

(No Model.)

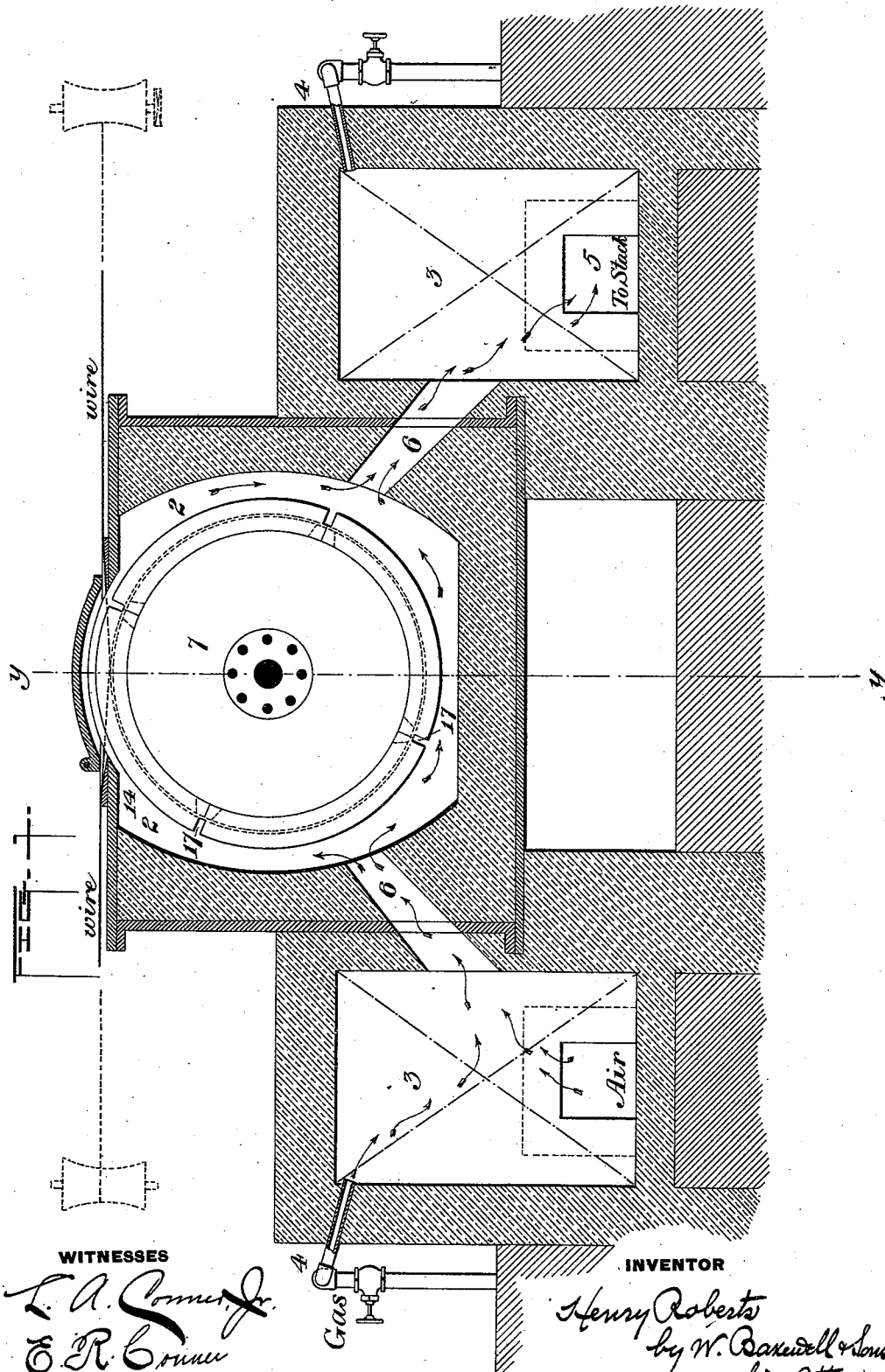
4 Sheets—Sheet 1.

H. ROBERTS.

APPARATUS FOR HEATING CONTINUOUS LENGTHS OF RODS, WIRE,
WIRE RODS, &c.

