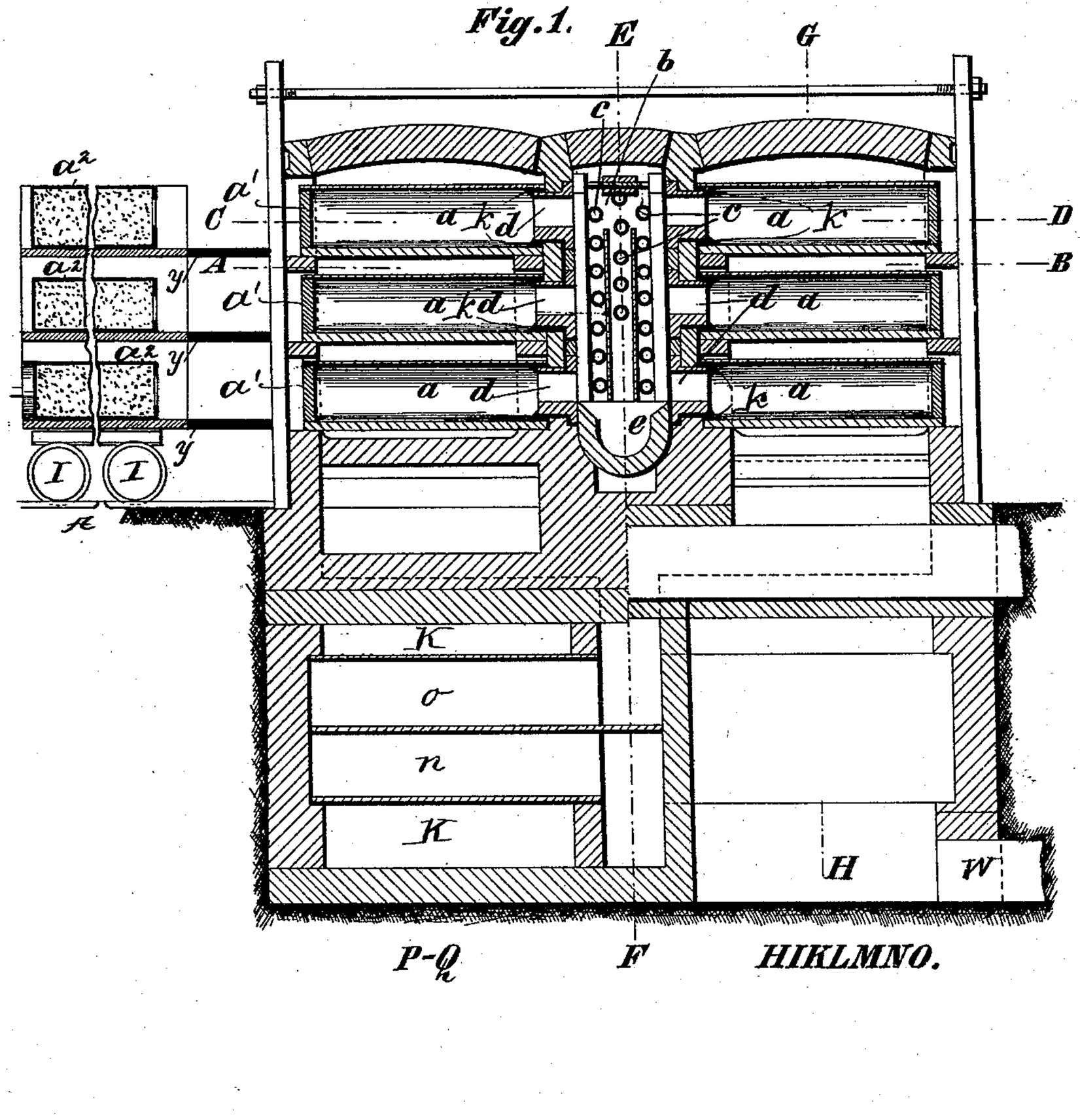
(No Model.) 4 Sheets—Sheet 1.

L. V. J. LYNEN.

PROCESS OF AND APPARATUS FOR EXTRACTION OF ZINC.

No. 543,256. Patented July 23, 1895.

Fig. 1.



