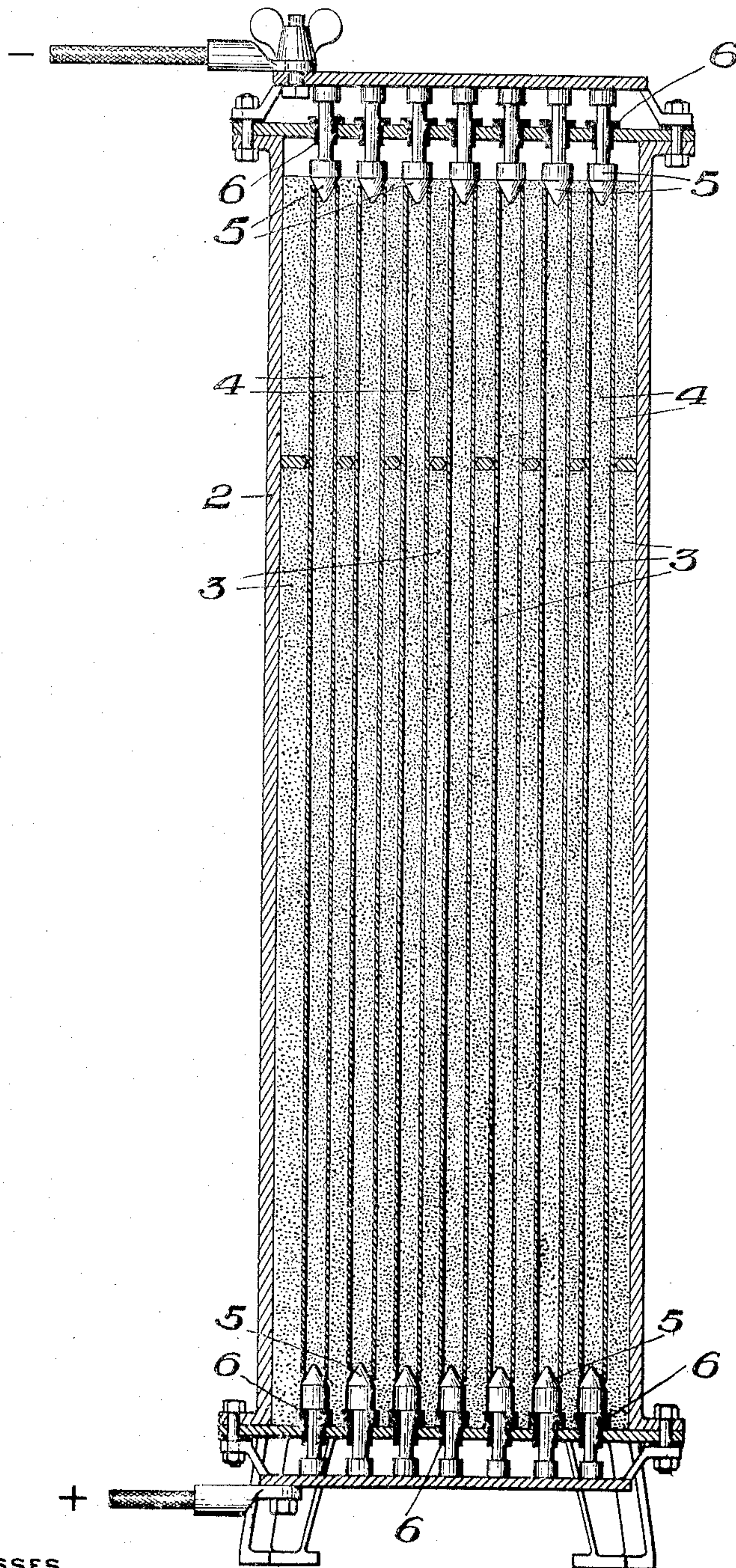


A. SANG.
METHOD OF COATING METALS BY CEMENTATION.
APPLICATION FILED JAN. 2, 1909.

948,663.

Patented Feb. 8, 1910.



WITNESSES

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Alfred Sang,
by Babcock, Byrnes & Carmichael,
his Atts.

UNITED STATES PATENT OFFICE.

ALFRED SANG, OF BELLEVUE, PENNSYLVANIA.

METHOD OF COATING METALS BY CEMENTATION.

948,663.

Specification of Letters Patent.

Patented Feb. 8, 1910.

Application filed January 2, 1909. Serial No. 470,369.

To all whom it may concern:

Be it known that I, ALFRED SANG, of Bellevue, Allegheny county, Pennsylvania, have invented a new and useful Method of
5 Coating Metals by Cementation, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming part of this specification, in which the figure is a longitudinal vertical section of one form of apparatus which may be used in carrying out
10 my invention.

