

915,480.

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APPARATUS FOR COATING METAL.  
APPLICATION FILED NOV. 2, 1908.

Patented Mar. 16, 1909.  
3 SHEETS—SHEET 1.

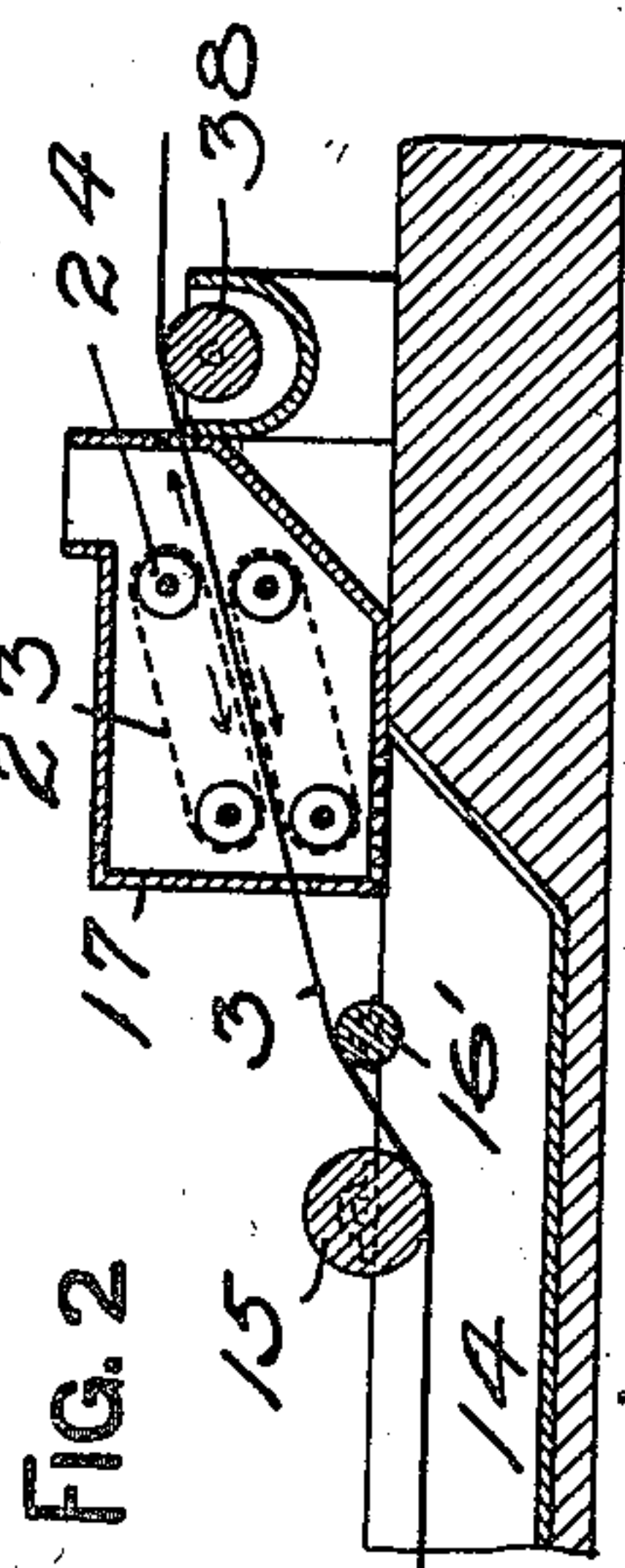
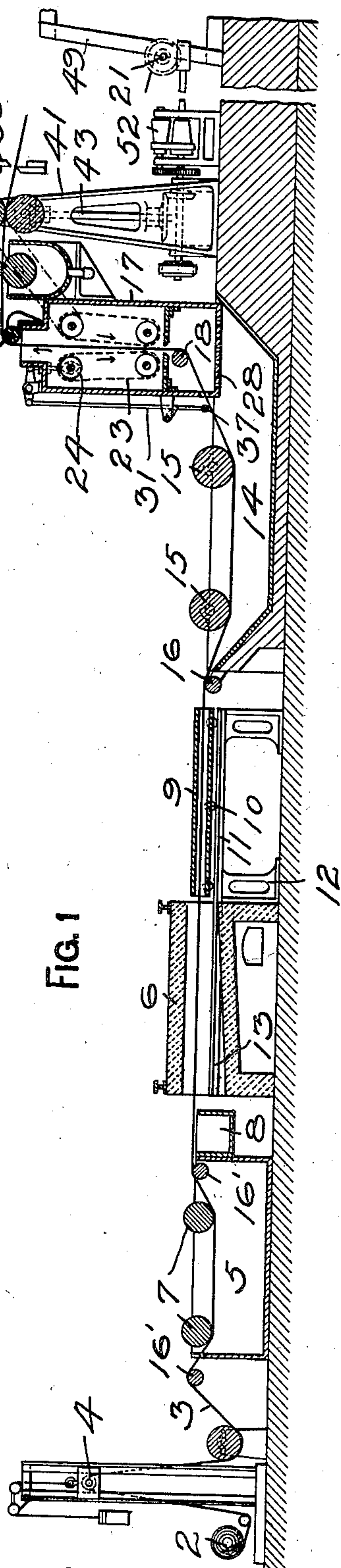


