April 14, 1925. 1,533,911

W. G. HARVEY

ELECTROLYTIC PRODUCTION OF MAGNESIUM

Filed Sept. 6, 1921

Fig. 1.

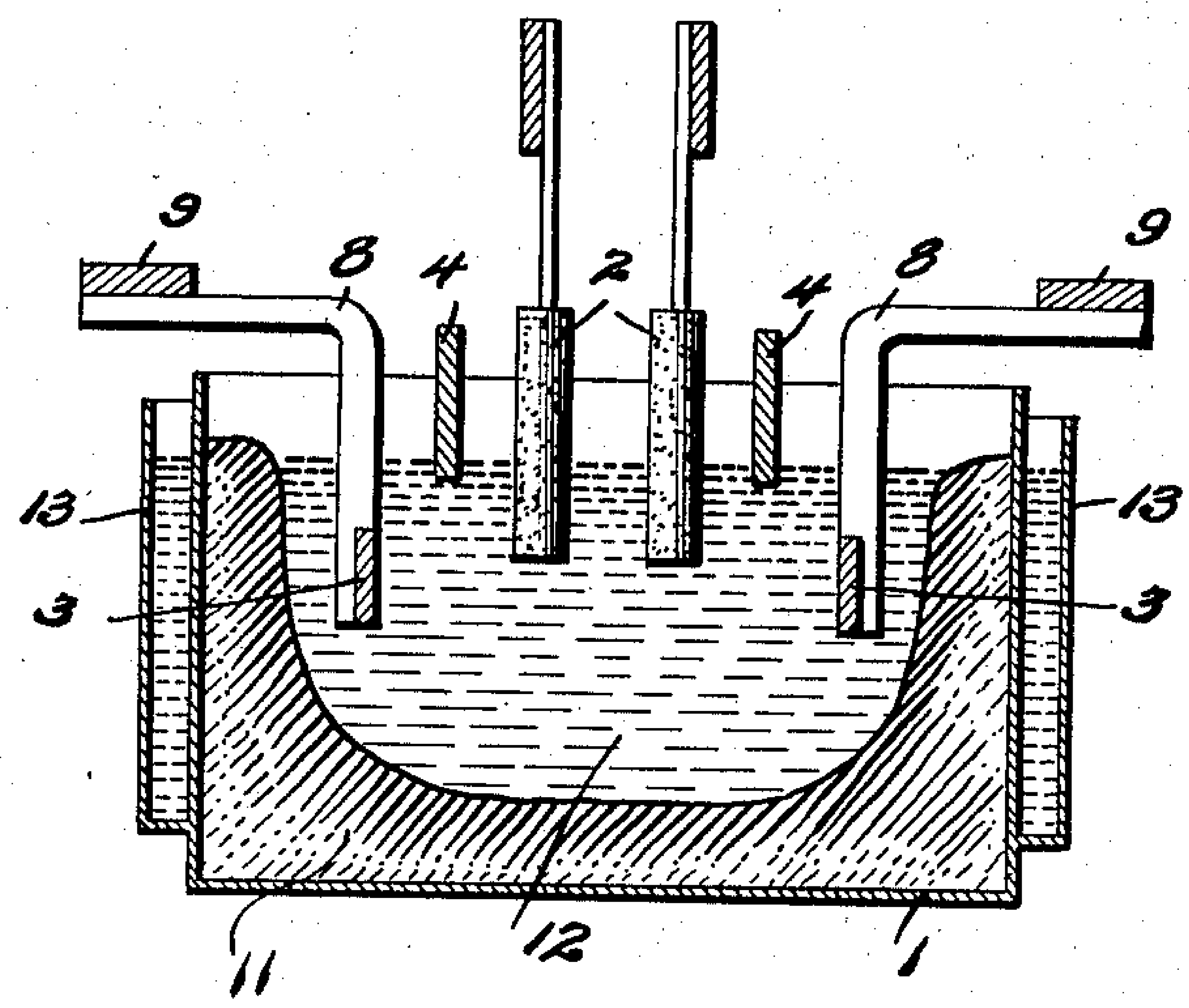
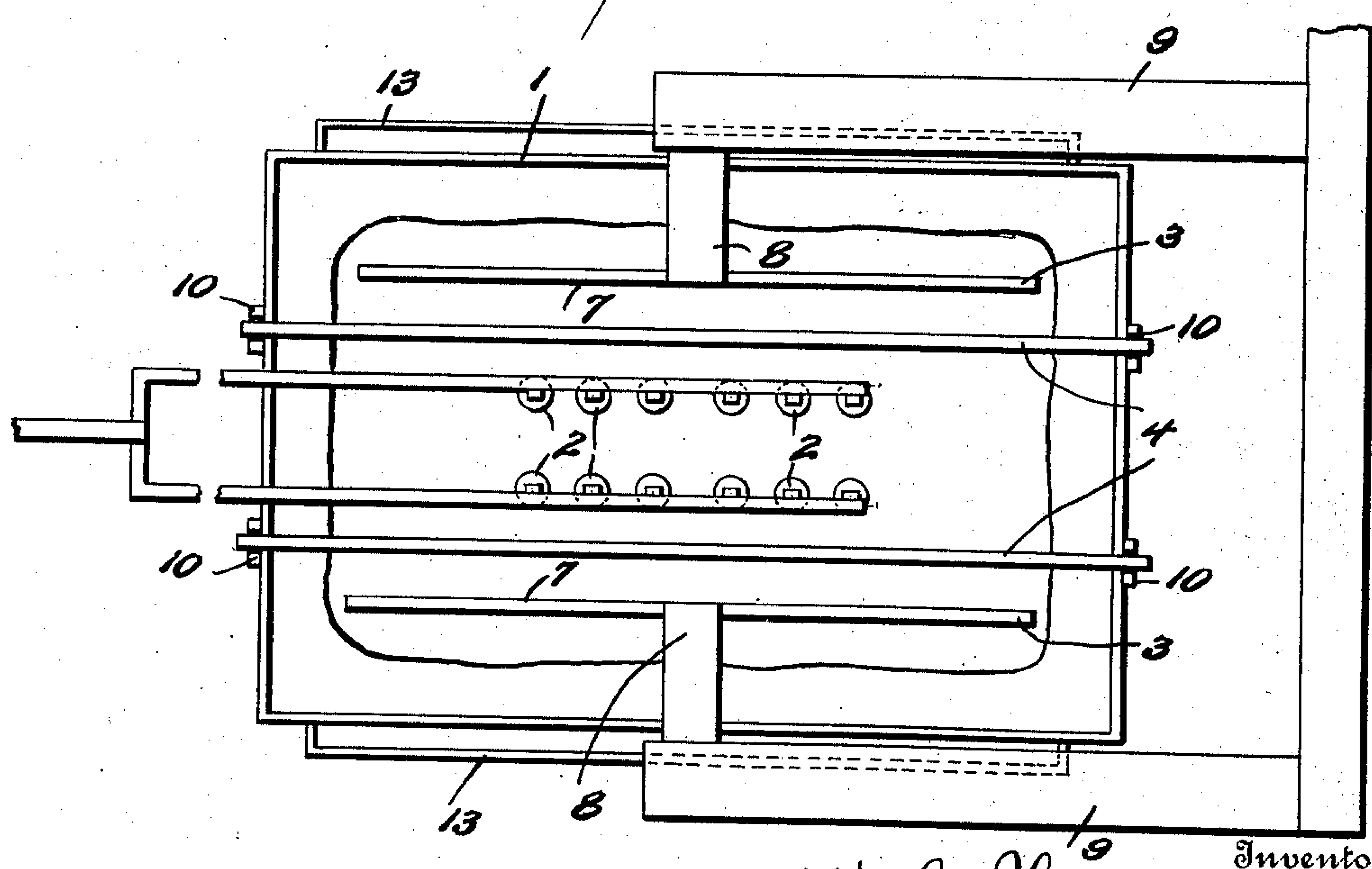


