

June 5, 1934.

C. D. JOHNSON

1,961,667

METHOD OF COATING WIRE

Filed Dec. 10, 1930

Fig. 1.

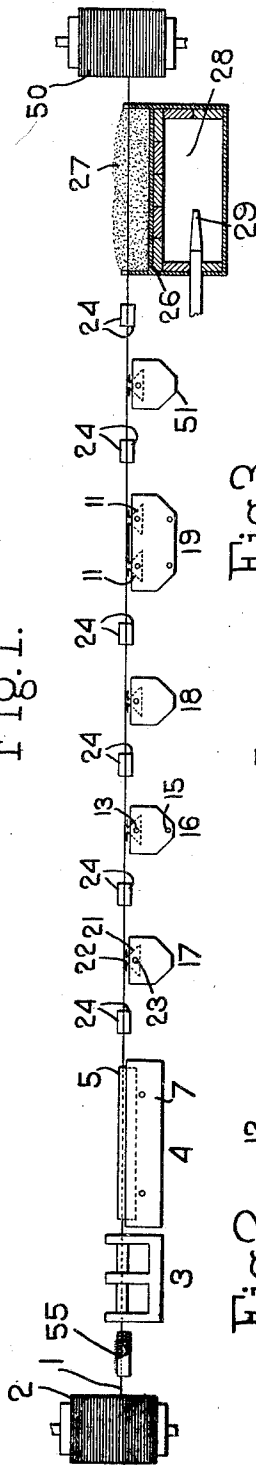


Fig. 2.

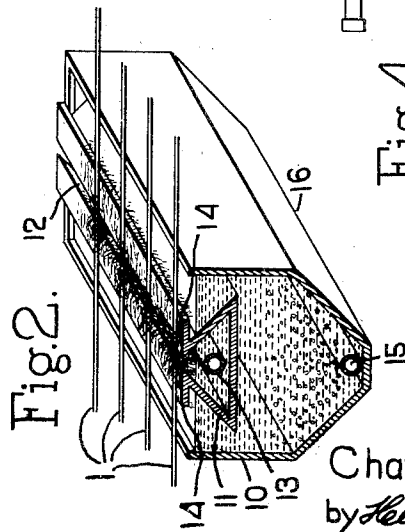


Fig. 3.

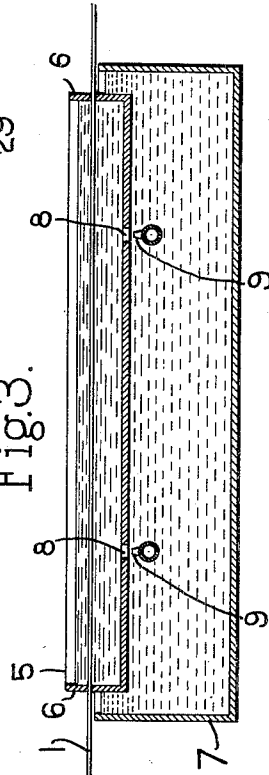
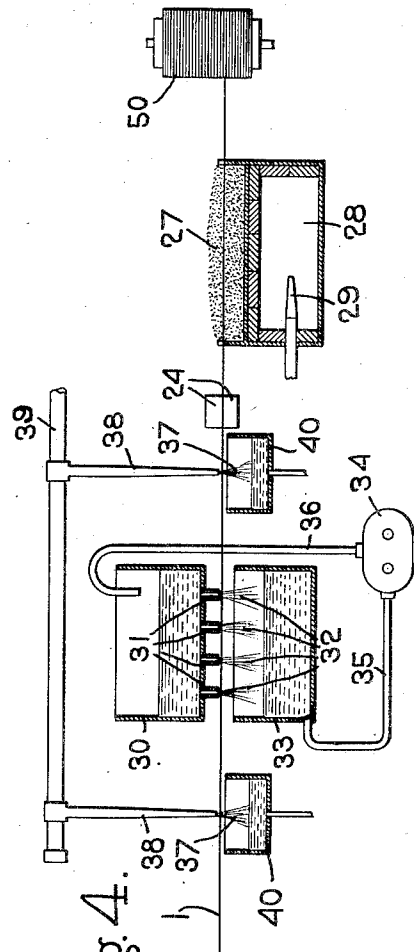


Fig. 4.



