

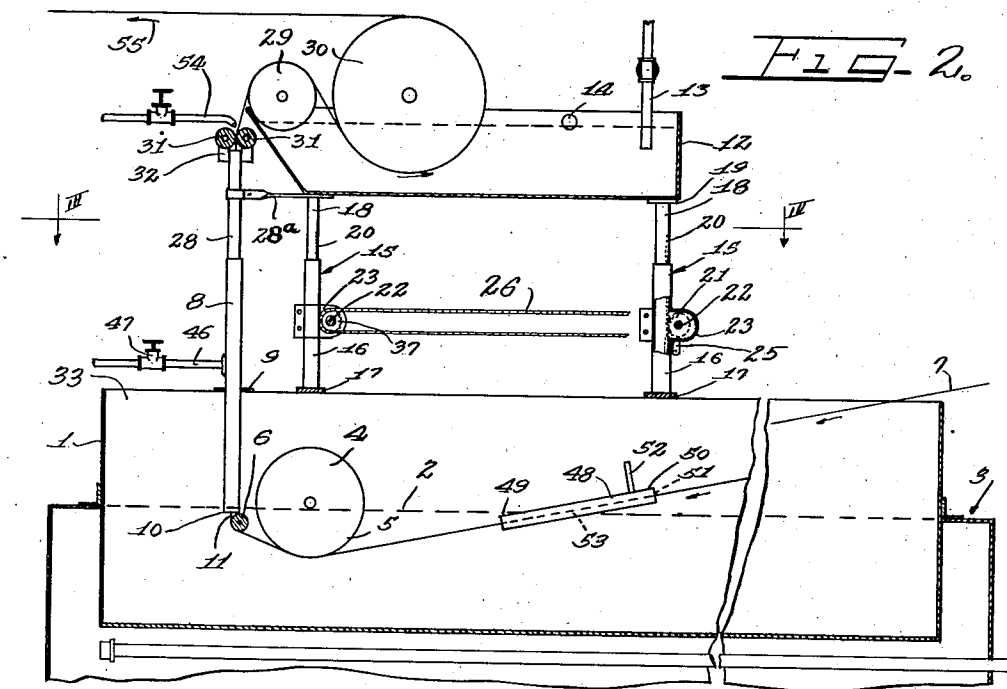
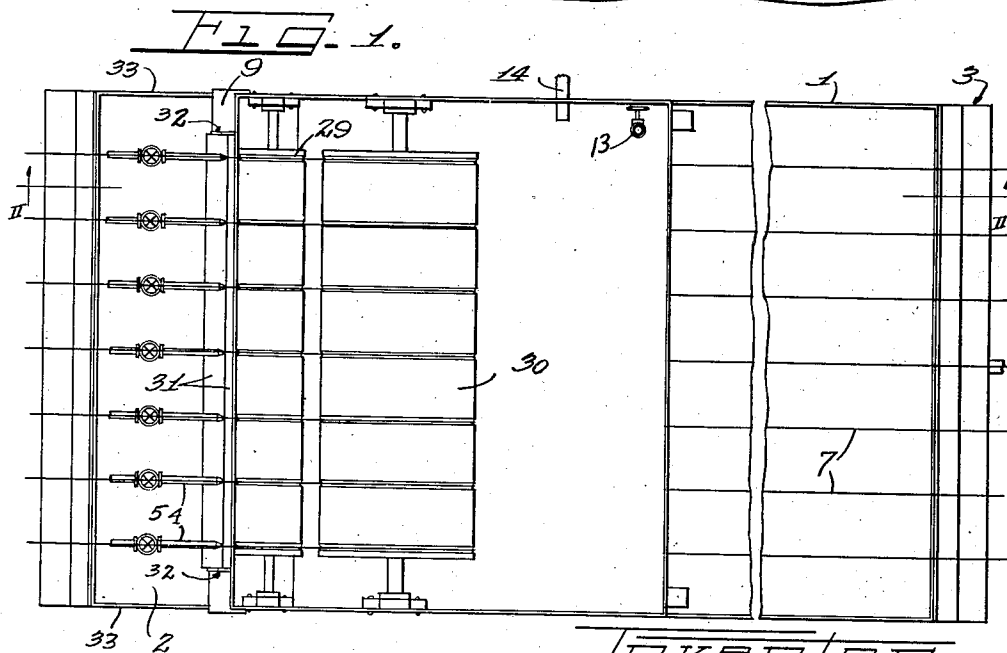
Aug. 13, 1935.

