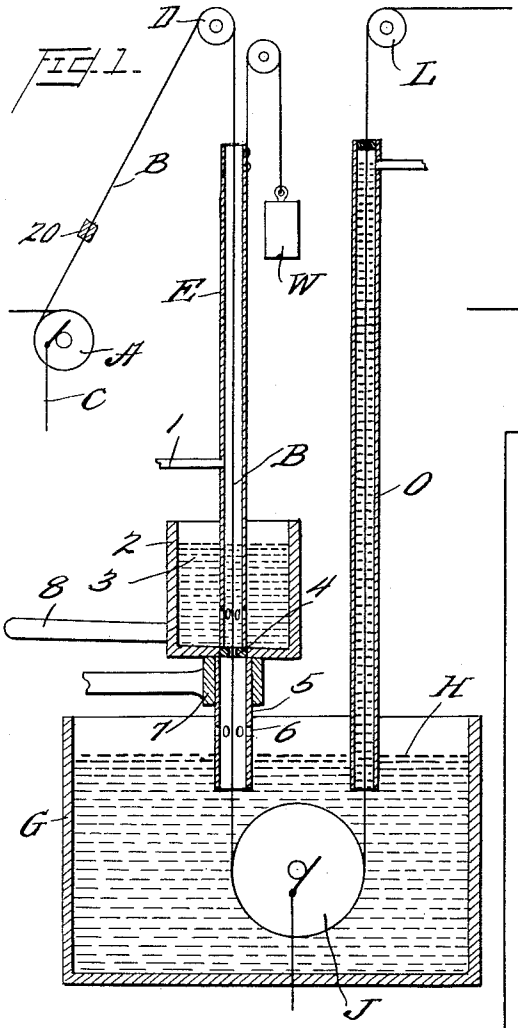
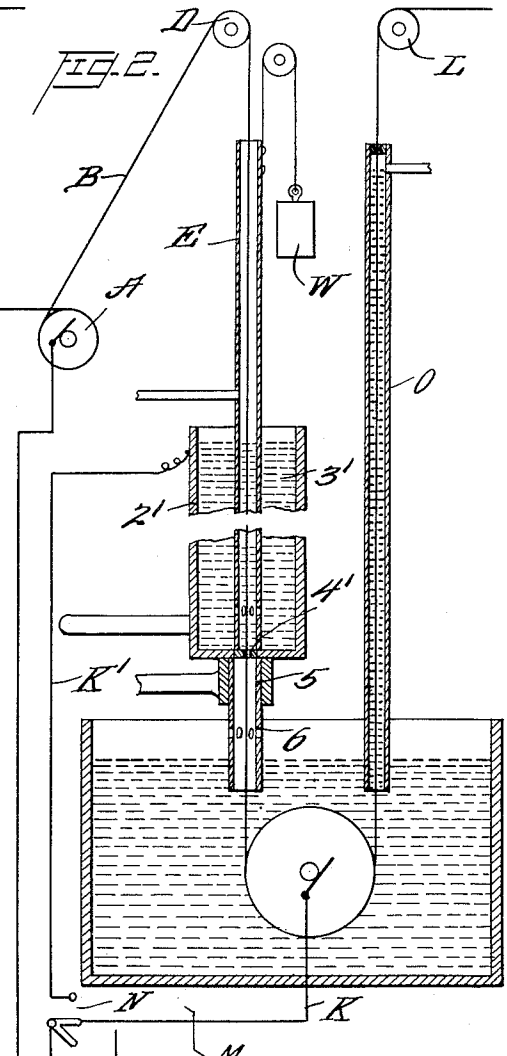
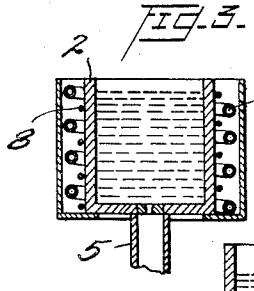
June 1, 1943. J. COOK 2,320,412

