

(No Model.)

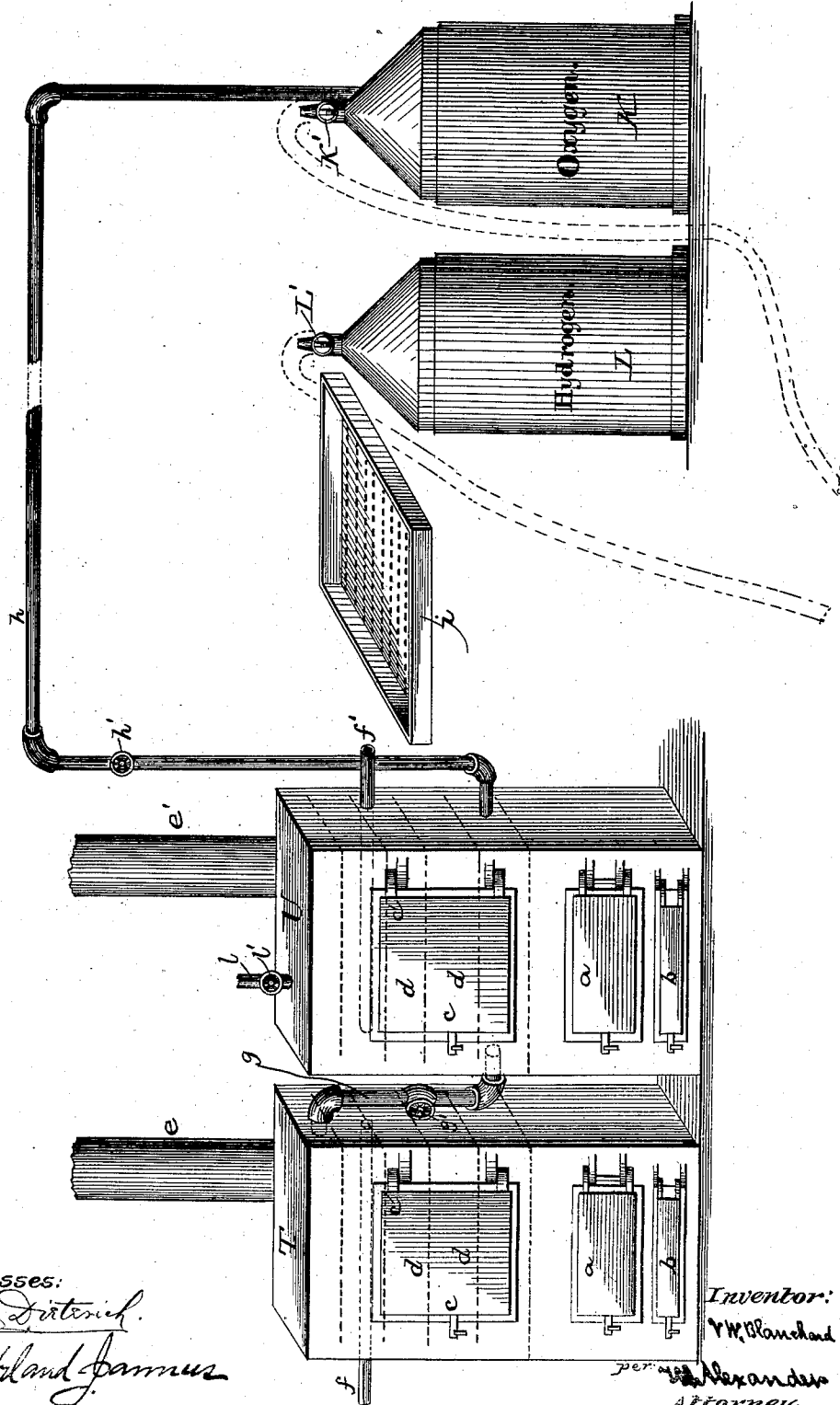
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V. W. BLANCHARD.
ELECTRIC GENERATOR.

No. 268,174.

Patented Nov. 28, 1882.

Fig. 1.



Witnesses:
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(No Model.)

