Feb. 25, 1930. W. R. SMITH 1,748,851

APPARATUS FOR APPLYING SOFT METAL LININGS TO HARD METAL TUBES

Filed Jan. 4, 1929

Fig. 1.

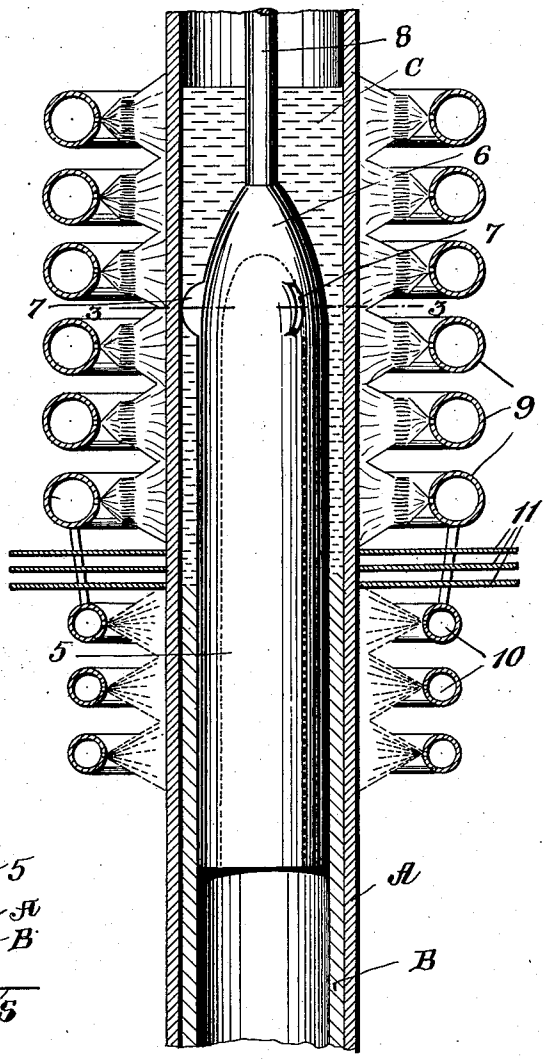
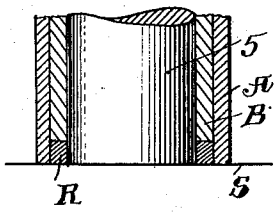


Fig. 3.



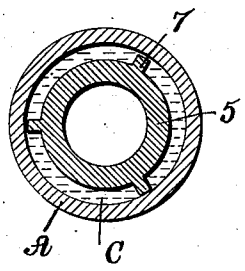


Fig. 2

INVENTOR
Warren R. Smith
BY
Munn & Co.
ATTORNEY

Patented Feb. 25, 1930 1,748,851

UNITED STATES PATENT OFFICE

WARREN R. SMITH, OF RIDGEWOOD, NEW JERSEY, ASSIGNOR TO CHEMICAL EQUIPMENT MANUFACTURING COMPANY, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY

APPARATUS FOR APPLYING SOFT-METAL LININGS TO HARD-METAL TUBES

Application filed January 4, 1929. Serial No. 330,384.

This invention relates to the art of metal lining, and refers more particularly to an improved method of and apparatus for applying a soft metal lining, such as lead, to a hard metal tube or the like, the same being similar to a method and apparatus set forth in copending application Serial No. 304,600, which was particularly designed for applying a coating to an article whether of tubular or solid formation.

The present invention comprehends an improved method of applying a soft metal lining to a hard metal tube which broadly consists in subjecting the interior of the tube progressively to a confined bath of the lining substance while the bath is initially subjected to a heating action and subsequently to a cooling action so that the bath is gradually decreased in temperature until the same finally solidifies and adheres to the interior of the tube to form the lining.

The invention further contemplates a method of and an apparatus for the purpose specified by virtue of which the lining operation is continuous and hence more rapid for the purpose of effecting a saving in time and labor and a resultant economy in the production of the lined tube.

The invention further embodies an apparatus for and a method of applying a soft metal lining to a hard metal tube or the like which necessitates no finishing operation for obtaining a uniformity and smoothness of the surface of the lining.

Other features of the invention reside in the provision of an apparatus for facilitating the application of a soft metal lining to a hard metal tube or the like, which apparatus is extremely simple in its construction and mode of use, inexpensive to manufacture, install and maintain and which is highly efficient in its purpose.

