(No Model.) 2 Sheets—Sheet 1.

T. CRANEY.

ELECTROLYTIC APPARATUS.

No. 496,864. Patented May 9, 1893.

Fig 1.

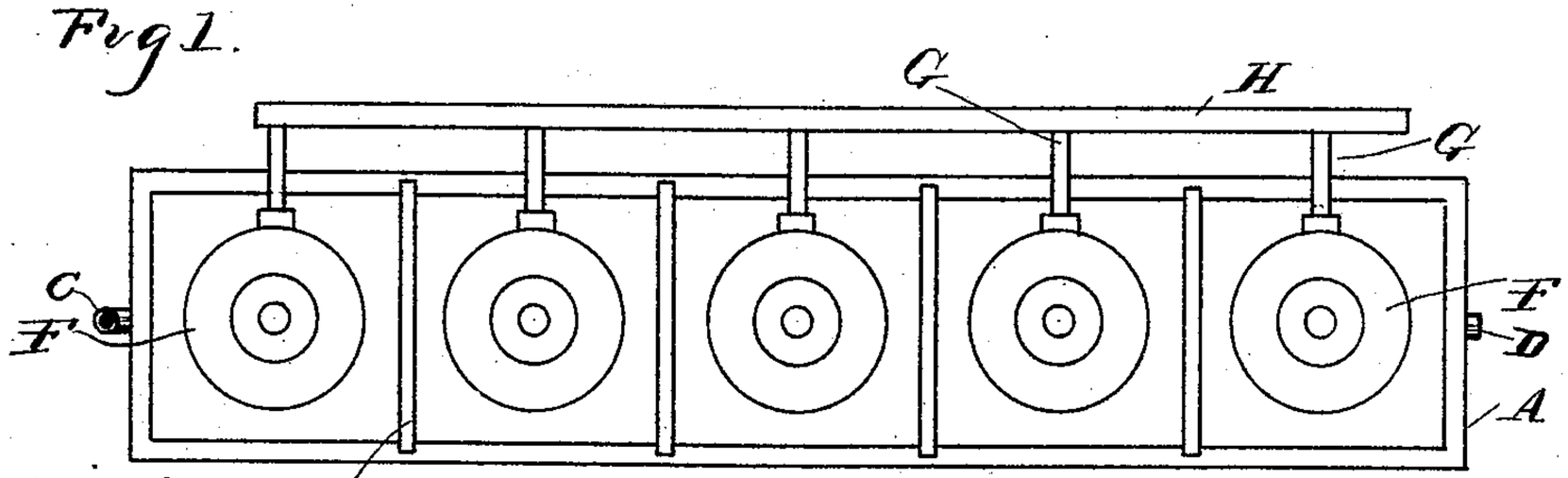


Fig 2.