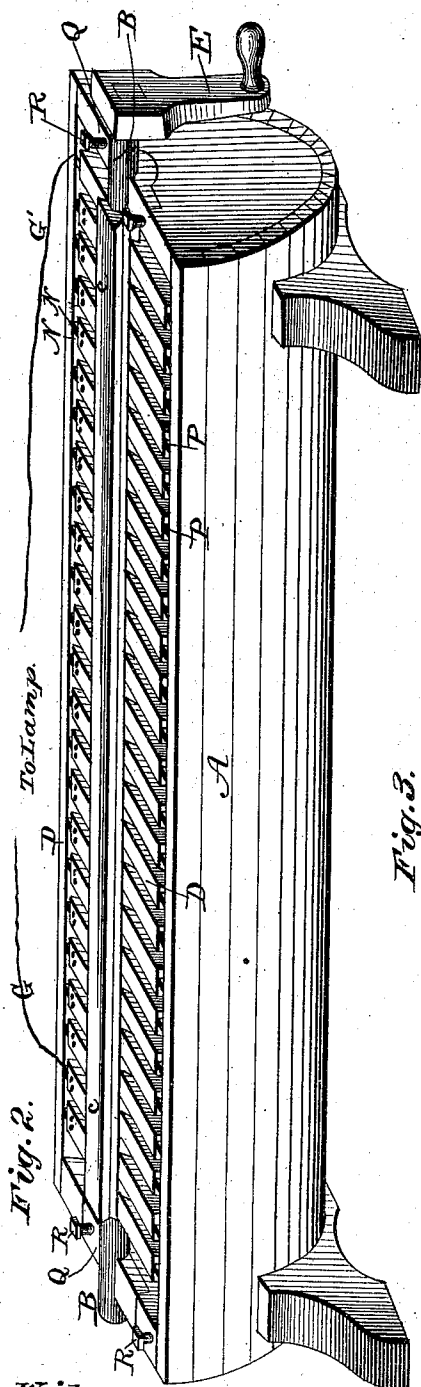
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V. W. BLANCHARD.

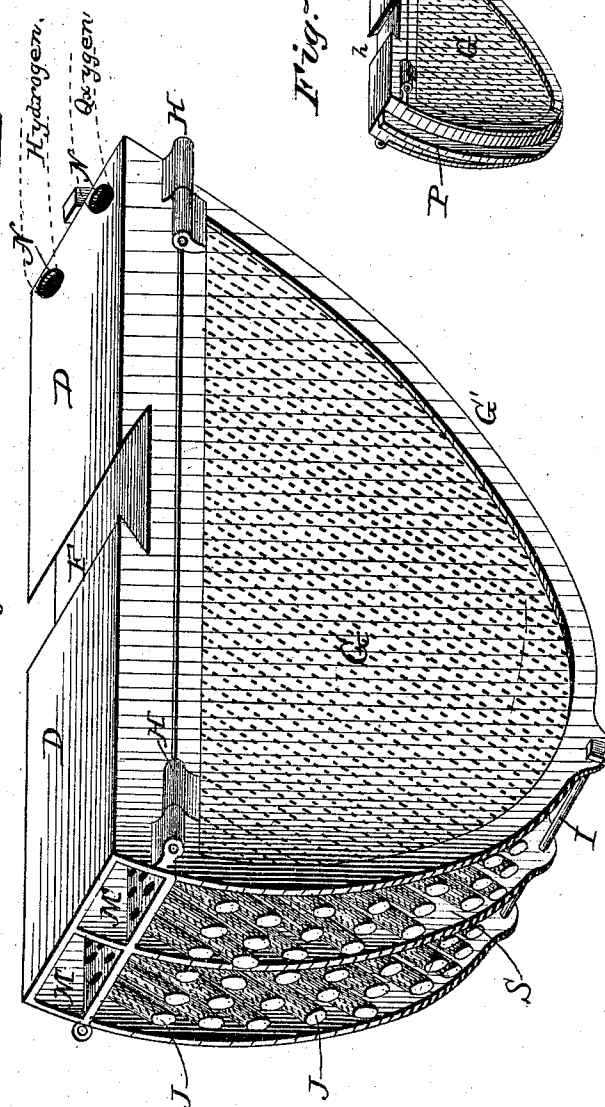
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Patented Nov. 28, 1882.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

VIRGIL W. BLANCHARD, OF NEW YORK, N. Y.

ELECTRIC GENERATOR.

SPECIFICATION forming part of Letters Patent No. 268,174, dated November 28, 1882.

Application filed August 31, 1882. (No model.)

