

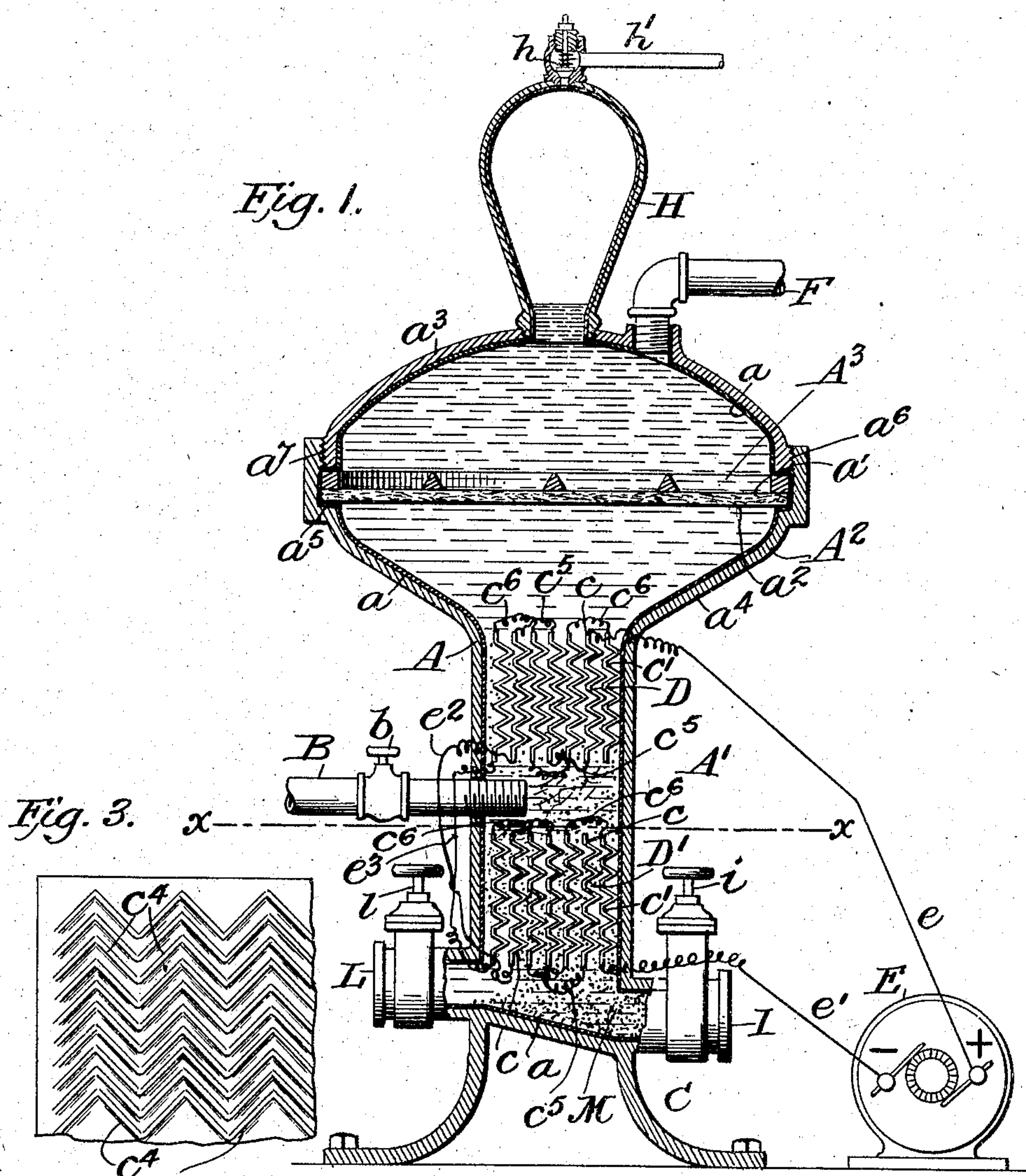
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# APPARATUS FOR TREATING LIQUIDS.

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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR TREATING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 791,457, dated June 6, 1905.

Application filed May 24, 1904. Serial No. 209,556.

*To all whom it may concern:*

Be it known that I, LÉON DION, a citizen of the United States, and a resident of the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Treating Liquids to Recover Metals and other Foreign Substances Contained in Them, of which the following is a specification.