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UNITED STATES PATENT OFFICE

1,961,667

METHOD OF COATING WIRE

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Application December 10, 1930, Serial No. 501,239

1 Claim. (Cl. 91—68.3)

This invention relates to the production of metal-coated wire and particularly to a process of producing metal-coated wire which is straight.

One common method of coating wire is to pass the wire through a bath of coating material. In doing this the wire usually passes over supporting rolls at the ends of the bath and under one or more hold-down rolls which are partly or entirely submerged in the bath and the function of which is to hold the wire submerged in the coating material. In thus coating wire it is also more or less customary to pass the wire through one or more washing baths during the coating operation and in passing through each washing bath the wire is taken over supporting rolls and under hold-down rolls.

This passing of the wire over the supporting rolls and under the hold-down rolls as it passes through the various baths bends the wire and tends to put into it a permanent set so that after having passed through the several baths the wire is not entirely straight.

For some purposes it is highly desirable that the coated wire should be as straight as possible and while the coated wire may be given the desired straightness by passing it through a wire-straightening device after the coating operation has been completed, yet the action of the wire-straightening device on the coated wire is very apt to injure the metal coating either by scratching it or otherwise so that while a wire which is straightened after being coated may meet the requirements so far as straightness is concerned it does not always meet requirements as regards the character of the coating.

It is one of the objects of the present invention to provide a metal-coated wire which is straight and which is provided with a coating that has not been injured by the wire-straightening devices. In accordance with the present invention I take the uncoated wire and pass it through a wire-straightening machine of some suitable type thereby to straighten the wire and the wire thus straightened is then subjected to the coating operation while maintaining the wire in a straight condition and without bending the wire. As a result the wire comes through the coating apparatus in a perfectly straight condition and with a coating which has not been injured or damaged by the wire-straightening device because of the fact that the coating is applied after the wire is straightened.

In order to give an understanding of the invention I have illustrated in the drawing some-

what diagrammatically different ways in which my improved process may be carried out.

Fig. 1 is a diagrammatic view illustrating one manner of practising my invention;

Fig. 2 is a sectional perspective view illustrating the manner in which the wire is subjected to the action of the plating material while maintaining the wire straight;

Fig. 3 is an enlarged sectional view showing the way of cleaning the wire while maintaining it straight;

Fig. 4 is a diagrammatic view illustrating a different manner of subjecting the wire to the plating bath and washing bath while maintaining it straight.

In the drawing, 1 indicates the wire which is to be straightened and plated or coated. In carrying out my invention I first subject the wire to the action of a wire-straightening machine thereby straightening the wire, and then plate or metal-coat the straightened wire while maintaining it in its straight condition.

The wire to be straightened and plated is shown as taken from a reel 2 and it is straightened by passing it through a wire-straightening machine 3. This wire-straightening machine may be of any suitable or usual construction, that herein shown being of the type known as a rotary wire-straightening machine. The wire-straightening machine is illustrated diagrammatically in the drawing since its construction and operation is well known to those skilled in the art. The wire comes from the straightening machine 3 in a straight condition and in accordance with my invention it is maintained in its straight condition while it is being plated.

As a preliminary step to the actual plating of the wire the latter is frequently cleaned in some suitable way so that it will be free from grease, oil, lime or other foreign matter when it is subjected to the plating operation. One common way of thus cleaning the wire is to subject it to the action of a suitable acid.

Fig. 1 of the drawing shows not only a means for cleaning the wire by subjecting it to an acid bath but also shows abrasive cleaning means which subjects the wire to an abrasive action to assist the cleaning operation. This abrasive or scouring action on the wire may be accomplished by drawing the wire through a bed of granular abrasive material. Such a bed is illustrated diagrammatically at 55 and it is shown as situated between the reel 2 and the straightening machine 3 so that as the wire is drawn from the reel to the straightening machine it will be

subjected to the abrasive or scouring action which will be effective in removing lime or similar foreign matter from the surface of the wire and will have a scouring action on the wire.

