(No Model.)

C. S. HALL, C. M. WHITCOMB & W. J. D'EWART.

PROCESS OF AND APPARATUS FOR ANNEALING AND CLEANING AND GALVANIZING OR PLATING WIRE CONTINUOUSLY.

No. 286,538. Patented Oct. 9, 1883.

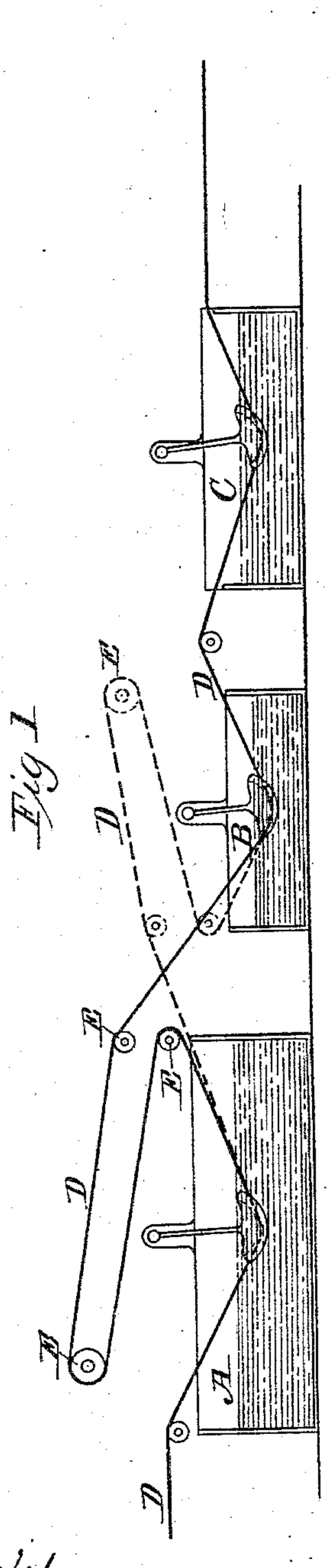

Fig 1

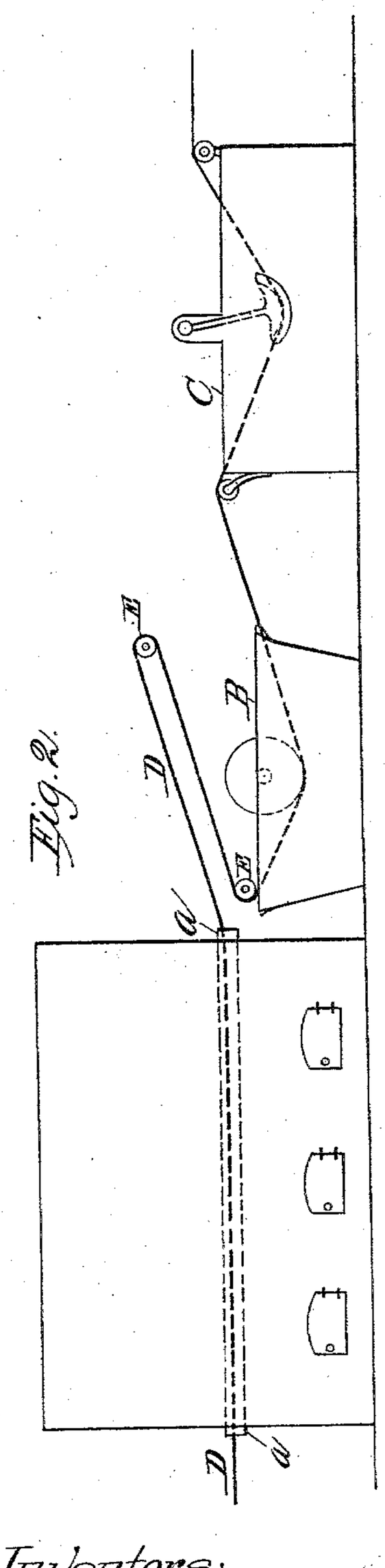

Fig. 2.