This invention, while capable of application in the recovery of foreign substances from liquids generally, is especially useful in the recovery of metals and other substances from the waters of mines and mineral and other springs, its object being to accomplish this result in a cheap and efficient manner, all as will hereinafter more fully appear.

In the carrying out of my invention various forms of mechanism may be employed. In the drawings accompanying this application, however, and forming a part hereof, I have shown a form of mechanism which may be conveniently employed for the purpose, Figure 1 being a side elevation thereof partly in vertical section; Fig. 2, a transverse section of the same, taken in the plane  $xx$  of Fig. 1 with parts broken away; and Fig. 3, an enlarged front elevation of a portion of one of the electrodes detached.

In all the figures like letters of reference are employed to designate corresponding parts.

A indicates a receptacle or reservoir for receiving the liquid, in which is contained the metal or other substance that it is desired to recover, and B a pipe through which the liquid is supplied thereto, the same being provided with a suitable valve  $b$ , by means of which the flow of the liquid therethrough is controlled and regulated. The receptacle or reservoir A is preferably constructed with a contracted lower body portion  $A'$ , with an enlarged upper globular portion  $A''$ , and is provided throughout its interior with a vitreous or other insulating-lining  $a$ . As thus constructed and provided this receptacle or reservoir is or may be supported upon a suitable base C and is equipped within its lower contracted body portion  $A'$  with two groups of

interlocking electrodes D and D', of which the group D is arranged above and the group D' below the inner discharging end of the pipe B, with a space between them. These groups of electrodes may be of various forms. As shown in the drawings, however, they are constructed of corrugated plates, with those constituting the positive or + electrodes  $c$  of each group arranged side by side in parallel relationship to one another and secured at one of their edges to a base-plate  $c'$ , while those constituting the negative or - electrodes  $c''$  of each group are similarly arranged and are secured to a corresponding base-plate  $c''$ . With the groups of electrodes constructed as thus described the electrodes are secured within the contracted body portion  $A'$  of the receptacle or reservoir A by screws or bolts passing through the respective base-plates  $c'$  and  $c''$  and engaging with the walls of the receptacle or reservoir or otherwise, with the positive or + electrodes of each group extending between and alternating with the negative or - electrodes thereof, but without contacting with them or without the extension of either of the positive or negative electrodes sufficiently far across to contact with the base-plate of the others.

In some instances the corrugations  $c^4$  in the plates constituting the electrodes  $c$  and  $c''$  may extend across them in parallel straight lines, while in others they may be arranged in the form of broken or indented lines, as shown in Fig. 3; but however arranged it is essential that the general direction of the corrugations extend transversely of the interior of the contracted body portion of the receptacle or reservoir A, whereby to form a sinuous course between the electrodes and insure of the contact of the liquid being treated therewith as it passes through between them.

The positive and negative electrodes being arranged as above explained the positive electrodes of each group are connected by appropriate conductors  $c^5$ , which extend between them, while the negative electrodes of each group are similarly connected by conductors  $c^6$  with both the positive and negative elec-



trodes connected with a source of electric supply—as, for instance, a dynamo E—through the intervention of conductors  $e$  and  $e'$ . In some instances the positive and negative electrodes of each group may be connected directly with the source of electric supply in multiple circuit, in which cases the positive and negative electrodes of each group will be connected with it through appropriate conductors extending between them. In the drawings, however, I have shown the electrodes of both groups connected with the source of electric supply in a serial circuit, the positive and negative electrodes of one group being respectively connected with the positive and negative electrodes of the other group by appropriate conductors  $e^2$  and  $e^3$  with the positive electrodes  $e$  of one group connected with the source of electric supply through a conductor  $e$  and the negative electrodes  $e^2$  of the other group connected therewith through a similar conductor  $e'$ , and either of these forms of connection may be employed, as preferred.

