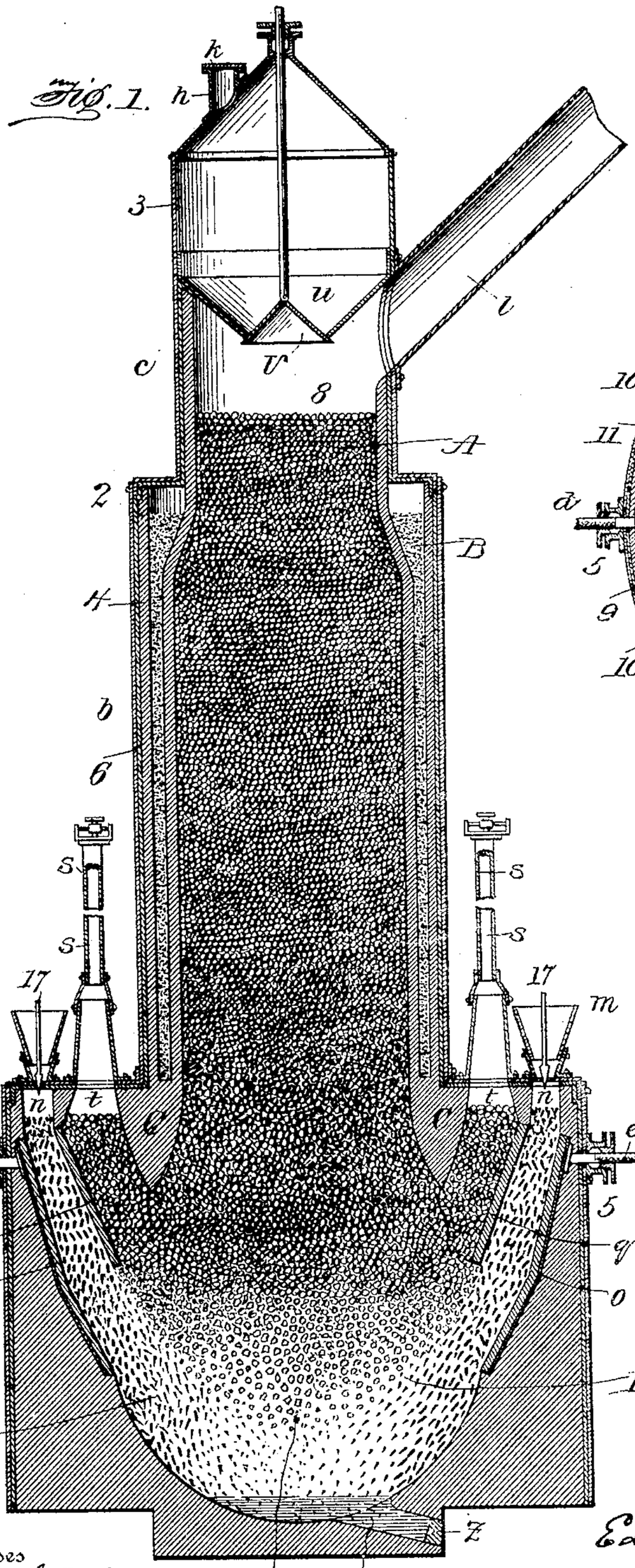


Fig. 3

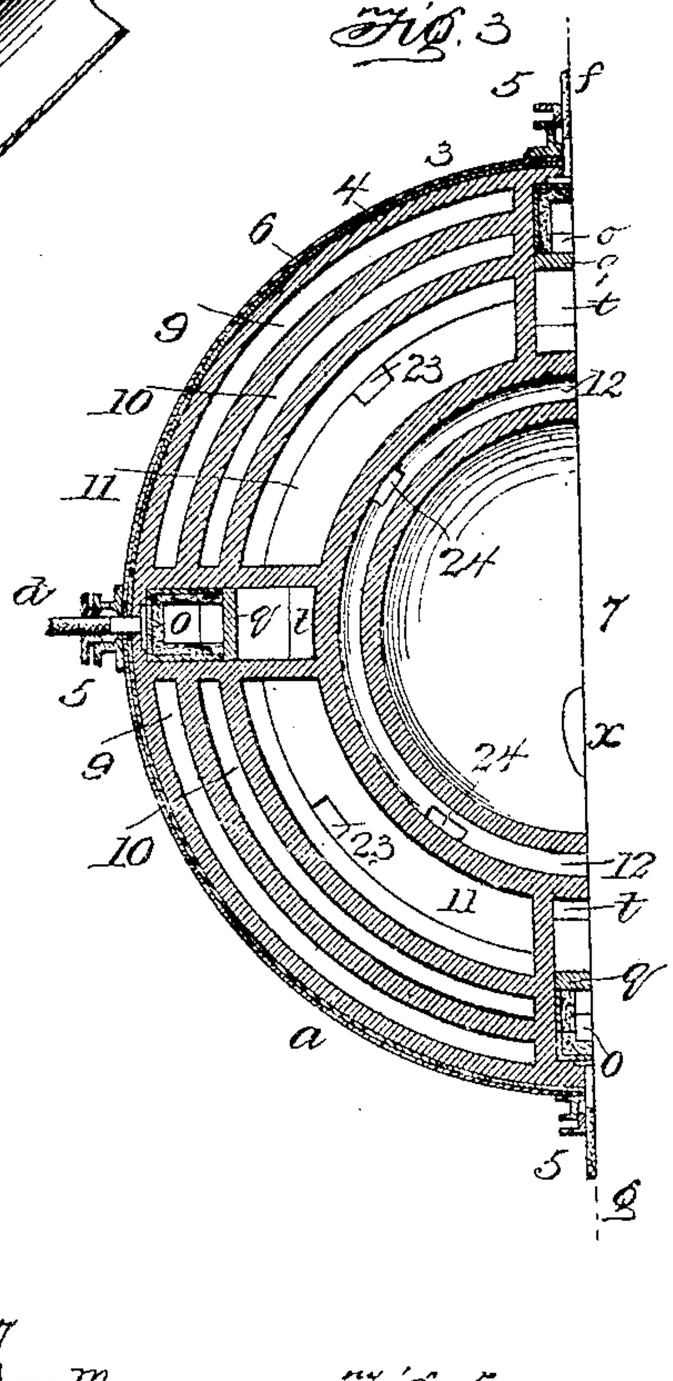
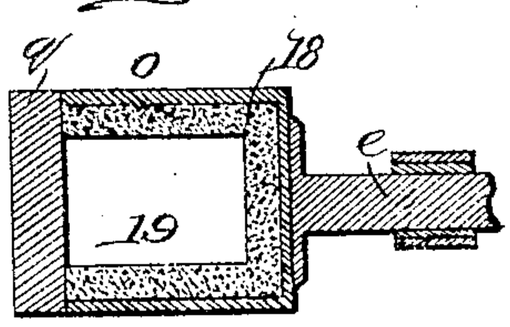


Fig. 5.



Witnesses
Fenton & Belt.
E. Thos. Loftus

Inventor
Edward R. Taylor,
By
Attorney.

No. 805,502. PATENTED NOV. 28, 1905.

E. R. TAYLOR.

METHOD OF PRODUCING CHEMICALS IN ELECTRIC FURNACES.

APPLICATION FILED JUNE 9, 1902. RENEWED FEB. 8, 1904.

2 SHEETS—SHEET 2.

Fig. 2.