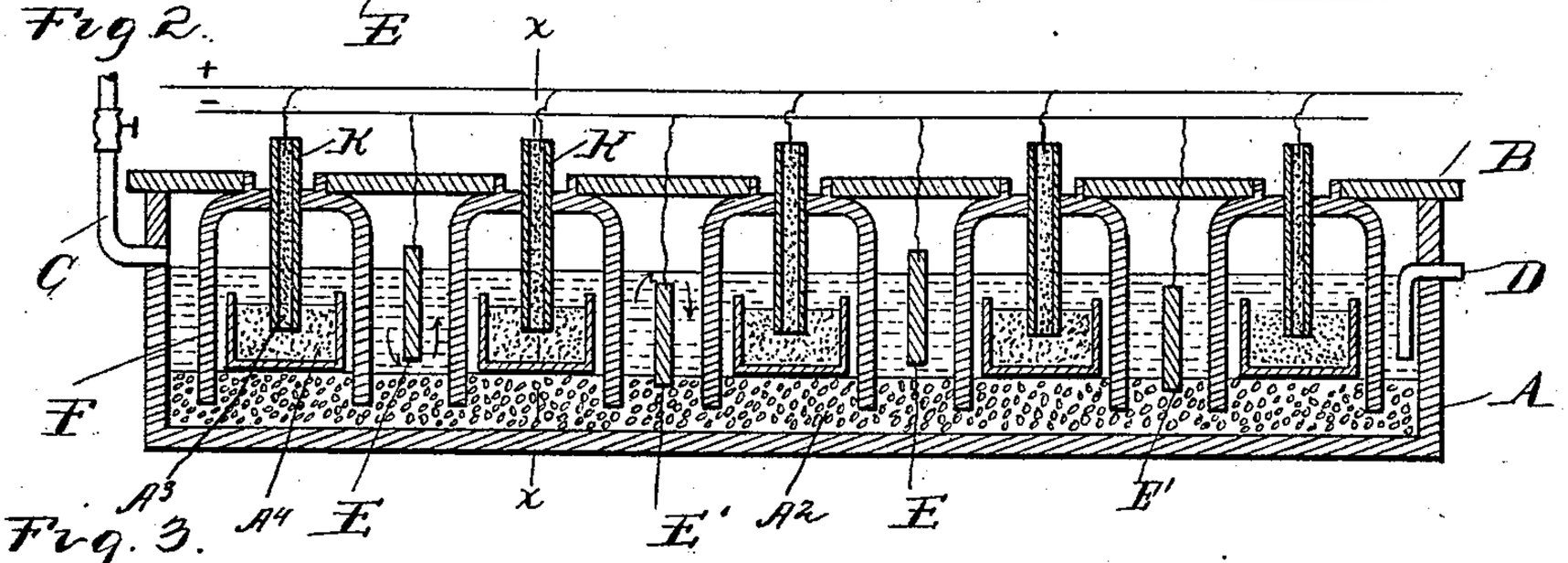


Fig. 3.

Fig. 5.

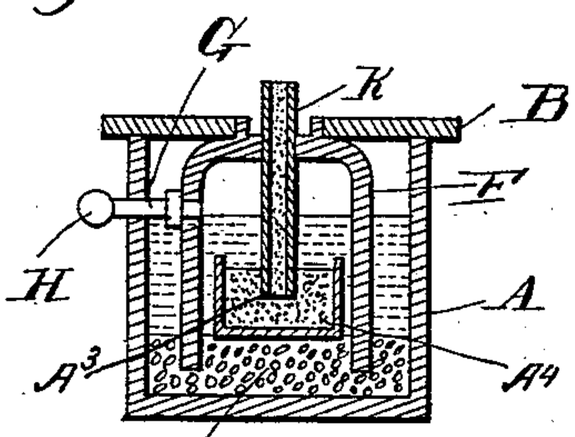