To all whom it may concern:

Be it known that I, VIRGIL W. BLANCHARD, of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Generators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

Figure 1 is a perspective view of the ovens and gas-reservoirs, showing their general arrangement. Fig. 2 is a perspective view of a vessel adapted to contain the elements and an electrolytic bath. Fig. 3 is a perspective view of one of the elements or plates having its elastic packing removed. Fig. 4 is a view of one of the elements having its circumferential elastic packing in position for use.

Similar letters of reference indicate corresponding parts throughout.

A represents a semicircular vessel containing the electrolytic bath, into which the generating-plates D D are placed. These plates are secured by the dovetailed groove F to a corresponding rib, C, forming part of the axis or shaft B, that revolves in adjustable boxes Q Q in the upper surface of the end walls of the vessel A. A greater or less number of the plates D may be adjusted on the axis B, the spaces between said plates forming cells in the electrolytic bath in the vessel A to contain the electrolytic fluid necessary in the generation of electric potential. It will be readily understood that two rows or series of generating-plates may be adjusted to the shaft or axis B, one (the lower) row occupying the vessel A, containing the electrolytic bath. The other (the upper) row, being attached in the same manner to said journal or axis, may be applied at any convenient time, and by rotating it the lower and previously-immersed series of plates will be removed from the electrolytic bath, while the upper row will then be in precisely the same position as that occupied by the row beneath previous to the revolution of the said shaft. It will be apparent that the plates may readily and quickly be removed from the axis or shaft by being slid along the rib until reaching its termination.

Q Q represent adjustable boxes in which

the axis or shaft B turns when actuated by the crank E.

R R represent screws passing through the extremities of the boxes Q Q in such a manner that by turning them the shaft or axis B may be raised or elevated in its whole length, carrying with it the generating-plates D D. The semicircular circumference of which generating-plates being made to fit accurately the semicircular diameter or interior of the vessel A, it becomes evident that by actuating the screws R R the periphery of the plates D D may be raised from actual contact with the interior circumference of the vessel A.

P represents a rubber gasket or strip of elastic material applied to the circumference of the plates, and when the axis B is lowered as far as possible in the electrolytic bath in the vessel A said strip P will form, by the pressure of the weight of the plate to which it is attached, a water-tight joint between the circumference of said plate D and the interior surface of the vessel A. By appropriately placing the plates D water-tight cells of suitable size may be formed between them to contain the electrolytic fluid essential to the operation of the invention while at the same time the immersed plates may easily and quickly be removed from the electrolytic bath in the manner heretofore set forth.

D represents one of the electric generating-plates forming part of this invention. The walls of this plate are divided by partitions into four compartments, two compartments, M M', occupying transversely the upper portion of the interior of the plate, and two compartments below occupying laterally the interior of the plate, below the upper apartments, M M'. It will be observed that the two lower apartments in the interior of the plate are divided by a partition, S, extending through the plate in a longitudinal direction into two symmetrical cavities, which are each provided with a number of pipes, J J J, said pipes opening into the cavities M M', and extending downward in a perpendicular direction to the outer peripheral wall of the plate D. These pipes have their lower extremities closed, and may be a greater or less distance from each other, as may be desirable in practice. It will be particularly observed that each compartment M M' communicates with the pipes traversing the compart-

ments directly below it, and that the partition S in the plate D divides the upper portion of the interior of said plate into two cavities, as well as the lower portion.

5 N N represent two openings into the upper straight surface of the generating-plate D, one aperture opening into the compartment M and the other into the apartment M' of the said plate.

10 K, Fig. 1, represents a reservoir of oxygen gas connected by a pipe with the apartment M', and L represents a reservoir of hydrogen gas connected by a pipe with the compartment M. The reservoir K is provided with the stop-cock K', and the reservoir L is provided with the stop-cock L', by which the passage of the gas to the plate D may be regulated. By opening the stop-cock K' oxygen gas will flow through the connecting-pipe into the apartment M', and from thence downward through the perforated pipes J J into the cavity beneath, and hydrogen gas in like manner, when the stop-cock L is opened, will flow from said reservoir into the compartment M, and from thence through the perforated pipes into the compartment beneath.

25 G' G' G' represent the frame of a door opening into one of the compartments in the plate D, which is situated beneath the compartment M, said frame being hinged at H H to the upper portion of the surface of said plate. A similar hinged door-frame is attached to the other side of the plate D, opening into a similar compartment, in which are seen the perforated pipes J J J, heretofore described.