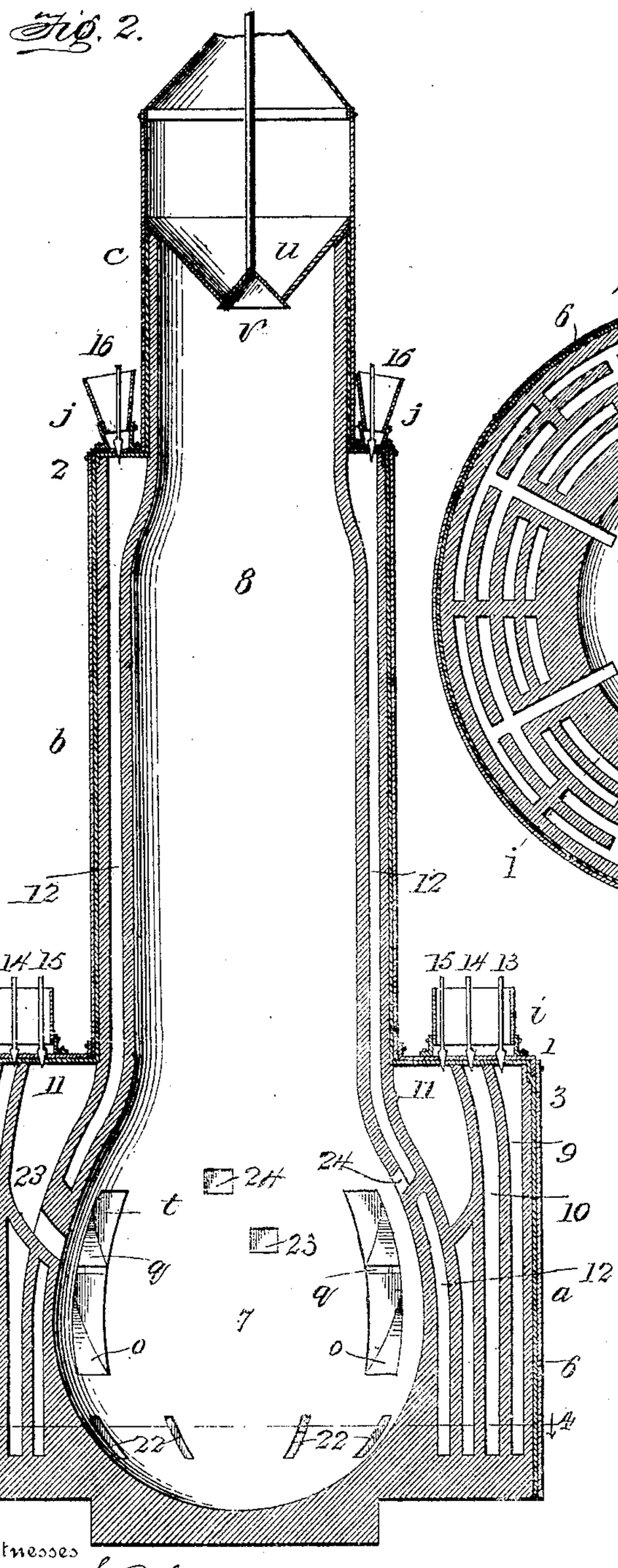


Fig. 4.

