No. 774,069. PATENTED NOV. 1, 1904.

H. H. GOODSELL.

METHOD OF TREATING SHEET IRON OR STEEL.

APPLICATION FILED NOV. 7, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

FIG. 1.

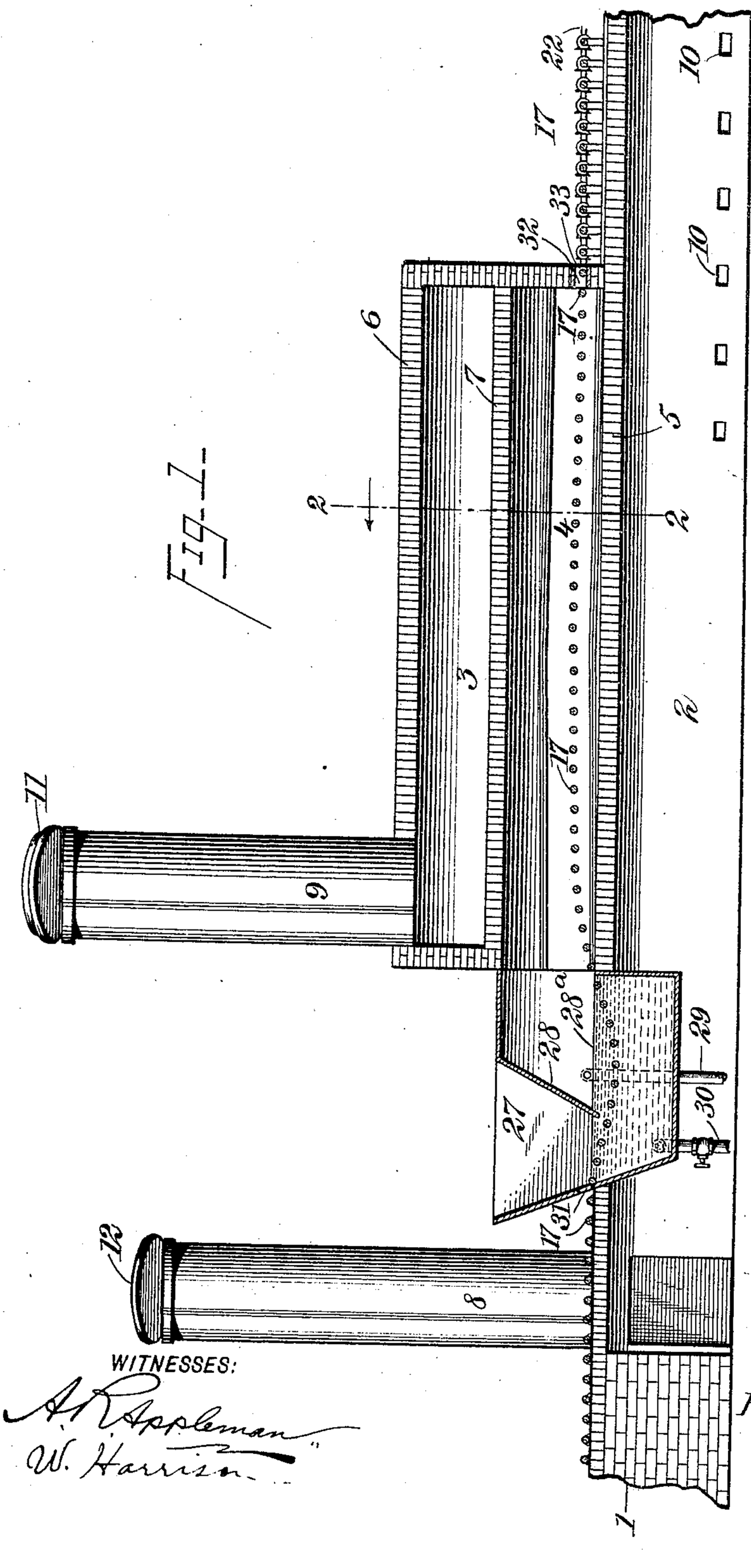
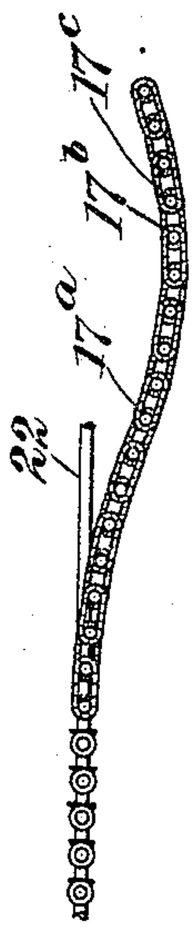


FIG. 2.