My invention has relation to a method of coating metals with other metals, by cementation; and is designed to provide a
15 novel, simple and effective method of this character which will largely overcome the difficulties heretofore experienced in this class of work; which will effect a large saving of time and heat, and which will reduce
20 the danger of oxidation of the coating material.

The great drawback heretofore in coating metals by cementation has consisted in the
25 fact that the coating metals, which are either in the form of a salt of the metal, an oxid, or an oxidized powder, are non-conductors, of extremely poor conductors, of both heat and electricity. This has made it difficult
30 to get the heat through the coating metal and to get an even distribution of heat at all portions of the surface or surfaces to be coated, except after a considerable period of time. The results, even where rotating
35 drums and other means have been employed to facilitate the distribution of heat, have been very irregular. My improved method is designed to obviate these difficulties by overcoming the resistance of the coating
40 material to the passage of heat and by providing a simple and efficient method whereby a proper heating action may be obtained.

In accordance with my invention, I immerse or bury the article or articles to be
45 treated in the coating material, which is in the usual powdered form, and when an oxid, or oxidized dust is employed as the coating material a reducing agent, such as carbon, or better still, carbonic oxid gas is employed,
50 If some other compound of the metal is used, suitable reagents are added excepting when the heat alone will reduce the coating material to the proper condition. I then heat the article or articles by means of an
55 electric current. This may be accomplished

in the case of pipes, as shown in the accompanying drawing, in which the numeral 2 designates a retort of any suitable character, 3 the powdered coating metal or compound of the metals in which the article 4 to be
60 coated (such as an iron or steel pipe) is immersed or buried. The pipes 4 are supported at their ends by terminals 5, which may be of conical form, and which pass
65 through non-conducting heads 6, or non-conducting portions of the heads, of the retort, and which are connected with any suitable source of electric energy (not shown). The
70 article or articles may be quickly brought to the necessary temperature to bring about the decomposition of the coating material and the deposition of the coating metal upon the article. This temperature will be
75 substantially uniform throughout the extent of the article, thus insuring uniformity of result.

When a plurality of articles are to be simultaneously treated, they may be all buried or immersed in the coating material and
80 connected in multiple in the heating circuit. With articles which form good resistances, and therefore heat up readily, they may be connected in various ways, as by copper conductors of sufficient capacity to prevent undue heating thereof.
85

My invention is applicable to the coating of various articles with various coating metals, a specific instance being the coating of iron or steel articles with zinc, in which case
90 the zinc used is preferably in the form of powdered zinc oxid, or zinc dust, the articles being buried or immersed in the oxid or dust, with a reducing agent, and heated in the manner described. Where the coating
95 material is a straight metal, the deposition takes place without a reducing agent, but carbon may be added to prevent oxidation. Where, however, the coating material is oxidized, as zinc dust, antimony dust, precipitated copper dust, copper converter flue
100 dust, and the like, and with the oxids of these and other metals, a reducing agent should be employed. Various compounds of the metals may be used, with the addition of a suitable agent or agents for taking care of
105 the non-metallic elements. I may also use a combination of different metals which will either unite to form an alloy coating, or which will be separately deposited to form a compound coating. Thus, if copper dust
110

and zinc dust are employed, a brass coating will be deposited. In some cases, however, I have noted a separation, or partial separation of the zinc and copper in the coating, showing or tending to show a precipitation of copper by the zinc before the zinc is deposited. It will also be obvious that various forms of apparatus may be used to carry out the invention.

10 What I claim is:—

1. The method of coating metal with another metal or metals by cementation, which consists in burying or immersing the article to be coated in a metallic coating material, and passing an electric current through the article to heat it to a sufficient temperature to cause the deposition of the coating material thereon; substantially as described.

2. The method of coating metal with another metal or metals by cementation, which consists in burying or immersing the article to be coated in the metallic coating material, and heating the article by an electric current, in the presence of a reducing agent, to thereby effect a reduction of the coating metal and its deposition upon the surfaces

of the article to be coated; substantially as described.

3. The method of coating metals with another metal or metals by cementation, which consists in surrounding the article to be coated with the metallic coating material in finely divided form and with a reducing agent present, and then passing an electric current through the article as a resistance core to effect a reduction of the coating material and its deposition upon the surfaces of the article to be coated; substantially as described.

4. The method of coating metal with another metal or metals by cementation, which consists in bringing the metal surface of the article to be coated in contact with the metallic coating material, and then heating such article by passing an electric current therethrough; substantially as described.

In testimony whereof, I have hereunto set my hand.

ALFRED SANG.

Witnesses:

H. M. CORWIN,
GEO. H. PARMELEE.