Fig. 2.



Inventor

W. G. Harvey

By John Boyle Jr.

Attorney

Patented Apr. 14, 1925. 1,533,911

UNITED STATES PATENT OFFICE.

WILLIAM G. HARVEY, OF NIAGARA FALLS, NEW YORK, ASSIGNOR TO AMERICAN MAGNESIUM CORPORATION, OF NIAGARA FALLS, NEW YORK, A CORPORATION OF NEW YORK.

ELECTROLYTIC PRODUCTION OF MAGNESIUM.

Application filed September 6, 1921. Serial No. 498,892.

To all whom it may concern:

Be it known that WILLIAM G. HARVEY, citizen of the United States, residing at Niagara Falls, in the county of Niagara and State of New York, has invented certain new and useful Improvements in Electrolytic Production of Magnesium, of which the following is a specification.

My invention relates to the electrolytic production of magnesium from its fused salts and particularly to the reduction of magnesium from its oxide substantially according to the process disclosed in the patent to Seward, 1,310,450, July 22, 1919. In this patent is disclosed a process for the electrolytic production of magnesium, in which there is employed a fused bath comprising fluorids of magnesium, barium and sodium carrying in suspension or solution, magnesium oxide. In order to replace the decomposed magnesium salts, a layer of magnesium oxide or magnesium carbonate is maintained upon the surface of the fused bath and floats thereon due to the higher specific gravity of the bath.

Among other features, the apparatus disclosed for carrying out this process utilizes a submerged solid metal cathode. The reduced magnesium first deposits on the cathode and on account of its specific gravity being less than the fused bath material, it rises to the surface where it is collected and removed from time to time.

In carrying out the process hereinabove specified temperature conditions are an important element in successful operation. In general, a low temperature is desirable from the standpoint of preventing volatilization and burning of the separated metal, and is also conducive to a larger production of magnesium, due to the lower vapor pressure of magnesium at such temperature.

In the cathode region, a low temperature is advantageous because it permits the metal to be skimmed off the bath with less inclusion of the bath composition, due to the fact that the latter becomes more viscous at lower temperatures, whereas the fluidity of the magnesium remains about the same as at the higher temperatures.

On the other hand, a high temperature in proximity to the anodes is in line with their natural requirements, as the bath must be kept very fluid in this region, thus making for rapid circulation around them and greater ease in freeing polarizing gases from them.

I have discovered therefore that if, instead of maintaining substantially uniform temperature in the zones of bath in proximity to the cathode and anode, the cathode zone of bath is maintained at a lower temperature than the anode zone, the advantages of the low and high temperatures hereinabove specified can be attained and without the disadvantages of either. The difference in temperatures between the two zones will be approximately 120 degrees C.

For securing this lower cathode zone of temperature various types of apparatus may be utilized.

The preferred type is that shown in the drawings in which—

Figure 1 is a transverse section of an electrolytic furnace; and

Figure 2 is a plan view of the same.

The furnace comprises a container 1 constructed of sheet iron or other suitable material, which may be of any desired length but transversely is only of such width as to provide suitable space for the carbon anodes 2, cast iron cathodes 3 and iron baffle plates 4. The cathodes are constructed to provide a longitudinal portion 7, connected to an elbow 8 which in turn is connected to the bus bar 9. On account of the high specific gravity of the bath, the cathode will have a tendency to float and does not require any special supporting means. The baffle plates 4, constructed of steel, are supported at their ends on the frames 10 attached to the end wall of the receptacle and dip into the bath sufficiently to separate the anode and cathode areas. The bath solidifies to a greater or less extent around the walls and upon the bottom as indicated at 11, the pool 12 remaining fluid under operating conditions.

Radiation through the walls of the receptacle will in part induce a lower temperature in the cathode zone. If this should prove insufficient, fluid cooling means such as the water pockets 13 may be applied to the walls of the receptacle to further lower the temperature.

It is not necessary that the cathode should be located on the outer side and it may be in the center with anodes on the outer side;

in this case, it would be necessary to provide special cooling means for the cathode.

I claim:

1. The method of electrodepositing magnesium from a molten fluorid bath utilizing a solid cathode, comprising maintaining the zone of bath in proximity to the cathode at a lower temperature than the zone of bath in proximity to the anode, whereby the cathode zone of bath is more viscous than the anode zone.

2. The method of electrodepositing magnesium from its fused salts, comprising passing an electric current through a molten bath containing magnesium fluorid and magnesium oxide, utilizing a solid cathode and maintaining the zone of bath in proximity to the cathode at a lower temperature than the zone of bath in proximity to the anode, whereby the cathode zone of bath is more viscous than the anode zone.

3. The method of electrodepositing magnesium from its fused salts, comprising passing an electric current through a molten bath containing magnesium fluorid and magnesium oxide, utilizing a solid cathode and maintaining the zone of bath in proximity to the cathode at a lower temperature than the zone of bath in proximity to the anode, whereby the cathode zone of bath is more viscous than the anode zone and withdrawing magnesium in the molten state from the upper portion of the bath.

4. The method of electrodepositing magnesium from its fused salts, comprising passing an electric current through a molten bath containing magnesium fluorid and magnesium oxide, utilizing a solid cathode and maintaining the temperature of the zone of bath in proximity to the cathode approximately 120 degrees C. lower than that of the zone of bath in proximity to the anode.

In testimony whereof I affix my signature.

WILLIAM G. HARVEY.