No. 876,182. PATENTED JAN. 7, 1908.

J. A. HERRICK.

ANNEALING FURNACE.

APPLICATION FILED MAR. 17, 1905.

3 SHEETS—SHEET 1.

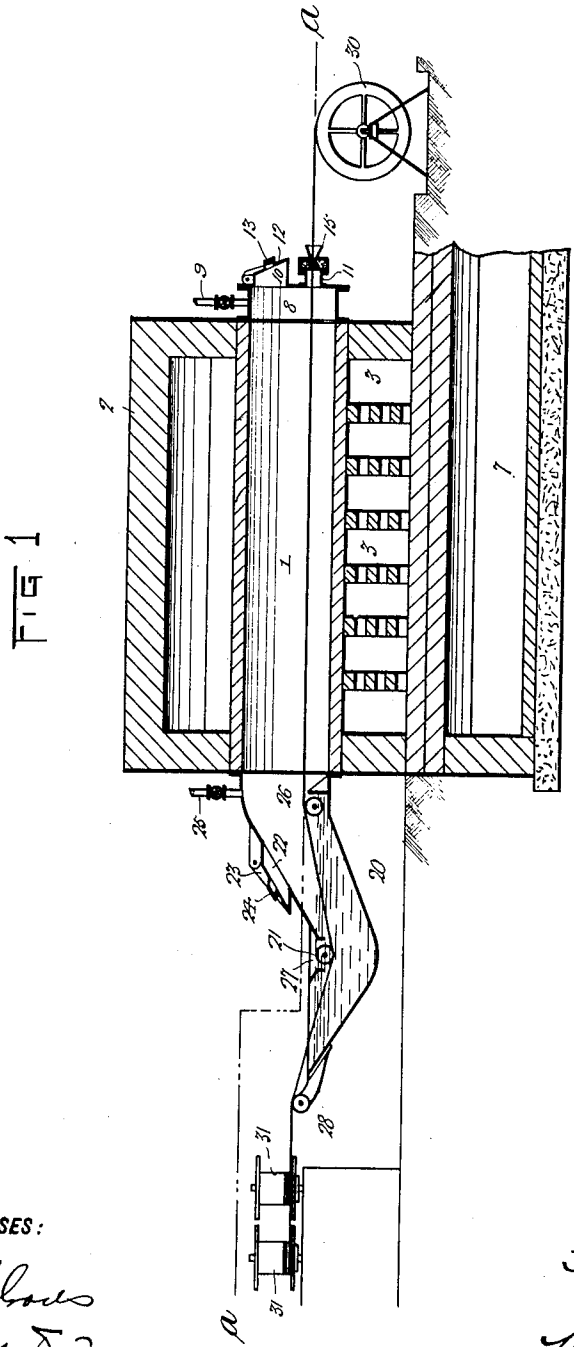

FIG 1

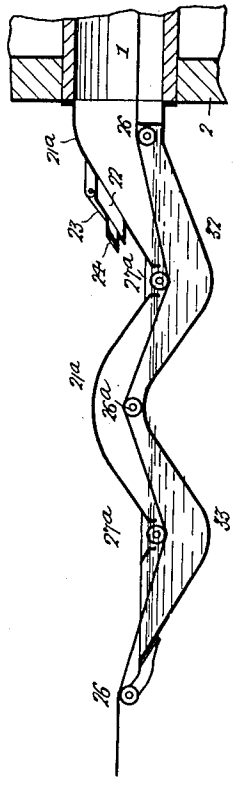

FIG 5

WITNESSES:

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3 SHEETS—SHEET 2.