A. F. BRADLEY
GALVANIZING APPARATUS

2,010,941

Filed Dec. 27, 1932

2 Sheets-Sheet 1



INVENTOR
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Aug. 13, 1935.

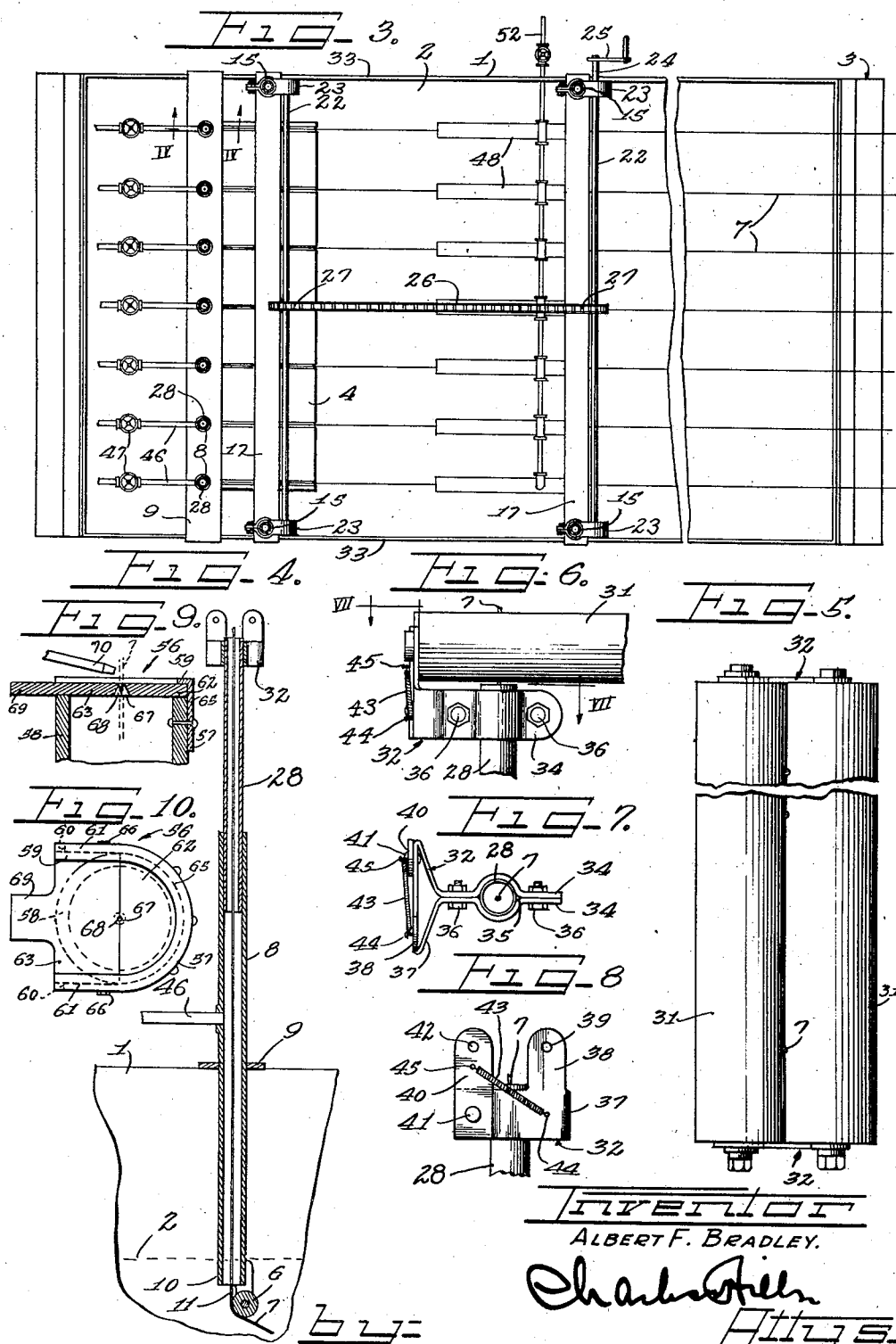
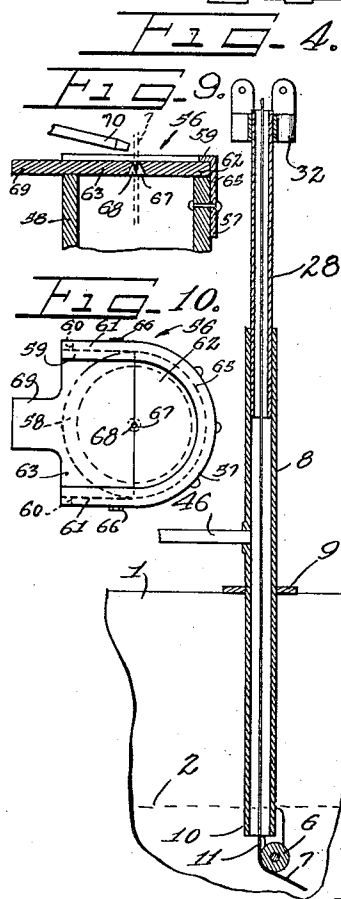
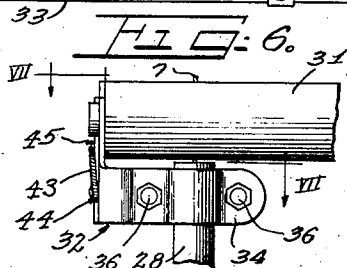
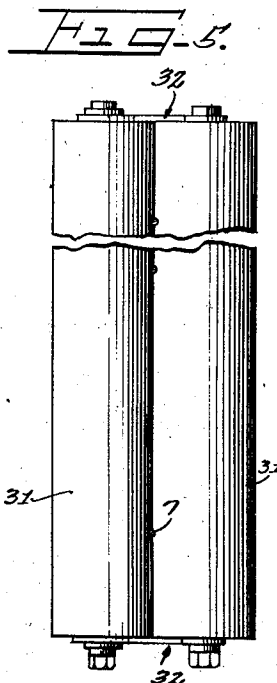
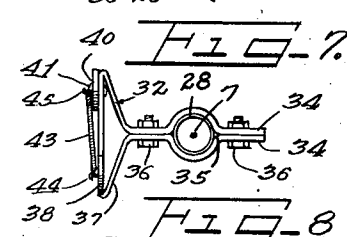
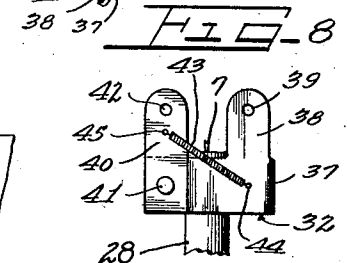
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2 Sheets-Sheet 2