With the electrodes thus disposed within the contracted body portion of the receptacle or reservoir A the upper enlarged globular portion  $A^2$  of the latter is provided with a suitable filter  $A^3$ . This filter, which may be constructed in any approved form, is here shown as composed of a suitable frame  $a'$ , with a layer or layers of felt  $a^2$  or other appropriate filtering material secured to or supported upon it, and is arranged centrally within the upper enlarged globular portion  $A^2$  of the receptacle or reservoir above and in transverse relationship to the electrodes D. To permit of this arrangement being effected, the upper enlarged globular portion  $A^2$  is constructed with a removable top  $a^3$ , with the bottom portion  $a^4$  counterbored for a small distance, whereby to form a shoulder or ledge  $a^5$ . Upon the shoulder or ledge thus formed the filter  $A^3$  rests and may be firmly clamped by the removable top  $a^3$ , which is provided around its outer lower edge with a screw-thread  $a^6$ , that engages with a corresponding female screw-thread  $a^7$ , formed in the interior of the counterbored upper end of the bottom portion  $a^4$ . By this means, as will be seen, not only is the filter firmly clamped in place when arranged in operative relationship, but the removal of the same and access to it afforded when desired. With the upper enlarged globular portion  $A^2$  thus equipped with the filter  $A^3$  it is also provided with a discharge-pipe F, by means of which the liquid passing through the filter may be discharged, and with a chamber H, which in turn is provided in its top with a pressure-valve  $h$  and with a discharge-pipe  $h'$ , leading from it, whereby when the pressure within the receptacle or reservoir A exceeds a certain limit the air or other contents of the chamber may pass off through them and such pressure be thereby relieved. While

the upper enlarged globular portion of the receptacle or reservoir A is thus supplied, the lower end of the contracted body portion  $A'$ , which extends some distance below the group of electrodes  $D'$ , is inclined downward toward one of its sides and the side toward which it thus inclines provided with a discharge-pipe I, through which any metal or other material deposited in the lower portion of the receptacle or reservoir may be removed, with such discharge-pipe provided with a suitable gate  $i$ , whereby the passage through the pipe may be opened or closed, as may be desired. As thus equipped the lower portion of this contracted body portion  $A'$  of the receptacle or reservoir is likewise provided with a hand-hole L, through which access to the interior of the receptacle or reservoir may be had when required, the same being preferably constructed in the form of a short projecting pipe and provided with a suitable gate  $l$ , whereby the opening and closing of this hand-hole may be effected when desired.

With an apparatus constructed as above described and with electric current supplied to the electrodes through a proper circuit the recovery of metals or other substances from a liquid containing them may be effected by admitting the liquid to the interior of the receptacle or reservoir A through the pipe B by opening the valve  $b$  therein. The liquid thus admitted to the interior of the receptacle or reservoir A will gradually fill the same, after which as it is delivered thereto it will overflow through the discharge-pipe F and be thereby conducted to the place where desired. In being thus supplied to the receptacle or reservoir the liquid will be brought into contact with and be caused to pass between the electrodes, where it will become charged with electricity, the consequence of which will be to cause the particles of metals or other substance to separate out from the liquid and fall by the action of their gravity downward between the electrodes of the different groups and be accumulated in the lower end of the lower contracted body portion  $A'$  of the receptacle or reservoir, as shown at M. In thus passing downward through the electrodes of the two groups D and  $D'$  the cohesive or other attractive force will cause the particles to more or less cohere, and thereby aggregate into masses of some considerable size. As the metal or other substances separated out from the liquid thus descend between the electrodes D and  $D'$  the liquid from which it or they is or are separated will as it or they is or are continuously supplied ascend in the receptacle or reservoir A to the upper enlarged portion thereof, where, passing through the filter  $A^3$ , any particles that have not been carried downward by the action of gravity will be retained, leaving the liquid free from them and purified to pass upward through the filter into the upper portion of the receptacle



or reservoir A and thence discharged through the discharge-pipe F. As thus carried on the operation will be continuous so long as the liquid is admitted through the pipe B and is carried away through the discharge-pipe F. Should, however, the discharge-pipe F for any reasons become incapable of discharging the purified liquid with the requisite facility, then the liquid will rise in the chamber H, compressing the air or other contents therein until a certain limit is reached, when the pressure-valve *h* in the upper end thereof will be forced upward and the surplus air or other contents therein carried off through the discharge-pipe *h'*, thereby preventing any unnecessary straining of the parts. The same result will also follow when air or gas is liberated from the liquid by the electric action thereon or otherwise. Such air or gas will pass upward into the chamber H, and accumulating therein until its pressure exceeds a certain limit will by raising the valve *h* escape there-through and through the pipe *h'*.

