No. 755,629. Patented March 29, 1904.

UNITED STATES PATENT OFFICE.

LEONARD D. DAVIS, OF ERIE, PENNSYLVANIA.

PROCESS OF ANNEALING STEEL.

SPECIFICATION forming part of Letters Patent No. 755,629, dated March 29, 1904.

Application filed July 5, 1901. Serial No. 67,228. (No model.)

To all whom it may concern:

Be it known that I, LEONARD D. DAVIS, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Processes of Annealing Steel; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a process of annealing steel; and it consists in certain improvements therein as will be hereinafter fully described, and pointed out in the claims.

Heretofore the process ordinarily used for annealing steel has been to heat the steel in an open furnace (where the steel is subjected to the action of heated gases) to a temperature ranging from 1,200° to 1,500° Fahrenheit, according to the nature of the steel. Great difficulty has been experienced with this method in getting an even heat to all parts of the steel, especially articles of large size and especially those of considerable length. This is particularly true in annealing tubing and shafting, which in the process of manufacture require annealing several times. With each annealing with the present method there is a considerable loss through scaling, and there is not only this loss, but this scaling interferes with the production of a smooth article, so much so that in many cases the metal requires pickling between the passes. I obviate largely all these difficulties by providing a molten-metal bath, in which the steel to be annealed is immersed. This bath is heated to a temperature of about 1,200° to 1,500° Fahrenheit, depending on the nature of the metal to be annealed, and maintained at that temperature. The steel to be annealed is immersed in this bath and of course immediately takes up enough heat to bring it to the temperature of the molten metal. I prefer using a metal which fuses at nearly the point it is desired to heat the steel—that is, a metal that fuses between 1,000° and 1,500°. I have found that aluminium answers the purpose better than any metal with which I have experimented, as the steel comes from it clearer than with most metals. It fuses at about the point that it is desired to heat the steel, so that the right temperature is kept if the aluminium is simply kept in a molten state. The loss of the metal when heated to a point slightly above its melting-point is comparatively slight, so that there is greater economy in the use of this metal than in any other metal known to me. It will be noted that as the steel is immersed in this metal during the heating the air is excluded from it, so that the oxidation or scaling is very largely obviated. This is of great importance, so much so that under present methods, where pickling to remove the scaling is objectionable because of the injury that it does to the metal, retort-annealing has been resorted to. This is an expensive method, and consists in heating the metal in a closed retort from which the oxygen has been largely excluded. In some cases the retort has been used without the exclusion of air; but of course the oxygen present is soon exhausted, so that the scaling is reduced over what it is in the usual or ordinary method. It will also be noted that with molten metal the temperature of one part of the mass is soon communicated to all parts of the mass, so that there is no difficulty in securing an even temperature to all parts of the molten mass. This assures an even heating of the steel being annealed in all parts. This it will be readily understood is a great advantage. I prefer using practically pure aluminium or alloys in which aluminium predominates. By using aluminium I accomplish a further result incident to the chemical action of aluminium on steel. Where the tubes are immersed in aluminium, not only is the air excluded, so that the formation of the scale is reduced to a minimum, but the action of the aluminium on steel tends to remove whatever scale may be formed.

What I claim as new is—

1. The process of annealing steel which consists in immersing steel in a bath of molten metal which fuses between 1,000° to 1,500° Fahrenheit and gradually cooling steel.

2. The process of annealing steel which consists of immersing it in a bath of molten metal

in which aluminium predominates and which is heated to a temperature of from 1,100° to 1,500° Fahrenheit and gradually cooling steel.

3. The process of annealing steel which consists in immersing steel in a bath of aluminium heated to a temperature of from 1,125° to 1,500° Fahrenheit and gradually cooling steel.

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

LEONARD D. DAVIS.

Witnesses:
JUSTIN P. SLOCUM,
H. Z. LORD.