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2,010,941

GALVANIZING APPARATUS

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Application December 27, 1932, Serial No. 648,918

6 Claims. (Cl. 91—12.5)

This invention has to do with the art of galvanizing and refers more particularly to an apparatus and method for galvanizing wire.

In galvanizing wire in accordance with methods heretofore in vogue, the wire passes from a suitable source of supply into a bath of molten zinc or galvanizing composition where it remains for a predetermined period and then passes up through the surface of the galvanizing metal, the dross or oxide at said surface adhering to the emerging wire. The emerging wire is passed between stationary wipers which serve to remove the excess spelter, the coating remaining on the wire consisting of layers of the galvanizing metal and the oxide thereof, or a mixture of the two. The portion of the coating consisting of the oxide of the galvanizing metal is non-protective and not very adherent, so that the coating is easily broken when the wire is bent and easily peels from the wire, thereby very materially reducing the life of the wire in use. Moreover, the finished wire has a mottled appearance when coated in accordance with previously known methods.

It is accordingly an object of the invention to provide a new and improved apparatus and process of galvanizing wire so that the finished article will be substantially free of oxide of zinc or other coating material.

It is another object of the invention to provide a new and improved apparatus and process for galvanizing wire so that the finished article will have a homogeneous coating.

It is another object of the invention to produce a galvanized wire having a coating of substantially uniform thickness.

It is a further object of the invention to prevent the formation of oxides of zinc or the like on the wire after the same has emerged from the galvanizing kettle.

It is a further object of the invention to provide means for varying the thickness of the galvanizing coat applied to wire or other metal.

Further objects and advantages of the invention will appear from the following description.

