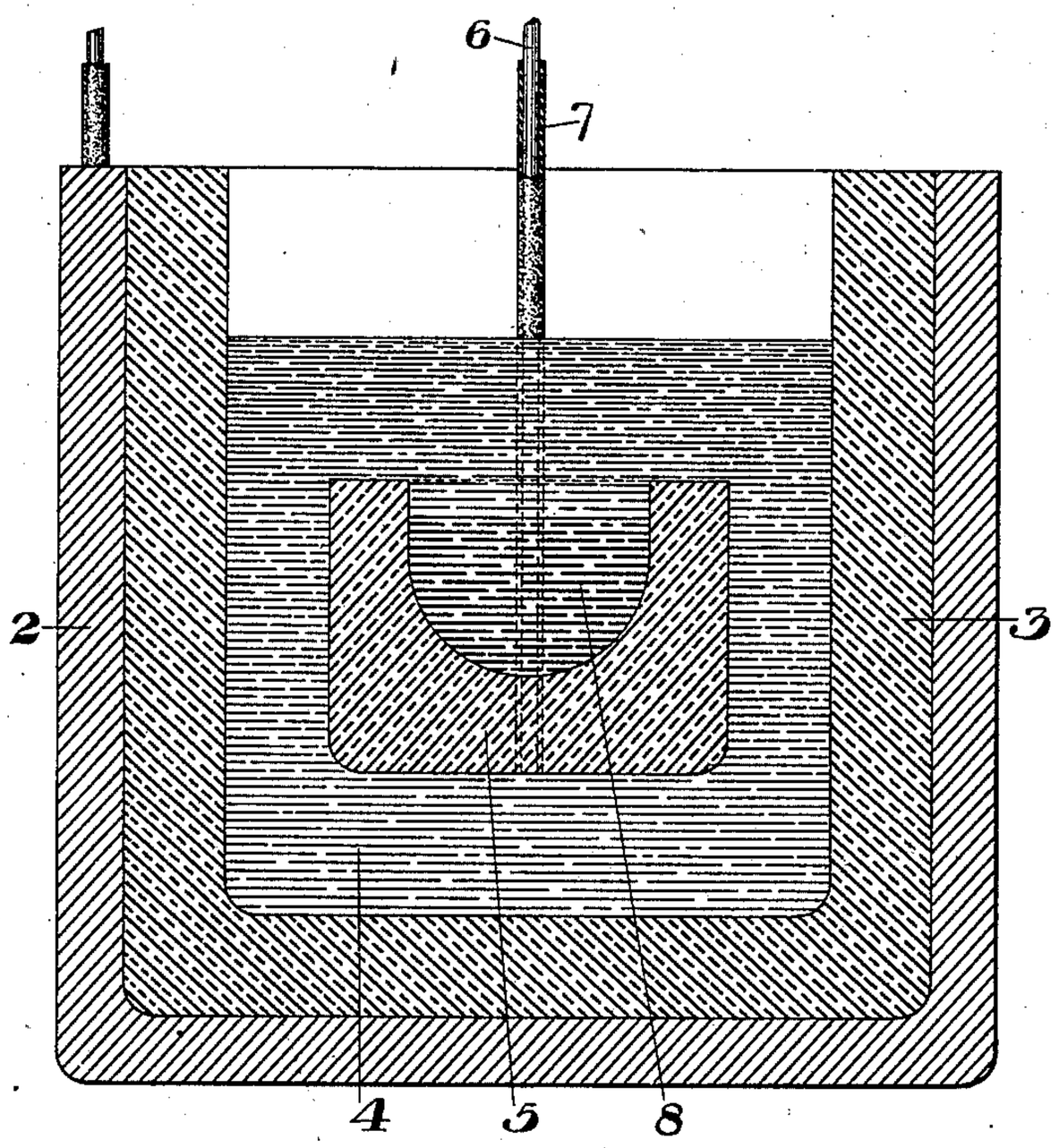
No. 673,364. Patented Apr. 30, 1901.

W. HOOPES.

PROCESS OF THE PURIFICATION OF ALUMINIUM.

(Application filed Sept. 1, 1900.)

(No Model.)



WITNESSES

Warren W. Swartz

H. M. Corwine

INVENTOR

William Hoopes

by Baldwin & Baldwin

his attys.