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PROCESS OF AND APPARATUS FOR ANNEALING AND CLEANING AND GALVANIZING OR PLATING WIRE CONTINUOUSLY.

SPECIFICATION forming part of Letters Patent No. 286,538, dated October 9, 1883.

Application filed February 20, 1883. (No model.)

To all whom it may concern:

Be it known that we, CHARLES S. HALL, CALVIN M. WHITCOMB, and W. JOHN D'EWART, all of the city and county of Worcester, and State of Massachusetts, have invented certain new and useful Improvements in the Art or Process of Annealing, Cleaning, and Galvanizing or Plating Wire or Wire Rods Continuously; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a longitudinal section of so much of a wire annealing, cleaning, and galvanizing or plating apparatus as is necessary to illustrate our aforesaid improved process; and Fig. 2 represents a modification, which will be hereinafter more fully described.

The object of our invention is to improve the quality of the wire or wire rods, to improve the galvanizing or plating, and to reduce the cost of thus treating said wire or wire rods, which we accomplish by cooling the wire gradually from a red heat as it leaves the annealing bath or furnace to a heat below redness between said bath or furnace and the acid cleaning-bath, as will be hereinafter more fully set forth.

To enable those skilled in the art to which our invention belongs to make and use the same, we will proceed to describe it more in detail.

In the drawings, A represents the annealing-bath, B the muriatic-acid cleaning-bath, and C the zinc galvanizing or plating bath, of an ordinary small apparatus, by means of which about six strands are usually treated at one time, one attendant upon each side tending three strands each.

In practice the wires or rods are uncoiled from suitable reels as they are fed into and through the annealing-bath, and as they leave the galvanizing-bath are coiled on suitable wire-blocks, both arranged at a short distance from the apparatus.

D represents a strand of wire as being treated by our improved process. It is first passed through the bath of lead A and properly annealed to a red heat in the usual way, when it is then passed over a suitable number of guide-rolls, E, properly arranged to obtain a sufficient length of wire between the annealing-bath and cleaning-bath B to allow the atmosphere to cool said wire gradually to a heat below redness. The wires may be passed back and forth over guide-rolls as many times as required to obtain the above result, either over the annealing-bath, acid cleaning-bath, (as shown by dotted lines in Fig. 1,) or in any other desired position suitable for the purpose—as, for instance, the wires may be passed over guide-rolls arranged in a semicircle over the baths, or the space between the baths; or the two baths may be arranged at a considerable distance apart and the wires passed from one to the other over guide or supporting rolls arranged in a horizontal line between said baths. If preferred, other means of support for the wires may be employed; or they may be entirely dispensed with, if the arrangement of the baths will admit of the same, and accomplish the result before described without departing from the principle of our invention.

In Fig. 2 our invention is shown as being applied to a large apparatus for annealing, cleaning, and galvanizing or plating wire or wire rods, this apparatus being made to treat about twenty strands of wire at one time. In this instance, instead of annealing the wires by passing them through a lead bath, as before described, and shown in Fig. 1, they are passed through hollow tubes *a*, arranged side by side lengthwise of the apparatus, and annealed by applying heat around said tubes by means of a furnace underneath, which heats the wires or rods to a red or white heat. In a furnace of this description a boiler is usually arranged over the annealing-tubes for the purpose of economizing the heat produced. Therefore it is more convenient to carry the wires (to cool the same) over the acid cleaning-bath, as shown in Fig. 2 and dotted lines, Fig. 1.

Although we have represented our invention as being applied to only two kinds of annealing, cleaning, and galvanizing or plating ap-

paratus, it may be applied to other apparatus used for a similar purpose, when cooling the wires or rods is essential or desirable.