Witnesses:

Jesse D. Kingsbery

H. K. Boulter

Inventor:

Leo Victor Joan Lynen

By

Whitaker & Prentiss Attys.

(No Model.) 4 Sheets—Sheet 2.

L. V. J. LYNEN.

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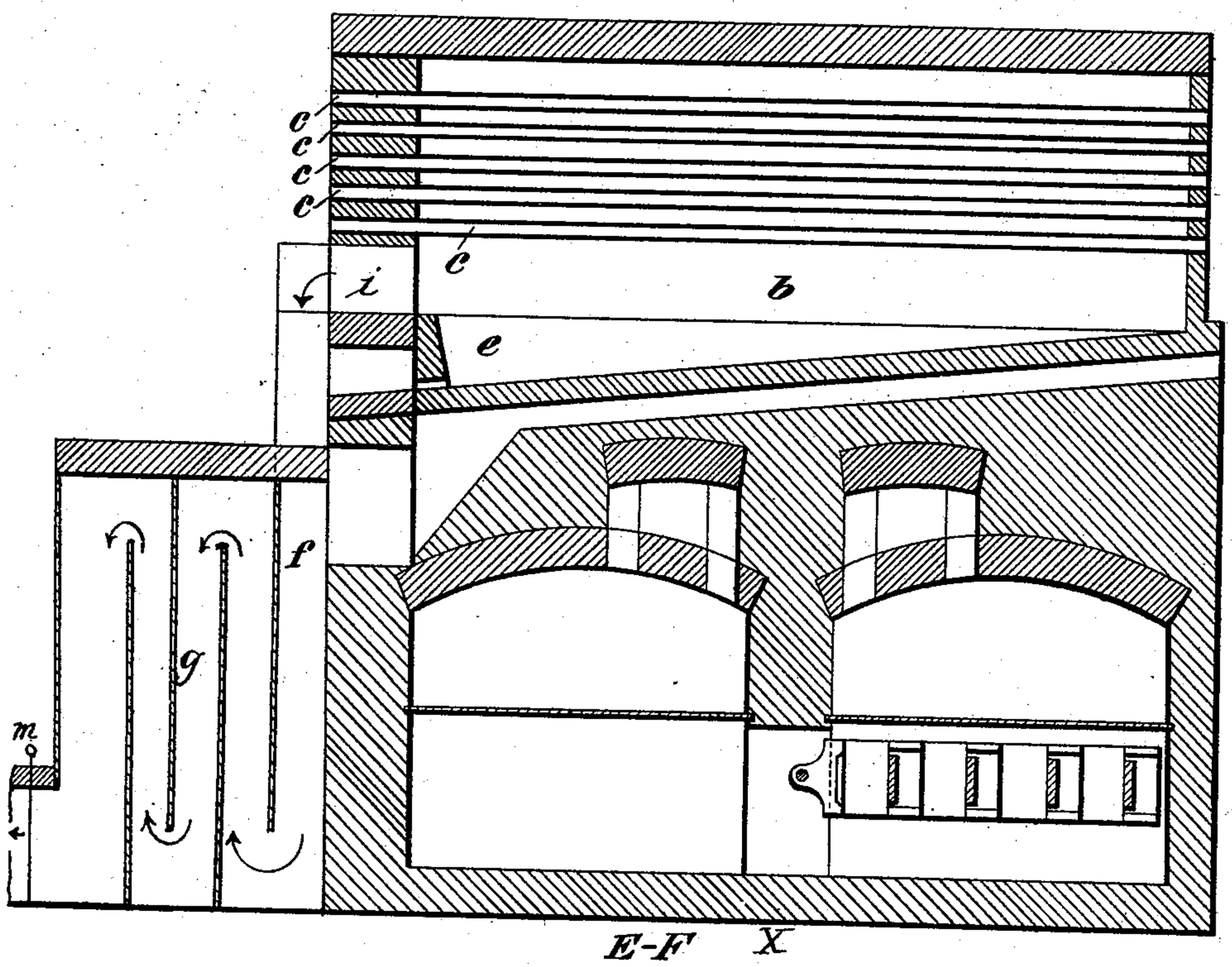
No. 543,256. Patented July 23, 1895.

Fig. 2.