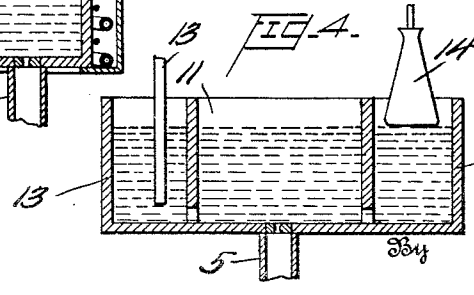
APPARATUS FOR ANNEALING AND COATING WIRE

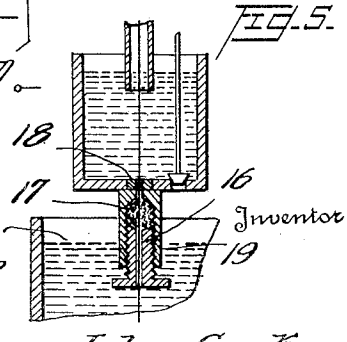
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Inventor

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By Parker & Cook, Attorneys

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APPARATUS FOR ANNEALING AND COATING WIRE

John Cook, Ridgewood, N. J.

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7 Claims. (Cl. 205—16)

This invention relates to the annealing and metal-coating of a moving wire.

An object of the invention is to provide an apparatus for continuously annealing and metal-coating of a moving wire.

A further object of the invention is to provide a continuous annealing and tinning equipment whereby the heat utilized in annealing the wire is also made use of to keep the tin in a molten condition.

A further object is to provide an apparatus to be used in conjunction with a wire-drawing machine, so that as the wire is received from the wire-drawing machine, it is electrically heated and annealed, and while still in the heated condition passes through a body of molten tin so as to tin the wire, and a protecting atmosphere keeps the wire from oxidizing and also prepares it or fluxes it for the reception and adherence of the tin coating.

A further object is to provide an apparatus whereby the molten tin acts as a bath to reduce the temperature of the wire before it engages the tin wipe so that the wire will have the additional strength corresponding to the lower temperature and thereby allow a high degree of annealing to take place.

A further object is to provide certain additional features, such as maintaining the tin at a desired temperature, either heating or cooling the same as may be necessary.

A further object is to provide means for introducing tin at a rate approximately commensurate with the amount of tin being used.

A further object is to provide means whereby the amount of tin or metal applied to the wire may be accurately regulated.

A still further object of the invention is to provide for the application of a liquid flux and cleaning agent for the wire, so that a smooth and continuous coating of tin or other metal will be obtained.

Other objects will hereinafter appear.

Referring to the drawing,

Fig. 1 is a plan or diagrammatic view of the annealing and tinning apparatus;

Fig. 2 is a similar view with an elongated tinning pot so that the wire may be reduced in temperature by means of the tin bath;

Fig. 3 is a detail view of the tin pot, which is provided with electric coils and water coils;

Fig. 4 is a detail view of the tin pot having means for providing the fluxing gases and also for the feeding of the bar tin; and

Fig. 5 is a detail view of a mechanism for wiping and polishing the tin coating.

Referring now particularly to the drawing, the final capstan of a wire-drawing machine is indicated at A and has a source of electricity connected thereto, as indicated by C. The wire B, after passing up over a raised sheave wheel D, passes down through a protecting sleeve and tin pot, to be hereinafter described, and around the lower contact pulley J.

The pulley J is housed within a water-containing tank G and the wire, after passing around the contact pulley J, passes up through a cooling tube O and out around an upper sheave wheel L.

This construction is identical with that described in my former Patent Number 2,176,583, of October 17, 1939, for Annealing apparatus, and illustrated in detail therein in Fig. 2 of said patent.

In order that the highly heated portions of the wire between the pulleys J and D will be protected from the atmosphere, an elongated pipe or sleeve E is provided, adjacent the lower end of which is supplied an inlet pipe 1, this inlet pipe being for the purpose of introducing a protecting atmosphere within the tube and which protecting atmosphere may also contain a fluxing agent so as to prepare the wire for the reception of the tin or other molten metal.