30 Letter G represents a perforated metallic plate or a wall formed of fibrous material attached to the door-frame G G G, and forming the outer wall of the semicircular plane surface of the plate D.

40 I represents a bolt passing from the door-frame on one side of the plate D to the door-frame on the other side of said plate, by means of which said doors are kept in proper position, securely closing both of the lower compartments in the plate D.

45 F represents an angular groove formed in the upper surface of the plate D, the use of which has heretofore been described.

50 T and U represent two ovens constructed in a similar manner, the doors *a* and *a'* entering into the fuel-chambers, the doors *b* *b'* entering into the ash-pits, the doors *c* and *c'* entering into the roasting-chambers, and the chimneys *e* and *e'* carrying off the waste gases from each.

55 *d* and *d'* represent shelves in the roasting-chambers of the respective ovens, the doors *c* and *c'* being provided with asbestos gaskets or packing, so that they will close the roasting-ovens air-tight.

60 Letters *f* and *f'* represent two tubes entering the roasting-chambers from without, with closed extremities within the ovens and open extremities without, in which a pyrometer may be introduced into each oven to accurately de-

termine the temperature of each, when a fire is burning on the grate in a fuel-chamber of each, without opening the doors *c* and *c'*. The pan *i* is provided with a perforated bottom for holding the metal to be oxidized or de-oxidized in the ovens T and U. These pans should be of a suitable size to enter the doors, and rest on the shelves in the ovens while the roasting process is going on. The pipe *g*, connecting the upper portion of the oven T with the lower portion of the oven U, may be opened and closed by means of the stop-cock *g'*.

70 *h* represents a pipe connecting the reservoir K with the oven U, and is provided with suitable stop-cock, *h'*. By means of the pipe *h* free oxygen gas may be introduced into the lower portion of the oven U beneath the pans *i*, which are supported on wire gauze or perforated metal.

85 *l* represents a discharge-pipe inserted into the top of the roasting-oven U, provided with the valve *l*, by which air or gases that said oven may contain may be discharged into the atmosphere.

90 If the central partition, S, in each plate is impervious to the electrolytic liquid, the plates will have to be connected in series by suitable wires.

95 In the practical operation of my invention a granulated metal, preferably lead, is placed in pans *i* on shelves *d* *d'* in the roasting-oven U. Fire is then kindled in the fuel-chamber of the oven, and when the granulated lead reaches the temperature of 350° to 400° Fahrenheit oxygen gas is admitted to said oven from the reservoir K through the connecting-pipe, the valve *g'* in the pipe *g* being closed. After the atmospheric air is allowed to escape from the oven U the valve in the pipe *l* is closed. The temperature of the oven may be determined from time to time by passing a pyrometer into the pipe *f'*. After the granulated lead has been kept at the temperature of 350° to 400° Fahrenheit for a short time in an atmosphere of free oxygen gas it will become converted into peroxide of lead, after which it may be removed from the roasting-oven, it being then fitted for use in the plates of my electric generator. By removing the bolt I in the generating-plate D the doors on each side of said plate may be opened, disclosing a cavity on each side of said plate partially filled with the perforated metal tubes J J, which I would prefer should be formed of lead, although they may be formed of other suitable material. The cavity on one side of the generating-plate D should be filled or closely packed with the granulated peroxide of lead, it being introduced between and around the perforated tubes J J, while the cavity in the other side of the generating-plate should be filled in a similar manner with fine granulated metal, preferably lead, after which the hinged sides or doors of the plate may be closed and firmly secured in place by a suitable bolt. It will then be observed that on one side of the generating-plate

we have a layer of the peroxide of lead packed around the perforated tubes, while on the other side of said plate, separated by the partition S, we have fine granulated lead packed in a similar manner around similar tubes. As the sides forming a large portion of the doors opening into the cavities in the plate D are composed of perforated metal, or preferably of fibrous material like felt or thick flannel, or any suitable material that will allow a free passage of gaseous or fluid elements, it becomes evident that oxygen and hydrogen gas may be forced from the reservoirs K and L and into the cavities M and M', and from thence through the pipes J J J J among the granulated material around said pipes, and from thence through the perforated plates or material forming the doors G G of the plate D. After a sufficient number of generating-plates have been filled with granulated metal and granulated metallic oxide in the manner just described, the said plates are slid along the rib C on the axis or shaft B, an interval of from one-fourth of an inch to two inches being provided between their opposing surfaces. Said plates should be so arranged that the metallic oxide in the interior of the plate should be in opposition to the metallic granules of unoxidized metal in the opposing plate. The vessel A is to be supplied with a proper quantity of electrolytic fluid, preferably a compound of diluted sulphuric acid, although any acidulated liquid will suffice. When the adjustable boxes Q Q have been sufficiently elevated by means of the set-screws R R one series of the generating-plates, now firmly attached to the axle or shaft B, may be immersed in the electrolytic bath by rotating the shaft B by means of the crank E.