FIG. 1

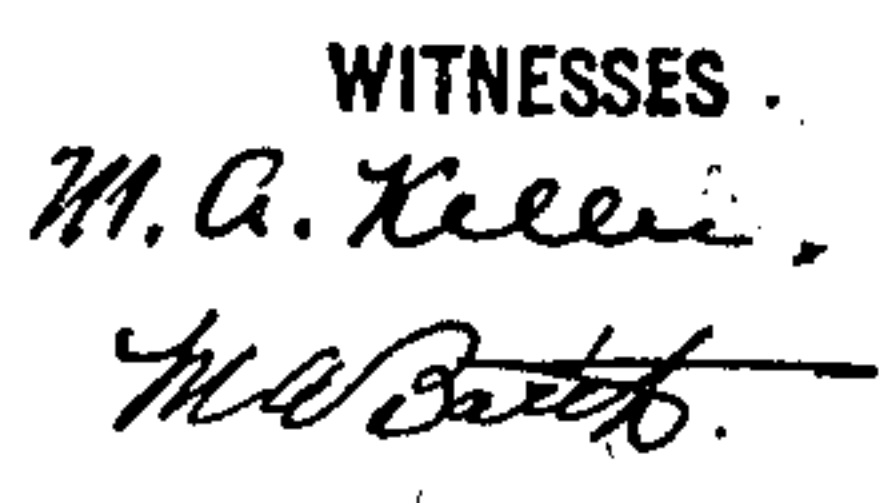


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**Fig. 3**



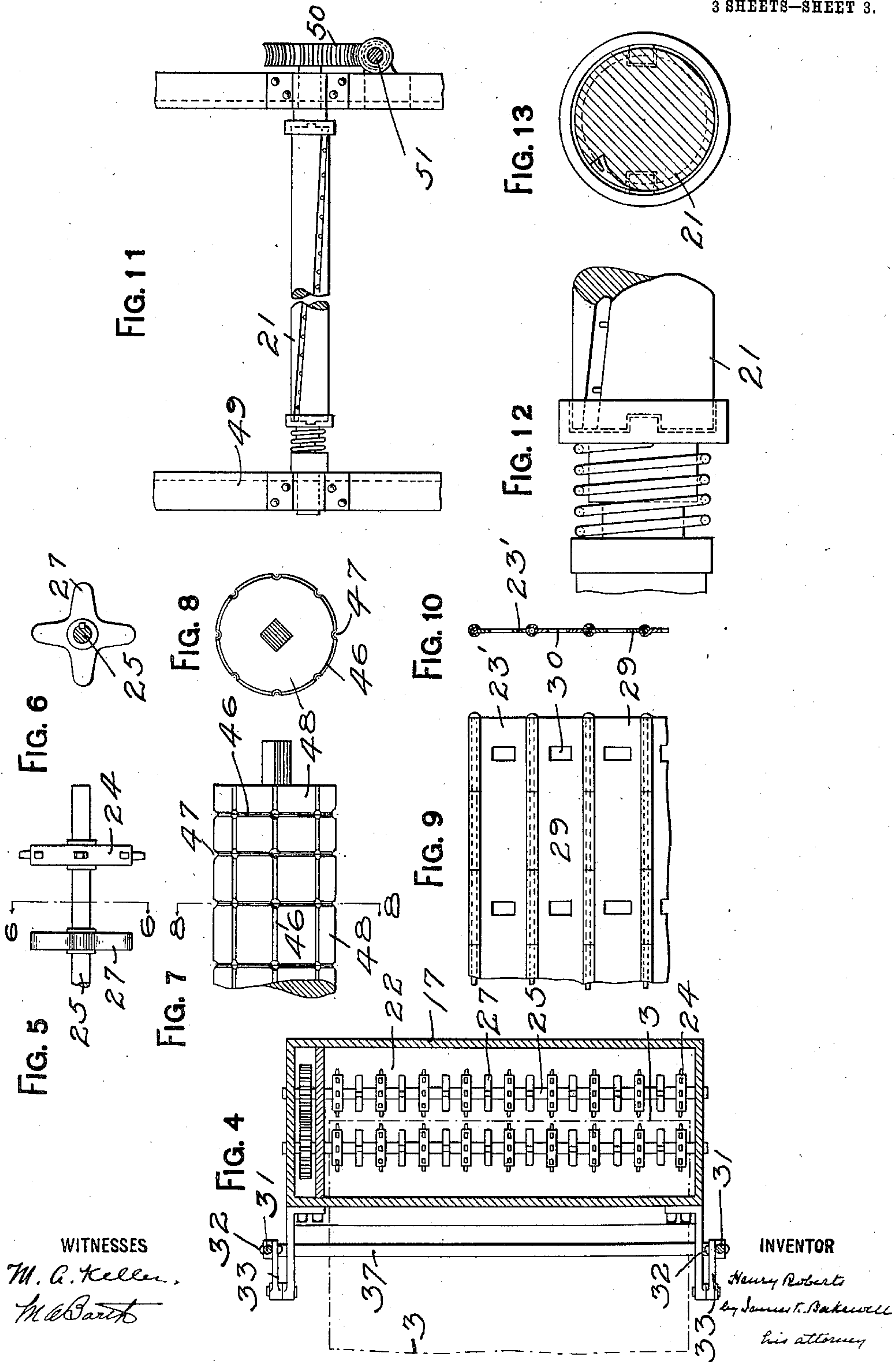
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# UNITED STATES PATENT OFFICE.

HENRY ROBERTS, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF ONE-FOURTH TO JOHN A. BLEICHNER, OF PITTSBURG, PENNSYLVANIA.

## APPARATUS FOR COATING METAL.

No. 915,480.

Specification of Letters Patent.

Patented March 16, 1909.

Application filed November 2, 1908. Serial No. 460,570.

*To all whom it may concern:*

Be it known that I, HENRY ROBERTS, of Pittsburgh, county of Allegheny, and State of Pennsylvania, have invented a certain new and useful Improvement in Apparatus for Coating Metal, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to apparatus for coating wire fencings, network and the like with zinc or analogous material, said process being commonly known as "galvanizing".

