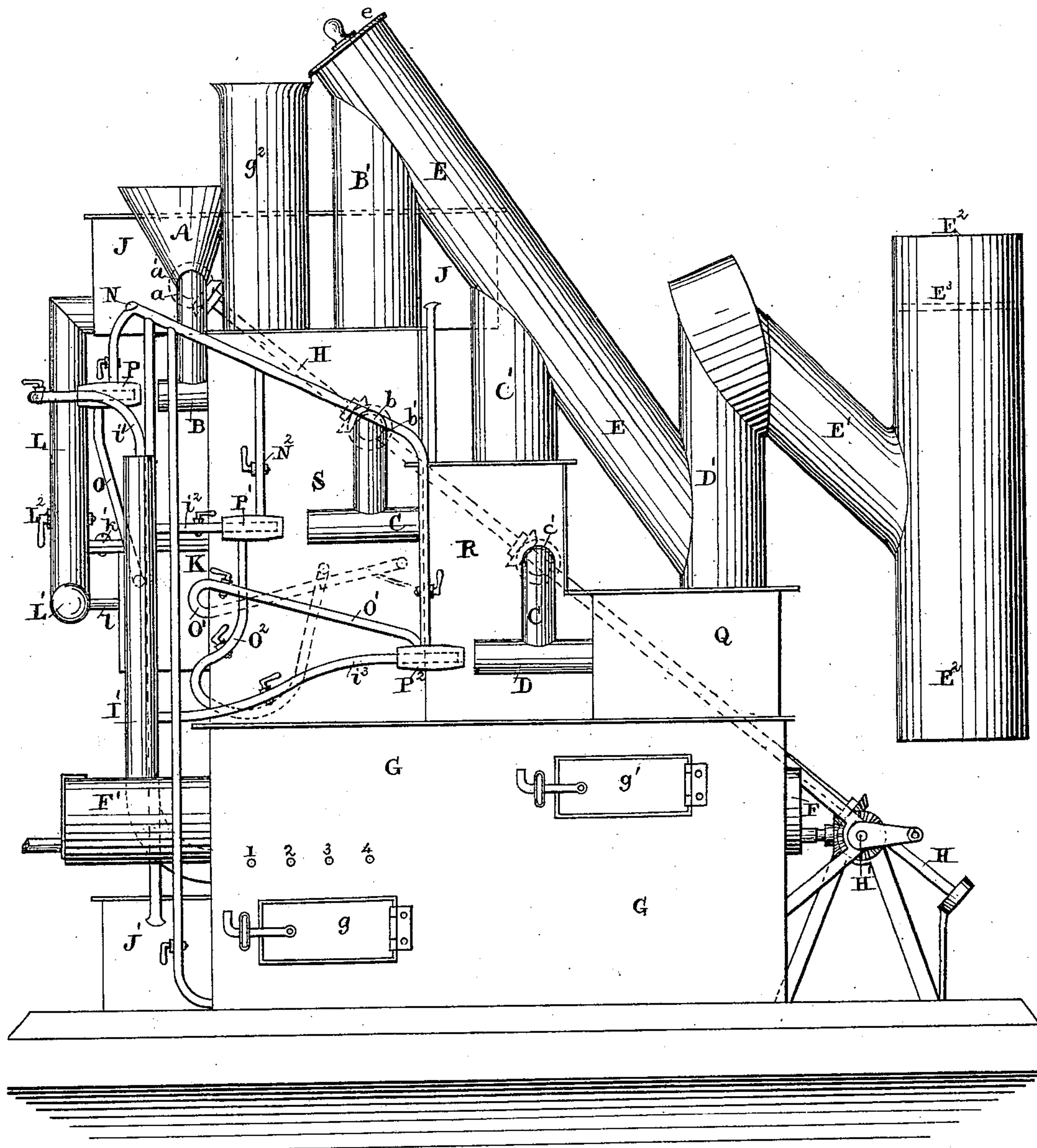


F. W. WIESEBROCK.  
 Process of and Apparatus for Desulphurizing and  
 Preparing Ores.  
 No. 241,108. Patented May 3, 1881.