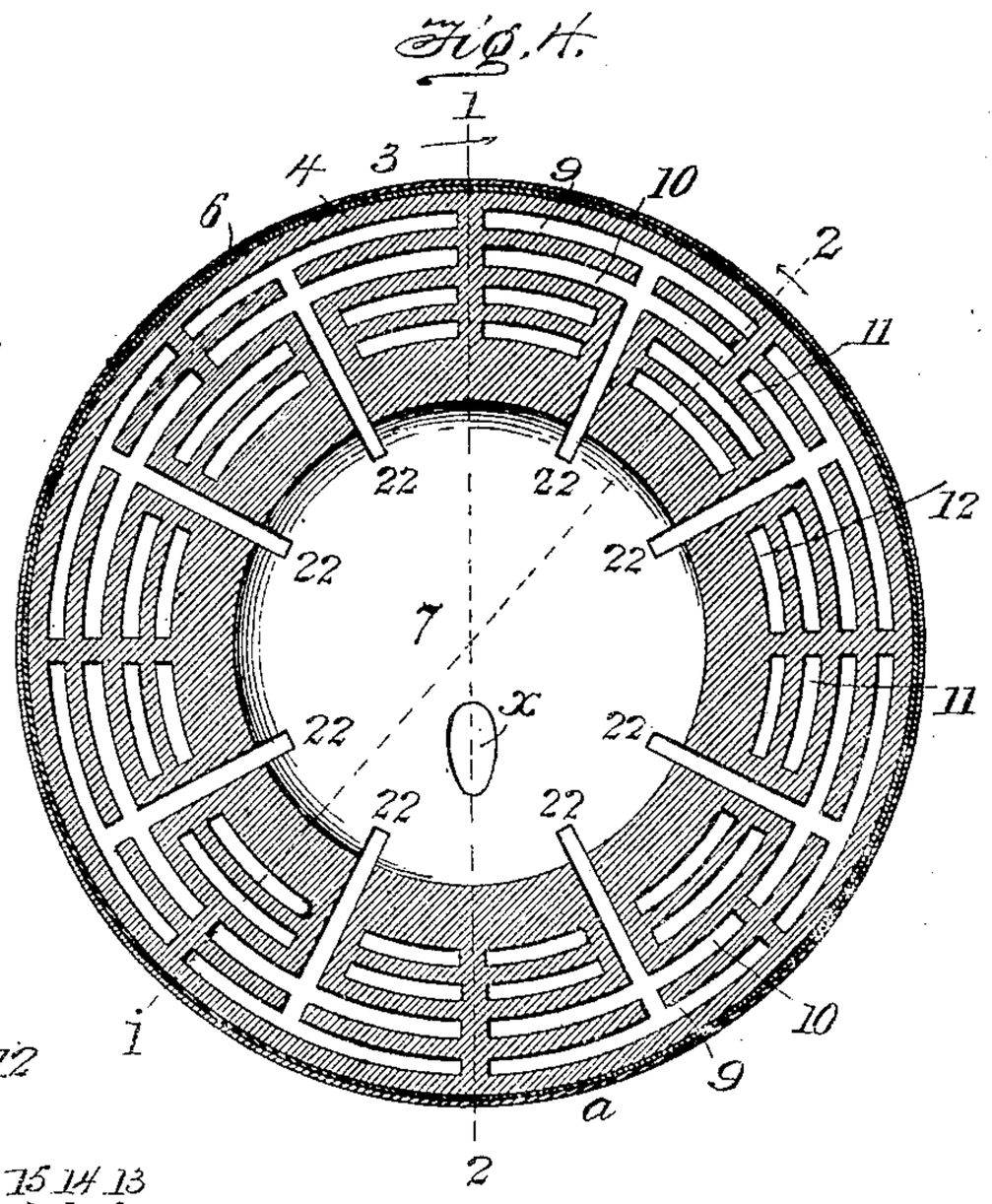
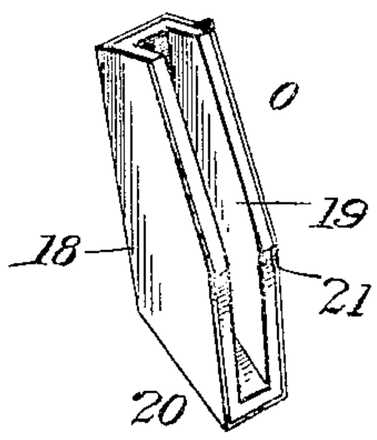


Fig. 6.



Witnesses
Fenton & Felt,
E. Thos. Loftus

Inventor
Edward R. Taylor
By D. L. Ewing,
Attorney.

UNITED STATES PATENT OFFICE.

EDWARD R. TAYLOR, OF PENN YAN, NEW YORK.

METHOD OF PRODUCING CHEMICALS IN ELECTRIC FURNACES.

No. 805,502. Specification of Letters Patent. Patented Nov. 28, 1905.

Application filed June 9, 1902. Renewed February 8, 1904. Serial No. 192,715.

To all whom it may concern:

Be it known that I, EDWARD R. TAYLOR, a citizen of the United States of America, and a resident of Penn Yan, in the State of New York, have invented a new and useful Improvement in Methods of Producing Chemicals in Electric Furnaces, of which the following is a specification.

This invention relates primarily to the production of bisulfid of carbon (CS_2) by a continuous process, but is applicable in part to other reactions and reductions.

The present invention consists in a novel method of disposing of the residue in such chemical reactions and reductions in electric furnaces, as hereinafter set forth and claimed.

The object is to fuse within the furnace and to discharge in fused condition the residue from the carbon and sulfur in the process of making bisulfid of carbon and like difficultly-fusible materials that are liable to accumulate in the bottom of the working chamber of an electric furnace.

Two sheets of drawings accompany this specification as part thereof.

Referring to the drawings, Figure 1 is a vertical section of an electric furnace suitable for carrying into effect the present invention, showing the same charged and in operation; and Fig. 2 is a vertical section through such furnace, empty, in a plane at an angle of forty-five degrees to the plane of Fig. 1. Fig. 3 represents a horizontal section through one side of the empty furnace on the broken line 3, Fig. 1. Fig. 4 represents a horizontal section through the empty furnace on the broken line 4, Fig. 2, indicating the planes of Figs. 1 and 2, respectively, by broken lines 1 and 2. Fig. 5 represents a section through one of the electrode-conduits on a larger scale, and Fig. 6 is a perspective view of one of the electrode-conduits detached.