A pot 2 slightly larger than the sleeve receives the lower end of the sleeve therein and which pot contains the molten tin 3. The tin pot 2 is in the form of an open-ended vessel and is provided in its bottom wall with a die 4, through which the wire B passes. The die is made approximately the size of the wire, so that the tin will not leak through the die and pass the same.

The exact size of this die will be more fully hereinafter described.

The bottom wall of the tin pot 2 is provided with a downwardly extending sleeve 5, through which the wire passes and is protected from the atmosphere thereby.

The lower end of the sleeve 5 extends into the tank of water G and below the water level H thereof. The sleeve 5 is also provided with several small holes 6, so that as the hot wire is quenched by the water, the resultant steam will pass out through the openings 6 and which steam will also prevent the entrance of the atmosphere which has a tendency to tarnish the tin while in its highly heated condition.

A bracket or clamp 7 surrounds the sleeve 5 and acts as a support for the tin pot, which

latter, however, may be readily removed by means of the handle 8.

In some instances, I find it desirable to have the die 4 equal in size or slightly larger than the diameter of the wire so as to prevent undue tension on the highly heated wire, as the wire has not cooled until after it has been immersed in the water in the tank G. It will be recognized that the wire and the coating thereon form the total thickness of what may be considered the finished wire. The die reduces the diameter of the wire and wipes off surplus coating until the diameter of the coated wire is that desired.

There are other times when a die equal in size or slightly larger than the wire will apply too much tin to the wire, and in those instances, I provide an elongated tin pot 2', as illustrated in Fig. 2. In this design, I also provide, in addition to the electric conductor K, which leads to the lower pulley or sheave J, a second electric conductor K', which leads directly to the tin pot 2'. The two conductors K and K' are selectively connected to an electric source R by a switch N which has two blades which are connected together and can occupy the various positions illustrated in the lower portion M of Fig. 2. By means of this switch, the annealing current can be switched from the sheave J to the tin pot 2', so that no heating current can be applied to the wire after it has reached the surface of the molten tin 3'. The molten tin 3' in Fig. 2 is maintained at a lower temperature than the incoming and highly heated wire, so that the wire will be reduced in temperature before it reaches the die 4', and the wire will accordingly have considerably increased tensile strength, and with this increased tensile strength.

In this regard, I wish to call attention to the fact that the tin acts as a lubricating agent and very materially aids in the reduction of the size of the wire by the die 4'. Also, I have found that the thickness of the coating of tin is a function of the reduction of the wire by the die 4, and further that this reduction of the wire takes place without the hardening of the wire as the wire is already at the annealing temperature.

In order that the tin pots, illustrated in Figs. 2 and 3, may be readily accessible, even while the apparatus is running, the sleeve or pipe E is adapted to be raised and lowered and held in such position by the counterbalancing weight W.

In order that the tin in the tin pot 2 and also particularly in the tin pot 2' may be maintained at the desired temperature, the tin pot is preferably constructed as illustrated in detail in Fig. 3, which shows the tin pot surrounded by an electrical heating coil 8 and also by a water-cooling coil 9, so that the tin pot may be either heated or cooled as may be desired, depending on the size of the wire and the speed at which it is run.

Normally I find that the temperature of the wire is more than sufficient to keep the tin in a molten condition.

Referring particularly to Fig. 4, it shows an elaborated form of tin pot, the main portion of the pot 11 being provided with the two outstanding chambers 12 and 13. The chamber 12, which communicates with the main portion 11, is utilized to heat a retort 14, which contains a liquid, the gases of which will act as a protecting atmosphere for the wire and also as a fluxing agent.

The outstanding chamber 13 is arranged to receive the bar or stick tin 15, the number of sticks and size thereof being regulated so that they melt to approximately equal the consumption of tin in the main chamber 11 and the level of the tin will be more or less maintained constant.

