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C. D. VREELAND.

PROCESS OF MANUFACTURING ARSENIC COMPOUNDS OF LEAD.

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FIG. 2.

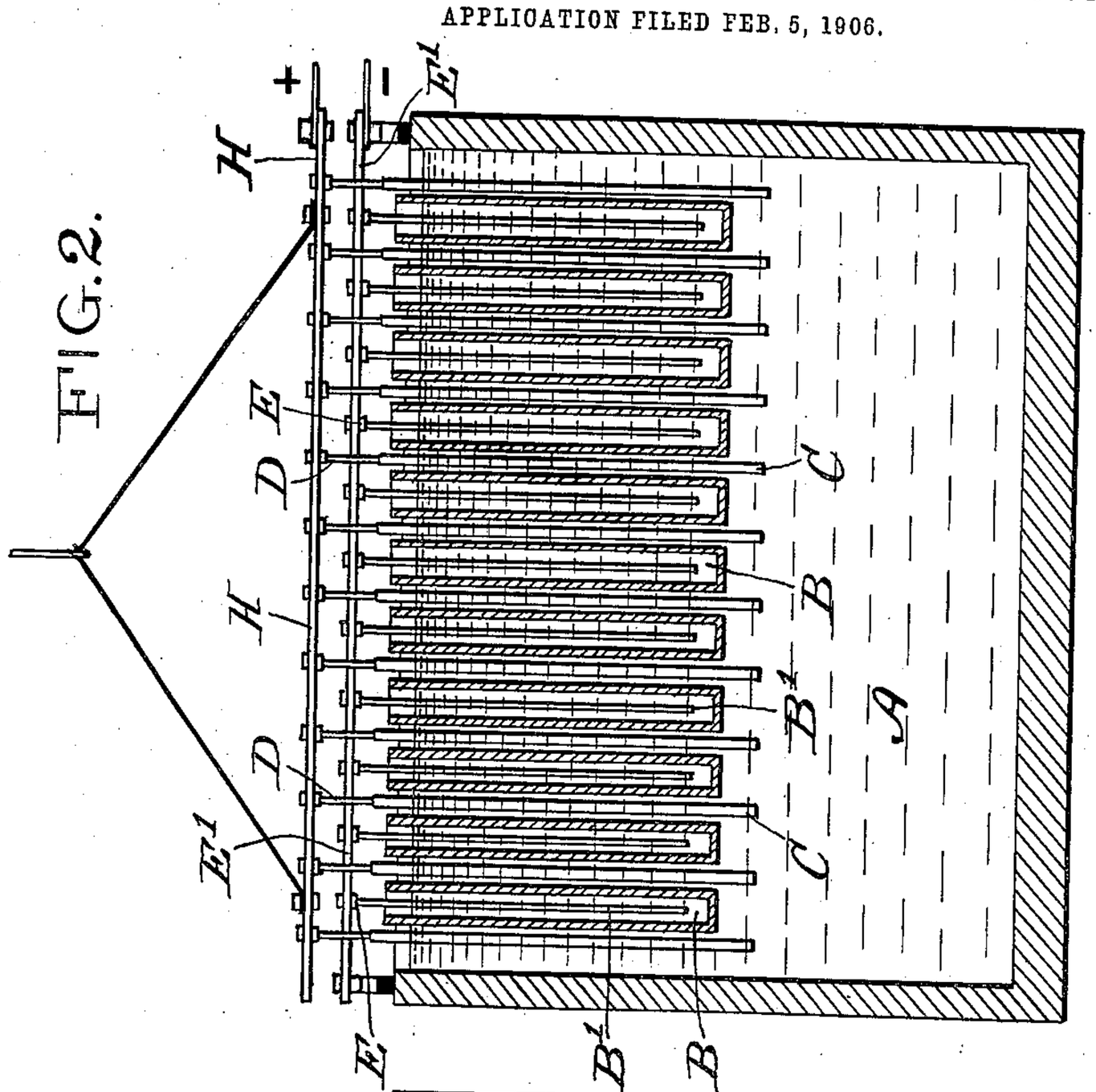
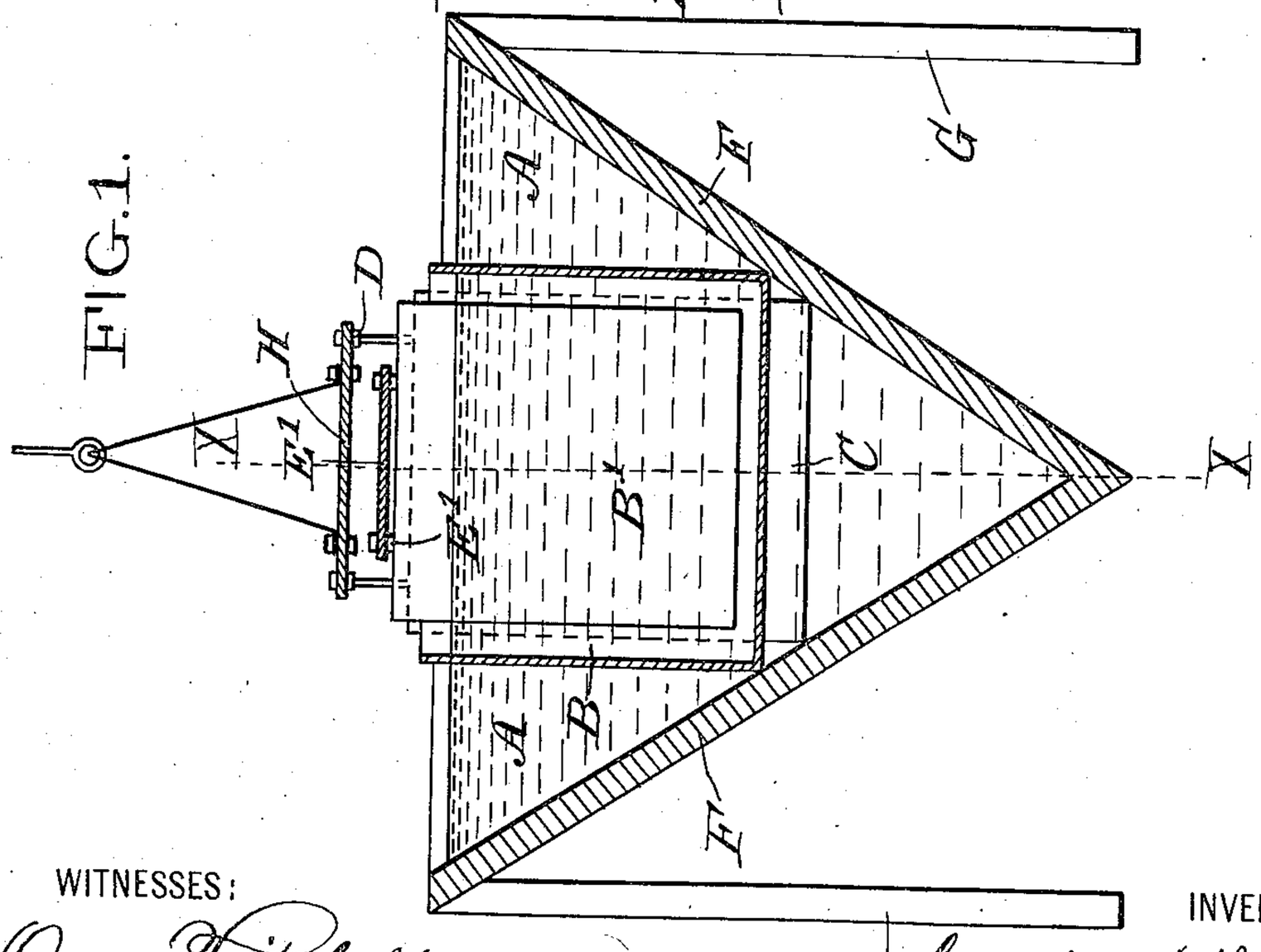