No. 423,445.

Patented Mar. 18, 1890.



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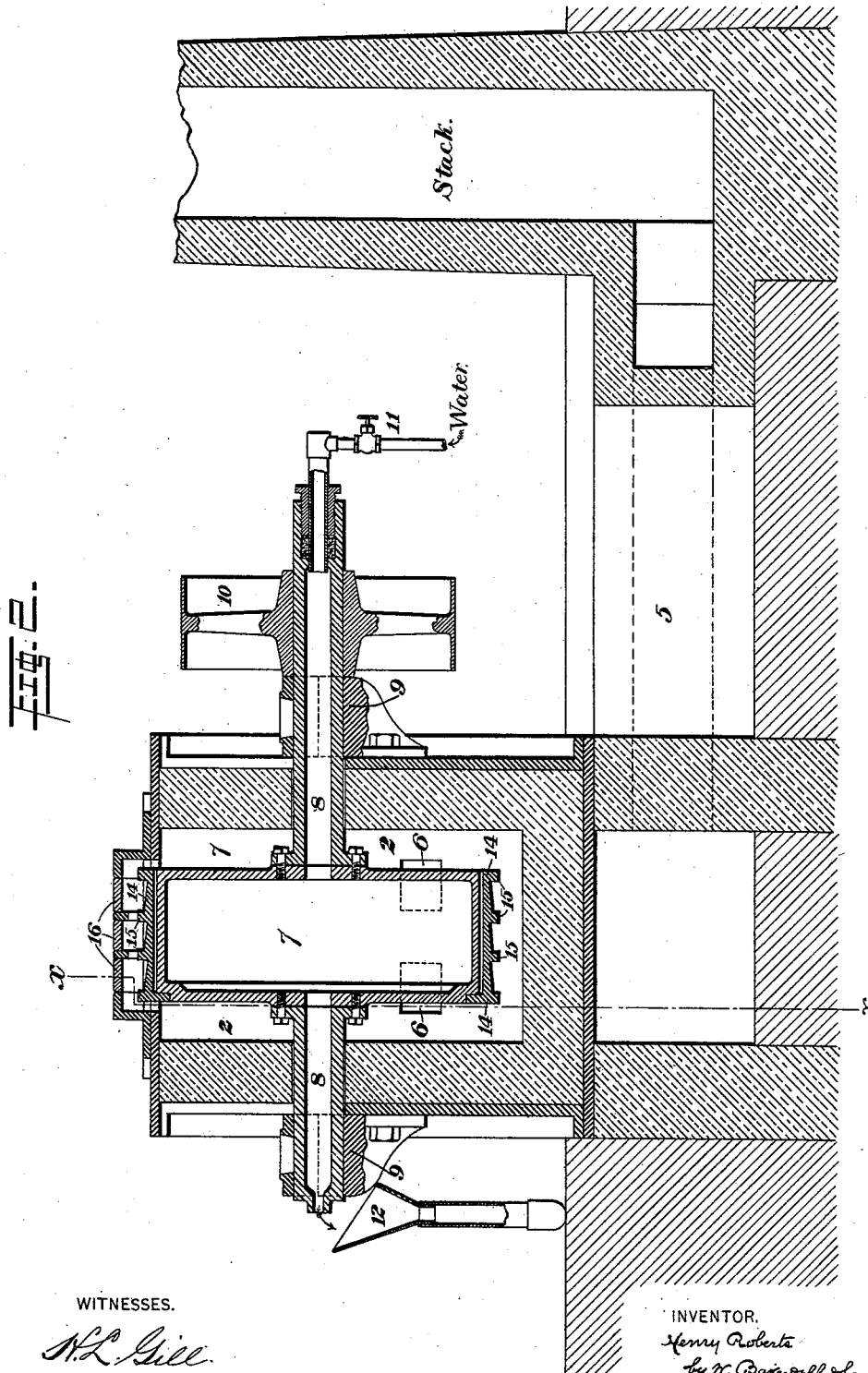
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WITNESSES.

H. L. Gill.
W. B. Conner

INVENTOR.

Henry Roberts
by W. B. Conner & Son
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(No Model.)