By lowering the set-screws R R the axle or shaft B may be lowered to allow the strip P on the semicircular periphery of each generating-plate D to be brought into forcible contact by the weight of the said plate with the interior surface of the vessel A, which contains the electrolytic bath, forming water-tight joints to separate cells. We have then, as shown in Fig. 1, in the electrolytic bath A, a series of generating-plates forming cells containing electrolytic fluid, said cells having no communication with each other, the two opposing vertical surfaces of each cell being formed, one of granulated metallic oxide and the other of granulated unoxidized metal, said metallic oxide and unoxidized metal being separated only by two layers of perforated metal, or preferably by two layers of fibrous material—such as felt or thick flannel—and the electrolytic fluid.

ating-plate in the series, said current of gases passing into the cavities M and M', and from thence downward through the perforated pipes J J among the granules of metallic oxide and unoxidized metal surrounding said pipes, and from thence outwardly through the perforated or fibrous walls G G into the electrolytic fluid in each cell in the bath A.

It will be observed that the electrolytic fluid in each cell of the bath A will freely permeate and circulate in the interior of the generating-plate D as far as the central partition that divides the lower portion of the plate into two cavities or apartments. In this manner it is readily seen that oxygen and hydrogen gas, or oxygen gas alone, may be applied to the metallic oxide and unoxidized metal in the generating-plate D in the presence of the electrolytic fluid, or while at the same time said fluid is in contact with said metal. In the reduction of this invention to practice, under certain circumstances, it is preferable to cause a current of oxygen gas to flow, in the manner set forth, into the cavity of the generating-plate occupied by the metallic oxide, and also to cause a current of hydrogen gas to flow into the cavity of said plate occupied by the unoxidized metal.

The use and application of oxygen and hydrogen gas, or of oxygen gas alone, to the generating-plate D in some instances may be dispensed with, although it is a very valuable auxiliary.

When the plates at the two extremities of the axis or shaft B are connected by a suitable conductor, O', the current will flow through said conductor, and by placing an electric lamp or motor in the circuit a light may be maintained or power realized to apply to other useful purposes. The current will continue to flow until sufficient oxygen from the metallic oxide on one side of the generating-plates D has been transferred to the opposing surface in each electrolytic cell and their equilibrium restored, or, in other words, until each opposing metallic surface in each electrolytic cell contains the same quantity of oxygen in the form of a metallic oxide. Before the generating-plates D D in the electrolytic bath A have entirely lost their susceptibility to chemical change, and their consequent electrical potential, a second set or series of generating-plates should be prepared, as described, and slid on the upper rib, C, of the axis B in the same relative position as those that were first attached to it. Then the adjustable boxes Q Q should be elevated in the manner heretofore described, so as to relieve the rubber gasket P on each plate from contact with the interior surface of the vessel A, when by means of the crank E the new plates just applied to the shaft B may be immersed in the electrolytic liquid and the exhausted plates removed therefrom by turning said shaft half round. By lowering the bearings Q Q, as described, the separate cells are again formed between the plates.

It will be necessary to have the metallic oxide located on similar surfaces of the generating-plates in the whole series of generating-plates in the electrolytic bath. Then by means of the reservoirs K and L and the tubes attached a current of both oxygen and hydrogen gas may be made to flow into each gener-

The exhausted generating-plates now occupying the upper side of the axis B may easily be detached from it, when the cavity in each plate that was at first filled with unoxidized metal should be emptied of its contents of oxidized metal and refilled with unoxidized metal, as in the first instance, when its susceptibility to chemical action will be re-established and its electric potential restored if placed in its former relation to other similar plates in the electrolytic bath.