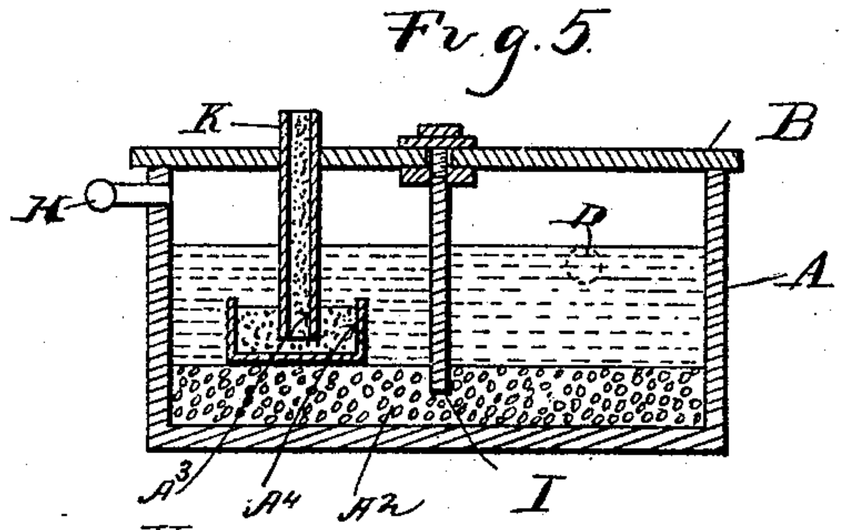
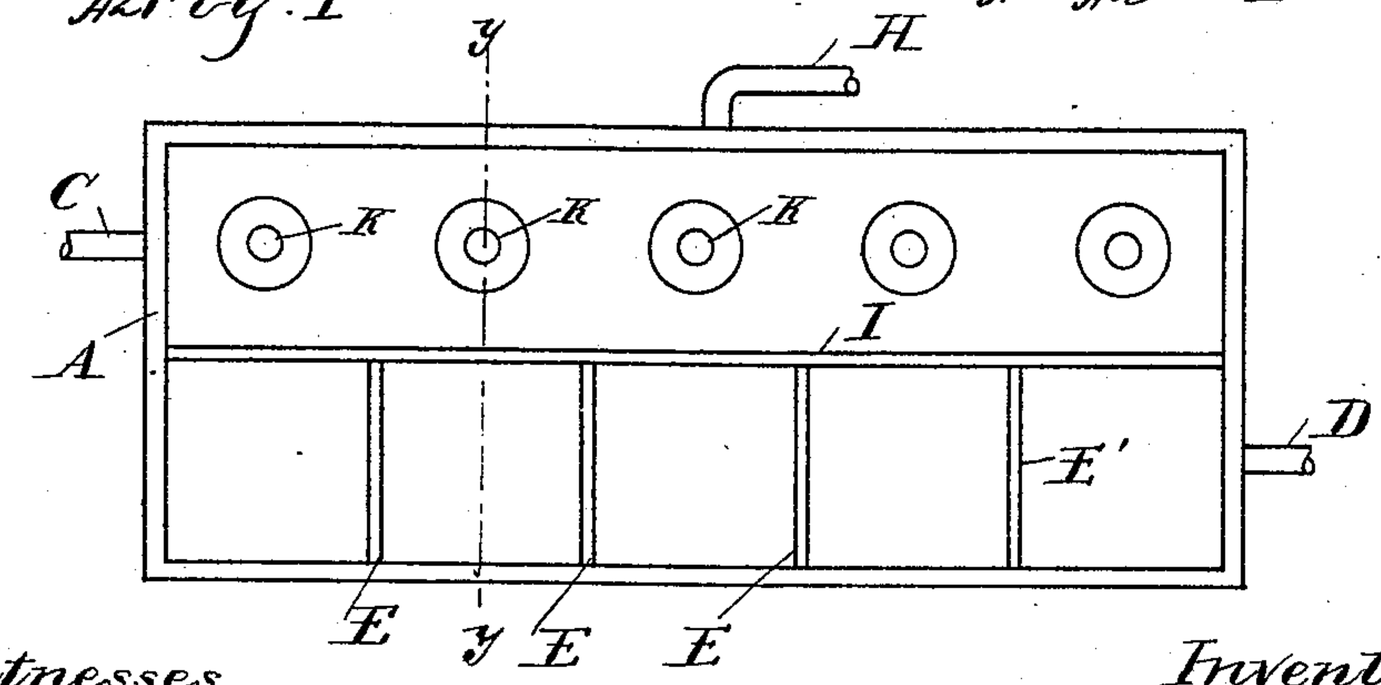