The operation of the apparatus having been once initiated may be continued as long as desired, or the liquid is supplied to the receptacle or reservoir A and the metal or other substances thereby separated out from the fluid deposited in the lower portion of the contracted lower portion A' of the receptacle A. From this portion of the reservoir or receptacle the metal or other substances thus separated out from the liquid and deposited may from time to time be removed through the discharge-pipe I by opening the gate *i* therein, when it will pass outward through the pipe into an appropriate receptacle arranged to receive it. The metal or other substances having been thus removed from the lower end of the lower contracted body portion A', the gate *i* will be closed and continued in that condition until the accumulation of metal or other substances in the lower end of the lower contracted portion become sufficiently great, when the gate *i* will be again opened, the metal or other substances removed, as before explained, and so on indefinitely.

Should the metal or other substance contained in the lower end of the lower contracted portion of the receptacle or reservoir A fail to discharge itself through the tube I when the gate *i* therein is opened, it may be forced outward therethrough by the hand of the operator or some implement thrust inward through the hand-hole L, which may be permitted when it is desired by simply opening the gate *l* arranged therein.

While in the drawings I have shown and in the foregoing described a form of mechanism in which my invention may be carried out, I wish it distinctly understood that this form is merely illustrative and that any other form of mechanism having the required electrodes and source of electric supply may be employed in lieu thereof. The same is also

true respecting the source of electric supply, for while I have shown the requisite current supplied from an ordinary dynamo I do not limit myself thereto, but may employ any other form of generator and may avail of either frictional, voltaic, or other forms of current, as may be preferred or found the most convenient. Again, while I have shown only the interior of the receptacle or reservoir A and the interior of the pipe I and L as coated with an insulated lining, it is to be understood that in practice the pipes B, F, and *h'* and the filter A<sup>3</sup> will be insulated at the points where they enter or come in contact with the receptacle or reservoir A.

Having now described my invention and specified one of the forms of mechanism by means of which it may be carried into effect, I claim—

1. The combination, with a receptacle or reservoir constructed with a discharge-orifice near its lower end, an inlet-pipe for supplying the liquid to be treated to such receptacle or reservoir, and an outlet-pipe for discharging it therefrom, of a gate for opening and closing said orifice, electrodes and a filter arranged within such receptacle or reservoir above the orifice and across the line of flow of the liquid from the inlet to the outlet pipe, and means for supplying an electric current to such electrodes, substantially as described.

2. The combination, with a receptacle or reservoir constructed with a discharge-orifice near its lower end and with its lower end inclined downward toward such orifice, an inlet-pipe for the liquid, and an outlet-pipe therefor, of a gate for opening and closing the said orifice, electrodes arranged within the receptacle or reservoir above and below the entrance of the inlet-pipe, and means for supplying an electric current to these electrodes, substantially as described.

3. The combination, with a receptacle or reservoir constructed with a downwardly-inclined lower end and with both a discharge-orifice and a hand-hole, an inlet-pipe through which the liquid is supplied to the interior of this receptacle or reservoir and an outlet-pipe through which it is discharged therefrom, of gates by which both the discharge-orifice and the hand-hole may be opened and closed, a group of electrodes arranged within the receptacle or reservoir above the inner end of the inlet-pipe, a second group of electrodes arranged therein below the inner end of such inlet-pipe, and means by which a current of electricity may be supplied to both groups of electrodes, substantially as described.

4. The combination, with a receptacle or reservoir constructed with an enlarged upper and a contracted lower portion, and with both a discharge-orifice and a hand-hole near its lower end, and an upper and an under group of electrodes arranged within the contracted lower portion of such receptacle or reservoir,



of gates by which both the discharge-orifice  
and hand-hole may be opened and closed, an  
inlet-pipe arranged to discharge the liquid be-  
tween the upper and under group of elec-  
trodes, an outlet-pipe leading from the en-  
larged upper portion of the receptacle or res-  
ervoir, a filter arranged intermediate the in-  
let and outlet pipes, and means for supplying

a current of electricity to both groups of elec-  
trodes, substantially as described. 10

In witness whereof I have hereunto set my  
hand this 29th day of January, 1904.

LÉON DION.

Witnesses:

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