WITNESSES:

A. R. Appleman

W. Harrison

INVENTOR

Harry Homer Goodsell

BY

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NO MODEL. 2 SHEETS—SHEET 2.

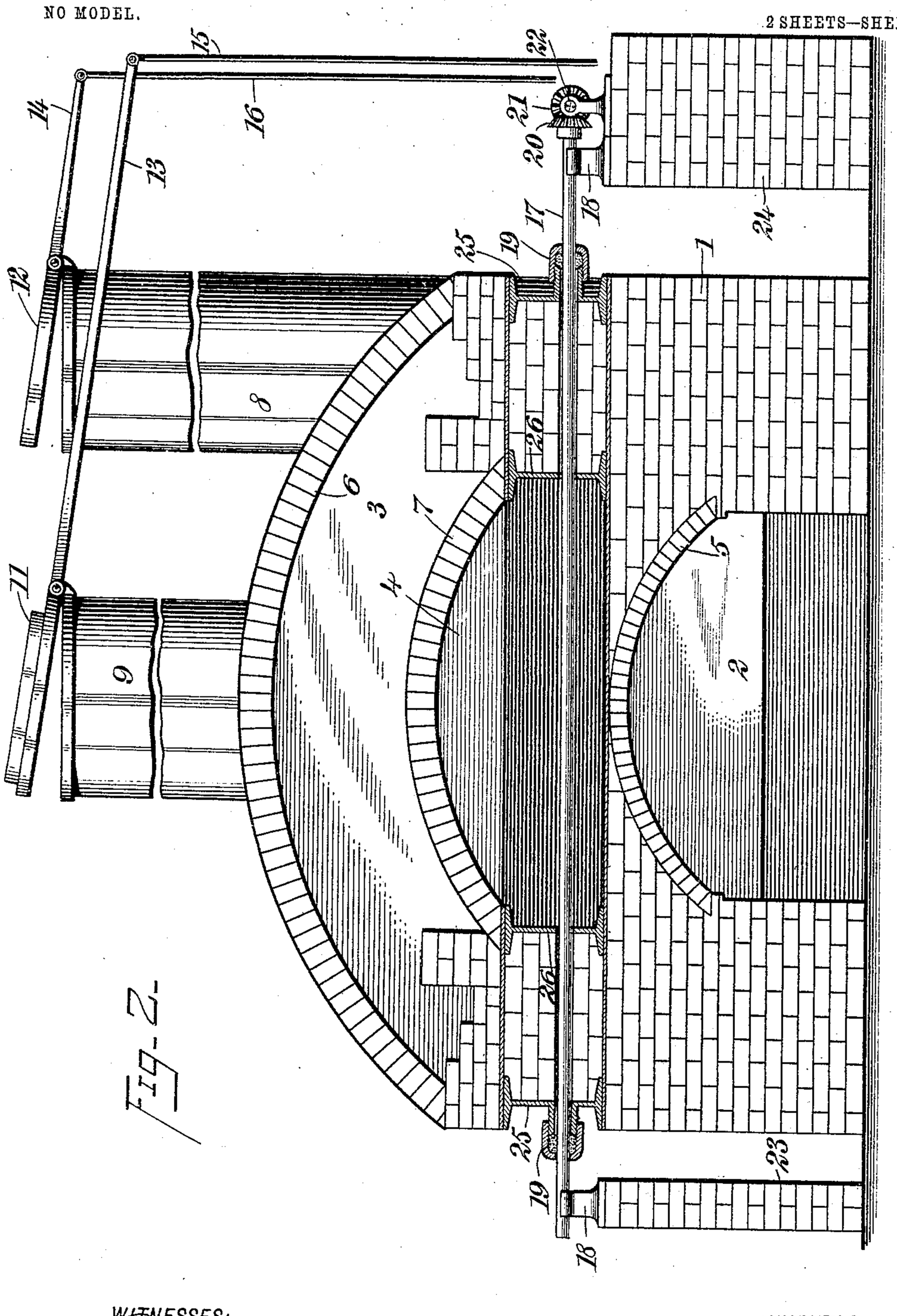

FIG. 2.

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UNITED STATES PATENT OFFICE.

HARRY HOMER GOODSELL, OF LEECHBURG, PENNSYLVANIA.

METHOD OF TREATING SHEET IRON OR STEEL.

SPECIFICATION forming part of Letters Patent No. 774,069, dated November 1, 1904.

Application filed November 7, 1903. Serial No. 180,190. (No specimens.)