5 The cleaning of the wire by the action of acid thereon may be done by a suitable apparatus which is indicated generally at 4. This consists of a trough 5 for containing acid, the ends 6 of which may be formed of rubber or some other
10 acid-resistant material which has holes therein through which the wire or wires pass.

Means are provided for maintaining the trough 5 filled with acid so that as the wire passes from one end to the other thereof it will be submerged
15 in the acid bath. As herein illustrated the trough 5 is supported above a vat or tank 7 containing acid and the bottom of the trough has one or more openings 8 beneath each of which is situated an air jet nozzle 9. Each air jet nozzle 9
20 blows air up through the opening 8 and the rising current of air carries with it acid so that the trough 5 will be kept filled with acid. This trough is of less length than the vat or tank 7 and, of course, there will be a leakage of acid
25 through the wire-receiving holes in the end walls 6 but such leakage will be compensated for by the acid which is carried from the tank 7 into the trough 5 by means of the air jet. In passing through the trough 5 the wire is maintained in
30 its straightened condition and with this construction the wire will be subjected to the necessary acid treatment for cleaning it while it is still maintained in a straight condition.

After the wire is taken from the cleaning bath
35 it is subjected to the plating operation and this is done while the wire is maintained in a straight condition. One way of thus plating the wire while it is maintained straight is by flowing the plating material over the wire as it is moved
40 along and while it is still maintained in a straight condition. Various devices for accomplishing this may be used without departing from the invention.

In Figs. 1 and 2 I have shown a device 16 by
45 which the wire is passed above a vat or tank containing the plating material and a continual stream of plating material is forced upwardly onto the wire as it moves along. 10 indicates a tank or container which is adapted to hold the
50 plating material. At the upper end of this tank is a trough-like member 11 having a relatively narrow throat 12 and extending longitudinally of the trough is a perforated pipe 13 which is connected to a source of compressed air. The
55 level of the plating material in the tank 10 will be so maintained that the trough 11 is partially submerged, the throat 12 of the trough, however, being above the level of the plating material. This trough is formed with two wings 14 extending
60 laterally from each side of the throat 12, these wings being situated below but closely adjacent to the wire 1 as it passes over the tank.

The compressed air which is delivered to the pipe 13 will cause the liquid plating material in
65 the trough 11 to bubble up through the throat 12 thus forming a sort of fountain and as the wire is passing over the trough closely adjacent the throat the wire will pass through this fountain of plating material, during which a deposit is
70 formed on the wire thereby plating it. The plating material which has been forced upwardly through the throat 12 of the trough flows over the wings 14 and back into the tank 10 again.

I have also shown a perforated pipe 15 in the
75 bottom of the tank 10 through which compressed

air is delivered. This air bubbles up through the mass of plating material in the tank 10 and thus keeps it thoroughly agitated and properly mixed.

The character of the plating material which
80 is used for plating or coating the wire may vary depending on the character of the coated wire which it is desired to produce. This coating material may be in the form of an aqueous coating solution, such as a mixture of blue vitriol and
85 suitable acid, which will result in applying a copper coating to the wire, or the aqueous solution may have the proper characteristic to apply a brass coating to the wire or the wire coating material may be of the proper character to apply
90 a coating of tin or zinc or any other desired metal to the wire.

Moreover, it may be desirable to subject the wire to more than one bath of plating material and if this is necessary to secure a coating of the desired character then additional devices such
95 as indicated at 16 and similar to that above described may be employed for subjecting the wire to a further bath of plating material.

In some plating operations it is customary to
100 wash the wire before and after each plating operation and with my invention I provide means for thus washing the wire without bending the wire and while it is still maintained in a straight condition. As shown in Fig. 1 the wire is sub-
105 jected to two plating operations, one through the medium of the plating device 16 and again through the medium of a somewhat similar plating device indicated at 19. The plating device 19 is similar to the plating device 16 except that the device 19 has two troughs 11 instead of one so
110 that in passing over the device 19 the wire will be subjected to a double plating action.

