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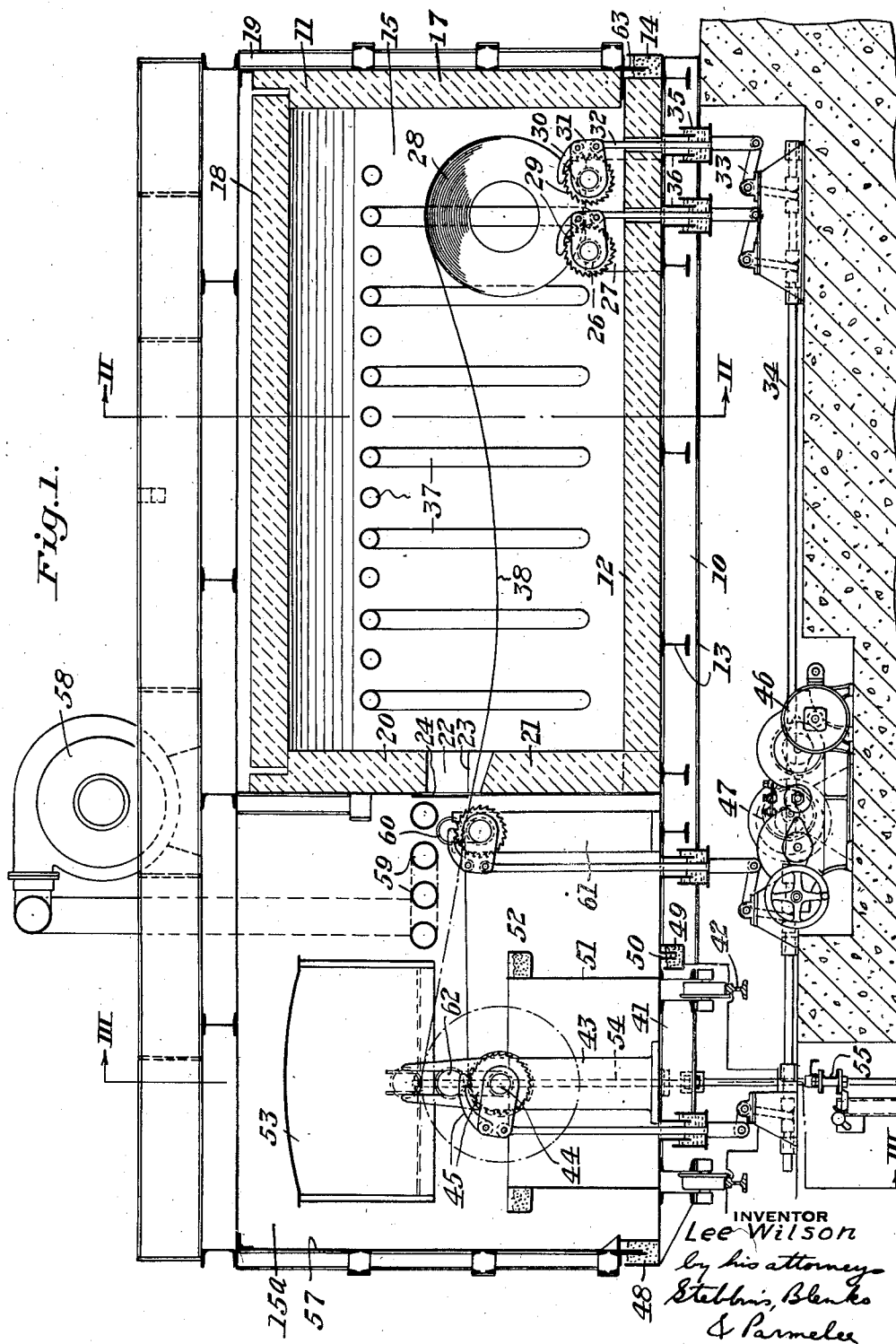
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2,109,204

METHOD AND APPARATUS FOR ANNEALING STRIPS

Filed Oct. 16, 1936

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Fig. 2.