Witnesses:

Jesse D. Knight

H. K. Boulter

Inventor:

Leo Victor Joan Lynen.

By

Whittaker & Prevost, Attys.

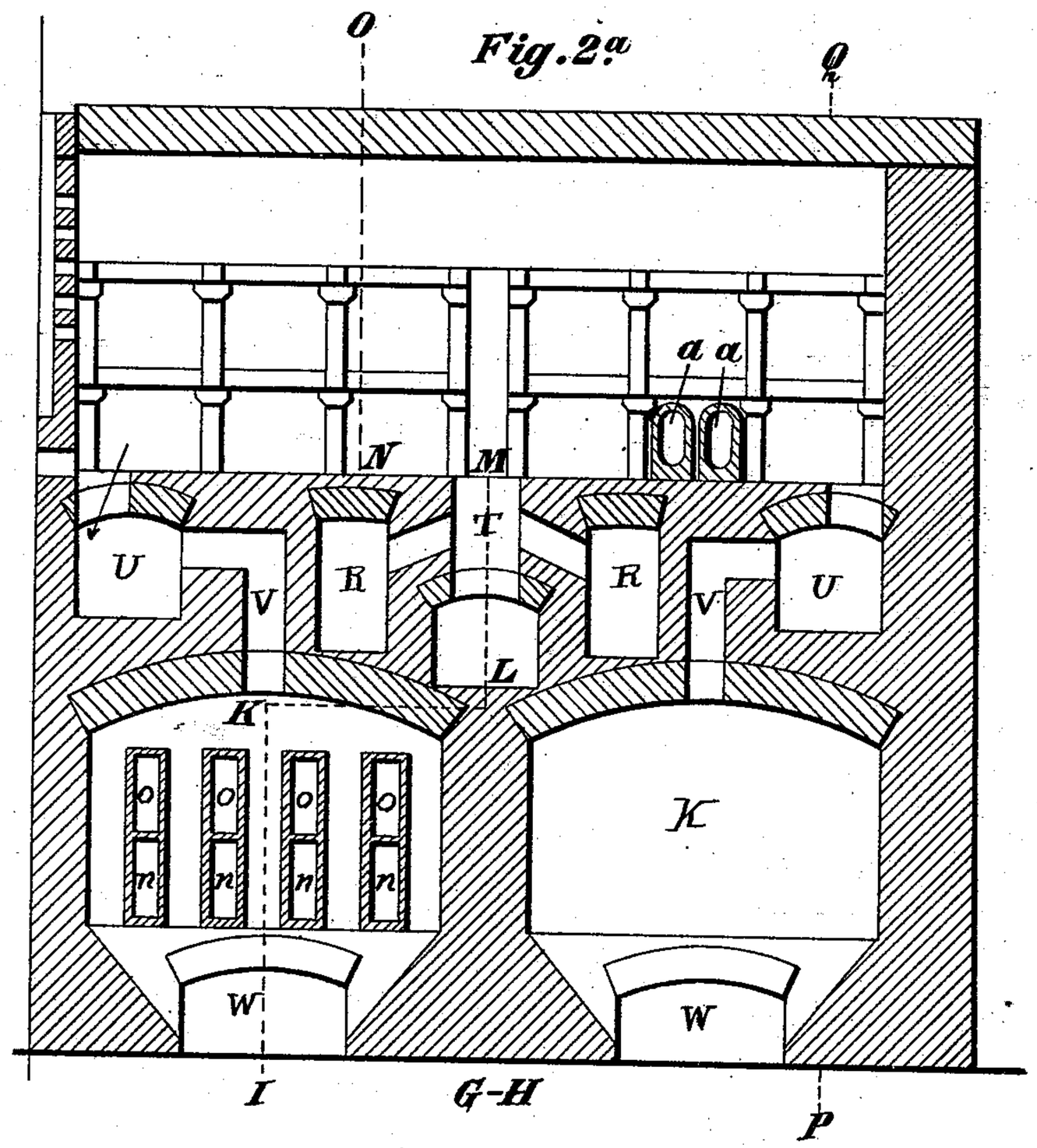
(No Model.) 4 Sheets—Sheet 3.

L. V. J. LYNEN.

PROCESS OF AND APPARATUS FOR EXTRACTION OF ZINC.

