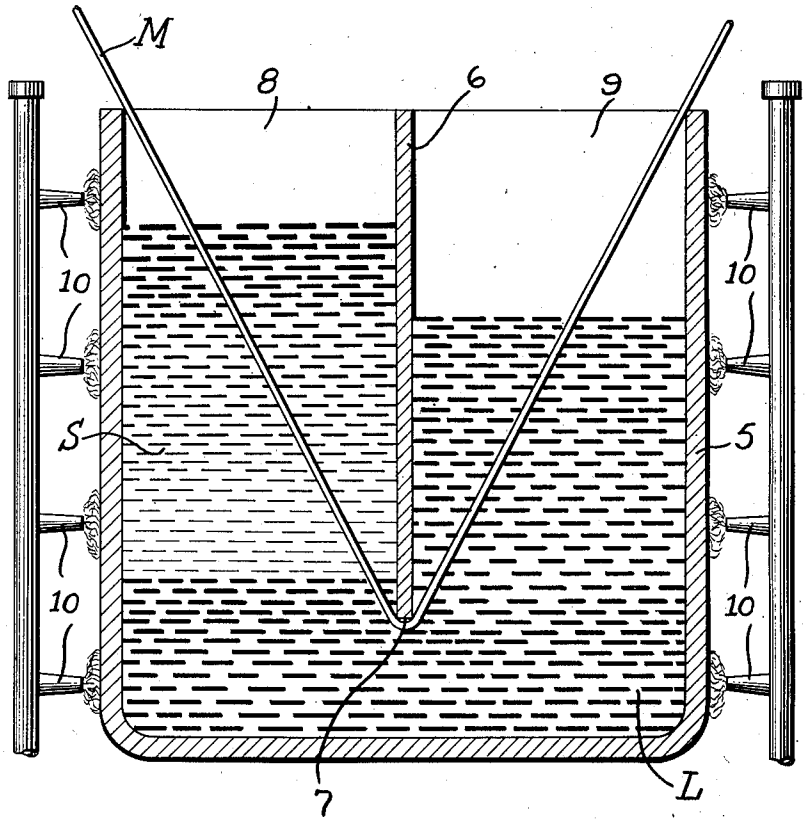
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PROCESS OF HEAT TREATING METALS

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PROCESS OF HEAT TREATING METALS

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This invention relates to an improved process of heat treating metals, and more particularly for annealing and other heat treatment operations where it is necessary to subject the metal to widely different heat temperatures. It has heretofore been the practice in the annealing of steel and other metals in wire or strip form to first pass the same through a heat treatment bath having a temperature of approximately 1500° F., to then remove the wire from said bath and immerse the same in a quenching bath contained in a second furnace or crucible and having a temperature of approximately 600° F. This operation not only results in loss of time in removing the metal wire from one bath to the other, but also frequently causes surface oxidation due to contact of the atmosphere with the highly heated metal wire during such transfer.

It is the primary object and purpose of my present invention to provide a process of annealing or otherwise heat-treating steel wire or other metals which will entirely obviate all possibility of an oxide coating forming on the surface of the wire and will also obviate the necessity of providing separate furnaces or crucibles to contain the annealing and quenching baths.

In the accompanying drawing I have illustrated more or less diagrammatically one typical furnace construction which can be utilized in carrying out the present process, said drawing representing a vertical section through the furnace. Referring to this drawing, it will be seen that the furnace includes a body 5, the side and base walls of which may be constructed of a suitable refractory material, said furnace body being preferably, though not necessarily, of rectangular form in plan and of requisite capacity. The interior of this furnace body is divided by a central vertical partition wall 6, said wall at its lower end 7 terminating in spaced relation to the bottom of the furnace body 5. Thus it will be seen that the partition wall provides two chambers or compartments 8 and 9 respectively, communicating at their lower ends with each other beneath said partition wall.

A series of gas or oil burners 10 of conventional form and construction may be arranged adjacent to each side of the furnace body exteriorly thereof for the purpose of maintaining the contents of the chambers 8 and 9 at a desired temperature.

In the operation of my improved process, a low temperature bath is first placed in the furnace, said bath being of relatively high specific gravity, and preferably consisting of molten lead. The level of this bath is appreciably above the lower end 7 of the partition wall 6 and extends into each of the chambers 8 and 9 of the furnace.