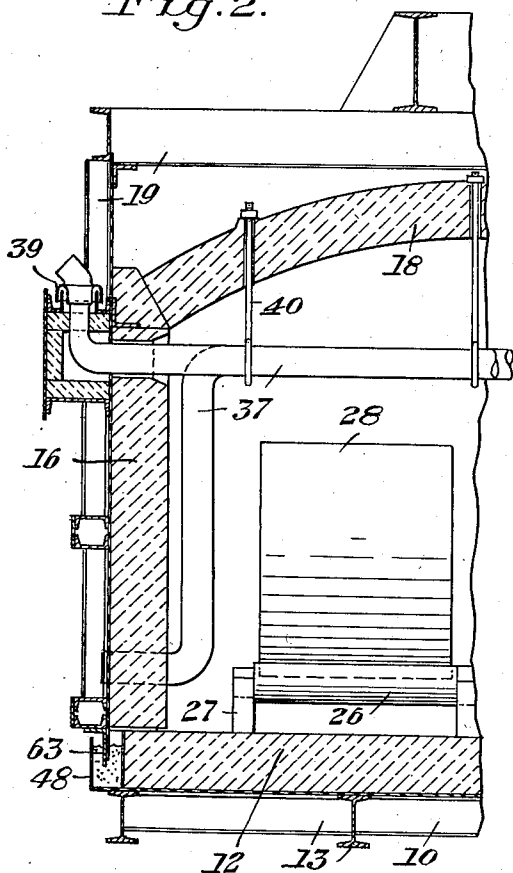
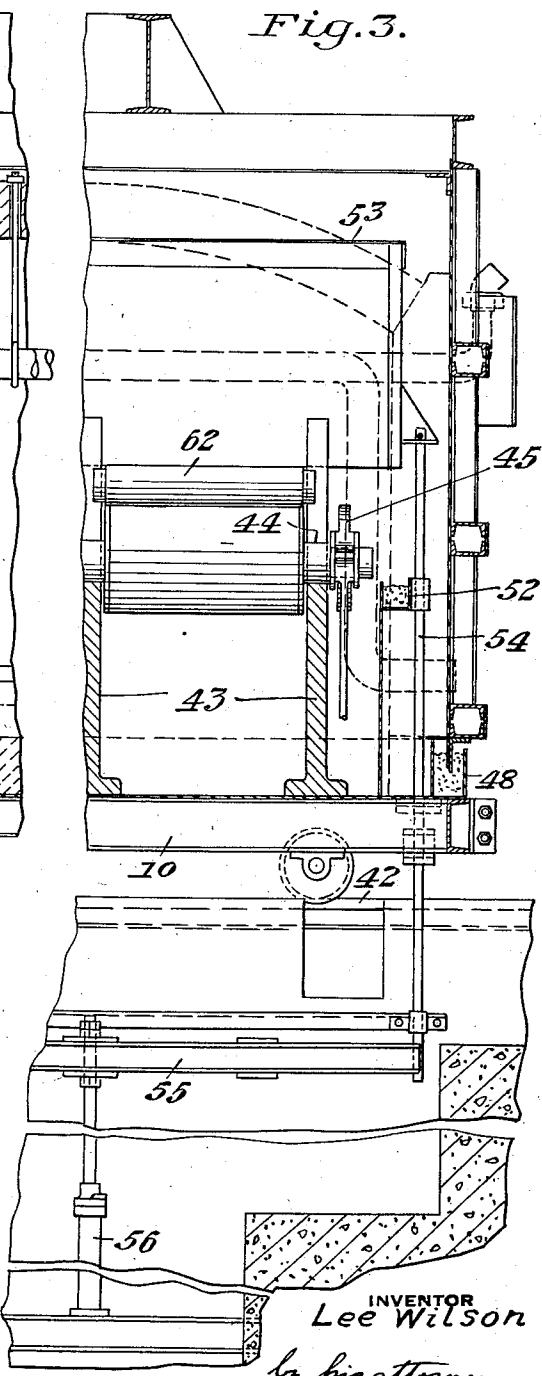


Fig. 3.



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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR ANNEALING STRIPS

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Application October 16, 1936, Serial No. 105,992

11 Claims. (Cl. 266—3)

This invention relates to the art of annealing and, particularly, to annealing of strip in strand form.

In my copending application Serial No. 26,853, filed June 15, 1935, for Method and apparatus for annealing, I have described and claimed a method of annealing strip in strand form by passing it through a continuous furnace and coiling it while it retains a substantial amount of heat from the annealing operation. I have now developed an improved form of apparatus for carrying out this method and a variation of the method itself, both of which I shall describe and claim herein.

In accordance with the present invention, I provide a cover-type furnace including a supporting base and an enclosing bell, for annealing strip in strand form. The interior of the bell is provided with radiant heat exchange tubes. The base is provided with means for supporting a coil while it is unwound. The cover also carries an enclosure for coiling means adapted to recoil the strip after annealing. Further details and advantages of the construction and method contemplated herein will become apparent as the following description thereof proceeds, and the novel features will be particularly pointed out in the appended claims.