FIG. 1.



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PROCESS OF MANUFACTURING ARSENIC COMPOUNDS OF LEAD.

No. 870,915. Specification of Letters Patent. Patented Nov. 12, 1907.

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To all whom it may concern:

Be it known that I, CORNELIUS D. VREELAND, a citizen of the United States, residing in the town of Montclair, county of Essex, and State of New Jersey, have invented a new and useful Process of Manufacturing Arsenic Compounds of Lead, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to a process of making arsenic compounds of lead by means of electrolysis.

The objects of my invention are to provide a rapid and economical process for producing arsenic compounds of lead and to obviate many of the steps necessary in the processes now used for this purpose. As the art is now practiced, these compounds are manufactured by dissolving lead or an oxid thereof in nitric or acetic acid, precipitating the dissolved lead by an arsenic compound, recovering the precipitate, recovering the by-product, etc., evaporation and crystallization usually being necessary.

My invention consists in the production by electrolysis of a soluble salt of lead in the presence of a soluble compound of arsenic and its immediate precipitation by the latter as an arsenic compound of lead.

My invention is practiced by immersing a mass of lead or of a suitable compound thereof in a solution of an electrolyte which, under the influence of an electric current, will produce a solvent of lead, passing a current of electricity through the solution and precipitating the lead salt thus formed by means of a soluble compound of arsenic.

My process can be carried out with apparatus of a variety of types and a number of different reagents may be used interchangeably.

The accompanying drawings illustrate one of the types of apparatus referred to in which drawings

Figure 1 is a sectional elevation and Fig. 2 is a sectional elevation at right angles to that shown in Fig. 1, on the line X—X thereof.

In these drawings is shown a V-shaped tank having walls F, F maintained by supports G, G. This tank forms or constitutes an anode compartment A, A in which is inserted the anode or series of anodes C, C connected electrically at D to the bus-bar H. The anode or series of anodes may be suspended or may rest upon the walls of the tank, as shown. Alternately disposed between said series of anodes are the series of porous cathode compartments B, resting upon the inclined walls F, F of the tank. In each cathode compartment is suspended a cathode B^1 electrically connected at E to the other common conductor E^1, conductors H and E^1 being connected to a source of electrical energy not shown.

In the type of apparatus illustrated as that with which I practice my invention at present, I employ a cell or tank divided as shown into a series of anode and cathode compartments. Each cathode compartment consists of a porous receptacle which is filled with a solution of sodium hydroxid of suitable strength, and a cathode is immersed therein consisting of a plate of iron. The anode compartment is filled with an aqueous solution of sodium nitrate and the anode immersed therein consists of a plate or cylinder of metallic lead. When the electric current is passed through the solution the sodium nitrate is split up by electrolysis and the nitric acid radical unites with the lead, forming soluble lead nitrate, while the sodium passes into the porous cup. Into this anode compartment I introduce a solution of a sodium salt of arsenic, for example, sodium arsenate, which reacts upon the lead salt to produce lead arsenate and sodium nitrate. The former, being a heavy insoluble substance, is precipitated out of the solution and settles to the bottom of the vessel, whence it can be drawn off in any suitable manner. The soluble sodium nitrate thus formed is in condition to be once more electrolyzed, as before.

I find it preferable to introduce the arsenic solution into the compartment continuously in just the proper quantity to react upon the lead nitrate formed, and as this latter action can be quantitatively determined, the flow of the arsenic compound can be accurately regulated. As I have stated, I prefer to introduce the arsenic salt directly into the anode compartment of the cell, but if desired the lead nitrate formed as the result of the electrolysis may be drawn off into another receptacle, the lead salt of arsenic precipitated there, and the sodium nitrate of the reaction returned to the anode compartment. The former method, however, will be found preferable, as the action is practically continuous. It may be found desirable from time to time to draw off a portion of the solution inside the cathode compartment and to add water in order to maintain the proper degree of concentration.