4 Sheets—Sheet 3.

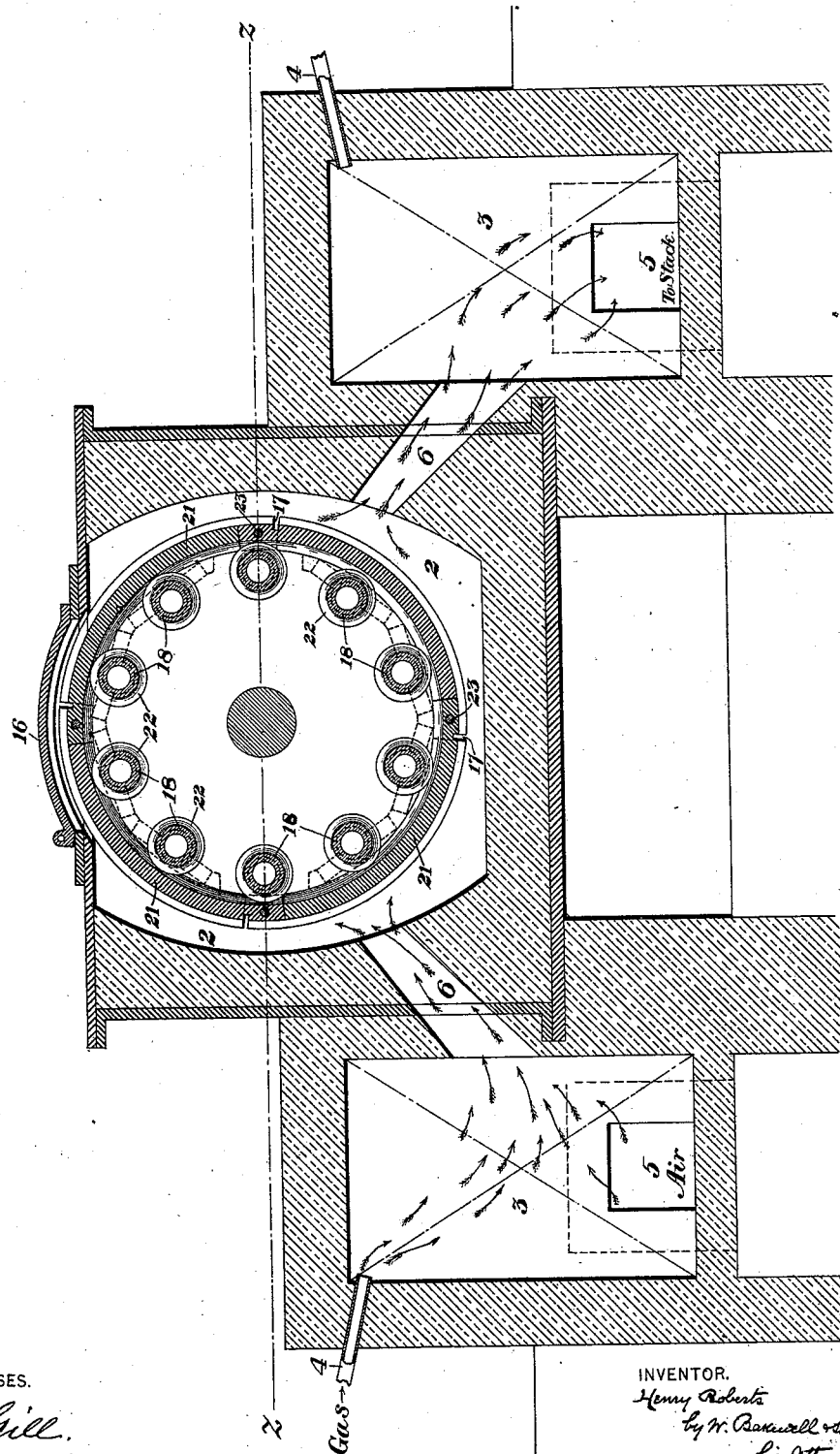
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FIG. 3.



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(No Model.)