The accompanying drawings illustrate a present preferred embodiment of the apparatus and practice of the method of my invention. In the drawings,

Fig. 1 is a longitudinal vertical sectional view through an annealing apparatus according to the present invention;

Fig. 2 is a partial sectional view taken along the line II—II of Fig. 1; and

Fig. 3 is a partial sectional view taken along the line III—III of Fig. 1.

The apparatus of my invention comprises a base 10 and a cover 11. The base 10 comprises a refractory hearth 12 laid on a structural framework 13. The base is surrounded on two sides, and the right-hand end by a sealing channel 14.

The cover 11 includes an annealing chamber 15 and a coiling chamber 15a. The annealing chamber is composed of side walls 16, an outer end wall 17, and a roof 18 of refractory material assembled within a structural frame 19. The annealing chamber also has an inner end wall 20 extending downwardly from the roof 18 about one-half the depth of the chamber. The other portion of the inner end wall is indicated at 21, and is carried on the base 10. The edges of the end wall portions 20 and 21 are recessed to form a slot 22, the joint between the wall portions be-

ing indicated at 23. A door 24 permits the slot 22 to be partially closed as desired.

Coil-supporting rollers 26 are journaled in bearings 27 mounted on the base 10 for supporting coils of strip as shown at 28. The rollers 26 are provided at one end with ratchet wheels 29 adapted to be driven by oscillating pawls 30, carried on plates 31 journaled on the ends of the rollers 26. Pitmen 32 extend downwardly through the base 10 to bell cranks 33, which are oscillated back and forth by a reciprocable shaft 34. The openings through which the pitmen 32 extend are sealed by fluid cups 35 carried on the pitmen, cooperating with sleeves 36 carried on the base. The reciprocation of the shaft 34, of course, causes rotation of a coil 28 to unwind strip therefrom.

Radiant heat exchange tubes 37 extend through the side walls 16 adjacent their lower edges and upwardly to a level between the roof 18 and the top of the coil 28. Thence they extend transversely across the annealing chamber and out through the opposite side wall. A burner (not shown) is positioned in the lower end of each tube for supplying hot combustion gases thereto. The tubes become heated to radiant condition by the passage of these gases and radiate heat to the coil 28 and the strand unwound therefrom, which is indicated at 38. The upper ends of the tubes have seals 39. The horizontal portions of the tubes are suspended by hangers 40.

A wheeled car 41 is adapted to travel on rails 42 extending transversely of the left-hand end of the base 10. The car is provided with coiling means comprising standards 43, a coiling mandrel 44 journaled therein, and a ratchet and pawl drive 45 therefor similar to those for driving the rollers 26. The drive for the coiling mandrel 44 is actuated by the shaft 34 which is driven by a motor 46 through a geared eccentric drive 47. The car 41 has a sealing channel 48 on three sides thereof similar to that shown at 14. A transverse sealing channel 49 extends across the end of the base 10 adjacent the rails 42. A down-turned flange 50 on the car cooperates with this channel to seal the joint between the car and the base.

A housing 51 extends upwardly from the car and surrounds the standards 43 which is provided with a sealing chamber 52 adjacent its upper edge. An inner cover 53 normally held in elevated position as shown, by thrust rods 54, is adapted to be lowered over the coiling mechanism, its lower edges being seated in the chan-

nel 52. The thrust rods 54 are carried on a cross head 55 mounted below the base 10 which is adapted to be raised and lowered by a piston and cylinder 56.

5 The coiling chamber 15a is composed of sheathing 57 secured to a structural frame similar to that in which the refractory material forming the annealing chamber is disposed. It will be understood that the framework of the cover is a rigid unit, both the annealing and coiling en-
10 closures being raised by lifting the frame.

A blower 58 mounted on the cover supplies air to cooling tubes 59 extending across the coiling chamber adjacent the slot 22. Pinch rolls 60
15 are mounted on standards 61 adjacent the slot to assist in drawing the strand of strip there-through.

A description of the operation of the apparatus already explained will suffice to disclose the
20 method of my invention. The cover 11 is raised from the base 10, as by an overhead crane and coils of strip disposed on the rollers 26. The end of the coil is passed through the pinch rolls 60 and is started on the coiling mandrels 44 with
25 which pressing rollers 62 cooperate. The cover is then lowered onto the base, a peripheral flange 63 depending therefrom entering the sealing channels 14 and 48. A suitable gaseous atmosphere, preferably non-oxidizing, is introduced
30 into the annealing and coiling chambers by any convenient means, not shown. When the desired atmosphere has been established, the burners in the tubes 37 are lighted or, if previously lighted, are turned on full to heat the interior of the annealing chamber to the proper
35 temperature. When this temperature has been attained, the motor 46 is started. The reciprocating shaft 34 operates the coil-supported rollers 26, the pinch rolls 60 and the coiling mandrels 44. The strip thus unwinds from the coil
40 28 and is re-coiled after annealing on the mandrels 44. The air traversing the tubes 59 cools the strip as it emerges from the annealing chamber sufficiently to prevent sticking between
45 adjacent turns coiled on the mandrels.