In carrying out the invention into practice, there is provided a kettle or bath of molten coating material such as zinc in which is immersed and from which projects a telescopic tube at the upper end of which wiping means in the form of asbestos or like rollers or pads are disposed. The tube is in communication with a source of supply of gas such as illuminating gas and provision is made for the burning of the gas within the tube. The wire is passed into the kettle, remaining therein a sufficient length of time to acquire a

desired thickness of coating, and is then guided into the submerged end of the tube and through the tube and wiping means. The burning gas in the tube burns and thereby destroys all oxide that may form or tend to form upon the molten zinc exposed to said gas. A blast of cold air, water or the like is directed against the wire emerging from the wiping means, whereupon the wire is passed through a cooling tank of water or the like and then conducted to the place where it is to be coiled upon reels, spools or the like. Provision is made for relative movement of the parts of the wiping instrumentalities so that a splice in the wire may proceed through said means without requiring the loss of time which has obtained with galvanizing constructions heretofore in vogue. Provision is also made for adjustment of the length of the tube to vary the time during which the wire emerging from the kettle is subject to the action of the gas in the tube.

Further in connection with the carrying out of this invention, instead of igniting the gas in the tube, some inert gas which will prevent access of oxygen to the molten zinc clinging to the emerging wire may be supplied to and retained in the tube.

Suitable means will preferably be employed to remove the burnt gases or prevent escape of the non-burning gas, as the case may be.

This invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

Figure 1 is a plan view of the apparatus embodying the principles of this invention.

Figure 2 is a longitudinal sectional view taken approximately in the plane designated by the line II—II in Figure 1, certain parts being shown diagrammatically.

Figure 3 is a horizontal sectional view of the galvanizing apparatus taken approximately in the plane designated by the line III—III in Figure 2.

Figure 4 is a sectional view taken approximately in the plane designated by the line IV—IV in Figure 3, certain parts being shown in elevation.

Figure 5 is an enlarged broken plan view of the wiping rollers shown in Fig. 2 with wires therebetween shown in cross section.

Figure 6 is a fragmentary elevation of one end of the wiping means and the mounting means therefor.

Figure 7 is a view taken substantially as designated by the line VII—VII in Figure 6, the wiping rollers being omitted.

Figure 8 is a fragmentary end elevation of the structure appearing in Figure 7.

Figure 9 is a fragmentary sectional view of a modified wiping device.

Figure 10 is a plan view of the structure shown in Figure 9.

Referring now more particularly to the drawings, the apparatus embodying the principles of the present invention includes a tank or kettle 1 containing galvanizing metal such as zinc 2 in a molten condition, the metal being maintained at the proper temperature by suitable electric or other heating means shown diagrammatically at 3. Supported on suitable bearings is a sheave 4 arranged to be partially submerged as at 5 below the surface of the zinc 2. Also supported in suitable bearings and preferably adjacent the sheave 4 is a second and preferably smaller sheave 6 which is preferably entirely submerged as shown in Figures 2 and 4. The sheaves 4 and 6 are formed to receive the portion of the wire 7 to be galvanized and which is submerged in the zinc 2 as shown in Figure 2. The sheaves may be formed to accommodate a single strand of wire, or may be formed with a plurality of grooves to accommodate as many strands of wire as may be desired, and furthermore, instead of employing a single sheave 4 and a single sheave 6 having a plurality of grooves, a series of sheaves 4 and a series of sheaves 6 each accommodating a single strand may be provided.

For each strand 7, there is provided a tube 8 suitably supported on a bar or the like 9 extending preferably across and supported by the tank 1. The tube 8 is arranged substantially vertically and its lower end 10 is preferably immersed in the zinc 2, extending substantially below the surface thereof, the tube being so arranged that its axis is substantially tangent to the sheave 6 so that the strand 7, when leaving the sheave 6 as at 11 will extend substantially vertically from the sheave 6 as it enters the tube 8. The tube 8 is preferably fixed against movement relative to the supporting member 9, and the sheave 6 is preferably supported by the lower end of the tube 8. If desired, means may be provided for adjusting the tube 8 vertically to vary the extent to which its lower end 10 is immersed in the zinc 2.