To all whom it may concern:

Be it known that I, HARRY HOMER GOODSELL, a citizen of the United States, and a resident of Leechburg, in the county of Armstrong and State of Pennsylvania, have invented a new and Improved Method of Treating Sheet Iron or Steel, of which the following is a full, clear, and exact description.

My invention relates to a process for treating sheet iron or steel, and more particularly for causing a uniform and thorough oxidation upon the exterior of the sheet, so that the oxid will adhere firmly to the sheet, being practically a part thereof, and presenting an elegant appearance; besides being very durable.

I find that by my process sheet iron or steel can not only be thoroughly annealed, so as to be suitable for the trade, but that the sheets of metal when thus treated can also be bent and otherwise manipulated to a considerable extent without disturbing the oxidized surfaces.

It is unnecessary to enumerate in detail all of the advantages to be gained by thorough annealing and good oxidizing of the iron or steel nor to enumerate the difficulties encountered in achieving this result, these things being well-known in the art.

I will first briefly describe my preferred apparatus for carrying out my process and will then describe the process itself. I, however, reserve the right to apply for a patent upon the apparatus independently of the method hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a vertical longitudinal section through my annealing-furnace. Fig. 2 is a vertical cross-section upon the line 2 2 of Fig. 1 looking in the direction of the arrow, and Fig. 3 is a reverse fragmentary elevation of a part of the gearing.

The brickwork is shown at 1 and is provided with large flues 2 3 4, concentric with each other, as shown, and provided at the top with arches 5 6 7. The furnace is provided with two chimneys 8 9, which carry off the gases of combustion from the flues 2 3. The flue 4 is not exposed to the gases of combustion, but is heated by the flues 2 3. The draft for supporting the combustion may be supplied in any suitable manner—as, for instance, through ventilator-holes 10. The chimneys are provided with closure-caps 11 12, mounted upon levers 13 14, controllable by rods 15 16, which may be manipulated by hand. A number of revoluble shafts 17 are each mounted upon bearings 18 and provided with stuffing-boxes 19, through which the shafts pass, as indicated in Fig. 2. Bevel-gears 20 21 connect the shafts 17 with the driving-shaft 22, whereby a slow and uniform rotary motion may be communicated to the shafts 17. Walls 23 24 support the weight of the revoluble parts, as indicated in Fig. 2.

I-beams 25 26 are used in the construction of the furnace, thereby giving the same considerable strength.

The vat 27 is provided with a shield 28, which extends downwardly at an angle and into the water 28^a. Feed-pipes 29 30 are connected with the vat 27 and are used for emptying and refilling the same. The vat 27 is provided at its rear end with a longitudinal slot 31, this slot being practically in alinement with several of the revoluble shafts 17.

A box 32 is fitted into the brickwork so as to leave a slot 33 of considerable width in alinement with a portion of the shafts 17, as indicated in Fig. 1.

As the shaft 22 is straight and as some of the rollers 17^a on the shaft are out of alinement with the rollers 17^b, I employ endless sprocket-chains 17^c to transmit power to the rollers 17^a. (See Fig. 3.)

The purpose in having the flues 2 3, which are used as the combustion-chambers, disposed above and below the flue 4, which is used as the annealing and bluing chamber, is to heat the latter-mentioned chamber without introducing the gases of combustion into the same. The annealing and bluing chamber 4 is heated to a high temperature at a point near the entrance of the furnace—that is, to the right of Fig. 1—and then toward the back of the furnace. (Represented at the left of Fig. 1.) The highest temperature of this chamber is about 900° Fahrenheit, this point being a

comparatively short distance from the box 32, the temperature gradually decreasing toward the rear of the furnace. At the extreme rear of the furnace the temperature is almost 212° Fahrenheit, this being of course the temperature of the water 28ª, which boils by virtue of its exposure to the lower combustion-chamber 2. Steam from the water passes directly into the annealing and bluing chamber 4 and thence works its way to the front end of the furnace, where it escapes through the aperture or slot 33, attaining just before making its escape the above-mentioned temperature of 900° Fahrenheit.