When the coils have been annealed throughout and their entire length transferred onto the mandrels 44, the inner cover 53 is lowered onto the housing 51. The cover 11 is then raised and
50 the car 41 may be moved away from the base 10. Before doing this, it is necessary to disconnect the pitman operating the ratchet and pawl drive 45. The thrust rods 54 must also be disconnected from the cover 53.

55 While additional coils are being placed on the rollers 26, another car similar to 41 is moved into position opposite the end of the base 10. The rods 54 are connected to the inner cover 53 and the pitman of the drive 45 is also reconnected. The cover 53 may then be raised to the illustrated position and the ends of the coils started on the mandrels 44 as before. The cover
60 11 may then be lowered and the annealing process repeated.

65 It will be apparent from the foregoing description that the invention provides highly efficient means for annealing strip in strand form. The coiled strip is unwound, heated to the annealing temperature in strand form and recoiled, and is
70 protected against contact with the atmosphere throughout the operation. Similarly, the annealed strip is cooled after recoiling in the absence of air. The inner cover 53 and the housing
75 51 serve to retard the rate of cooling of the an-

nealed coils, as well as affording protection against atmospheric oxidation.

The apparatus is compact and simple in construction, and is relatively low in cost compared to furnaces previously used for annealing strip
5 in strands. The operation is largely automatic, except for the placing of fresh coils of strip and the removal of annealed coil. The operation is semi-continuous, and a relatively large production of annealed strip can be obtained at a low
10 unit cost.

Although I have illustrated and described a preferred form of the apparatus and practice of the method of my invention, changes therein may be made without departing from the spirit
15 of the invention or the scope of the appended claims.

I claim:

1. Annealing apparatus comprising a base-portion, an open-bottomed furnace cover adapted
20 to be lowered thereover and raised therefrom, an open-bottomed coiling enclosure extending from one end of said cover and liftable therewith, a base-portion which the enclosure is adapted to overlie, and coiling means on said
25 last-mentioned base-portion.

2. The apparatus defined by claim 1 characterized by said last-mentioned base-portion being movable to and from a position in alignment with said first-mentioned base-portion.
30

3. The apparatus defined by claim 1 characterized by a coil holder on said first-mentioned base portion.

4. The apparatus defined by claim 1 characterized by means in the coiling enclosure for
35 cooling the strip as it emerges from the heating chamber.

5. Annealing apparatus comprising a base including a fixed portion and a movable portion, a removable cover adapted to cooperate with said
40 base, said cover including an insulated chamber adapted to overlie the fixed portion of the base, said cover having means thereon for heating strip passing therethrough, and a second chamber overlying the movable portion of the base,
45 said movable portion having means thereon for coiling strip emerging from the insulated chamber.

6. The apparatus defined by claim 1, characterized by rotatable means on said first mentioned base portion for supporting a coil of strip
50 for unwinding.

7. The apparatus defined by claim 1, characterized by a protective cover within said enclosure, and vertically reciprocable means extending through the base portion which said enclosure overlies for supporting said protective
55 cover above said coiling means and lowering it thereover.

8. A method of annealing strip including the steps of uncoiling strip from a coil and recoiling it in another coil, enclosing the first coil in a heating chamber, enclosing the second coil in a
60 coiling chamber, covering the second coil after recoiling the full length of the strip therein and while it remains enclosed in the coiling chamber, and removing the second coil from the coiling chamber for cooling while maintaining it covered.

9. A cover type furnace comprising a base, an insulated heating chamber and an enclosed coiling chamber mounted within a common frame
70 and adapted to be removably disposed on said base, and means for uncoiling and recoiling strip so positioned on said base as to lie in said chambers, respectively.
75

10. Annealing apparatus comprising a cover and a base forming an annealing furnace, a frame supporting the cover, a coiling enclosure carried by said frame, a movable collar cooperating with said enclosure, and cooperating means on the collar and enclosure constituting them a substantially gas tight chamber, 5
- forming an annealing furnace, a frame supporting the cover, and an enclosure carried by said frame, of a car cooperating with said enclosure, cooperating means on the enclosure and car constituting them a substantially gas tight chamber, 5 coiling means on said car and a drive for said means exterior to said enclosure.

11. The combination with a cover and base

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