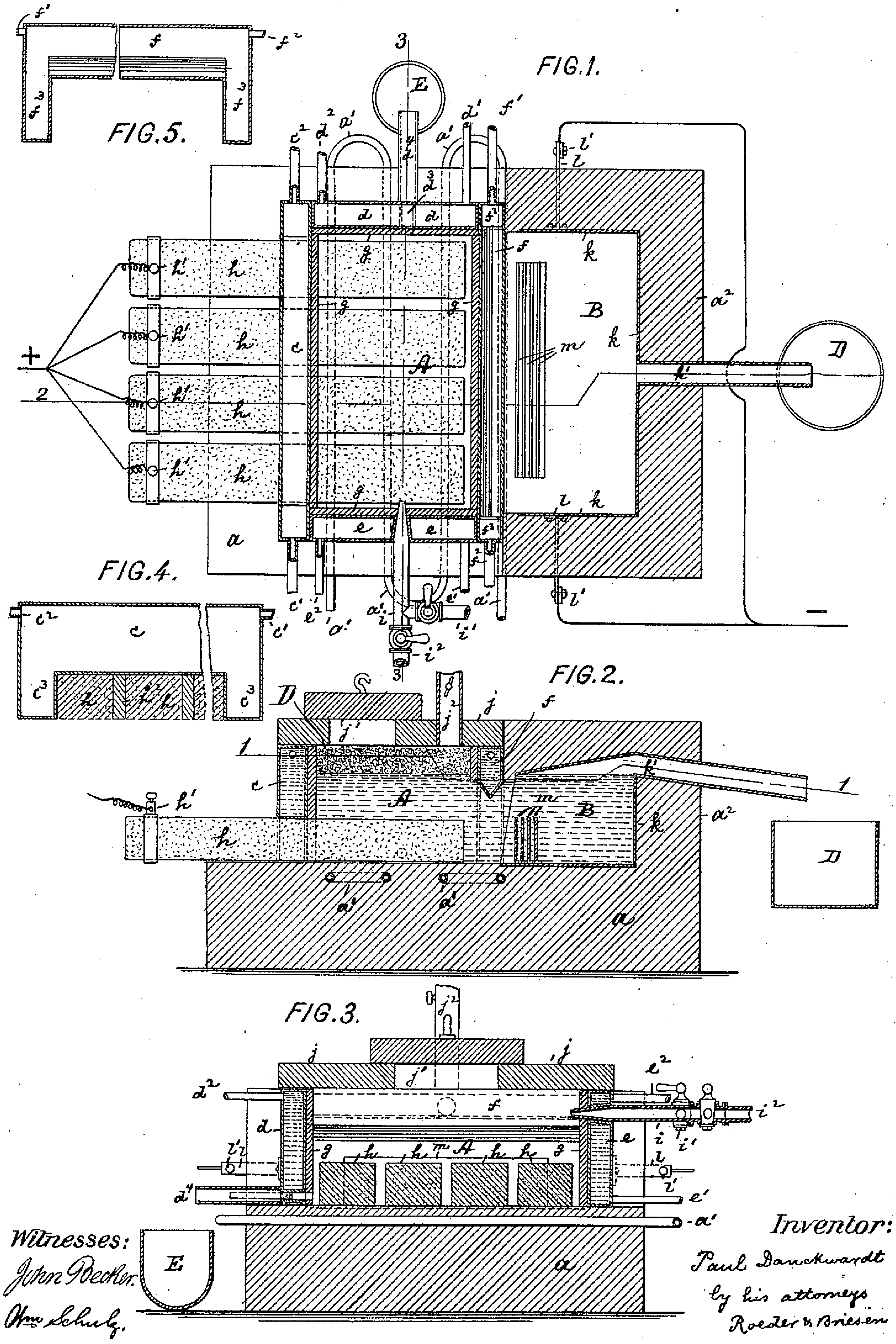
No. 607,506. Patented July 19, 1898.

P. DANCKWARDT.

APPARATUS FOR PRODUCING ALKALI METALS FROM THEIR CHLORIDS.

(Application filed Jan. 4, 1898.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PRODUCING ALKALI METALS FROM THEIR CHLORIDS.

SPECIFICATION forming part of Letters Patent No. 607,506, dated July 19, 1898.

Application filed January 4, 1898. Serial No. 665,559. (No model.)

To all whom it may concern:

Be it known that I, PAUL DANCKWARDT, a citizen of Germany, residing at New York city, county and State of New York, have invented certain new and useful Improvements in Apparatus for Producing Alkali Metals from their Fused Chlorids, of which the following is a specification.

This invention relates to an apparatus for producing alkali metals from their fused chlorids which is so constructed that the heat is created within a chamber inclosed by walls which are formed partly by water or other cooling jackets or by bricks cooled by water-pipes. Thus a long life is given to the apparatus, which is particularly well adapted for the manufacture of alkali metals on a very large commercial scale.

In the accompanying drawings, Figure 1 represents a horizontal section of my improved apparatus on line 1 1, Fig. 2. Fig. 2 is a vertical longitudinal section of the same on line 2 2, Fig. 1; Fig. 3, a vertical transverse section on line 3 3, Fig. 1; Fig. 4, a sectional detail of water-jacket *c*, and Fig. 5 a similar detail of partition *f*.

The apparatus consists of two compartments—viz., the positive compartment A and the negative compartment B. It is set up on a solid brick foundation *a a*, forming part of the bottom.