FIG. 1.



WITNESSES:

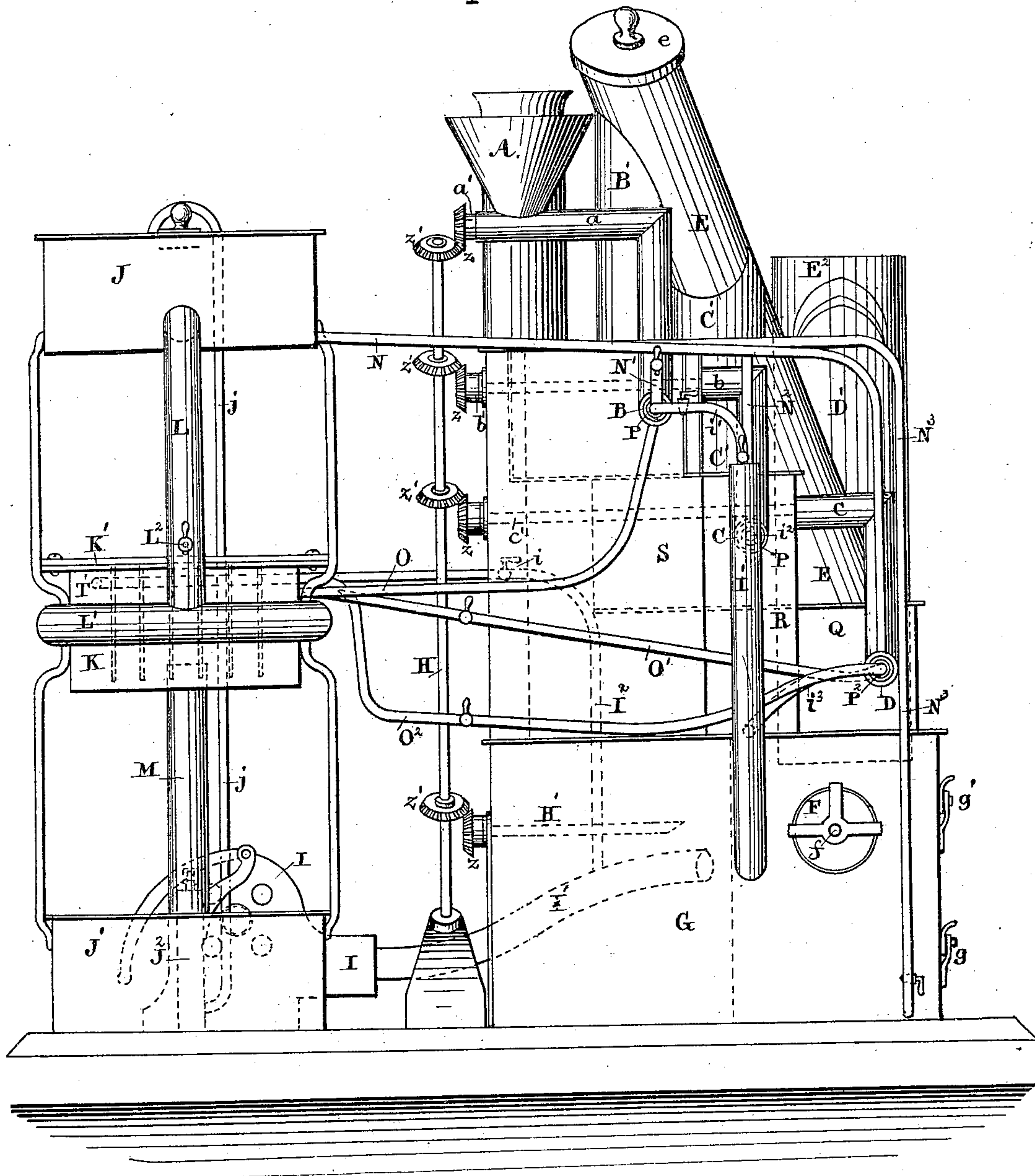
*A. Bernay*  
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INVENTOR:

*Frederick W. Wesebrock*  
*by Adam E. Schatz*  
*his Atty*

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FIG. II.