I next place in one of the furnace chambers, in the instance illustrated the chamber 8, a bath solution of metal salts which is of comparatively low specific gravity. This salt bath solution S may correspond to that fully described in Patent No. 1,491,510, dated April 22, 1924. As disclosed in said patent, I preferably use an eutectic mixture of two or more metal salts which is capable of being heated to a relatively high temperature without appreciable volatilization and is also of exceedingly low viscosity, thus providing for the rapid transmission of heat so that this salt bath which is superimposed upon the lead bath L may be rapidly heated throughout the body thereof to a uniform temperature. This salt bath solution being superimposed upon that portion of the lead bath L extending into the chamber 8, forces the molten lead bath upwardly in the other of the chambers 9, said metal salt bath and the molten lead bath S however, remaining at all times unamalgamated. By means of the burners illustrated or other suitable heating apparatus, the molten lead bath is maintained at a temperature of approximately 600° F., while the metal salt bath material contained in the chamber 8 and superimposed upon said lead bath is maintained at a temperature of approximately 1500° F. The lead bath being of a highly viscous character, does not absorb heat very rapidly and the major portion of said molten lead bath will remain at a relatively low temperature, though that portion thereof upon which the high temperature heating bath

is immediately superimposed may attain a somewhat greater temperature than 600° F.

In practical operation of the new process, the steel wire or other metal indicated at M is first drawn or passed downwardly through the bath of salt solution S so that it is heated to the temperature of the salt solution, namely, substantially 1500° F. and the desired physical transformation of the metal takes place. The metal is then drawn or passed under the partition wall 6 of the furnace and into and upwardly through the chamber 9 containing the bath of molten lead L. This bath being at a relatively low temperature, namely approximately 600° F. has a quenching effect upon the metal as it passed therethrough so that the temperature of the latter is rapidly reduced. It will, of course, be understood that the length of time the metal remains in contact with the two bath materials may be regulated and controlled as required by simply adding to the quantity of the bath materials contained in the chambers 8 and 9 respectively, until the level of the respective baths is at a desired point above the lower end of the furnace partition wall 6.

It will be readily seen that by means of the process above described, the metal is not withdrawn from the high temperature salt bath S and exposed to the atmosphere as has heretofore been the practice before immersion in the quenching bath, but the metal is directly drawn or passed from the high temperature salt bath into and through the low temperature quenching bath. Thus possible oxidation of the surface of the metal is avoided and there will be a minimum loss of the high temperature salt solution. It will further be appreciated that by means of my present process, I dispense with substantially one-half of the equipment heretofore necessary in the annealing of such metals, since I use only a single furnace for both the high and low temperature baths instead of two separate furnaces as required in the operation of the prior arts methods and processes.

I have above made reference to a particular kind of low temperature bath solution, which I have found very desirable in actual practice. Insofar as the essential features of my present improvement are concerned, however, it is apparent that other high temperature baths of relatively low specific gravity might be employed, and it is likewise possible to utilize furnace structures specifically different from that which I have illustrated in the accompanying drawing. In other words, my present improvements are to be broadly comprehended as consisting in a process of this character wherein high and low temperature baths of relatively different specific gravity are employed and in which the low specific gravity bath is directly superimposed upon the bath of high specific gravity. Accordingly, it is to be understood that in actual practice I reserve the privilege of resorting to all such legitimate changes as may be fairly embodied within the spirit and scope of the invention as claimed.

I claim:

1. A process of heat treating metals which consists in providing a low temperature lead bath, superimposing upon part of said lead bath a fused salt bath of relatively low specific gravity and maintaining said fused salt bath at a comparatively high temperature, and then passing the metal to be treated downwardly through said fused salt bath directly into and upwardly through the lead bath before exposing the metal to the atmosphere.

2. A process of heat treating metals which consists in maintaining a low temperature lead bath at its low temperature, maintaining a fused salt bath of a comparatively higher temperature at its higher temperature, while said baths are superposed on each other, and in contact with each other, the fused salt bath being above the lead bath and over part thereof, and then passing the metal to be treated downwardly through said fused salt bath directly into and through the contacting lead bath and upwardly thereof without exposing the metal to the atmosphere, until after the metal passes out of the lead bath.

3. A process of heat treating metals which consists in maintaining a low temperature lead bath at a temperature approximately 600° F., maintaining a fused salt bath of a comparatively higher temperature at a temperature of approximately 1500° F., while said baths are superimposed on each other and in contact with each other, the fused salt bath and over part thereof being above the lead bath, and then passing the metal to be treated downwardly through the fused salt bath directly into and through the contacting lead bath and upwardly thereof without exposing the metal to the atmosphere until after the metal passes out of the lead bath.

In testimony that I claim the foregoing as my invention, I have signed my name hereto.

ARTHUR E. BELLIS.