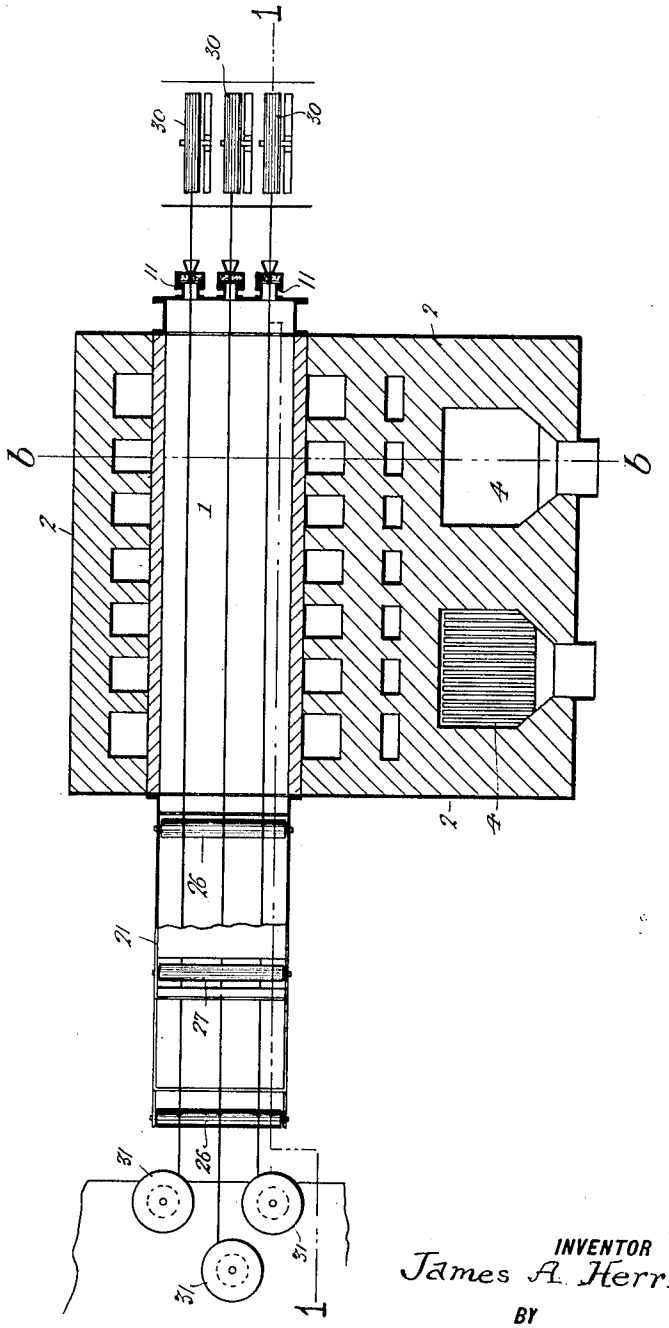

FIG 2

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3 SHEETS—SHEET 3.

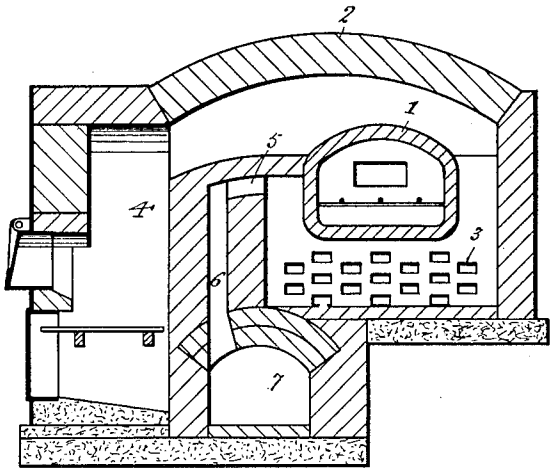

FIG 3

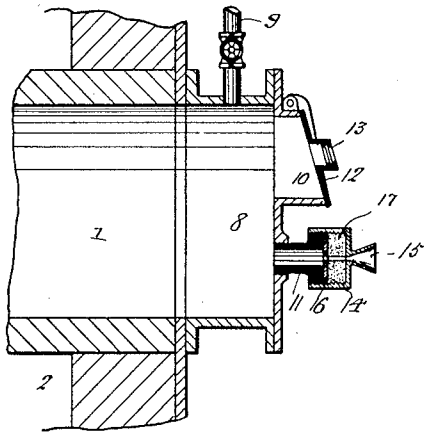

FIG 4

WITNESSES:

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UNITED STATES PATENT OFFICE.

JAMES A. HERRICK, OF PHILADELPHIA, PENNSYLVANIA.

ANNEALING-FURNACE.

No. 876,182. Specification of Letters Patent. Patented Jan. 7, 1908.

Application filed March 17, 1905. Serial No. 250,658.

To all whom it may concern:

Be it known that I, JAMES A. HERRICK, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Annealing-Furnaces, of which the following is a specification.