I do not wish to be understood as limiting myself to the particular materials which I have enumerated, but desire to claim broadly the process, irrespective of the particular chemical substances used, which, as will readily be understood, can be varied considerably without departing from the spirit of my invention: for example, for the cathode at present I use an iron plate merely because it is inexpensive and very little affected by the action, although other substances, such as carbon, could, of course, be used without essentially altering the process. Again, the anode may consist of a mass of an oxid of lead instead of the lead plate. The electrolyte may be the nitrate or acetate of sodium or potassium, or certain other compounds, the essential requirement being that it shall be an electrolyte which under the influence of the electric current will separate into a solvent of lead. The arsenic salt used may be sodium arsenate or sodium arsenite, or a potassium salt of arsenic, or some other soluble arsenic com-

pound which will combine with the soluble lead salt to produce an insoluble lead compound of arsenic. As, for example, a solution of arsenic acid which re-acts upon the lead salt to produce lead arsenate and nitric acid. The nitric acid thus formed neutralizes the sodium hydroxid which diffuses from the cathode compartment, forming sodium nitrate, which is electrolyzed as before.

I find that it aids the action of the cell to provide some means for agitating the contents of the anode chamber in order to prevent any deleterious deposit being formed upon the anode. This may be accomplished by any of the means commonly employed to effect such a result.

In order to prevent the possible formation of undesirable basic salts, I prefer to maintain the electrolyte in a slightly acid condition.

Having described my invention, what I claim is:

1. The process of manufacturing arsenic compounds of lead which consists of the formation of a soluble salt of lead by electrolysis in the presence of a soluble compound of arsenic and the simultaneous precipitation of the lead thereby as an arsenic compound of lead.

2. The process of manufacturing arsenic compounds of lead which consists in placing a body of metallic lead in a solution of an electrolyte which under the influence of the electric current will separate into a solvent of lead at the anode and dissolve the lead therefrom, and in precipitating the lead thus brought into solution with a soluble compound of arsenic.

3. The process of manufacturing arsenic compounds of lead which consists in immersing a suitable cathode in a solution of an alkaline hydroxid contained within a porous receptacle, immersing said porous receptacle in a vessel containing a solution of an electrolyte which under the influence of the electric current will separate into a solvent of lead, immersing in said electrolyte an anode consisting of a body of lead or of a compound thereof, passing an electric current through the circuit, and introducing into the anode compartment a soluble compound of arsenic.

4. The electrolytic process of manufacturing arsenic salts of lead which consists in immersing the cathode in a solution of an alkaline hydroxid contained in a porous receptacle, immersing said porous receptacle in a vessel containing an anode of lead or of a compound thereof and an electrolyte which under the influence of the electric current will separate into a solvent of lead, and introducing into said anode compartment a solution of a compound of arsenic.

5. The process of manufacturing arsenic compounds of lead which consists in immersing a mass of iron in a solution of an alkaline hydroxid contained in a porous receptacle, immersing said porous receptacle in an electrolyte which when subjected to an electric current will produce a solvent of lead, immersing in the electrolyte a mass containing lead, connecting the mass of lead or compound of lead to the positive pole of a source of electrical energy, connecting the mass of iron to the negative pole, and precipitating the dissolved lead by means of a soluble compound of arsenic.

6. The process of manufacturing arsenic compounds of lead which consists in immersing a cathode of iron in a solution of an alkaline hydroxid contained in a porous receptacle, immersing said porous receptacle in a vessel containing an anode of lead and a solution of a salt which when electrolyzed will produce a solvent of lead, passing a current of electricity through the circuit and precipitating the lead salt thus formed by means of a soluble compound of arsenic.

7. The process of manufacturing arsenic compounds of lead which consists in immersing a cathode of iron in a solution of an alkaline hydroxid contained in a porous receptacle, immersing said porous receptacle in a vessel containing an anode of lead and an electrolyte which under the influence of the current will separate into a solvent of lead, passing a current of electricity through the circuit, and precipitating the lead salt thus formed by means of a soluble salt of arsenic.

8. The process of manufacturing arsenic compounds of lead which consists in immersing a cathode of iron in a solution of an alkaline hydroxid contained in a porous receptacle, immersing said porous receptacle in a vessel containing an anode of lead and a solution of a salt which when electrolyzed will produce a solvent of lead, passing a current of electricity through the circuit, and precipitating the lead salt thus formed by means of a soluble salt of arsenic.

CORNELIUS D. VREELAND.

Witnesses:
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