WITNESSES:

*A. Bernay*  
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INVENTOR:

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F. W. WIESEBROCK.  
 Process of and Apparatus for Desulphurizing and  
 Preparing Ores.  
 No. 241,108. FIG. III. Patented May 3, 1881.

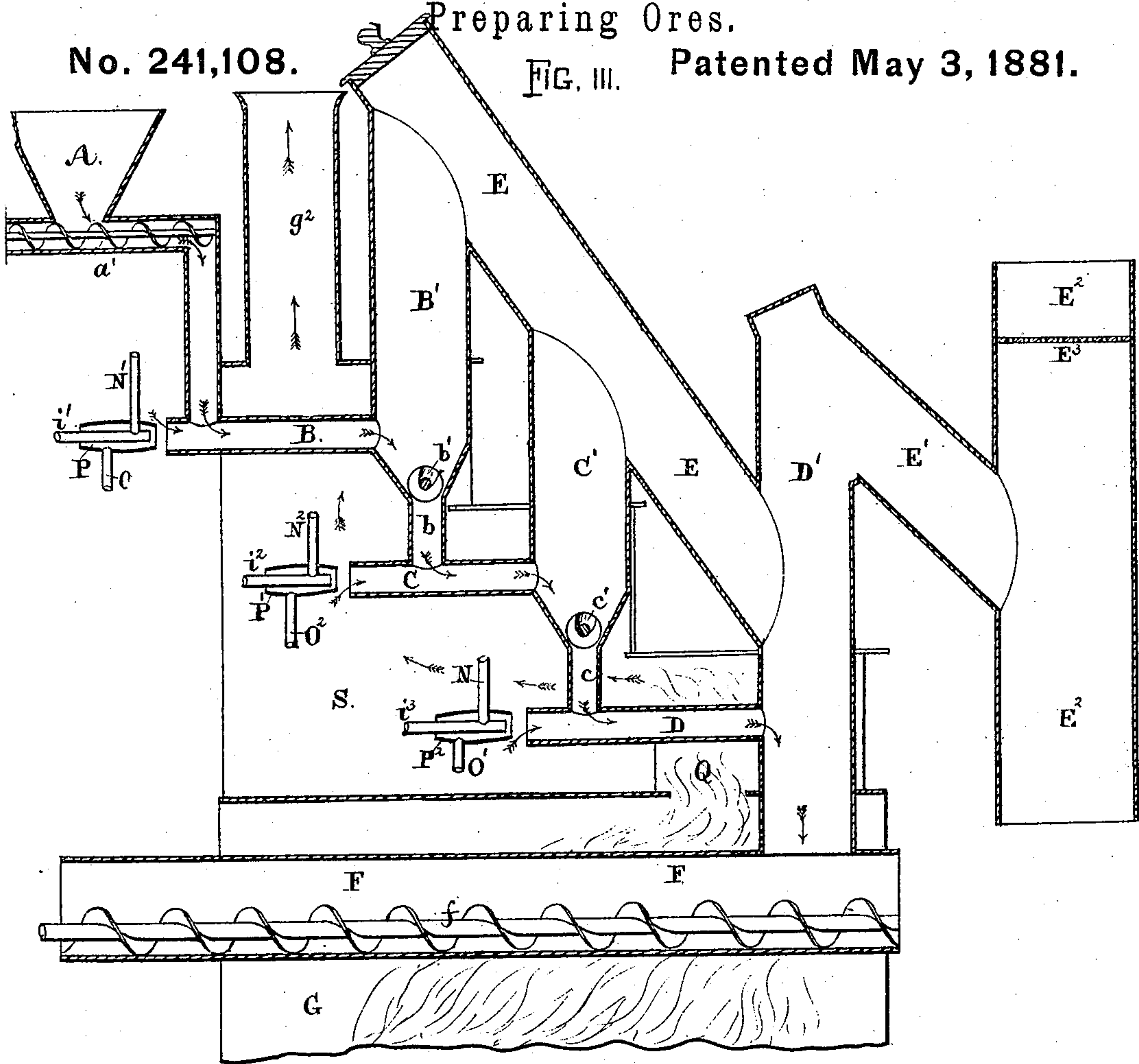
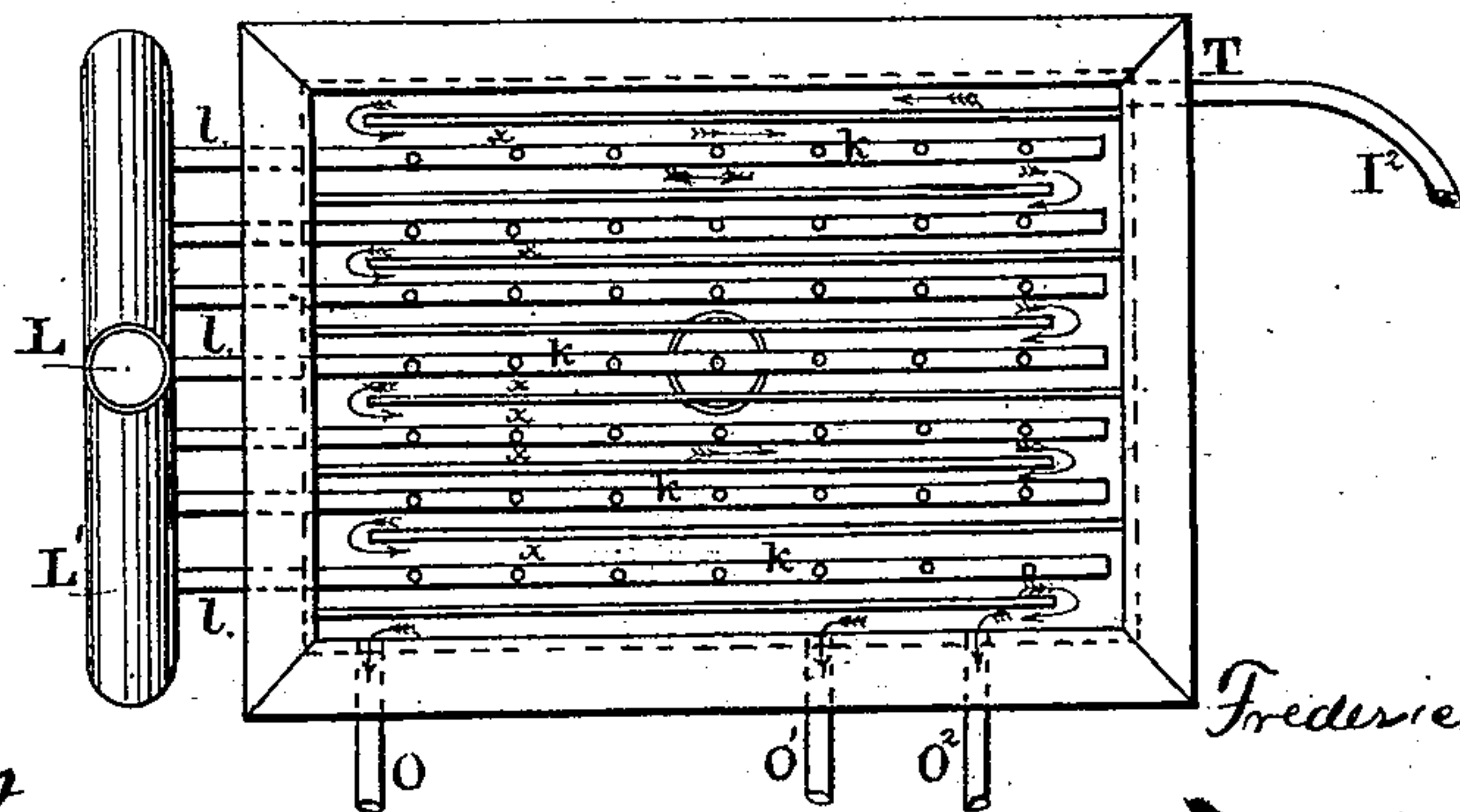