Heretofore in the manufacture of fencing and similar structure, the numerous wire strands composing the same were given their protective coating by galvanizing before being fed into the fence weaving machine or other wire fabric machinery. The life of a fence so manufactured has been found to be only from two to three years. This short life of the fence is attributable more or less to what is known as "rotten" joints, caused by the rusting or corroding due to the exposition to the elements of the said unprotected joints and knots in the fence. In the course of manufacture, the protective coating given the wire preparatory to the weaving operation, is caused to break or peel off at these joints and knots, due to the manipulation of the wire incident to their formation by the weaving machine. This destruction of the protective coating and consequent exposure renders the joint or knot, which is the weakest point in a fence, very susceptible to rust or corrosion. This destruction of the said coating is augmented in cases where heavily coated wire is used, and lightly coated wire has been used with a view to overcoming this difficulty, but with little or no success; such light coating of the wire as would permit of the formation of an otherwise perfect knot or joint, was found to give in itself practically no protection to the wire.

The object of this invention is to overcome the above mentioned difficulties by causing the fence to be galvanized after it has come from the weaving machine, insuring the application of a perfectly uniform protective coating to every portion of the fabric.

I have shown my invention in connection with that process of galvanizing wherein the metal to be galvanized is caused to be slowly drawn through cleaning or preparatory material, such as finely broken stone or gravel immersed in a bath of acid; then through a suitable furnace whereby it is caused to be dried before it passes to the galvanizing or coating bath, and then directly from the galvanizing bath to the wiping box whereby the surplus of coating is removed; my invention consisting in the novel construction of the different mechanisms for carrying out this process.

In the drawings, Figure 1 is a vertical longitudinal sectional view of my invention; Fig. 2 is a fragmentary vertical sectional view showing a modified form of wiping box; Fig. 3 is an enlarged vertical sectional view of a portion of my improved apparatus; Fig. 4 is a horizontal sectional view taken on the plane of line 4—4 of Fig. 3; Fig. 5 is a fragmentary elevation of one of the horizontal shafts mounted within the wiping box and showing sprocket-wheels for operating the endless wipers, also means for agitating wiping material within the box; Fig. 6 is a vertical sectional view taken on the line 6—6 of Fig. 5; Figs. 7 and 8 are detail views of rollers for drawing the fabric through the different mechanisms of the coating apparatus; Figs. 9 and 10 are detail views showing modified forms of endless wiping chain or apron; and Figs. 11, 12, and 13 are detail views of the winding drum or take-up reel.

I will now describe my invention so that others skilled in the art to which it appertains may construct and use the same.

The reference numeral 2 represents the delivery reel upon which the fabric to be coated is wound. The fabric, however, may be fed directly from the weaving machine to the coating apparatus. The fabric, which I will indicate by the reference numeral 3, may pass over a suitable tension roller 4 by means of which the fabric may be kept in a taut condition during its passage through the coating apparatus.

The preparatory or cleaning bath 5, which may consist of suitable cleaning material



such as finely broken stone or gravel immersed in acid, is situated directly in front of the furnace 6.

The numeral 7 indicates the rollers by means of which the fabric is caused to be immersed in the cleaning bath.

Situated at the end of the cleaning bath is the box or receptacle 8 adapted to receive any cleaning material which may be carried forward out of the cleaning bath on the moving fabric.

The purpose of the furnace 6 is to dry the fabric as it emerges from the damp cleaning bath.

The fabric is frequently caused to be stopped in its travel through the coating apparatus, caused by the delay incident to the changing of the fabric at the take-up reels, or other stoppages in the apparatus which are beyond the control of the operator. In the coating of wire, it has been found that this delay or stoppage of the wire causes that portion of the wire inclosed by the furnace to be burned imparting a laminated or scaly surface to the wire which renders it exceedingly difficult to properly coat or galvanize, the tendency of this scaly surface being to work loose and peel off as the wire emerges from the coating bath and passes to the wiping mechanism. This deleterious effect on the wire also reduces its tensile strength. To overcome this difficulty, I have provided the furnace (as shown in Fig. 1) with a casing or envelop 9 which may be lined with any suitable non-conductor of heat, such as asbestos or mineral wool. This casing is provided with the wheels 10 adapted to travel on the track 11 mounted at one end of the furnace 6 on the supports 12, and extending within the furnace for its full length as at 13. The length of the envelop or casing 9 may correspond to or be slightly longer than the furnace. Should the fabric at any time be caused to stop in its travel through the apparatus, injury to the fabric from overheating may be prevented by causing the casing 9 to be shoved within the furnace 6 along the track 11, completely inclosing and protecting that portion of the fabric from the excessive heat of the furnace. As the fabric passes from the drying furnace it is immersed in the coating or galvanizing bath. This coating bath may be placed in a suitable receptacle, such as indicated by the reference numeral 14, having the rollers 15 under which the fabric is threaded, and by means of which a proper insertion of the fabric within the coating bath is insured. A more gentle bend to the fabric may be obtained as it enters the coating tank by placing one or a number of supplemental rollers 16 at a suitable point outside the coating tank. Other rollers serving the same purpose throughout the different mechanisms are indicated by the nu-