The operation of my device is as follows: The shaft 22 is set in motion, thereby driving the several shafts 17 by means of the bevel-gears 20 21. The shafts 17 slowly revolve in a direction contra-clockwise, according to the view shown in Fig. 1, so that the plates to be operated upon pass through the slot 33 and gradually work their way toward the left. It will be noted that the row of shafts 17 bends slightly toward a point at about the middle of the furnace. By this arrangement the plates gradually go up on an incline until they reach the center of the annealing-chamber and then gradually move downward until they reach the vat, whereupon they dip into the boiling water 28ª and finally emerge by passing through the slot 31. In passing through this slot they continue to move slowly to the left, being thoroughly dried by the dry heat at the rear of the vat 27. As each sheet of steel or iron passes through the slot 33 it may have a comparatively low temperature. Once inside of the annealing and bluing chamber 4 the temperature is raised by the steam, which, as above explained, is of a higher temperature toward the entrance of the annealing and bluing chamber. The plate soon acquires the same temperature as the hot steam, and as the plate moves toward the left, where the temperature of the steam is lower, the plate of course gradually cools. The cooling of the plate is therefore gradual and continues until the plate reaches the water, by which time its temperature is but little, if any, more than 212° Fahrenheit. Of course the plates should not be rushed through at such a rate of speed as to prohibit this gradual cooling action. The boiling water has comparatively little oxidizing effect and serves to "pickle" or season the plates and also to cleanse them. I find that by thus subjecting the plates to the action of exceedingly hot and dry steam and gradually allowing them to cool under the conditions above described each plate acquires a beautiful blue coating of oxid which is exceedingly tenacious and which has working properties not ordinarily found in an oxid of iron or steel. The plates are completely oxidized by the time they leave the water. Passing through the water, they are cooled, so as to end the oxidizing process. After emerging from the water at the back of the vat they are thoroughly dried by the heat. The use of the water, as described, is to cool the plates under proper conditions to prevent any atmospheric oxidation outside of the furnace.

The process above described, it will be noted, is an annealing process as well as an oxidizing process. My theory is that a sheet of metal coming rather abruptly into contact with steam at the high temperature mentioned is caused to expand and to open its pores, thereby allowing the subtle steam, which is an oxidizing agent of a very high order and which has great penetrative power, to enter into the body of the sheet, causing oxidation to take place at a comparatively great depth within the substance of the metal. It will of course be observed that if the plate happens to be above 212° Fahrenheit at the time it reaches the water it will certainly be at this temperature when it emerges from the vat and is subjected to a drying heat immediately in the rear of the vat. The oxidation is practically completed prior to the time when the plate emerges from the vat, so that the mere drying of the plate in the rear of the vat does not materially change the degree of oxidation. In fact, there is no increase in oxidation after the plate touches the water, for the reason that hot water is a very poor oxidizing agent, and when the plate emerges from the hot water its temperature is too low to be materially affected by the action of the air. The small quantity of dry heat to which it is subjected after emerging from the bath removes all remaining moisture from the plate and prevents further slow oxidation after the removal of the plate from the furnace.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The method herein described of treating sheet iron or steel, which consists in subjecting said sheet iron or steel to the action of steam at a high temperature, gradually lowering the temperature of said iron or steel while the same is in contact with said steam, submerging said iron or steel in boiling water, and finally drying said iron or steel.

2. The method herein described of treating sheet iron or steel, which consists in forming a volume of steam ranging in temperature from about 900° to about 212° Fahrenheit, subjecting said iron or steel to the portion of said steam which has such temperature of 900° Fahrenheit, gradually bringing said iron or steel into contact with other portions of said steam at lower temperatures, whereby the temperature of said iron or steel is gradually reduced, submerging said iron or steel in boiling water, and finally drying said iron or steel.

3. The method herein described of treating sheet iron or steel, which consists in forming a volume of steam ranging in temperature from about 900° to about 212° Fahrenheit,

subjecting said iron or steel to the portion of said steam which has such temperature of 900° Fahrenheit, and gradually bringing said iron or steel into contact with other portions of said steam at lower temperatures, whereby the temperature of said iron or steel is gradually reduced.

4. The method herein described of treating sheet iron or steel, which consists in subjecting the same to the action of an oxidizing agent at a comparatively high temperature, and gradually conveying said iron or steel through successive portions of said oxidizing agent having successively lower and lower temperatures, until said metal becomes of a temperature so low that it is not attacked materially by contact with atmospheric air.

5. The method herein described of treating sheet iron or steel, which consists in subjecting the same to the action of an oxidizing agent at a comparatively high temperature, whereby the temperature of said iron or steel is raised to that of said oxidizing agent, and gradually moving said iron or steel into contact with cooler portions of said oxidizing agent, and thus gradually lowering the temperature of said iron or steel while the same is in contact with said oxidizing agent until a temperature is reached at which comparatively little oxidation can take place when said iron or steel is exposed to the air.

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

HARRY HOMER GOODSELL.

Witnesses:
D. P. TROUT,
E. B. JOHNSON.