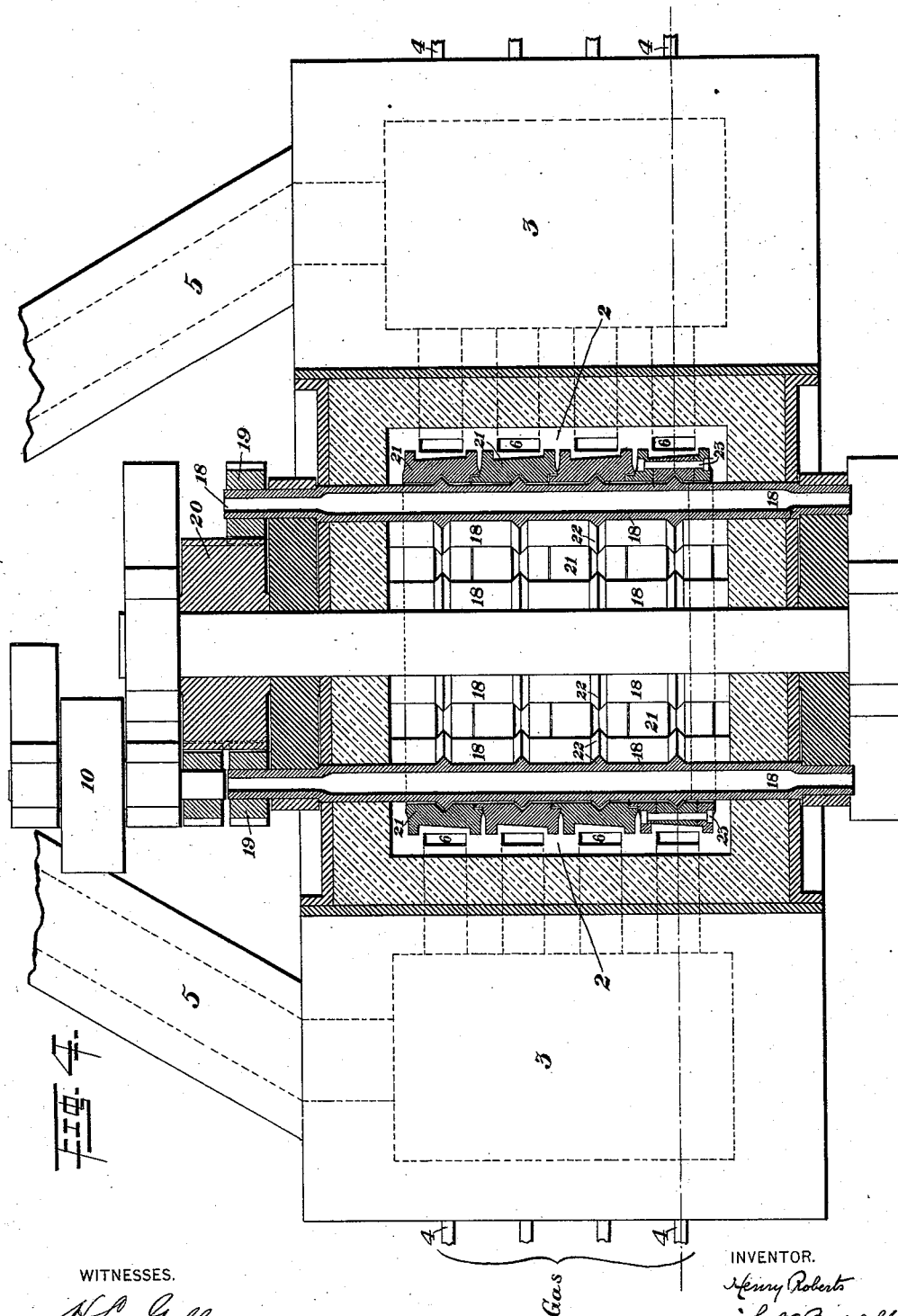
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UNITED STATES PATENT OFFICE.

HENRY ROBERTS, OF PITTSBURG, PENNSYLVANIA.

APPARATUS FOR HEATING CONTINUOUS LENGTHS OF RODS, WIRE, WIRE RODS, &c.

SPECIFICATION forming part of Letters Patent No. 423,445, dated March 18, 1890.

Application filed June 7, 1888. Serial No. 276,294. (No model.)