meral 16'. From the coating bath the fabric passes up through a suitable opening in the forward end of the overhanging wiping box 17, over the guide rollers 18 and 19 within the box to the feed rollers 20, and thence to the take-up reel 21. The upper chamber or compartment 22 of this wiping box 17 is adapted to contain a suitable wiping material for removing the surplus coating metal on the fabric. Any suitable material adapted to this purpose may be employed. I prefer, however, to use "mineral wool" or "asbestos cement"; the two, if desired, may be combined. I find this to be admirable wiping material by reason of its slight affinity for or adhesion to the melted coating metal. The wiping material is caused to perform upon the fabric as said fabric is slowly drawn through the box by means of a series of endless chains or carriers 23, carried by the sprocket wheels 24 mounted upon the horizontal shafts 25, which may be operatively connected by means of a belt or chain 26 to the feed rollers 20. The carriers 23 are adapted to travel in a direction opposite to that of the moving fabric, as shown by the arrows in Figs. 1, 2, and 3. By reason of the uneven or irregular surfaces of the carriers, the wiping material is caused to be dragged downwardly through the central portion of the box between the traveling converging lines formed by the endless carriers against and in a direction opposite to that of the incoming fabric. The wiping material is caused to be taken up by the traveling carriers from the bottom and along the outward portion of the box to the top, where it again descends between the moving carriers. This agitation constantly presents new surfaces of wiping material to the fabric as it passes through the box. In order to facilitate the agitation of the wiping material, I provide each of the horizontal shafts 25 with the series of star wheels 27 which are interposed between the sprocket wheels 24. These star-wheels in conjunction with the carriers 23 serve to disintegrate and agitate the wiping material which otherwise would have a tendency to accumulate and congest at the bottom of the wiping box. The coating metal wiped from the fabric by the wiping material is deposited at the bottom of the box where it returns through the apertures 28 to the coating bath.

In place of the endless chains or carriers 23, I may employ endless aprons 23' shown in Figs. 9 and 10. This apron may be constructed in any suitable manner. The apron illustrated is constructed of the interlocking plates 29, provided with suitable apertures 30 by means of which the apron may be operatively carried by the sprocket wheels 24.

While I have shown and described the endless wiping chains or carriers 23 as operating



in a substantially vertical plane, it will be apparent that they may be arranged to operate horizontally, or on an angle, such as shown in Fig. 2 wherein the said carriers are arranged to operate on an inclined plane adapted to correspond to the inclination of the fabric passing through the box.

In Fig. 3 I have shown the box 17 provided with the removable lower front plate 17', its purpose being to render the box accessible at this point to remove the fine particles of wiping material which have a tendency to accumulate there.