With the above recited and other objects in view, reference is had to the following description and accompanying drawings, in which there is exhibited one example or embodiment of the invention, while the claims define the actual scope of the same.

In the drawings:

Figure 1 is a sectional view through an apparatus constructed in accordance with the invention and illustrating the lining operation.

Figure 2 is a cross sectional view therethrough taken approximately on the line indicated at 2—2 in Figure 1.

Figure 3 is a fragmentary sectional view illustrating the manner in which the lining operation is started.

Referring to the drawings by characters of reference, and more particularly to the apparatus employed, a core member 5 having a reduced nose 6 at its meeting end is provided, which core member for the major portion of its length conforms substantially to the cross sectional configuration of tube A to be lined. The core member is of a reduced diameter or cross sectional area with respect to the tube A, the reduction in size being determined by the thickness of the lining B which it is desired to apply to the tube A. At or adjacent the juncture of the leading end or nose 6 with the remainder of the core 5, a plurality of radial outwardly projecting guide lugs 7 are provided which are designed to engage with the bore of the tube A for the purpose of centering the core and guiding the same concentrically through the tube A. Suitable means is connected with the nose 6 and leads therefrom through the tube A for the purpose of advancing the core axially through the tube or for the purpose of holding the core stationary while the tube is relatively moved with respect to the core. Said means may be in the form of a stem 8 or its equivalent. In order to provide means for heating the lining substance C to maintain in a molten state that portion of the same which surrounds the nose 6, the stem 8 and a given length of the core 5 from the nose towards its rear or following end, a burner or battery of burners 9 is employed, which surround the tube at a section coincident with said portions. In order to provide means for cooling the coating substance adjacent the rear or following end of the core 5, a cooling element or elements 10 surround the tube A adjacent the following portion of the core for directing radially inward the jets of cooling fluid. In practice, the

heating and cooling mediums are separated and insulated from each other by annular cooling flanges 11.

In operation, the core 5 and the tube A may be initially positioned upright on a supporting surface S and a spacing ring R surrounding the core may be used to center the lower end, as illustrated in Figure 3. The lining substance C in a molten state is then introduced to the upper end of the tube to the necessary amount for the lining operation, it being understood that the inner surface or bore of the tube has been previously prepared or treated with a substance which will cause the lining material to adhere thereto. After the required time for the cooling element or elements 10 to cause the coating substance to adhere to the inner surface of the tube adjacent the rear or following portion of the core, the core and the heating and cooling elements are advanced simultaneously upwardly and progressively so that the lower end of the bath has its temperature gradually reduced to cause the lining substance to solidify onto the inner surface of the tube A. By advancing the core and heating and cooling elements at a defined rate of speed, the lining will be applied uniformly and evenly throughout the entire length of the tube so that no finishing operation will be required.

From the foregoing, it will be seen that the method employed consists essentially in subjecting the interior of the tube progressively to a confined bath of lining substance while the bath is initially subjected to a heating action to maintain the same in a molten state and subsequently to a cooling action to cause the same to solidify while confined between the core and the inner surface of the tube. While the core and heating and cooling elements are described as being moved relatively to the tube, it is obvious that within the scope of the invention the tube may be moved relatively with respect to the core and heating and cooling elements.

From the foregoing, it will thus be seen that an apparatus and method have been devised for facilitating the application of a soft metal lining, such as lead, to hard metal or steel tubes or the like, by virtue of which the lining operation is continuous and the lining which is produced uniform, without the necessity of subsequent finishing operations.

What is claimed is:

1. An apparatus for applying a soft metal lining to a hard metal tube comprising a core of less cross sectional area than and of the same cross sectional configuration as the tube, which core and tube are adapted for relative axial movement, means for progressively effecting the heating and the cooling of the tube exteriorly coincident with the leading and following portions of the core, said core having a reduced nose at its leading end and means at the juncture of the reduced leading end with the remainder of the core for centering the core on the tube.

2. An apparatus for applying a soft metal lining to a hard metal tube comprising a core of less cross sectional area than and of the same cross sectional configuration as the tube, which core and tube are adapted for relative axial movement, means for progressively effecting the heating and the cooling of the tube exteriorly coincident with the leading and following portions of the core, said core having a reduced nose at its meeting end and means at the juncture of the reduced meeting end with the remainder of the core for centering the core on the tube, said means consisting of a plurality of circumferentially spaced radially projecting lugs engageable with the bore of the tube.

WARREN R. SMITH.