To all whom it may concern:

Be it known that I, HENRY ROBERTS, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for Heating Continuous Lengths of Wire, Wire Rods, &c.; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to an improvement in apparatus for heating wire, wire rods, hoop iron or steel, and similar metal, for the purpose of enabling them to be rolled, annealed, tempered, galvanized, or for any other purpose to which the apparatus may be applicable; and it consists in a furnace of improved construction in which the wire or rod is heated in its passage through the furnace.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section through the furnace on the line *xx* of Fig. 2, showing the rolls in dotted lines for supporting the ends of the wire. Fig. 2 is a vertical cross-section on the line *yy* of Fig. 1. Fig. 3 is a vertical longitudinal section of a furnace, illustrating a modification of my invention. Fig. 4 is a horizontal section on the line *zz* of Fig. 3.

Like symbols of reference indicate like parts in each.

In the drawings, 2 represents the heating-chamber of the furnace. In order to adapt it for use on the regenerative principle, I prefer to provide it at the ends with chambers 3, filled with checker-work and provided with gas-inlets 4 and with ports 5, which by means of suitable valves may be connected with the stack to serve as an outlet for the waste products of combustion, or with the outer air to serve as an air-inlet. The chambers 3 are connected with the heating-chamber 2 by neck-flues 6. The gas and air enter the combustion-chamber 2 from one of the regenerator-chambers, and after they have burned therein the products of combustion pass through the other regenerator-chamber to the stack, heating the latter chamber in their passage. The course of the gas and air may

then be reversed, and the regenerators are used alternately as inlet and outlet passages in the usual way.

Inside the heating-chamber 2 is journaled a spool or drum, around which the wire or wire rod is wrapped in one or more coils or plications. It is caused to travel through the chamber from one side to the other around this spool or drum, and as it thus has a circuitous or indirect passage it is subjected for a considerable time to the heat of the burning gases, and may thus be raised to a high degree of heat, dependent upon the number of times it passes around the drum and the consequent duration of its subjection to the fire of the furnace. This construction of apparatus which I have just described (except the regenerator-chambers, which are an unessential feature) constitutes my invention. The spool, however, may be constructed in many different ways, and I have illustrated some of them in the drawings. Others will suggest themselves to those skilled in the art.

In Figs. 1 and 2 I show one form of the spool. It consists of a hollow cylindrical casting 7, mounted on a hollow shaft 8, which is supported in suitable journals 9, and is driven by a belt-pulley 10 or other suitable power-connection. The shaft 8 is hollow and is provided with a water-supply pipe 11, by which a constant stream of water through the shaft and through the body of the spool is maintained. The water has its exit from the end of the shaft into a waste pipe or passage 12. The water serves to cool the spool and its shaft and to prevent them from being burned by the heat of the furnace. On the periphery of the spool 7 is a shell or ring 14, preferably made in two or more transversely-divided sections, and provided with peripheral ribs 15, which divide it into a number of grooves to enable two or more wires or rods to be passed through the furnace at a single time. These grooves are preferably inclined, as shown in Fig. 2, so that the wire shall be automatically distributed on the surface of the spool and shall be prevented from overlapping when the wire is wrapped more than once around it. The shell 14 is pro-

vided in each groove with one or more notches or cavities 17, in which the end of a wire may be inserted and secured.

The operation is as follows: When it is
5 desired to pass a wire through the furnace, the cover 16 of the furnace is removed and the end of the wire which is drawn from a reel situate at one end of the furnace is introduced
10 14 by insertion into one of the notches 17, and then the rotation of the spool wraps the wire around its circumference in one of the grooves, and when it has been wrapped a sufficient number of times—say from one to
15 twenty times—the end is unfastened from the spool and is drawn from the other side of the furnace and is secured to a rotary reel situate at the opposite end of the furnace, or is passed to the rolls or to the galvanizing apparatus, according to the nature of the treat-
20 ment which the wire is to receive. Two or more strands of wire may be fastened to the spool and wound thereon at once. The rotation of the spool draws the wires into the
25 furnace at one end and causes them to pass out at the other in a continuous course; but, owing to the number of the wrappings around the spool, the wires are exposed to the heat for a sufficient length of time to heat them to
30 a high degree, even though the spool be driven quite rapidly. I am thus enabled to heat the wire without causing it to travel so slowly as to impede or diminish the output of the mill in which the apparatus is used.