By reason of the peculiar shape and the size of the knots or joints of the fence, obviously more coating metal will adhere to the said knots or joints as the fabric emerges from the tank than to the body of the fabric. In order to prevent this excessive accumulation of metal from entering the wiping box to be removed, I provide means for vibrating the wire fabric before it is caused to be passed into the wiping box. As best shown in Figs. 3 and 4, it consists of the reciprocating arms 31 pivoted at 32 to the swinging arms 33, and at 34 to the double-arm levers 35 which in turn may be operatively connected by means of suitable cam mechanism 36 to one of the horizontal shafts 25. To the lower ends of the arms 31 are attached the rod or cross piece 37, which is adapted to extend transversely across the wire fabric. The sharp reciprocating movement imparted to the arms 31 through the action of the cam 36, imparts a quick swinging reciprocating movement to the horizontal rod 37, which in turn sets up a vibration in the wire-fabric, causing such surplus of metal which may have accumulated at the joints or knots or any excessive accumulation of metal on the strands of the fabric, to be precipitated to the coating tank or receptacle below. In passing from the top of the wiping box 17, the fabric passes over the rollers 38; and mounted above this roller is the water spray 39, by means of which the wire fabric is cooled as it is drawn from the wiping box by the rollers 20. Underneath the roller 38 and the spray 39 is the tank or receptacle 40 which serves to receive the water as it passes from the roller 38. The instantaneous cooling of the fabric as it emerges from the wiping box prevents that yellow tinting or discoloring ordinarily attendant upon the gradual cooling of the coated metal after emerging from the bath.

As stated above, the fabric is caused to be drawn through the different mechanisms of the coating apparatus by means of the rollers 20. These rollers are journaled in the upright standard 41 and are operatively connected by means of the bevel gears 42 to the vertical shaft 43, which in turn is operated by the horizontal shaft 44 through the bevel gears 45. Referring to Figs. 7 and 8, it will

be seen that the surfaces of the rollers are provided with the intersecting grooves 46, which are adapted to receive the strands of the wire fabric as it passes between the rollers, said rollers being provided at the intersection of the grooves with the counter-sinks 47 which are slightly deeper than the grooves proper and in which the knots or joints formed by the intersecting wires of the fabric are adapted to seat. These rollers as shown in Fig. 7, may be constructed of the separable sections 48, the width of each section being adapted to correspond to the width between the longitudinal strands of the wire fabric, the rollers being made up of said separable sections to conform to the pattern of the fabric to be coated.

The reels 21 for taking up the fabric as it passes from the rollers 20, are mounted in the framework 49 and are all operatively connected by suitable gear connections 50 to the horizontal shaft 51. This shaft is operated by the shaft 44 through the medium of the cone pulley system 52 and the spur gears 53. The cone pulley system 52, which may be of the well known type, affords a differential drive for the shaft 51, it being evident that as the diameter of the roll of fabric increases, the reel will proportionately take up more fabric at every revolution, necessitating a reduction in the speed of the roll in order to prevent the stripping of the fabric from between the feed rollers. In the cone system mentioned above, the change may be accomplished by causing a shifting of the speed controlling belt 54.

At the rear of the rollers 20, I show the shearing mechanism 55, which may be of any suitable construction, the illustration being merely diagrammatic to show the relative position of said shears with respect to the feed rollers and the take-up reels.

It will be apparent that many changes may be made in the construction of the different mechanisms of my apparatus without departing from my invention.

My invention will be appreciated by those skilled in the art. By my improved apparatus I am enabled to "galvanize" wire fabric of any pattern or construction. It will also be found equally adaptable to the coating of wire where an even uniform protective coating is desired, as in the case of electrical conduits and the like; and it will be found especially valuable for the coating of field fencing, producing a smooth uniform protective coating over both joint and strand, resulting in the increase of the life of the fence.

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

1. In apparatus for coating metal, an endless carrier arranged to present a suitable



wiping material to the metal for the removal of the surplus coating metal.

2. In apparatus for coating metal, a coating bath, means for removing the surplus coating metal from the metal as it emerges from the bath, consisting of traveling carriers adapted to present wiping material to the moving metal.

3. In apparatus for coating metal, a coating bath and means for removing the surplus coating from the metal as it emerges from the coating bath, comprising traveling chains arranged to carry wiping material against the said metal.

4. In apparatus for coating metallic fabric, a coating bath, and means for removing the surplus coating metal from the fabric as it emerges from the coating bath, comprising traveling carriers arranged to convey wiping material against the said fabric in a direction opposite to that of the moving fabric.