Like letters and numbers refer to like parts in all the figures.

The furnace above referred to and hereinafter incidentally described is the subject-matter of a companion specification forming part of an application for United States Patent, filed the 4th day of April, 1901, Serial No. 54,328, and renewed the 2d day of January, 1902, Serial No. 88,042, (Patent No. 706,128, dated the 5th day of August, 1902.) Its features of construction comprise a preferred upright or stack form, with three diameters at successive heights, as shown in Figs. 1 and 2; a round (or equivalent) shape in cross-section, as represented by Figs. 3 and 4, with horizontal shoulders 1 and 2 connecting the base *a*, body *b*, and dome *c;* an iron shell 3 common to all; a chambered refractory lining 4, of fire-brick or its equivalent, extending upward to a sufficient extent above the top of said body *b;* stuffing-boxes 5 in diametrically opposite pairs on said shell 3, through which insulated conductors *d*, *e*, *f*, and *g* extend into the furnace from a suitable generator of electricity; suitable insulation 6 between said shell 3 and lining 4 throughout; a central working chamber 7 within said base *a;* a commodious feeding-chamber 8 extending downwardly to the working chamber and in free communication therewith; an inlet *h* to said feeding-chamber through said dome *c;* spaces 9, 10, 11, and 12 concentric with said feeding and working chambers and with each other within the fire-brick lining of the walls; hoppers *i* and *j*, Fig. 2, upon said shoulders 1 and 2, respectively, provided with plugs 13, 14, 15, and 16, which respectively open and close the inlets into said spaces 9, 10, 11, and 12 for the admission of fusible material for a given reaction or reduction; a cap *k*, Fig. 1, to open and close said inlet *h* for an infusible or less fusible material for the reaction or reduction, and an outlet *l* leading from said dome *c* for the discharge of gaseous material.

The lower shoulder 1 of the furnace is further provided with hoppers *m*, Fig. 1, above the several stuffing-boxes 5, provided with plugs 17 for the admission of fragmentary conductive material adapted to constitute self-renewing electrodes in the working furnace, as represented at D and E, Fig. 1, and passages *n* extend downwardly from such inlets within the brickwork of the base of the furnace.

Conduits *o*, (shown in detail by Figs. 5 and 6,) constructed of conductive material, are arranged in continuation of said passages *n* within the brickwork of the base and electrically attached, as in Fig. 5, to the several conductors *d*, *e*, *f*, and *g*. Each of these conduits is preferably composed of a trough-shaped casting 18, Fig. 5, of suitable metal, forming back and side walls, and a lining 19, Fig. 5, of carbon brick, and is, furthermore, preferably constructed with the lower part 20, Fig. 6, of its back wall and the lining thereof at an angle to retard the descent of the fragmentary conductive material through the conduit and

to direct the same inwardly toward the middle of the working chamber, the several conduits being arranged at the sides of the furnace, as shown in Figs. 1 and 3, and preferably with the upper portions of their back walls slightly inclined inward, as in Fig. 1.

To prevent or resist the passage of the electric current directly from side to side of the furnace or to aid in thus confining the current to the electrodes at this point, protective walls *q*, Figs. 1, 2, and 3 and Fig. 5, of non-conductive material, such as fire-brick, are interposed between the several conduits *o* and the middle of the furnace and are preferably and conveniently directly superposed, so as to bridge the open side of each conduit, as in Fig. 5, from its upper end, where the electric conductor is attached to its back, to the upper limit of its outlet, where the face of the conduit recedes, as shown at 21 in Fig. 6, to conform it to the preferred spheroidal shape of the working chamber. (Compare Fig. 1.)

Feeding themselves by gravity the electrodes D E descend into the bottom of the working chamber 7 from the outlets of said conduits *o* and flow toward each other, as represented in Fig. 1, being naturally thinnest where they come together, and thus affording the necessary resistance at this point to convert the electricity into heat. The heat zone of the furnace is thus located at the bottom.

To provide for further protection to the several conduits *o* and for the regulation or control of the operation of the furnace without interfering with the continuity of such operation, feed-pipes *s*, Fig. 1, are mounted on said lower shoulder 1 of the furnace between the last-mentioned hoppers *m* and the body *b*, and passages *t* are formed in the shoulder portion of the iron shell and in the brickwork of the base *a* leading from said pipes *s* into the working chamber 7, as shown in Figs. 1 and 2. Either conductive or non-conductive material of any suitable kind that will feed through said pipes *s* or their equivalent may be supplied thereto and fed by gravity through said passages *t* into the working chamber immediately in front of each or any of the electrodes at will. Such supplemental material is represented at C in Fig. 1.