35 The slowness of action of prior apparatus in which the wire is caused to pass directly through a heating-chamber from one side to the other has been fatal to their successful use. The only disadvantage in this form of
40 apparatus is that if it be used for heating more than one wire or rod at a time anything which would necessitate the stopping of the spool for one of the wires would oblige it to be stopped for all, and from this cause serious
45 inconvenience might result. I overcome this by constructing the spool so that there shall be a separate section or part for each of the wires, these sections or parts being so arranged that any of them may be checked in its rota-
50 tion without checking the others. This secures independent action of the wires, and any accident which may affect one need not affect the others. For this purpose the spool is preferably composed of several parallel ro-
55 tary shafts 18, arranged within the furnace and at their ends provided with gear-wheels 19, intermeshing with a common driving-pinion 20, Figs. 3 and 4. Around the shafts 18 and supported thereby are a number of rings
60 21, with grooved peripheries, arranged side by side, as shown in Fig. 4. The rings are prevented from side movement by enlargements or collars 22 on the shafts 18, which fit within grooves on the interiors of the rings
65 21. The rotation of the driving-pinion 20

drives all the shafts 18, and as the rings 21 are in contact therewith they are driven with a rotary motion, all revolving together; but as they are driven by friction and not by positive mechanical connections any one of the
70 rings may be stopped without disturbing the rotation of the others. The wires are wrapped around the rings and passed through the heating-chamber in the same manner as already described with reference to the first and sec-
75 ond sheets of the drawings.

In order to permit easy adjustment of the rings 21, I prefer to make them in segments and to bolt the segments together by bolts 23, as shown in Fig. 4.

The shafts 18 are preferably made hollow and cooled by the passage through them of streams of water in the usual way.

The apparatus may be variously changed in form, position, and details of construction
85 without departing from the principles of the invention.

I claim—

1. In an apparatus for heating wire, &c., the combination, with a heating-chamber, of
90 a coil-spool arranged therein and adapted to receive one or more wraps or turns of the wire to be heated, mechanism for rotating said spool, whereby the wire is continuously
95 drawn in and delivered from the heating-chamber by the rotation of the coil-spool, and rolls or reels for discharging and receiving the wire, substantially as and for the purposes described.

2. In an apparatus for heating wire, &c.,
100 the combination, with a heating-chamber, of a power-driven horizontally-journaled tapering coil-spool arranged therein and adapted to gradually and progressively receive and
105 discharge one or more wraps or turns of the wire to be heated, and rolls or reels for discharging and receiving the wire, substantially as and for the purposes described.

3. In an apparatus for heating wire, &c.,
110 the combination, with a heating-chamber, of a coil-spool arranged therein and adapted to receive a series of coils or turns of the wire, &c., to be heated, said coil-spool being composed of separate independently-rotary annular sections, substantially as and for the pur-
115 poses described.

4. In an apparatus for heating wire, &c., the combination, with a heating-chamber, of
120 a coil-spool arranged therein and adapted to receive a series of coils or turns of the wire, &c., to be heated, said coil-spool being composed of separate independently-rotary annular tapering sections, substantially as and for the purposes described.

5. In an apparatus for heating wire, &c.,
125 the combination, with a heating-chamber, of a power-driven hollow coil-spool arranged therein and adapted to receive a series of coils or turns of the wire, &c., to be heated, said spool being mounted upon a hollow shaft
130

or shafts connected with a water-supply, substantially as and for the purposes described.

6. An apparatus for heating wire, &c., which consists in a heating-chamber and a power-
5 driven rotative spool arranged therein, having devices—such as a notch on the spool—for detachably securing the end of a wire thereto, whereby the wire on being wrapped on the spool and drawn through the heating-
10 chamber may be subjected to heat to a length

of time depending on the number of its convolutions around the spool, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 29th day of May, A. D. 1888.

HENRY ROBERTS.

Witnesses:

W. B. CORWIN,
THOMAS W. BAKEWELL.