The object of my invention is to effect the annealing of metal, in the form of wire, strips or the like, more expeditiously and effectively than usual, and by the use of cheaper and simpler forms of apparatus than those now employed. This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which

Figure 1, is a longitudinal section of annealing apparatus constructed in accordance with my invention; Fig. 2, is a sectional plan view of the same on the line *a*—*a*, Fig. 1; Fig. 3, is a transverse section upon the line *b*—*b*, Fig. 2; Fig. 4, is an enlarged section of part of one end of the annealing retort; and Fig. 5, is a longitudinal section illustrating a special feature of my invention.

Hereafter, for convenience, I shall allude to the metal which is to be annealed as "wire," intending this term to include not only wire strands but strips or other forms of metal which are capable of being treated like wire.

According to the usual practice, coils of wire are passed slowly through a muffle or other annealing furnace, and after being suitably heated therein in a non-oxidizing atmosphere, are thrown into water or other fluid or carried through the same by mechanical means. These coils are heavy and consequently difficult to handle, they require the employment of large and extensive muffles or retorts, and they can only be heated properly by exposure to the action of the muffle or retort for a considerable length of time, thus involving the expenditure of a large amount of fuel and incurring the danger of over-heating the wire at the outer portion of the coil in an endeavor to raise the temperature of the wire at the inner portion of the coil to the required degree, this unevenness of temperature imparted to the different portions of the wire resulting in a correspondingly uneven annealing, especially with fine wire or strips.

Besides the labor and special machinery required for treating the wire in bulk, the wire must, after annealing, be wound from the coils upon spools and must be cleaned and polished while passing from the coil to the spool.

All of these objections are overcome by my invention, which consists in passing the wire continuously through a heated muffle or annealing furnace or retort containing a non-oxidizing atmosphere. The wire can then be passed through a suitable fluid bath or baths to complete the annealing and cleaning operations, and thence to a spool or spools suitably placed and power driven. Provision is thus afforded for locating any suitable mechanism for polishing, drawing, or the like between the bath and the spools upon which the wire is finally wound, so that the whole operation can be performed at once instead of necessarily comprising a number of separate and independent operations, as usual.

Referring now to the drawings, 1 represents a retort which may be made of any suitable refractory material and of any desired size and form, this retort being so mounted in the furnace 2 that the ends of the retort are firmly supported upon and built into the end walls of the furnace, the retort being, if desired, supported at various points throughout its length by the perforated walls 3 of refractory material, as shown in Fig. 1, or instead of a single retort, a plurality of the same may be used. At the front of the furnace structure are fire places 4 the products of combustion passing first over the top of the retort, thence down along one side of the same, thence across the bottom of the retort between the supporting walls 3, thence up along the opposite side of the retort, and thence through passages 5 and 6 to a discharge flue 7. The retort being thus enveloped in the products of combustion, provision is afforded for uniformly heating the retort throughout its entire extent to any desired temperature without risk of overheating its contents or injuring them by direct contact with the products of combustion. Instead of direct coal firing, any acceptable system of uniformly heating the retort 1 as by oil or gas, may be employed.

At the charging end of the retort is provided a neck 8 with pipe 9, opening 10 and a series of nozzles 11. The pipe 9 is intended for the flow into or from the retort of steam or other fluid which will serve to expel air from said retort and maintain a non-oxidizing atmosphere therein. The opening 10 is

provided with a pivoted valve or cover 12, having a peep hole 13 therein, and each of the nozzles 11 is provided with a screw cap 14, with a receiving funnel 15, said cap serving to confine against the enlarged end of the nozzle 11 a washer 16 and a mass 17 of asbestos or other suitable refractory packing material, so that each nozzle provides for the introduction of a wire into the retort without risk of permitting inlet of air with the same.

Where a plurality of retorts are used, they may be small and each may have a single nozzle 11, at its receiving end.

At the discharge end of the retort is a trough 20, and above the same a depending hood 21, the latter having an opening 22 with pivoted door 23, having a peep hole 24. The hood is also provided with a pipe 25 for the inflow or outflow of steam or other non-oxidizing fluid.