Suitably mounted in superposed relation to the galvanizing tank 1, as a cooling water tank 12 having a source of supply 13 and overflow outlet 14. The means whereby the tank 12 is mounted may be of any suitable construction and, in accordance with the illustrated embodiment of the invention, may take the form of telescopic posts 15. The number of posts 15 may be varied as desired, four being herein illustrated. Each post 15 includes a tubular member 16 preferably stationarily supported in any suitable manner as by a bar or beam 17 extending across and supported by the tank 1. The other part of the telescopic post 15 comprises a rod 18 fixed by any suitable means to the tank 12 at 19. Each rod 18 is formed as a rack having teeth 20 cooperating with the teeth of a gear 21. The gear 21 is supported for rotation with a shaft 22 and carried in brackets 23 in turn supported by the stationary tubes 16 of the posts 15. One of the shafts 22 is extended at 24 and furnished with a crank 25. Simultaneous operation of the shafts 22 and consequently of the gears and racks is effected through a chain drive including a sprocket 27 mounted for rotation with each shaft 22. By operating the one crank 25, it will be apparent that the length of each post 15 will be length-

ened or shortened, as the case may be, and that the cooling tank 12 may be readily and easily raised or lowered.

A tube 28 formed to fit into and have telescopic relation with the tube 8 is mounted by any suitable means such as the bracket 28a on the tank 12 to move therewith, and it will be observed that adjustment of the tank 12 as described in the previous paragraph will automatically involve corresponding adjustment of the tube 28.

The cooling tank 12 carries sheaves 29 and 30 by which the galvanized wire 7 is conducted into the water in the tank 12 and then out to the place where the wire is to be wound on reels, spools or the like. Wiping means comprising asbestos rollers 31 substantially tangent to each other are mounted so that their line of tangency substantially intersects the axis of the telescopic tubes 8 and 28. The rollers may be supported by any suitable means and are herein shown to be carried by brackets 32 which, in the illustrated embodiment of the invention, are secured to the upper ends of those tubes 28 which are located nearest the sides 33 of the tank 1.

Each bracket 32 may be of any suitable construction and is herein shown as comprising a substantially T-shaped member whose stem consists of two parts 34 of the same piece forming together an opening 35 in which the upper end of the tube 28 is received, the bracket 32 being securely held on the tube 28 by any suitable means such as the bolt and nut means 36. The head 37 of the T 32 is formed adjacent one end thereof with an upstanding ear 38 having an opening 39 to receive a trunnion at one end of one of the rollers 31. An arm 40 is pivoted at 41 to the other end of the head 37 and the portion thereof extending upwardly from the head 37 is formed substantially as the ear 38 and is provided with an opening 42 for receiving the trunnion on the end of the cooperating wiper roll 31. The arm 40 is constantly urged resiliently toward the ear 38 by a spring 43, one end of which is secured at 44 to the bracket head 37 and the other end of which is secured at 45 to the arm 40. The spring 43 thus serves to hold the wiping rolls 31 against each other resiliently, the arm 40 being however manually movable in a direction away from the ear 38 to separate the rolls 31 for the purpose of allowing a splice in the wire to pass through or between the rolls. Manual separation of the rolls is, however, not necessary since the splice itself will serve as a wedge to spread or space apart the rolls as the splice moves upward therebetween. If desired, a separate set of wiping rolls may be applied on a separate mounting for each tube 28. Such a provision would enable the operation of the machine with a plurality of wires simultaneously without requiring stoppage of the other wires when one of the wires has a splice therein positioned between the wiping rolls. It will be understood, of course, that pads may be employed instead of rollers for wiping the excess spelter from the galvanized wire, and that such pads could be arranged for relative movement in much the same way in which the rollers above described are arranged.

If desired, the rollers 31 may be of such a resilient character that only the portions of the rolls immediately engaged by a splice in the wire will be separated thereby, and in such event, the rolls could be continuous as shown and the wiping of the portions of the other wires which are

not spliced could be effected without necessitating a cessation in the movement of such other wires. In the rolls 31 herein illustrated, it will be observed that the wires 7 passing therebetween as seen particularly in Figure 5 cause the immediately adjacent portions of the rolls to be displaced without causing a separation of the rolls themselves, so that substantially the entire outside of the wire is wiped by the rolls.

To the end that the coating applied by the galvanization process may be substantially free of slag or oxide, an atmosphere of inert gas such as nitrogen or illuminating gas is provided for the wire as it emerges and throughout a major portion of the time during which the coating on the wire is in a molten condition. This gas may be supplied to the tubes 8 and 28 through a pipe 46 controlled by a suitable valve 47, and a suitable yieldable closure applied to the top of the tube 28. Such closure could be of any suitable construction which will allow the wire 7, both spliced and unspliced, to pass through the same with sufficient clearance to obviate contact between the closure and the coating on the wire, and yet would be effective to satisfactorily prevent escape of any substantial amount of the gas in the tubes 8 and 28. The valve 47 may be operated at will to insure the presence of sufficient gas in the tubes to prevent access of oxygen to the portion of the wire disposed at any instant in said tubes. Thus formation of oxide of the zinc 2 within the tubes 8 and 28 is prevented.