In Fig. 1 I have shown one wire-washing device
17 between the acid bath and the plating device 16, another washing device 18 between the two
115 plating devices 16 and 19 and a third washing device 51 by which the water is washed after it comes from the second plating device 19.

These wire-washing devices may conveniently
120 be constructed similar to the plating devices in that they are provided with means for creating a sort of fountain of water through which the wire is drawn and which serves to wash the wire while it is still maintained in a straight condition. The washing device 17, for instance, is illustrated
125 as comprising a tank 20 containing water in the upper end of which is a trough-like element 21 having the narrow throat 22. The trough is partially submerged in the water in the tank 20 but the throat 22 is above the level of the water. Situated
130 in the bottom of the trough is a perforated pipe 23 through which air under pressure is delivered.

The air bubbles up through the water in the
135 trough carrying a sort of fountain of water up through the throat 12 through which fountain the wire is drawn.

24 indicate wipers of any usual construction by
140 which the wire is wiped after it is subjected to each bath.

In producing some kinds of plated wire it is desirable to dry the wire rapidly and without subjecting it unnecessarily to oxidization as soon as the wire comes from the last water bath. I have
145 herein shown a drier 26 suitable for this purpose and which is in the form of a bed 27 of heated granular material through which the wire is drawn. The granular material is shown as supported in a pan above a furnace 28 which may be
150 heated by any suitable means such as an oil or gas

burner 29. The passage of the wire through this heated granular material serves to evaporate quickly any moisture remaining on the coated wire and while the wire is buried in the granular material. In this way the wire can be thoroughly dried without any appreciable oxidizing effect.

50 indicates a reel on which the straightened and plated wire may be wound.

With the above method the wire is first straightened and then is maintained in a straight condition during the plating operation so that as the wire comes from the plating operation it is in its straight condition with a plating or coating which has not been injured by the straightening process.

In Fig. 4 I have shown a different way of subjecting the wire to the action of the plating bath while the wire is maintained in a straight condition. In this embodiment the plating material is contained in a tank 30 situated above the wire and this tank has one or more discharge ports 31 in its bottom through which streams 32 of plating material gravitate. The wire while maintained in a straight condition is passed beneath these discharge ports and through the streams of plating material and is thereby subjected to the plating action.

In this construction I have shown a collecting tank 33 into which the jets or streams 32 of plating material are collected and the plating material may be pumped from the collecting tank 33 back into the tank 30 through the medium of a pump 34 which is connected to the tanks through suitable pipes 35, 36.

In this embodiment of the invention also the washing of the wire is shown as being done by gravitating jets or streams of water 37 which may be delivered from nozzles 38 that are connected to a suitable water supply pipe 39. The wire while still in a straight condition passes

through the water jets 37 and thus becomes properly washed. 40 indicates collecting tanks situated underneath the jets to collect the water delivered from the jets.

In both embodiments of the invention the liquid plating material is projected upon the wire in a flowing stream or jet which serves to apply the plating material thoroughly to all the surface of the wire and to remove any particles of foreign matter which may have adhered to the wire. It also prevents the possibility of improper plating of the wire which might be caused by entrainment of wire bubbles by the wire as it is passed through a liquid bath of plating material as in previous known constructions. In short, the present method ensures the complete coating of the wire while in straightened condition and avoids damage to the coating by subsequent straightening of the wire as heretofore pointed out.

In both embodiments of the invention the wire is first straightened and then it is subjected to the plating operation while it is still held in the straight condition. In other words, the wire is maintained in a straight condition during the plating operation.

As stated above the invention is not limited in its use to any particular kind of plating material but may be used in connection with the plating of wire by any suitable liquid plating material.

I claim:

The process of treating wire which consists in passing wire through a straightening machine by which the wire is straightened and then immediately passing the wire while still in a straightened condition through an upwardly-directed fountain of plating material.

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