Fig. 4





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(No Model.) 2 Sheets—Sheet 2.

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ELECTROLYTIC APPARATUS.

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Fig. 7

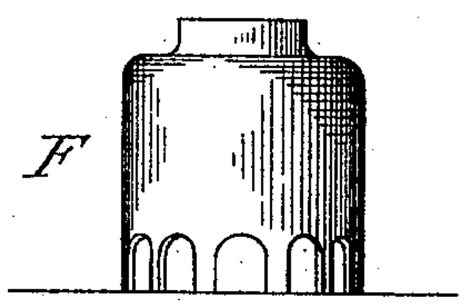
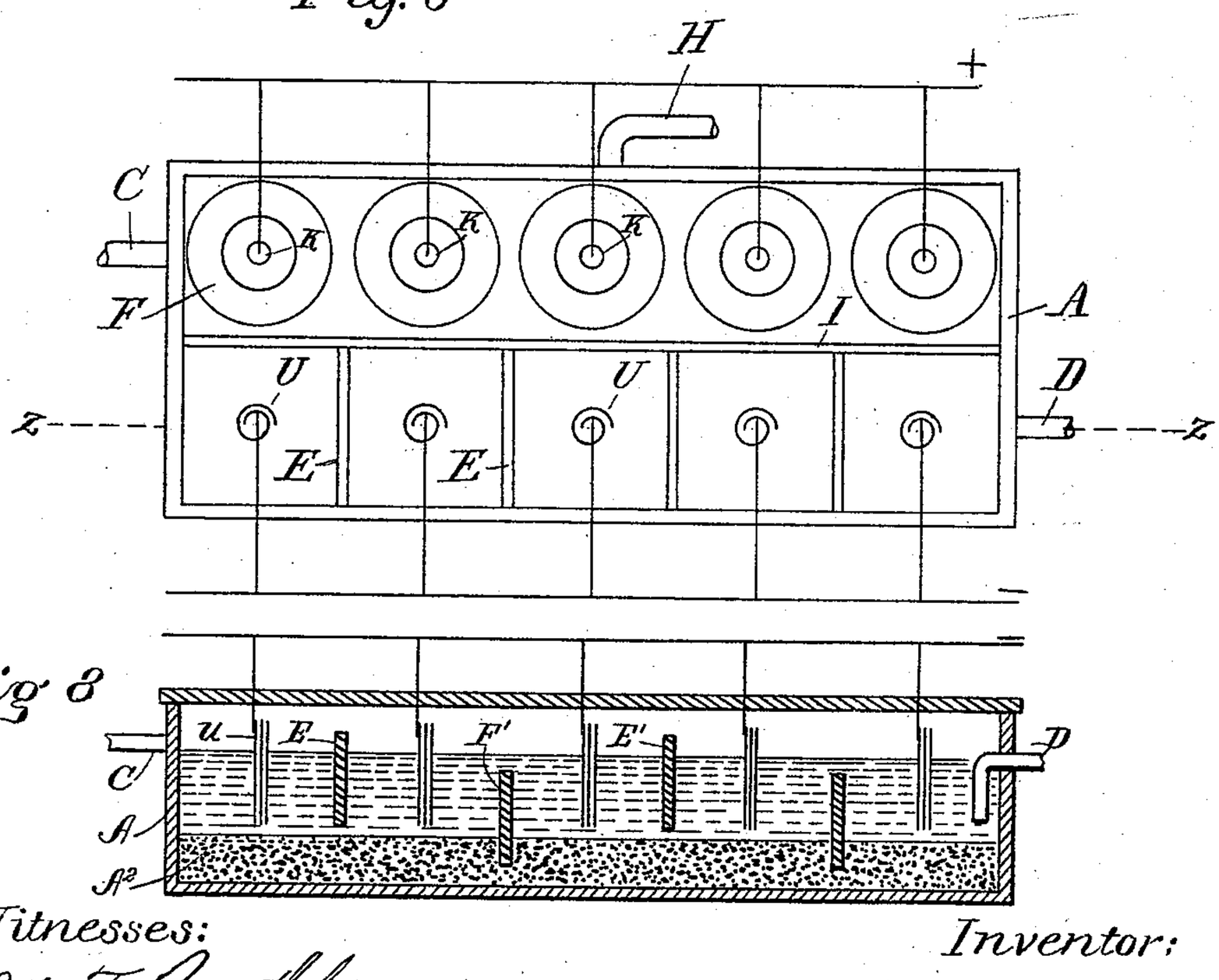


Fig. 6



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UNITED STATES PATENT OFFICE.

THOMAS CRANEY, OF BAY CITY, MICHIGAN.

ELECTROLYTIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 496,864, dated May 9, 1893.

Application filed April 7, 1892. Serial No. 428,221. (No model.)

To all whom it may concern:

Be it known that I, THOMAS CRANEY, a citizen of the United States, residing at Bay City, in the county of Bay and State of Michigan, have invented certain new and useful Improvements in Electrolytic Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates more specifically to electrolytic apparatus, principally designed for the commercial manufacture of sodic hydrate, from common salt, and the invention consists in the peculiar construction and arrangement of the vessel or receptacle in which the decomposition takes place, and has for its object primarily to render the construction more economical and in a form more adapted for the commercial exploitation of the process of electrolysis, than has been devised heretofore. To this end I construct and combine in a simple and economical manner a plurality of cells communicating with each other and inclosed in a single vessel or vat, whereby the liquid to be treated circulates from one cell to the next one, and so on, until the electrolytic action has reached its limit.

My invention also consists in the peculiar provision made for mechanically separating and collecting the products of electrolysis,—all as more fully hereinafter described, and shown in the drawings, in which—

Figure 1 is a diagram plan view of my improved apparatus, with the cover removed. Fig. 2 is a vertical, central, longitudinal section thereof. Fig. 3 is a cross section on line *x—x* in Fig. 2. Fig. 4 is a plan view of an apparatus somewhat modified, with the cover removed. Fig. 5 is a cross section of this modified form on the line *y—y* of Fig. 4. Fig. 6 is a plan similar to Fig. 4 with the exception that the cathodes are separated from the partitions, as referred to in the modification described in the specification. Fig. 7 is a detached elevation of one of the bells. Fig. 8 is a vertical longitudinal section on lines *z z* of Fig. 6.