If desired, a tube 48 may be secured to the tank 1 or otherwise in any suitable manner (not shown) so that its lower and open end 49 is positioned below the surface of the zinc and its upper end 50 above the surface of the zinc. The end 50 is provided with an opening 51 of sufficient size to permit the wire 7 including splices therein to pass without obstruction into the tube 48. The tube 48 communicates by means of a pipe 52 to a source of supply of inert gas and is maintained so that the portion 53 of the surface of the zinc 2 disposed in the tube 48, together with the portion of the wire 7 disposed in said tube, are safeguarded against contact with oxygen so that no oxide forms on said surface portion 53. Consequently, the wire entering the zinc 2 is entirely free of oxide of zinc.

The wiping instrumentalities 31, it will be observed, are disposed immediately adjacent the upper end of the tube 28, and sufficient inert gas will be located at that point to prevent oxidation of the coated wire emerging from the tube 28 and entering between the rolls 31. Thus from the time the wire 7 enters the bath of zinc 2, to the time it leaves the roll 31, no opportunity for the forming of zinc oxide on the wire 7 has been afforded.

For the purpose of cooling and quickly congealing the zinc coating on the wire after it leaves the rolls 31, a blast of cold air or water from a valve controlled nozzle 54, preferably supported either directly by the cooling water tank 12 or by the tube 28 in any suitable manner (not shown) is directed against the wire as it leaves the rolls 31. This cooling of the wire renders the coating thereon too cool for oxidizing, and the wire is then conducted over the sheave 29 and under the sheave 30 and thence in any desired direction as shown by the arrow 55 where it is to be wound on reels and the like for shipment.

If desired, the wiping rolls 31 may be initially formed with complementary substantially semi-circular circumferential grooves, each cooperat-

ing pair of grooves serving to surround the wire 7 disposed therebetween, in order to effect a uniform wiping of the surface thereof.

A modified wiping means is indicated generally at 56. This wiping means embodies a substantially U-shaped frame 57 which embraces a portion of the upper end of the tube 58 and is formed with an inwardly extending flange 59 and with longitudinal slots 60 in its arms 61. Complementary wiping members 62 and 63 are arranged to slide and fit between the top 64 of the tube 58 and the flange 59, the member 62 being substantially semi-circular and fitting in the bight 65 of the frame 57, and the member 63 fitting between the arms 61. The member 63 is tapped at its sides to receive the screws 66 which may be tightened against the arms 61 to hold the member 63 in cooperative relation to the member 62, or may be loosened to permit the member 63 to be withdrawn from the member 62. The members 62 and 63 are formed with complementary semi-circular openings 67 and 68 of a predetermined size corresponding with the ultimate size of galvanized wire to be produced by the foregoing construction and process herein described. When a splice in the wire approaches the wiping means 56, the screws 66 are loosened and the member 63 grasped by the handle 69 to provide adequate space to allow passage of the splice between the members 62 and 63 without marring the coated surface of the splice. In the event it is desired to produce a wire having a thicker or thinner coating of zinc, the members 62 and 63 may be replaced by another complementary set of members differing from the members 62 and 63 herein shown only in the size of opening formed by the complementary semi-circular openings corresponding to the openings 67 and 68.

With this wiping construction, a blast of cold air or water may be directed at 70 to the wire 7 as it emerges from the wiping elements 62 and 63 as above described in connection with the roller means for wiping, after which the wire 7 is conducted into and out of the cooling water tank 12 in any suitable manner such as that above described.

In employing the wiping means including the rollers 31, it will be observed that the telescopic tube construction 8 and 28 affords a variation in time during which the zinc coating coagulates on the wire 7, and this determines, for a given rate of movement of the wire, the thickness of the ultimate coating on the wire. In employing the wiping means 56, the tube 58 may be of fixed length and the size of the coating may be determined by the size of the opening 67, 68 in the wiping elements 62 and 63.

It will be understood that the apparatus heretofore described and illustrated in the accompanying drawings is largely diagrammatic and is merely included herein as one or more of a number of different constructions which may be employed in carrying out the process or processes of the invention.