No. 543,256. Patented July 23, 1895.

Fig. 2ª



Witnesses:
Jesse D. Knightsberg.
H. K. Boulter

Inventor:
Leo Victor Joan Lynen
By
Whitaker & Prevost Attys.

(No Model.)

4 Sheets—Sheet 4.

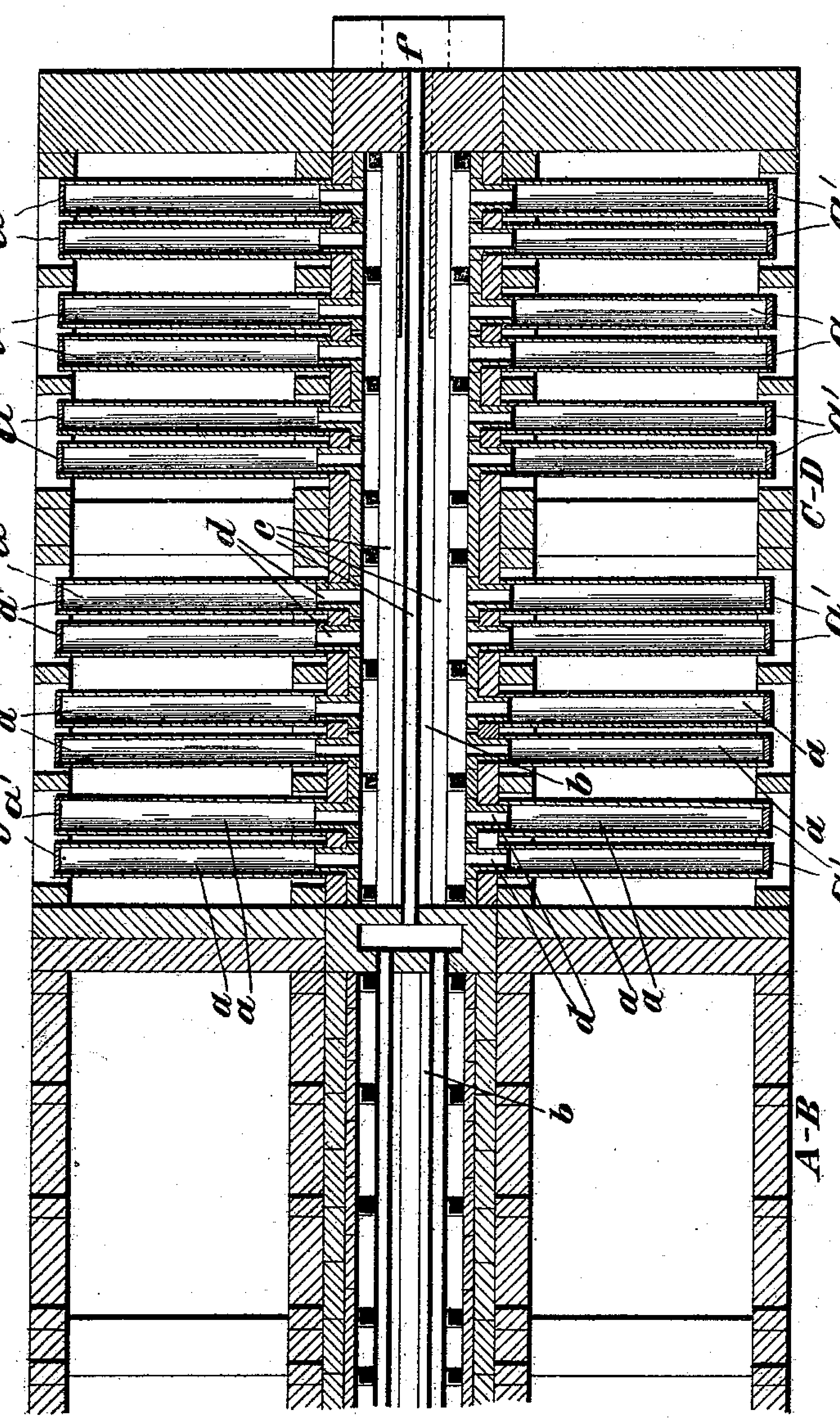
L. V. J. LYNEN.