A is a vat which may be of stoneware, glass, cement, slate, or any other material of like indestructible character, but preferably of wood provided with an indestructible lining where necessary. This vat is provided with a hermetically closing cover B to prevent the escape of gaseous products, and with a suitable inlet opening C for the admission of the brine, and an outlet opening D for the discharge of the liquid product of decomposition. The entire bottom of this vat is covered with an indestructible porous medium such as ground slate, glass, sand, asbestus, &c., which when packed is of the nature of a so-called electrolytic diaphragm, which permits electrolysis to take place through it, while at the same time prevents the intermingling of the products of decomposition, so as to prevent their reuniting. Partitions E E′ divide the vat into compartments or cells, in such a manner that they partially intercept the free flow of the liquid and compel it to flow alternately over the top of one partition and then under the lower edge of the next partition in its passage from one end of the vat to the other. These partitions may be built of material like the rest of the vat or they may be wholly or partially of metal, as in the drawings, so as to form the cathodes for the cells into which they divide the vat, if not so formed separate cathodes are provided for each cell, as shown in Fig. 6, in which U are such separate cathodes consisting of sheet metal bent or rolled up. An anode is contained in each cell and this I inclose in a bell F, of stone ware or other non-destructive material, preferably non-porous and provided with an open bottom projecting into the porous medium and suitably supported above the bottom of the vat by providing it with a scalloped lower edge, or in any other desired manner. Each bell has a discharge pipe G for the escape of the chlorine gas and this is preferably made at the height of the surface of the liquid in the vat so as to serve as an overflow through which a small portion of the liquid may be allowed to escape with the gas to carry off impurities and facilitate the escape of the chlorine gas, which by its specific gravity collects on the surface of the liquid. The discharge pipes of all the bells pass through the side of the tank and connect into a common overflow pipe H through which the chlorine gas is conducted off to a place where it is collected for further use. The anodes K are preferably formed of powdered carbon tightly packed in a tube A^3 which extends at its lower end into a cup A^4 also filled with carbon ex-

posed at its surface, to contact with the liquid, as described and shown in Letters Patent No. 482,724, September 20, 1892.

The parts being constructed and arranged as described and shown, it will be seen that I obtain all the objects set forth in a very simple and economical way. The brine flows into the first cell, preferably in a continuous feed commensurate with the capacity of the apparatus and the strength of the current, whereby the flow from the discharge pipe D is correspondingly regulated so as to obtain a solution of caustic soda to the full limit of decomposition. However, I do not confine myself to the complete carrying out of the process in one vat but may connect several like vats if necessary to carry the decomposition to its full limit. The liquid being acted on in the first cell is conducted into the next cell by overflowing over the first partition and then from the second cell into the next adjoining by flowing under the partition and so on to the last cell. By thus directing the circulation the liquid is more uniformly decomposed, the process is kept under control, and the gaseous products separate more readily.

In the modification shown in Figs. 4 and 5 the vat is longitudinally divided by a partition I into a large compartment which is common to all the anodes and the other half is subdivided by partitions E E′ in like manner, as shown for the vat in Figs. 1, 2, and 3, and these partitions may also constitute the cathodes of the apparatus. The partition I extends into the porous medium in the bottom of the vat but does not extend entirely to the bottom, or, in lieu thereof has openings *b* near the bottom communicating with the compartments containing the cathodes. The bell over the anode can be dispensed with in this construction and single overflow pipe serves for the whole anode compartment. The inlet and outlet openings are again arranged to cause the liquid to flow from one compartment into the next in the same manner as above described and several vats are shown united into a system.

My apparatus is equally applicable to the electrolytic decomposition of other metallic salts.

What I claim as my invention is—

1. The combination and arrangement in an electrolytic apparatus, of a vat provided with inlet and discharge connections for the liquid, a porous medium contained in the bottom of the vat, anodes and cathodes contained in chambers formed in said vat, and partitions extending alternately above and below the liquid in the vat and separating the cathode chambers, substantially as described.

2. The combination and arrangement in an electrolytic apparatus, of a vat for containing the liquid to be electrolyzed and provided with inlet and outlet connections, a porous medium contained in the bottom of the vat, partitions dividing the vat above the porous medium into separate chambers containing the cathodes and communicating with each other alternately at the top and bottom, and anodes contained in separate chambers communicating with the cathodes through the porous medium in the bottom of the vat, substantially as described.

3. The combination and arrangement in an electrolytic apparatus of the vat containing a porous medium at the bottom thereof, anodes and cathodes inclosed in separate chambers formed in said vat and communicating with each other through the porous medium and partitions separating the cathode-chambers, said cathode-chambers communicating alternately at the top and bottom, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

THOMAS CRANEY.

Witnesses:
M. B. O'DOGHERTY,
N. L. LINDOP.