FIG. IV.



WITNESSES:

*A. Berney*  
*J. A. Tegeler*

INVENTOR:

*Frederick W. Wiesbrock*  
*per Adam E. Schatz*  
*his Atty.*



# UNITED STATES PATENT OFFICE.

FREDERICK W. WIESEBROCK, OF NEW YORK, N. Y., ASSIGNOR TO JOHN GEORGE GILLIG AND ADAM E. SCHATZ; SAID SCHATZ ASSIGNOR OF THREE-EIGHTHS TO THEODORA WIESEBROCK, ALL OF SAME PLACE.

PROCESS OF AND APPARATUS FOR DESULPHURIZING AND PREPARING ORES.

SPECIFICATION forming part of Letters Patent No. 241,108, dated May 3, 1881.

Application filed October 7, 1879.

*To all whom it may concern:*

Be it known that I, FREDERICK W. WIESEBROCK, of the city of New York, county of New York, State of New York, have invented  
5 a new and useful Process of and Apparatus for Desulphurizing and Preparing Ores for the Extraction of Metals therefrom, of which the following is a specification.

In order to thoroughly effect the desulphurization of ores, it is necessary that the same  
10 should be subjected to the action of oxygen while in a highly-heated state, in order that the sulphur may be liberated. Heretofore this has been accomplished by passing a flame  
15 commingled with atmospheric air into a body of the ore by blowing a current of pulverized ore into the flame of a furnace, or by forcing a jet or jets of atmospheric air into a highly-heated furnace, into which the ore, in a reduced condition, is simultaneously introduced.  
20

By the above-named methods it has been found almost impossible to thoroughly desulphurize ores containing a large percentage of sulphur, and such methods, moreover, are tedious and expensive.  
25

The object of my invention is to obviate these objections and provide a means by which the ore may be thoroughly desulphurized, no matter what the percentage of sulphur may be,  
30 and at a great reduction of time and expense; and to this end the invention consists, first, in a process for desulphurizing ores by dropping the finely-powdered ore into the oxidizing-flame of a compound blow-pipe injector, the said  
35 flame carrying an excess of oxygen with the blast-flame, whereby the air and ore are highly heated, and regulating the supply of ore and the strength of the blast to carry the ore entirely through retorts or chambers into suitable  
40 receivers, where the highly-heated ore is oxidized, and to convey the fumes resulting from the desulphurization into gatherers or condensers, where they are condensed and collected; second, in an apparatus for desulphurizing ores,  
45 of the combination of a series of retorts, provided with tubes or hoppers having feed-conveyers, with a series of blow-pipe injectors for heating and conveying the ores through the retorts by means of blast-flames of carburated  
50 and atmospheric air, as more fully hereinafter

specified; third, in an apparatus for desulphurizing ores, of the combination of the feeding mechanism, the blow-pipes, and the retorts above mentioned, and a retort provided with a suitable conveyer and located in a suitable furnace, as more fully hereinafter specified; fourth, in the combination, in an apparatus for desulphurizing ores, of the feeding mechanism, blow-pipes, and retorts, one or more receivers connected with a flue leading  
55 to a condenser or gatherer, as more fully hereinafter set forth; and, fifth, in the combination, with the retorts and hoppers, the blow-pipe injectors, and a series of receivers, of a furnace having a flue leading to the condenser, as more fully hereinafter set forth.  
60

In the drawings, Figure 1 represents a side elevation of the apparatus employed in carrying out the invention. Fig. 2 represents a front elevation. Fig. 3 represents a vertical  
65 section of the same; and Fig. 4, a plan of the air-carbureting tank, the cover being removed.