The positive compartment A is formed by three hollow iron walls *c d e* and a partition *f*, arranged, preferably, in a square, and of which the longitudinal wall *c* and partition *f* are supported at their ends by water-legs c^3 f^3, so as to be raised off the foundation *a* and form intervening passages. Each of the hollow walls *c d e* and partition *f* forms a water-jacket and communicates with a water-inlet pipe c' d' e' f' and a water-outlet pipe c^2 d^2 e^2 f^2, respectively. A lining of tiles *g* on the inner face of the water-jackets and partition protects the same from the direct effects of the fire. Through the opening beneath the front water-jacket *c* there are adapted to be slipped into the compartment A the ends of a number of carbon sticks *h*, that rest directly upon the bottom *a*. These sticks carry on their outer ends binding-posts h' to connect them with the positive pole of a source of electric energy. The interstices between the sticks may be plugged up by clay, as at h^2, Fig. 4. The water-jacket *e* is provided near its top with one or more twyers, through which project the tapering nozzles of blast-pipes *i*, charged with fuel-gas and air by branches i' i^2 and adapted for the introduction of gaseous or fluid fuel into the compartment A. The water-jacket *d* is provided with a tap-hole d^3, communicating with a gutter d^4. This tap-hole is kept plugged up with clay while the furnace is working and is opened only when the work is stopped to discharge the molten contents of the bath. The side walls of the partition *f* converge at the bottom to form a sharp angle, beneath which a passage or communication between the compartments A and B is formed that permits free access of any molten matter from one compartment into the other. At the bottom the compartment A is cooled by pipes a' let into foundation *a* and through which water is caused to flow while the bath is in operation. At the top the compartment is covered by a chamotte-plate *j*, having manhole j' and a gas-outlet pipe j^2.

The negative compartment B consists of an iron box *k*, supported upon foundation *a* and bricked in all around, as at a^2, to prevent loss of heat, while its open inner side is insulated by bricks from the adjoining partition. The box *k* has a top plate which slants toward the partition *f*, and a neck k', which constitutes an outlet for the alkali metal. Two T-irons *l*, attached to box *k* and having binding-posts l', form connections for the negative pole of the dynamo, so that in this way the iron box itself forms the negative pole of the bath.

As principally during the beginning of the operation a layer of solid salt is liable to form on the inside of compartment B, I bolt to the bottom of such compartment a number of iron plates *m*, which project upwardly into the fluid part of the bath. These plates are of such a length only that they do not extend quite across the compartment, but leave end spaces, through which the molten contents of compartment B may pass freely into compartment A when the furnace is stopped and the molten chlorid is to be withdrawn.

To start the apparatus, the air and fuel-gas supply of pipe i is turned on. The water in the three water-jackets and the partition f will now become rapidly heated, care being taken that the heat is not increased too suddenly. To heat up also the compartment B, the flue j^2 is closed, so that the hot gases will be forced to flow underneath the partition f and through compartment B out of neck k'. After both compartments are sufficiently hot I shut off pipe i and slip the carbons h underneath water-jacket c into compartment A, plugging up the spaces between them. Next I introduce salt or a proper mixture of salts through manhole j' and again turn on the heating-blast of pipe i. The salt or salts will melt rapidly and will run partly into the negative compartment B. After all the salt has been well molten I introduce another charge, heat the same, as described, and continue this operation until both compartments are filled up to about the lower level of the neck k'. The electric current being now turned on the decomposition of the salts will begin. I therefore open the flue j^2 to permit the escape of the gases to some place where the chlorin contained in them may be utilized. The alkali metal which is formed at the negative pole being lighter than the chlorids will rise to the surface and run out of the neck k' into a receiving vessel D. From time to time more salt is added at a ratio corresponding to that at which the salt in the bath is decomposed. This operation is continued until the work is to be stopped, when the current is turned off. The clay plug in tap-hole d^3 is then opened and the salt is allowed to run through gutter d^4 into a pot E. Finally the fuel-gas supply is stopped and the furnace is allowed to cool, when it may be cleaned and prepared for a fresh run.

If desired, solid fuel, such as charcoal, may be used in lieu of the fuel-gas, which is charged through manhole j' on top of the salt and is ignited. The air-blast is now turned on, while the fuel-gas remains turned off. After the first layer of salt is molten I introduce through the manhole alternate layers of salt and charcoal until the compartment A is filled up. When all the layers of salt are molten, the salt will all settle on the bottom, while the charcoal will float on top in a layer D, Fig. 2. The process is now the same as described with reference to the fuel-gas. When the apparatus is to be stopped, the compartment is filled with charcoal only and the heating is continued until substantially all the salt has been used up. The tap-hole is then opened and the remaining salt and ashes are removed.

The air-supply may be reduced after the apparatus has been fairly started. Thus the chlorin will not be diluted to a degree which would destoy its commercial value..

What I claim is—

1. In an apparatus for producing alkali metals, a double-walled jacket forming a positive compartment, means for passing a current of water through the jacket, anodes and independent means for generating heat within the compartment, a negative compartment, and a double-walled partition between the compartments and raised above the foundation of the apparatus to form a bottom passage between the compartments, substantially as specified.

2. In an apparatus for producing alkali metals, a double-walled jacket forming a positive compartment, means for passing a current of water through the jacket, anodes within such compartment, and an iron box open at one side and forming a negative compartment, said box communicating at its open side with the positive compartment, substantially as specified.

3. An apparatus for producing alkali metals composed of a double-walled jacket forming a positive compartment, means for passing a current of water through the jacket, anodes and independent means for generating heat within such compartment, an iron box forming a negative compartment that communicates with the positive compartment and has a top outlet, and electric connections for the anodes and iron box, substantially as specified.

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Witnesses:
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