5. In apparatus for coating metallic fabric, the combination with means for bringing the fabric to be coated from the preparatory or cleaning bath to the coating bath, of means for removing the surplus coating metal from the fabric, comprising traveling endless carriers adapted to continuously present a suitable wiping material to the fabric as the fabric emerges from the coating bath, said carriers being arranged to travel in a direction opposite to the movement of the fabric.

6. In apparatus for coating metallic fabric, the combination with means for bringing the fabric to be coated from the preparatory bath to the coating bath, of a wiping box adapted to receive the fabric as it emerges from the coating bath, wiping material within the said box and a series of endless carriers adapted to present the said wiping material to and in a direction opposite to that of the moving fabric as said fabric passes through the wiping box for the removal of the surplus coating material.

7. In apparatus for coating metallic fabric, a coating bath, a wiping box adapted to receive the fabric as it emerges from the coating bath for the removal of surplus coating metal, and means for vibrating the said fabric for the removal of surplus coating metal as the fabric enters the box preparatory to the final wiping operation therein.

8. In an apparatus for coating metallic fabric, a coating bath, a wiping box adapted to receive the fabric as it emerges from the coating bath, endless carriers arranged to travel within the said box, and adapted to present a wiping material to the fabric for the removal of surplus coating metal, and means for vibrating the said fabric for the removal of surplus coating metal as the fabric enters the box preparatory to the final wiping operation therein.

9. In apparatus for coating metallic

fabric, a coating bath, a wiping box adapted to receive the fabric as it emerges from the coating bath, and adapted to present a suitable wiping material to the said fabric as it is caused to be passed through the said box, means for drawing the said fabric through the wiping box, means for cooling the said fabric as it passes from said wiping box, and means for cutting the fabric into desired lengths as it is fed from the drawing mechanism.

10. In apparatus for coating metallic fabric, a coating bath, a wiping box adapted to receive the fabric as it emerges from the coating bath, endless carriers arranged within the said box and adapted to present a suitable wiping material to the said fabric as it is caused to be passed through the said box, means for drawing the said fabric through the wiping box, and means for cooling the said fabric as it passes from the said wiping box.

11. In apparatus for coating metallic fabric, a coating bath, a wiping box, and means for drawing the said fabric from the coating bath through the wiping box, consisting of rollers having a series of intersecting grooves, adapted to conform to the patterns of the fabric, and adapted to receive the strands of the fabric as the rollers are caused to be rotated, said rollers being composed of separable interchangeable sections.

12. In apparatus for coating metallic fabric, a coating bath, a wiping box, and means for drawing the said fabric from the coating bath through the wiping box, consisting of rollers having a series of intersecting grooves, adapted to conform to the patterns of the fabric, and adapted to receive the strands of the fabric as the rollers are caused to be rotated.

13. In apparatus for coating metal, means for subjecting the metal to the action of acid or abrasive material, means for heating and drying the metal after emerging from said acid or abrasive material, and means for shielding the metal to prevent overheating the same.

14. In apparatus for coating metal, means for subjecting the metal to the action of acid or abrasive material, means for heating and drying the metal after emerging from said acid or abrasive material, and means adapted to be used in conjunction with said heating and drying means, when desired to prevent overheating the metal.

15. In apparatus for coating metal, means for subjecting the metal to the action of acid or abrasive material, a chamber for heating and drying the metal after emerging from said acid or abrasive material, and a movable shield adapted to be moved into operative relation with the heating and dry-

ing means when desired to prevent overheating the metal.

chamber when desired to prevent overheating the metal.

In testimony whereof, I have hereunto set my hand.

HENRY ROBERTS.

Witnesses:

N. A. BARTH,

M. ARTHUR KELLER.

16. In apparatus for coating metal, means for subjecting the metal to the action of acid or abrasive material, a chamber for heating and drying the metal after emerging from said acid or abrasive material, and a movable shield adapted to be moved within said

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