The carbon, such as charcoal or coke, and the crushed sulfur for the bisulfid of carbon reaction are represented, respectively, at A and B in Fig. 1, the former as descending within said feeding-chamber 8 and the latter as filling the innermost 12 of said spaces within the brickwork of the furnace-walls. The introduction of the carbon into the working furnace is conveniently facilitated by a hopper *u* and bell *v* within the dome *c* above said gas-outlet *l*. The crushed sulfur introduced into any or all of said spaces 9, 10, 11, and 12 is fused therein by heat of the furnace that would otherwise be lost by radiation, such spaces surrounding the working chamber 7, as in Fig. 3 and Fig. 4, and descends by gravity toward the heat zone, where it is vaporized simultaneously with the heating of the carbon, and the reaction is thus continuously effected.

The two outer spaces 9 and 10 preferably discharge into the working chamber in the plane of the heat zone through ducts 22, Figs. 2 and 4, and the two inner spaces 11 and 12 discharge above the heat zone at different heights through outlets 23 and 24, Figs. 2 and 3, arranged in different vertical planes, so that the fused sulfur may run down the inner walls of the furnace toward the heat zone in separate streams, and thus distribute its cooling and preserving effect.

By feeding the self-renewing electrodes into the bottom of the working chamber and passing the electric current through the same, as aforesaid, the residue from the carbon and sulfur that would otherwise accumulate there as an ash may be and is fused by a sufficient current therethrough, and other like difficultly fusible matter may be fused in like manner. By thus periodically disposing of the ash in the production of bisulfid of carbon the occasional cooling down to dispose of the accumulations of ash is dispensed with and the continuity of the process is promoted. A taphole *x*, Figs. 1, 3, and 4, normally closed by a stopper *z*, provides for periodically discharging such fused residue or product. Such taphole *x* may preferably be arranged in a different plane instead of beneath one of the electric conductors, where it is shown for convenience of illustration. The furnace may be square or of other shape in cross-section. The spaces 9, 10, 11, and 12 within the walls may be increased or reduced in number. There may be but one pair of electrodes or more than two pairs, and other like modifications of the furnace will suggest themselves to those skilled in the art.

The present invention consists exclusively in the novel method of treating the residue carried into effect by said furnace, as hereinafter claimed.

The novel process or method of forming self-renewing electrodes and of continuously effecting reactions and reductions by means of such electrodes, including the production of bisulfid of carbon (CS_2) by such process or method, is hereby disclaimed in favor of the specification forming part of my divisional application, filed the 24th of January, 1902, Serial No. 91,114, of which the application of which the present specification forms part is a division. The furnace as a machine or apparatus, with every novel feature thereof, is hereby disclaimed in favor of said companion specification forming part of said renewed application, Serial No. 88,042, (Patent No. 706,128, dated the 5th day of August, 1902,) of which as originally presented said process application, Serial No. 91,114, is a division.

Having thus described said improvement, I claim as my invention and desire to patent under this specification—

1. In the art of producing chemicals in an electric furnace, the process which consists in feeding fragmentary conductive material into the bottom of the working chamber, charging said chamber with material capable of producing a gaseous product, passing a suitable electric current through such charge by means of said fragmentary conductive material, discharging a gaseous product, fusing the residue by a sufficient current therethrough, and drawing off such residue in fused condition.

2. In the art of making bisulfid of carbon in an electric furnace, the process which consists in feeding fragmentary conductive material into the bottom of the working chamber, continuously supplying said chamber with carbon and sulfur, passing a suitable electric current through the same by means of said fragmentary conductive material, discharging the bisulfid of carbon, fusing the residue by a sufficient current therethrough, and drawing off such residue in fused condition.

3. In the art of making bisulfid of carbon in an electric furnace, the improvement which consists in fusing the residue from the carbon and sulfur within the furnace and removing the same from the furnace in fused condition, substantially as hereinbefore specified.

EDWARD R. TAYLOR.

Witnesses:
M. F. HOBART,
O. M. HOBART.