PROCESS OF AND APPARATUS FOR EXTRACTION OF ZINC.

No. 543,256.

Patented July 23, 1895.

Fig. 3.



Witnesses:
Jesse D. Kingsbury
H. K. Boulter

Inventor:
Leo Victor Joan Lynen
By
Whitaker & Prevost. Attys

UNITED STATES PATENT OFFICE.

LEO VICTOR JOAN LYNEN, OF LONDON, ENGLAND.

PROCESS OF AND APPARATUS FOR EXTRACTION OF ZINC.

SPECIFICATION forming part of Letters Patent No. 543,256, dated July 23, 1895.

Application filed December 22, 1893. Serial No. 494,371. (No model.) Patented in Germany August 23, 1893, No. 77,556,

To all whom it may concern:

Be it known that I, LEO VICTOR JOAN LYNEN, engineer, of Nos. 18 and 19 Fenchurch Street, in the city of London, England, have invented a new and useful Process and Apparatus for the Extraction of Zinc, (for which I have obtained Letters Patent in the German Empire, No. 77,556, dated August 23, 1893,) of which the following is a specification, reference being had therein to the accompanying drawings.

The extraction of zinc is carried out at the present time in different ways—for instance, either by the Silesian process or by the Liege process, or by the combined Silesian-Liege process—in such manner that the vaporous zinc produced in the muffle or in the tube enter into a smaller and cooler receiver organically in one with the same and condenses there. Connected to the receiver is an extension (allonge) or crucible ("Tüte") in order to catch, in addition, a part of the uncondensed zinc vapors going through the receiver, which take the form of zinc-dust. In this manner each system consists of retorts, receiver, and crucibles, forming an inclosed single apparatus with all the deficiencies of small and intricate apparatus. The quantity of zinc extracted is therefore essentially dependent on the temperature necessary for the condensation of the zinc vapors being kept up in the receiver. The limits are tolerably narrow between which the reduction into a fluid state of the zinc is effected from vapor form—say between 420° centigrade and 555° centigrade. If the temperature in the receiver be below 420° centigrade, the zinc vapors instantly go over to the solid condition—that is to say, they solidify. If the temperature be above 550° centigrade, they go through the receiver without condensing and are partly burned in the furnace.

The mistake in the present system is that it is impossible to regulate the temperature of every single receiver in either one or the other direction, whereby also a great loss of time is unpreventable.

The new process has for its object to meet this inconvenience in such manner that the retorts are all connected to one or more condensation-chambers common to all, which by their proportions and arrangements permit of a determined influence being exercised on the temperature of the interior and the retaining of the same within the desired limits. If necessary the chambers may be warmed, and they may also be cooled by conducting cold air or water through them. In like manner the temperature may be so automatically regulated that a part of the liquefied zinc is always left in the condenser and is not run off. This liquefied zinc besides would act favorably by surface attraction on the condensation of the vaporous zinc. Simultaneously a complete liquation of the lead takes place. By dispensing with the receiver and extension-piece the charging of the retorts is facilitated and made to be carried out mechanically by, for instance, charging the material in envelopes, whereby are prevented, on emptying and charging again, great loss of time and heat as well as the contamination of the sides of the muffle by the slag.

As the furnace is entirely closed the poisoning of the air with zinc vapors is finally prevented, and the furnace is consequently preferable also on hygienic grounds.

The accompanying drawings represent an apparatus for carrying out this invention, of which—

Figure 1 is a cross-section on line I K, L M, N O, or P Q of Fig. 2ª. Fig. 2 represents a longitudinal vertical section of one half of the apparatus, taken on the line E F of Fig. 1. Fig. 2ª represents a similar section of the other half of the machine, taken on the line G H of Fig. 1; Fig. 3, a plan section on line A B or C D of Fig. 1.