The letter A indicates a hopper attached to a feed-pipe, *a*, into which it opens. The said feed-pipe is provided with a screw-conveyer,  
70 *a'*, by means of which a gradual or regulated delivery of ore to the retort B may be maintained. The said feed-pipe is preferably located at a greater elevation than the retort, in such manner that the ore may fall into the retort  
75 from above. One end of said retort is open for the introduction of the blast-flame, and at the other end the retort is connected to a receiver, B', which is of sufficient size to permit the blast to expend its power therein, so as to  
80 allow the ore to settle to the bottom of the same. The said receiver B' has a funnel-shaped bottom, which serves as a hopper, and is connected with a feed-pipe, *b*, provided with a screw-conveyer, *b'*, for the purpose of carrying the ore  
85 to a retort, C, with which said pipe *b* is connected. The retort C is substantially similar in construction to the retort B above mentioned.

The letter C' indicates a receiver similar to the receiver B', the said receiver being connected with the retort C. The bottom of said receiver is connected with a retort, D, similar to the retorts B and C before mentioned, by means of a tube, *c*, provided with a screw-conveyer, *c'*. The last-mentioned retort commu-  
90 100



nicates with an upright flue, D', which connects at its bottom with a retort, F, provided with a screw-conveyer, *f*, which is of less diameter than the said retort, in order to allow  
5 an unobstructed passage of atmospheric air through the retort to assist in the final oxidation of the ore, as more fully hereinafter described.

The letter G indicates a furnace, in which  
10 said retort F is located, the retort passing entirely through the furnace, which is provided with proper doors, *g g'*, and draft-openings 1 2 3 4.

The letters Q R S, Fig. 3, indicate flues leading from the furnace to the chimney *g*<sup>2</sup>, through which the products of combustion escape.

The receivers B' C' D' communicate with the flues E E', which lead to the condensers E<sup>2</sup>, and are inclined in order to prevent the accumulation of the ore therein.  
20

The condenser is provided with a perforated or foraminous partition, E<sup>3</sup>, near its upper end, through which a stream of water is caused to flow into the condenser in a shower or spray,  
25 in order to arrest the fine particles of ore and prevent their escape.

The respective screw-conveyers above mentioned are each provided at one end with bevel-gear wheels *z*, gearing into bevel-gear wheels *z'*  
30 on a shaft, H, so as to convey the ore to the respective retorts in proper quantities.

The letter I indicates a blower having a blast-pipe, I' and I<sup>2</sup>, which latter is provided with a stop-cock, *i*. The pipe I' passes through the  
35 furnace in order that the air may be heated, and is provided at one end with the branch pipes *i' i<sup>2</sup> i<sup>3</sup>*, which are provided with suitable stop-cocks, and lead respectively to the nozzles P P' P<sup>2</sup>, the said pipes projecting into said  
40 nozzles, as shown in Fig. 3, forming a blow-pipe injector.

The letters J J' indicate oil-tanks, and K an intermediate air-carbureting tank, which communicates with the tank J by means of a pump,  
45 J<sup>2</sup>, pipe *j*, and pipe L. The supply-pipe L has a stop-cock, L<sup>2</sup>, and branches L', the said branches connecting with a series of pipes, *l l*, which pass through the side of the carbureting-tank into the same, being perforated at  
50 their inner ends. The said tank K is provided with partitions *k k*, as shown in Fig. 4, the alternate partitions being set in such a manner that the space between them forms a circuitous channel, as shown by the arrows.