The old method of passing the annealed wire directly into the acid bath while at a red or white heat by the two baths being arranged in close contact to each other, which prevents the wire from being cooled only in a very slight degree, results in the production of a large amount of poor wire, for the following reasons: First, the gases contained in the wire before and after the annealing operation, and which to produce good wire should pass off before entering the acid, are prevented from so doing by the said old method or process; second, the wire being immersed in the acid at a red or white heat, as aforesaid, causes it to become too brittle, and for the same reason the surface of the wire is not properly acted upon by the cleaning operation, which consequently affects the proper action of the galvanizing or plating operation, thereby resulting in a considerable quantity of black or imperfectly-coated wire; third, by immersing the wire at a red or white heat the acid is caused, by this intense heat, to evaporate very rapidly, thus causing a good deal of waste, and consequently unnecessary expense. Then, again, this rapid evaporation is not only objectionable for the above reason, but is a source of great annoyance and danger to the attendants of the apparatus, for reasons which will be obviously seen. The wire being coated while brittle, as aforesaid, cannot be softened or annealed afterward to produce good wire, if very brittle, which is often the case, and is therefore spoiled for recoating, or first-quality wire of any description.

The aforesaid objections, as well as others well understood by those skilled in the art to which our invention appertains, we have ascertained by practical application of such apparatus in treating thousands of tons of wire and wire rods, by which means we have also ascertained, after many experiments, the practicability of our invention, many hundreds of tons of wire having been successfully treated by this process in a large wire manufactory in the United States since we conceived and perfected our invention.

Practical application of our invention, as aforesaid, has demonstrated the fact that the objections before enumerated, caused by the use of the old processes, are entirely obviated, very tough and pliable wire being produced, which is also well and evenly coated with the galvanizing or plating material.

Another advantage of our invention over the old is that a greater production of finished wire may be obtained, for the reason that the wire may be fed forward, by cooling it as before described, much more rapidly than by the old method, the length of wire exposed to the atmosphere between the annealing and cleaning operations being varied according to the speed at which it is fed forward, and the heat imparted to the wire in annealing also correspondingly varied.

In lieu of rolls for supporting and guiding the wire to cool the same, as before described, suitable hollow tubes may be employed for the purpose; or, if preferred, the wire may be cooled gradually between the two points mentioned in any other suitable and convenient manner. The results obtained by passing the wires through hollow tubes, as above described, although less favorable than by the use of rolls, is much to be preferred to the old methods now in vogue, inasmuch as by the use of tubes, which admit of a circulation of air around the wires, the gases contained therein are allowed to pass off, while by the old method of quick immersion in the acid the gases are prevented from leaving the wires, as before described.

We are aware that it is not new or novel to anneal, clean, and galvanize wire continuously, and therefore make no claim, broadly, to the same, our invention being confined simply to the means for cooling the metal being treated, as before described, in combination with said old means of annealing, cleaning, and galvanizing wire.

Having described our improvement in the art or process of annealing, cleaning, and galvanizing or plating wire or wire rods continuously, what we claim therein as new and of our invention, and desire to secure by Letters Patent, is—

1. In the art or process of annealing, cleaning, and galvanizing or plating wire or wire rods by a continuous operation, the improvement consisting in gradually cooling said wire or wire rods after annealing and prior to introduction into the acid cleaning-bath, substantially as described.

2. In the art or process of annealing, cleaning, and galvanizing or plating wire or wire rods by a continuous operation, the improvement consisting in exposing the said wire or wire rods to the atmosphere for a space of time sufficient to cool the same gradually before introducing them into the cleaning-bath, substantially as described.

3. In the process of annealing, cleaning, and galvanizing or plating wire or wire rods continuously, cooling said wire or wire rods gradually until they are nearly or quite cold, or, at least, considerably below an extreme black heat, after the annealing and prior to the cleaning operation, by passing the same over suitable guide-rolls or their equivalents, so that they may be exposed to the action of the atmosphere, substantially as shown and described.

4. The combination, with the annealing bath or furnace and the acid cleaning-bath, of means, as described, for gradually cooling the wire or wire rods under treatment, after annealing and previous to their introduction into said acid bath, without interrupting

the continuous process of annealing, cleaning, and galvanizing, as set forth.

5. The combination, with the annealing bath or furnace and acid cleaning-bath, for carrying out the process of annealing, cleaning, and galvanizing or plating wire or wire rods continuously, of two or more rolls or their equivalents for supporting and conducting said wire or wire rods back and forth, so as to expose them to the action of the atmosphere between the annealing and cleaning operations, substantially as and for the purpose set forth.

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