The trough 20 contains a supply of water or other liquid, and the lower edge of the hood 21 dips into the same so as to seal the delivery end of the retort, suitable rollers 26, 27 and 28 serving to so direct the wire in its passage from the retort that the same will be caused to pass through the liquid contained in the trough.

In the present instance the central roller is contained in a slotted portion of the hood 21, so that it is under observation and is accessible at all times.

Adjacent to the inlet end of the retort are a series of rotatable carriers 30 for the coils of wire, and adjacent to the sealed outlet end of the retort is a support for the spools 31 upon which the wire is to be wound after being annealed, any suitable means of rotating these spools by power being employed. There is one of these spools for each coil at the receiving end of the retort, the spools being so placed in respect to the coils that the respective wires can be drawn through the retort in substantially straight lines.

The operation of the apparatus is as follows. The furnace being in operation and the retort 1 uniformly heated, steam or other suitable fluid is admitted to the retort so as to drive out the air therefrom and produce a suitable non-oxidizing atmosphere therein, and the ends of the various wires to be annealed are then, by means of suitable lead wires or in some other available way, drawn from the coils through the packed nozzles 11 and through the retort and its liquid seal. The ends of the wires are then connected to the spools 31 and rotative movement is imparted to the latter. As each strand of wire is drawn taut from one end of the retort to the other it is suspended clear within the retort, and being entirely surrounded by the highly heated steam or non-oxidizing fluid contained in the retort will be rapidly and uniformly heated, a shorter and smaller retort being used than those required when the wire is treated in bulk as usual. If desired, a bed of charcoal or other slow burning material may be placed on the bottom of the retort below the wires, so as to aid in maintaining a non-oxidizing atmosphere in the retort. Owing to the facility with which each strand of wire can be heated, said strands can be drawn rapidly through the retort, each heated strand being finally passed through the liquid in the sealed outlet of the retort and thence to the spool upon which it is wound, suitable cleaning, drawing, polishing or other devices being, if desired, interposed between the sealed end of the retort and the spools, so as to combine any desired number of operations in one. As the submerged roller 27 is located in a slot in the top of the hood 21, the wires passing under said roller are always under observation and can be kept a proper distance apart, and, if desired, the sealing hood at the delivery end of the retort may be of such length that the wire leaving the retort at high temperature can be cooled to any desired extent before entering the liquid, and the outside of the sealing chamber can be cooled by water or other fluid to hasten such preliminary cooling of the wire.

Different liquids, such for instance as lime water or pickling solutions may be used as sealing liquids, or I may in some cases, pass the wire first through oil or other liquid and then through another liquid, such as water. In such case the trough may be provided with two pans, such for instance, as shown at 32 and 33 in Fig. 5 and the hood 21[a] may have two depressions, one above each pan, the number of guide rolls being increased so as to cause the wire to first dip into the oil or other sealing liquid in the pan 32 and then into the water or other sealing liquid in the pan 33, as shown in Fig. 1.

The asbestos or other packing of the nozzle 11, serves to remove from the wire grease scale or other foreign matter which may adhere to the surface of the same, so that the wire enters the retort in the best condition for the action of the same.

I am aware that coils or other bodies of metal in bulk have been carried by means of endless carriers through a retort and through a liquid sealing device at the delivery end of the retort or through such devices both at the delivery end and at the receiving end of the retort, but my invention, besides being distinct from the previous devices in treating the wire or other material in the form of separate strands instead of in bulk needs no conveying machinery whatever within the retort, the entire device being self contained and substantially automatic, and hence being susceptible of wider use in general practice than the devices heretofore known, and with which I am familiar.

Having thus described my invention, I

claim and desire to secure by Letters Patent:—

1. The combination of a heated retort having at the delivery end a seal containing a plurality of independent bodies of liquid with means for causing one or more strands of wire to pass through said retort, and successively through the bodies of liquid at the sealed end of the same.

2. The combination of a heated retort having a duplex seal at the delivery end of the same, with means for passing one or more strands of wire through the retort and successively through the bodies of liquid with which said duplex seal is provided.

3. The combination of a heated retort having a liquid seal at the delivery end, means for causing a wire or series of wires to pass through said retort and its seal, a slotted hood for said seal, and a directing roller located in line with the slot in the hood of the seal.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JAMES A. HERRICK.

Witnesses:
E. R. LOUGHERY,
JOS. H. KLEIN.