In Fig. 5, I have illustrated a packing gland 16, which is adapted to contain an asbestos wipe 17, which acts to wipe the excess tin off the wire and without imposing undue tension on the wire. This asbestos wipe may also be used in conjunction with the die 18, in which case the wipe 17 acts in the nature of a polisher.

The packing gland 16 includes the tube 19, which extends down below the water level H as in the previously-described constructions.

It is to be understood from the foregoing that wherever the word "tin" has been used, other metallic coatings are understood to be included, such as hot galvanizing, for example.

At times I find it desirable to apply a liquid fluxing agent to the relatively cool portion of the wire, and to this end, I have provided the sponge or wipe, as shown at 20 in Fig. 1. A suitable fluxing agent would be hydrochloric acid, although other agents may be used.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An apparatus of the class described comprising an initial contact wheel, a final contact wheel, a source of electric current the terminals of which are connected to the respective wheels, a protecting tube intermediate said contact wheels, and a pot containing a molten bath of metal receiving the lower end of said tube therein, means for supplying a protecting and fluxing atmosphere for said tube, and a water bath surrounding the final contact wheel.

2. An apparatus for the continuous annealing and metal-coating of a moving wire comprising means for heating said wire by conducting an electric current through said wire, a protecting tube surrounding the highly heated portions of said wire, the lower end of said tube provided with a bath of molten metal through which the wire passes, and means for cooling said bath of molten metal.

3. An apparatus for the continuous annealing and metal-coating of a moving wire comprising means for heating said wire by conducting an electric current through said wire, a protecting tube surrounding the highly heated portions of said wire, the lower end of said tube provided with a bath of molten metal through which the wire passes, and a die reducing the diameter of the coating on said wire to thereby control thickness of the metal coating thereon.

4. Apparatus for the continuous annealing and metal-coating of a moving wire comprising the final capstan of a wire drawing machine over which a wire passes, of means to conduct electric current to said final capstan, a protecting sleeve through which the wire passes, a bath of molten metal into which the lower end of the protecting sleeve extends and formed with a passage through which the wire leaves the bath, a die in said passage to control the size of the coated wire, a quenching tank, a vented sleeve between the die and the liquid in the quenching tank through which the wire passes, a pulley over which the wire passes and means to conduct electric current from said pulley.

5. Apparatus for the continuous annealing and metal-coating of a moving wire comprising the combination with the final capstan of a wire drawing machine over which a wire passes, of means to heat the wire, a protecting sleeve

through which the wire passes, a bath of molten metal into which the lower end of the protecting sleeve extends and formed with a passage through which the wire leaves the bath, a die in said passage to control the size of the coated wire and a quenching tank.

6. Apparatus for the continuous annealing and metal-coating of a moving wire comprising the combination with the final capstan of a wire drawing machine over which a wire passes, of means to conduct electric current to said final capstan, a protecting sleeve through which the wire passes, means to conduct a protective and fluxing atmosphere through the sleeve, a bath of molten metal into which the lower end of the protecting sleeve extends and formed with a passage through which the wire leaves the bath, a die in said passage to control the quantity of molten metal on the wire, a quenching tank, a vented sleeve between the die and the liquid in the quenching tank through which the wire passes, a pulley in the tank over which the wire passes after leaving the sleeve and disposed in the quenching tank and a cooling tube through which the wire passes from the quenching tank.

7. Apparatus for the continuous annealing and metal-coating of a moving wire comprising the combination with the final capstan of a wire drawing machine over which a wire passes, of a protecting sleeve through which the wire passes, a bath of molten metal into which the lower end of the protecting sleeve extends and formed with a passage through which the wire leaves the bath, a die in said passage to control the size of the coated wire, a quenching tank, a pulley over which the wire passes after leaving the die, means to selectively conduct electric current to the final capstan and the bath of molten metal and means to conduct current from the pulley in the tank.

JOHN COOK.