It will be observed that the apparatus involved is extremely simple, that adjustments can be made readily and with a minimum loss of time, and when adjusted as desired requires little or no attention, and is arranged to occupy a minimum of space.

The tubes 8 and 28 may be fitted together fairly snugly to prevent escape of gas therebetween and are yet relatively slidable to permit of their adjustment. If desired, however, suitable gaskets or other leak-proof means may be employed between the tubes.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. In a galvanizing apparatus including a kettle containing molten zinc and instrumentalities for conducting a piece of metal to be galvanized through the zinc, means for excluding oxygen from a portion of the surface of the zinc to prevent oxidation of said portion and serving as a conductor for the piece as it emerges from the zinc, means according an atmosphere of inert gas for the piece while the adhering zinc is in a substantially molten condition to thereby prevent oxidation of the zinc adhering to the piece, and means for wiping zinc in excess of a predetermined thickness of coating from the piece, the first means being expansible and contractible to vary the time during which the galvanized piece is subjected to said atmosphere.

2. In a galvanizing apparatus including a kettle containing molten zinc and instrumentalities for conducting a piece of metal to be galvanized through the zinc, means for excluding oxygen from a portion of the surface of the zinc to prevent oxidation of said portion and serving as a conductor for the piece as it emerges from the zinc, means according an atmosphere of inert gas for the piece while the adhering zinc is in a substantially molten condition to thereby prevent oxidation of the zinc adhering to the piece, means for wiping zinc in excess of a predetermined thickness of coating from the piece, and means operatively connected with the first means for varying the length of the first means so as to vary the time during which the galvanized piece is subjected to said atmosphere.

3. In a galvanizing apparatus including a kettle containing molten zinc and instrumentalities for conducting a piece of metal to be galvanized through the zinc, means for excluding oxygen from a portion of the surface of the zinc to prevent oxidation of said portion and serving as a conductor for the piece as it emerges from the zinc, a tube extending into said zinc and upwardly therefrom and containing an inert gas, a wiping device at the upper end of the tube, means according a blast of cold air against the piece emerging from said device, a tank containing cooling water adjacent the last means, instrumentalities for conducting the piece into and out of the tank, and means for varying the length of the tube.

4. In a galvanizing apparatus, including a kettle containing molten zinc and instrumentalities for conducting a piece of metal to be galvanized through the zinc, means for excluding oxygen from a portion of the surface of the zinc to prevent oxidation of said portion and serving as a conductor for the piece as it emerges from the zinc, means affording an atmosphere of inert gas for the piece while the adhering zinc is in a substantially molten condition to thereby prevent oxidation of the zinc adhering to the piece, and means for wiping zinc in excess of a predetermined thickness of coating from the piece, the first said means comprising a tube formed of two telescoping sections one of which is fixed relative to said kettle, and means for raising and lowering the other section to vary the length of the tube and the time the galvanized piece is subjected to said atmosphere, without varying other operating conditions.

5. A galvanizing apparatus comprising, in combination, a container for molten zinc, means for conducting metal to be galvanized through said container, a cooling tank above said container, a telescopic tube having one leg secured to said container and the other leg secured to said cooling tank, said tube extending below the normal level of zinc in said container and upwardly therefrom to said cooling tank, means for directing the piece of metal conducted through the container into the tube at the lower end thereof, means for directing the metal from the upper end of the tube into the cooling tank and means for raising and lowering said cooling tank relative to said container to thereby extend and collapse said telescopic tube for varying the length of time which the metal is in the tube.

6. In an apparatus for galvanizing wire, in combination, a tank for containing molten zinc, means for directing a plurality of strands of wire to be galvanized through said tank, a plurality of vertical telescopic tubes extending into said tank with the lower ends thereof below the normal level of molten zinc in the tank, means for directing each strand of wire through a separate telescopic tube, means for directing the wire emerging from said tube through a cooling tank, means for securing the upper legs of said telescopic tubes to said cooling tank, and means for raising and lowering said cooling tank relative to said first mentioned tank for collapsing and extending said telescopic tubes to vary the length of time in which the wires are in the tubes.

ALBERT F. BRADLEY.

CERTIFICATE OF CORRECTION.

Patent No. 2,010,941.

August 13, 1935.

ALBERT F. BRADLEY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, lines 16, 32 and 51-52, claims 1, 2 and 3, respectively, for "according" read affording; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of September, A. D. 1935.

Leslie Frazer

Acting Commissioner of Patents.

(Seal)