The protoxide of lead removed from the exhausted generating-plates may be set aside for future use; or it may be introduced into the roasting-oven U in the manner previously described, when by the application of heat ranging from 500° to 575° Fahrenheit the oxygen gas it contains will be set free, and by a proper adjustment of valves be driven over and stored in the reservoir K for future use in the electrolytic bath. By these means the greatest simplicity, effectiveness, and economy are realized in the production of electric potential.

When oxygen gas is not introduced into the generating-plate D in the manner heretofore described, but when the electric potency of the said plate is entirely dependent on the peroxide of lead introduced into one of its cavities after its effectiveness ceases in the electrolytic bath, it will be found that each of its cavities contains protoxide of lead or oxidized form of lead closely related to it. In this case both cavities in the generating-plate may be emptied of the oxidized metal they contain. Thus a part of it may be placed in the roasting-oven T and a part in the roasting-oven U. When by raising the temperature of the oven T to 575° Fahrenheit and the temperature of the oven U to about 350° Fahrenheit, and at the same time opening the valve *g'*, the oxygen gas contained in the oxidized metal in the oven T will be set free, and will pass through the pipe *g* and combine with the protoxide of lead in the oven U, forming the peroxide of lead. We then have the protoxide of lead removed from the generating-plate D converted in equal portions to the peroxide of lead and deoxidized lead, or left in a metallic state for future use, for it is well known that oxidized lead exposed to a temperature just below the melting-point will yield its oxygen and become reduced to metallic lead, and also that the protoxide exposed to oxygen gas at a temperature of 350° Fahrenheit will combine with said oxygen and form the peroxide of lead. Thus we have the protoxide of lead restored to a condition to be used again in the generating-plate D, with a very slight expenditure in material or cost in the method of reduction.

An important feature of my invention consists in the fact that the elements of my electric generator may be prepared for use at a distance from the electrolytic bath in which they yield electric energy, and that after their store of chemical potential becomes exhausted they may readily be removed from said bath

and others substituted without interrupting, except in a slight degree, the maximum efficiency of the device.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An electric generating device consisting essentially of a series of hollow box-like plates or elements having a removable filling of oxidized and non-oxidized granular metal in separated compartments, an electrolytic bath, and suitable connecting-wires, substantially as described.

2. An electric element or generating-plate formed with a central partition having chambers on each side thereof, provided with hinged walls of foraminous material and adapted to contain granular metal, and a passage above each of said chambers, having a series of perforated tubes leading therefrom into and among the granular metal, and adapted to convey gaseous fluid thereto, as specified.

3. A semicircular element formed of two adjacent compartments containing respectively oxidized and non-oxidized granular lead, and provided with hinged side walls and passages connected with one or more reservoirs of gas communicating with said compartments, and a strip or gasket of elastic material arranged to form an edgewise packing for said element, substantially as described.

4. The combination of the revolving semicircular sets of plates, removably secured to an adjustable axis, and a semicylindrical containing-vessel, and adapted, when lowered into the said vessel, to form separate cells between each of said plates, substantially as described.

5. The plate D, formed with longitudinal and transverse partitions, the hinged perforated sides G, extending below said transverse partitions, a suitable circumferential elastic strip, and the perforated tubes J, extending downward and adapted to convey gaseous fluid from the compartments M M' to the compartments below the transverse partitions, substantially as set forth.

6. The combination of the plates D, constructed as described, with the semicylindrical vessel and adjustable bearings, a suitable axis and operating devices, and the electrolytic liquid, substantially as described.

7. The combination of the plates D and two or more gas-reservoirs in connection therewith, a vessel containing electrolytic liquid, and an adjustable supporting-axis, as shown and described.

8. The roasting-ovens T U and connecting-pipes, in combination with the reservoirs L K and plates D, substantially as shown and described.

9. The vessel A, having bearings Q Q, shaft B, and plates D, in combination with gas-reservoirs L K and the ovens T U, substantially as shown and described.

10. The semicircular detachable elements formed with grooves F, and the ribbed shaft

B, adapted to carry the same, in combination with the vessel A, having vertically-adjustable bearings Q Q, whereby the said elements may be lowered into peripheral contact with the sides of the vessel A to form electrolytic cells, and also be raised therefrom and removed or immersed by rotation of said axis, substantially as shown and described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

VIRGIL W. BLANCHARD.

Witnesses:

BERNARD J. KELLY,
GEORGE N. WILSON.