UNITED STATES PATENT OFFICE.

WILLIAM HOOPES, OF NEW KENSINGTON, PENNSYLVANIA, ASSIGNOR TO THE PITTSBURGH REDUCTION COMPANY, OF SAME PLACE.

PROCESS OF THE PURIFICATION OF ALUMINIUM.

SPECIFICATION forming part of Letters Patent No. 673,364, dated April 30, 1901.

Application filed September 1, 1900. Serial No. 28,815. (No specimens.)

To all whom it may concern:

Be it known that I, WILLIAM HOOPES, of New Kensington, in the county of Westmoreland and State of Pennsylvania, have invented a new Process for the Purification of Aluminium, of which the following is a specification.

I have discovered that if impure aluminium is used in a melted state as anode in an electrolytic cell, especially one in which the electrolyte contains fused aluminium fluorid and a fluorid of a metal more electropositive than aluminium, pure aluminium will be deposited at the cathode when current is passed through the cell. I attribute this to the fact that aluminium is the most readily oxidizable element present in the usual specimens of impure aluminium, so that when the current sets free aluminium at the cathode and fluorin at the anode, the aluminium having greater affinity for fluorin than have the usual impurities—silicon, iron, or copper—the aluminium of the anode will be attacked by the fluorin, while the impurities remain unaffected. If the aluminium anode should contain as impurity any metal—such as magnesium, sodium, or potassium—which has a greater affinity for fluorin than has aluminium, such metals, although they would be dissolved by the bath, would not be deposited at the cathode, since their fluorids are less easily decomposed by the electric current than is aluminium fluorid. They would merely cause some of the aluminium fluorid in the bath to be displaced by the fluorid of the metal dissolved. The effect, therefore, of using impure aluminium as the anode of the electrolytic cell is to deposit pure aluminium on the cathode, the impurities of the anode which have less affinity for fluorin than aluminium remain undissolved, and those that have a greater affinity for fluorin than has aluminium pass into and remain in the bath. A somewhat-similar action takes place when the bath contains alumina in solution, as in this case the aluminium anode will be attacked by the oxygen set free in advance of all impurities likely to be found excepting magnesium and calcium, and if these are present they will be dissolved by the oxygen and will remain in solution so long as any dissolved alumina is present. I have made these discoveries the basis of a process of purifying impure aluminium, and I will now describe the same with reference to the accompanying drawing, which shows in cross-section a form of apparatus in which my process may be practiced, although other forms of apparatus may be substituted.

In the drawing, 2 represents an electrolytic pot having a carbon lining 3, adapted to contain a molten bath 4 of double fluorid of aluminium and sodium. One or more fluorids of other metals more electropositive than aluminium may be substituted for the fluorid of sodium. A carbon tray or holder 5 is set in the pot and is connected to the positive terminal of the electric generator by a conductor 6, which is protected from the bath by a carbon tube or sheath 7 and which may serve as the support for the tray. The tray is charged with a body of impure aluminium 8 in a melted state, and a current having a density, preferably, of twenty to thirty amperes per square inch of the surface of the aluminium anode 8 is passed through the bath for several hours. It will be found that by such procedure the aluminium will be caused to deposit on the surface of the pot-lining 3, which is the cathode, and that the impurities will remain in the residuum of metal which remains in the suspended tray. Metal of great purity can thus be obtained at the cathode. Like results are obtainable when alumina is dissolved in the double-fluorid bath.

In my broader claims I do not restrict myself to the fluorid-bath described, as other molten baths may be used within the scope of my invention.

I claim—

1. The method herein described of purifying impure aluminium, which consists in passing an electric current from an anode composed of such impure aluminium in a melted state to a suitable cathode through a bath capable during electrolysis of dissolving the aluminium of the anode; substantially as described.

2. The method herein described of purify-

ing impure aluminium, which consists in passing an electric current from an anode composed of such impure aluminium in a melted state to a suitable cathode, through a bath containing fluorid of aluminium and the fluorid of a metal more electropositive than aluminium; substantially as described.

In testimony whereof I have hereunto set my hand.

WILLIAM HOOPES.

Witnesses:
F. E. GAITHER,
G. B. BLEMING.