(No Model.)

T. A. EDISON.

METHOD OF AND APPARATUS FOR DRAWING WIRE.

No. 436,968. Patented Sept. 23, 1890.

Fig 1

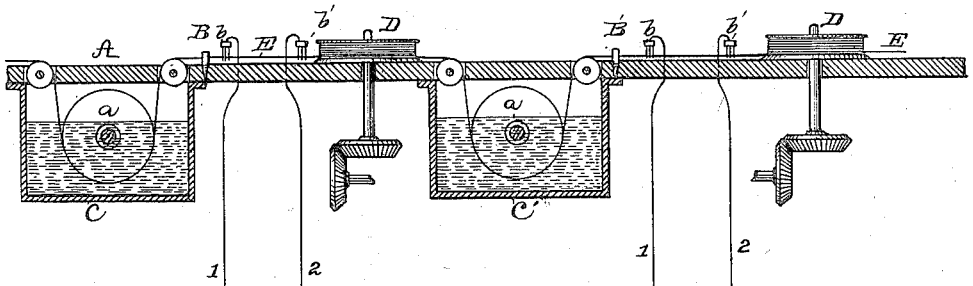


Fig 2

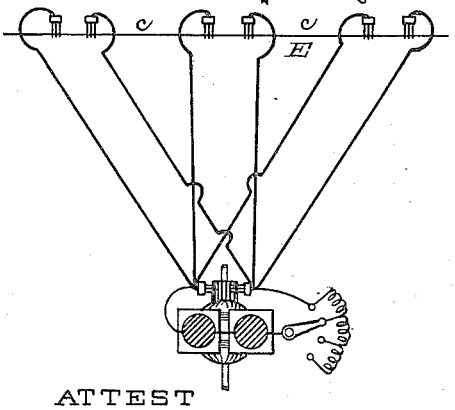
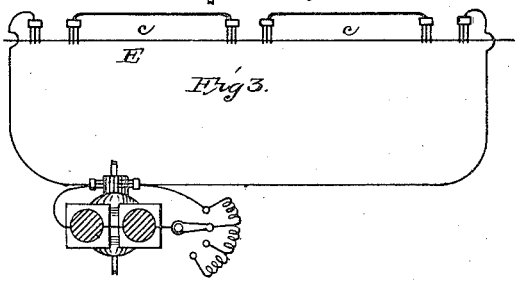


Fig 3.



ATTEST

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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY.

METHOD OF AND APPARATUS FOR DRAWING WIRE.

SPECIFICATION forming part of Letters Patent No. 436,968, dated September 23, 1890.

Application filed June 10, 1884. Serial No. 134,244. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Improvement in the Method of and Apparatus for Drawing Wire, (Case No. 622,) of which the following is a specification.

The object I have in view is to make the operations of drawing wire and annealing it a continuous process, the result being a cheapening of the product and a saving in cost of manufacturing plant. This I accomplish by providing means for annealing the wire at intervals between a series of graduated die-plates, through which it is drawn. The annealing I prefer to perform by heating the wire by an electric current of low tension and large quantity at proper intervals between the die-plates. A suitable number of die-plates of regularly-decreasing size are arranged to receive the wire in succession, means being provided for drawing the wire through the die-plates. At each interval between the die-plates, or at every other interval, as found desirable, the wire for a portion of its length is included in the circuit of a dynamo-electric machine operated by a steam-engine or other power. Connection is made with the wire by brushes or rollers, or both, and the electric current from the dynamo-electric machine heats the portion of the wire included in the circuit, annealing it, so that it will be received by the next die-plate in a softened condition. The dynamo-electric machine will be regulated to produce the desired heating. The wire is preferably heated in this way at two or more of the intervals between the die-plates, and the current for the two or more portions of the wire included in circuit may be supplied by the same machine or by different machines. Separate machines are preferred, since the wire will require somewhat different strengths of current, being of smaller size and higher electrical resistance after each die-plate. If one machine were used, however, the circuits to the different portions of wire might be independent circuits, and by using independent artificial resistances in these circuits the currents in the two or more circuits could be independently regulated, the same as when different machines are used; or the two or more portions of the wire to be heated could be arranged in series in one circuit, and the difference in current supplied to the several portions could be regulated by an adjustment of the contact brushes or rollers upon the wire so as to include more or less of it at each point where heated. This way of regulating the current could also be used if independent circuits from one or different machines were used. Pickling-reservoirs will also be arranged in the line of the wire after each dynamo-connection to remove the oxide, and proper drawing-wheels will be used, before or after which the heating-connections can be located.

The power that is saved by annealing the wire between the dies will serve to reduce the expense of running the dynamos, even if the power thus saved will not be all the power required by them.

The saving in the handling of the wire and the saving in the plant by doing away with expensive annealing apparatus will, however, result in cheapening the product.

The continuous process of drawing and annealing may be performed with apparatus in which the wire is heated at intervals by passing through heating-chambers from which the air is excluded; but this apparatus is not claimed herein, it forming the subject-matter of another application for patent.

In the accompanying drawings, forming a part hereof, Figure 1 is a vertical section of the wire-drawing apparatus, the annealing-dynamos being shown in top view, with the magnet-yokes removed and the electrical connections being illustrated diagrammatically. Figs. 2 and 3 are diagrams showing multiple-arc and series connections from one machine to the several portions of the wire to be heated.

A is the drawing-bench, upon which are located a number of die-plates B B′ of graduated sizes. The pickling-tubs are shown at C C′ and the drawing-wheels at D D′. These parts are of any ordinary or suitable construction and will be readily understood. They are arranged to receive the wire E in succession, the pickling-tubs having drums *a*, around which the wire passes.

F F′ are dynamo-electric machines, having connections 1 2 to pairs of contact brushes or rollers *b b′*, bearing upon the wire E in front of the drawing-wheels. If the wire is to be

heated to a point where it would be stretched materially by the drawing-wheel, the connections may be made to points between the drawing-wheel and the pickling-tubs.

The dynamo-electric machines F F′ have adjustable resistances R in their field-circuits to vary or adjust the current; but this may be done in any of the other ways before indicated. Multiple-arc or series connections from one machine may be used, as shown in Figs. 2 and 3. The electrical conductors will be made of sufficiently-low resistance, so that the intermediate sections *c* of the wire will not be heated to an undesirable extent.

What I claim is—

1. The wire-making process herein described, consisting in continuously drawing, annealing, and pickling the wire.

2. The wire-making process herein described, consisting in continuously drawing, heating by an electric current, and pickling the wire.

3. In wire-making apparatus, the combination of one or more dies, one or more electric circuits, including a portion or portions of said wire, and one or more pickling-tubs, substantially as set forth.

4. In wire-making apparatus, the combination of a series of dies, a series of drawing-wheels, electric circuits, including portions of the wire, and a series of pickling-tubs, substantially as set forth.

This specification signed and witnessed this 2d day of June, 1884.

THOS. A. EDISON.

Witnesses:

ALFRED W. KIDDLE,

EDWARD C. ROWLAND.