a a represent the retorts, which are of cylindrical form and are luted interiorly onto tubular connections *d*, provided on the interior vertical walls of the furnace, as indicated at *k k*, and the outer ends of said retorts are closed by means of stone or other closures *a'* of the required size, which are preferably placed in the mouth of the retort and luted. Between the interior walls of the furnace the condensing-chamber *b* is formed, into which the vapors from the retorts pass through connections *d*. In the bottom of this chamber is a trough *e*, into which the fluid or condensed zinc falls and by means of which it is readily drawn off. The condensing-chamber is provided with a plurality of pipes *c c* through

which a heating or cooling medium can be made to pass, and by means of these pipes the temperature of the condensing-chamber can be readily controlled. The zinc-dust passes through an opening *i* at the end of the condensing-chamber and into a passage *f*, which conducts it to the dust-chamber *g*, provided with tortuous passages, as indicated in Fig. 2, Sheet 2, where the dust is collected. The dust-chamber *g* is connected with the chimney, as indicated in this figure, and provided with a damper or valve *m*, by means of which a regulated draft or suction can by secured to draw the dust into the dust-chamber, or the dust-chamber may be connected with some other suitable exhaust apparatus.

The retorts are charged by placing the charges in envelopes a^2 of the cross-section of the retort, which envelopes are made of pasteboard or other suitable material prepared before use with water-glass, or in any other suitable manner. These envelopes are preferably placed on a charging-table A, (see Fig. 1,) which preferably is provided with supporting-surfaces in line with the retorts, and the envelopes are arranged in such a manner that one will be opposite each retort. The table A is supported on wheels on a track and is run up close to the retorts, the closures of which have been removed, and the envelopes are singly or simultaneously pushed into their respective retorts and the closures inserted and luted. The envelopes are preferably open at the end adjacent to the connections *d* of the retorts. These envelopes carbonize during the heating of the retorts, thus serving as a protection for the walls of the retorts, and they also facilitate the removal of the slag. By charging the retorts in this manner and using these envelopes the hitherto unavoidable loss of time and the cooling of the furnace are prevented.

If the pasteboard envelopes were not treated with water-glass they would be liable to be destroyed by the heat of the furnace and the oxygen contained in the zinc ore. By treating these envelopes with water-glass they carbonize and remain intact, and the contamination of the walls of the retort is thus avoided during the extraction of the zinc and also in removing the slag, as the slag will come out surrounded by the carbonized envelope.

Any desired form of heating apparatus may be employed, and the same forms no part of my invention.

In the drawings I have shown a form of heating apparatus which I comtemplate using.

X represents the fire-box from which the heating-gases pass into the passage *x*, Fig. 1, and through the horizontal channels *n o*, located in the chamber K, and pass thence through channels R and *s* into the mixing-chamber T. Air is admitted at L, Fig. 1, and is conducted into the mixing-chamber T, where it unites with the burning gases. The gases are then conducted through channels U V into the compartment K and outside of the channels *n* and *o*, thereby heating them and the gases passing through the same, and the gases pass off through the outlet W.

I claim—

1. The process of extracting zinc which consists in inclosing the ore in non metallic carbonizable envelopes, placing said envelopes in retorts, applying heat and condensing the zinc vapors, substantially as described.

2. The process of extracting zinc which consists in inclosing the ore in a series of non metallic carbonizable envelopes, placing said envelopes in retorts, applying heat, condensing the zinc vapors, drawing off the uncondensed zinc into a dust chamber and retarding the passage of the same through said chamber to allow the zinc dust to settle, substantially as described.

3. In a zinc reducing furnace the combination with the retorts, of non metallic carbonizable envelopes adapted to be placed within said retorts, whereby the removal of slag is facilitated and the contamination of the retort walls is prevented, substantially as described.

4. In a zinc reducing furnace the combination with the retorts, of charging envelopes composed of pasteboard treated with water glass adapted to be placed within said retorts, substantially as described.

5. In a zinc reducing furnace, the combination with a series of retorts, of a condensing chamber communicating with all of said retorts and provided with means for conveying off the condensed metal, and a series of pipes for a circulating medium located within said condenser for positively regulating the temperature thereof, substantially as described.

6. In a zinc reducing furnace, the combination with a series of retorts, of a condensing chamber communicating with all of said retorts and provided with means for conveying off the liquid portions of the condensed metal, a series of pipes for a circulating medium located within said condenser for positively regulating the temperature thereof, and a dust box provided with serpentine passages communicating with the condenser for collecting uncondensed metallic particles, substantially as described.

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

LEO VICTOR JOAN LYNEN.

Witnesses:
H. HOTOPF,
ADA LANSBERG.