The letter M indicates an overflow-pipe inserted in the tank K at its bottom, extending sufficiently into the tank to maintain a proper quantity of oil therein. The lower end of said  
55 pipe leads into the tank J', in order to convey the overflow-oil from the tank K to said tank J'.

The blast-pipe I<sup>2</sup> connects with the carbureting-tank at one end of the circuitous channel, as shown at T, Fig. 4 of the drawings, and from the other end of said channel extend the pipes  
60 *o o' o<sup>2</sup>*, provided with suitable stop-cocks, the said pipes connecting respectively with the

nozzles P P' P<sup>2</sup>, to convey the carbureted air to the same, and to regulate the flow for increasing or diminishing the blast-flame in its  
70 action upon the ore.

The letter N indicates a pipe connected at one end to the tank J, and provided with branches N' N<sup>2</sup> N<sup>3</sup>, the said pipe and branches being provided with suitable stop-cocks. The  
75 ends of the said pipe N and the branches N' N<sup>2</sup> pass through the nozzles P P' P<sup>2</sup> and connect with the ends of the blast-pipe injectors.

The branch N<sup>3</sup>, Fig. 1, is connected with the furnace, and is intended to convey oil to the same from the tank J, to be used as fuel when  
80 desired.

The branches N' N<sup>2</sup> and pipe N are for the purpose of feeding oil to the nozzles when desired.

The operation of my invention is as follows:  
85 The reservoir J' is properly filled with oil. A suitable quantity is then pumped into the tank J. This oil, flowing through the pipe L, passes into the perforated pipes *l l*, and is distributed in spray between the partitions *k k*, and drops  
90 into the bottom of the carbureting-tank, where it collects until it reaches the end of the overflow-pipe M. Having heated the air-blast pipe and the retorts and receivers by means of the  
95 furnace, so as to prevent the absorption of heat from the blast-flames, the apparatus is in condition to commence the process of desulphurization. The hopper A is then charged with the ore properly comminuted or pulverized,  
100 and the blower is put in operation. The stop-cock L<sup>2</sup> is then opened, allowing the oil to flow into the carbureting-tank, the stop-cock *i* of the blast-pipe I<sup>2</sup> being also opened. A current of air is thus forced through the channels *k k*  
105 and through the spray of oil, evaporating and absorbing the oil in its passage. The stop-cocks of the blast-pipe injectors and gas-pipes are now opened and the gas or carbureted air ignited, after which the retorts are ready to receive the ore. The shafting is then set in  
110 motion, rotating the screw-conveyers, so as to feed the ore to the apparatus. The delivery of the ore is regulated by the velocity of the shafting, which is adjusted so as to deliver the ore at greater or less speed, according as the per-  
115 centage of sulphur in the same varies—the larger the percentage of sulphur the slower the feed, and vice versa.

The flame produced by the carbureted air is sufficient to desulphurize ore containing a very  
120 large percentage of sulphur; but should it be desired to still further augment its intensity, the stop-cock of the oil-pipe N may be opened, so as to allow a proper quantity of oil to flow directly into the current of heated air in the  
125 blast-pipe, which almost instantly evaporates and ignites the oil and forms an increased flame, which is also carried into the retorts. The current of blast-flame, as it is forced into the retorts, carries with it an additional supply of  
130 air, which enters around the blast-flame of the injector, whereby a powerful desulphurizing



flame is projected into the retorts, directly into the ore as it falls into the same, insuring the most thorough heating prior to reaching the receiving or oxidizing chambers.

5 These retorts are of a length sufficient to cause the ore to be suspended in the blast-flame until the same is sufficiently heated in order to absorb the oxygen from the atmosphere drawn in by the blast-flame, and as the  
10 blast-flame has sufficient oxygen for supporting its own combustion, the oxygen drawn in at the mouth of the retort by the force or impetus of the blast-flame is, by its passage through the retort, heated, so that on coming  
15 in contact with the heated ore the oxidation of the same is facilitated and insured.

It is obvious that the fine particles of ore, by reason of the force of the flame-blast, are kept in constant suspension and agitation, thus  
20 exposing them thoroughly to the action of the flame, by means of which the sulphur is eliminated. The particles of ore, upon reaching the end of the retort, are carried into the receiver B', which is of such size and length as to allow  
25 the force of the blast to nearly expend itself therein, but at the same time permit the highly-heated particles to be thoroughly agitated and oxidized without being carried over into the condensers to any great extent, so that they  
30 will finally settle in the bottom of said receiver, while the fumes pass over to the condenser through the flues by the slight force still exerted by the blast-flame, thus obviating the injurious results attendant upon carrying the  
35 fumes and gases along with the ore-particles, as when thus carried along with the ores the particles are liable to become enveloped with the sulphurous fumes liberated by the heat, and thus oxidation is retarded or wholly pre-  
40 vented.

The ore, after settling in the receiver B, passes through the successive retorts until it finally reaches the retort F, from which it is discharged into a suitable receptacle.

45 Thus it is evident that a greater number of retorts and receivers than herein shown and described may be employed, if desired, whereby much expense and labor may be saved in handling ores where it is necessary to subject  
50 the same to the desulphurizing process a number of successive times.

After the fumes and fine ore-particles pass through the flue E, they enter the condenser E<sup>2</sup>, where, in their ascension, they are met by the  
55 water-spray, and are carried downward into a suitable tank or receiver and collected, and, if necessary, the fine particles of ore may be again passed through a retort, and thus almost all of the metal saved.

When it is necessary to chloridize the ores, 60 mechanical means for the introduction of the necessary ingredients and any suitable menstruum may be provided for the purpose.

Having thus described my invention, what I claim, and desire to secure by Letters Pat- 65 ent, is—

1. The process herein described of desulphurizing ore, which consists in dropping the finely-powdered ore into the oxidizing-flame of the compound blow-pipe injector, admitting excess 70 of air with the blast-flame, whereby the air and ore are highly heated, and regulating the supply of fine ore and the strength of the blast-flame to carry the ore entirely through retorts or chambers into receivers, where the highly- 75 heated ore is oxidized, and the fumes resulting from oxidation into condensers or gatherers, substantially as described.

2. In an apparatus for desulphurizing ores, the combination of the series of retorts, provided 80 with tubes or hoppers having feed-conveyers, with the series of blow-pipe injectors for heating and conveying the ores through the retorts by means of blast-flames of carbureted and atmospheric air, all substantially as and for the 85 purpose specified.

3. In an apparatus for desulphurizing ores, the combination of the series of retorts provided with tubes or hoppers having feed-conveyers, the series of blow-pipe injectors for heating and 90 conveying the ores through the retorts by means of blast-flames of carbureted and atmospheric air, and the retort F, provided with conveyer f, located in the furnace G, all substantially as and for the purpose specified. 95

4. The combination, in an apparatus for desulphurizing ores, of the series of retorts provided with tubes or hoppers having feed-conveyers, the series of blow-pipe injectors for heating and conveying the ores through the retorts 100 by means of blast-flames of carbureted and atmospheric air, the receivers B' C' D', flue E, and condenser E<sup>2</sup>, all substantially as and for the purpose specified.

5. The combination, in an apparatus for desulphurizing ores, of the series of retorts and hoppers, each of the latter provided with a conveyer, the series of blow-pipe injectors, the receivers B' C' D', furnace G, flue E, and condenser E<sup>2</sup>, all substantially as and for the pur- 110 pose specified.

In witness I have hereunto set my name this 4th day of October, 1879.

FREDERICK W. WIESEBROCK.

In presence of—

FREDERICK OPPERMAN, Jr.,  
JOHN GEO. GILLIG.