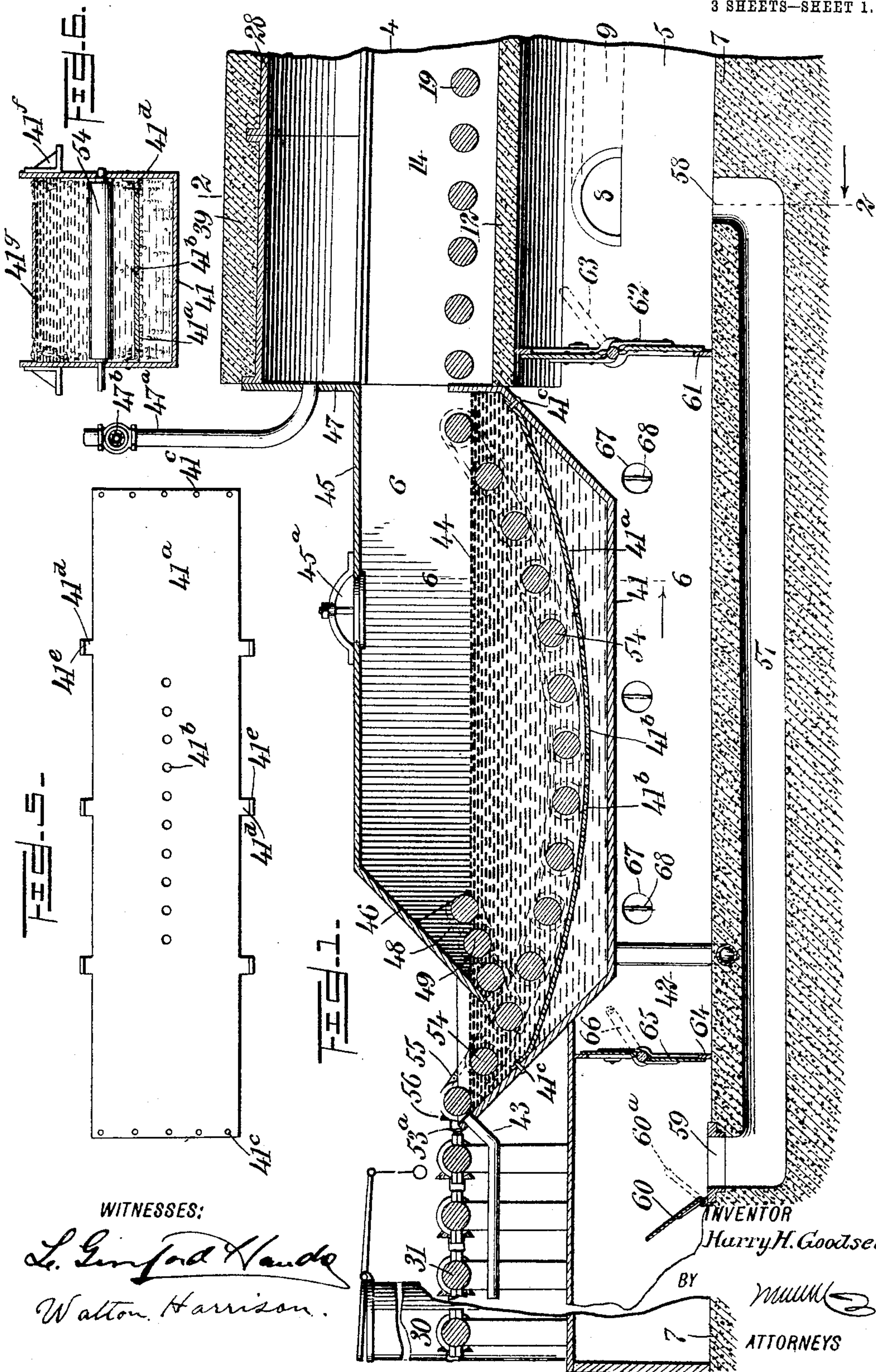


No. 803,337.

PATENTED OCT. 31, 1905.

H. H. GOODSSELL.  
METALLURGICAL FURNACE.  
APPLICATION FILED FEB. 25, 1905.

3 SHEETS—SHEET 1.



WITNESSES:

*L. Gifford Vander*  
*Walton Harrison.*

INVENTOR  
Harry H. Goodsell

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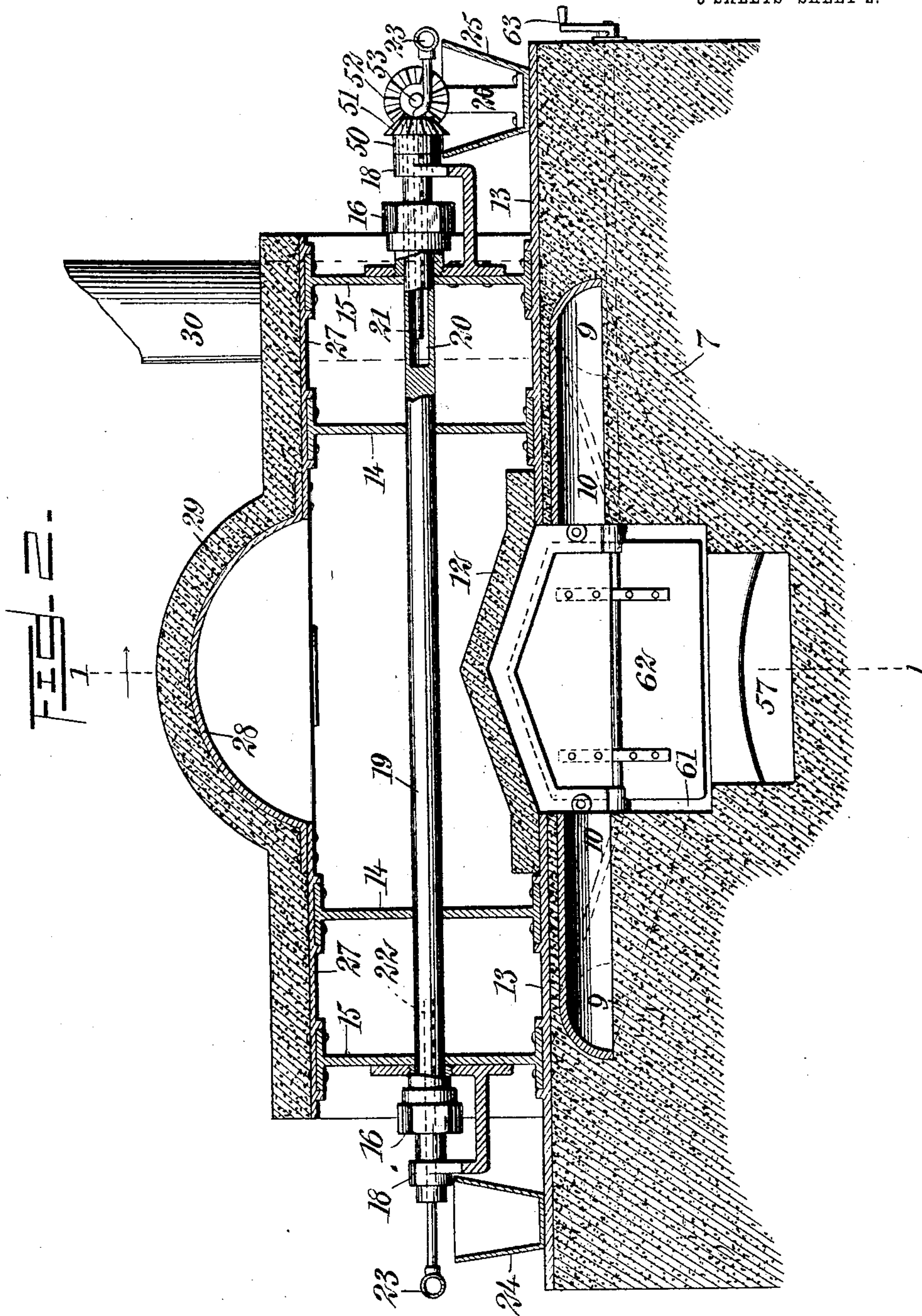
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3 SHEETS—SHEET 2.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

HARRY HOMER GOODSSELL, OF LEECHBURG, PENNSYLVANIA.

## METALLURGICAL FURNACE.

No. 803,337.

Specification of Letters Patent.

Patented Oct. 31, 1905.

Application filed February 25, 1905. Serial No 247,259.

*To all whom it may concern:*

Be it known that I, HARRY HOMER GOODSSELL, 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 Metallurgical Furnace, of which the following is a full, clear, and exact description.

My invention relates to furnaces used for treating iron and steel, but more particularly to an improved type of furnace having certain features in common with my application, Serial No. 218,633, filed July 29, 1904, and allowed November 17, 1904, for a furnace for treating sheet iron and steel.

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 fragmentary vertical section through the furnace, taken upon the line 1 1 of Fig. 2 looking in the direction of the arrow. Fig. 2 is a vertical cross-section through the furnace, taken upon the line 2 2 of Fig. 1 looking in the direction of the arrow. Fig. 3 is a fragmentary vertical longitudinal section taken in the same plane as Fig. 1, but showing the front portion of the furnace. Fig. 4 is a fragmentary elevation of the door through which the plates are fed into the furnace. Fig. 5 is a plan view of the baffle-plate, and Fig. 6 is a section on the line 6 6 of Fig. 1 looking in the direction of the arrow.

My improved furnace employs what I call a "bluing-chamber" 4, superposed over a heating-flue 5, as indicated in Figs. 1 and 3. A cooling-chamber 6 is located at the rear of the bluing-chamber and is heated from the heating-flue 5. The base 7, made, preferably, of any refractory material, is provided with passages 8, 9, and 10, connected serially and together constituting a pair of air-flues. The passage 8 at the rear end of the furnace and the passage 10 at the front end thereof both terminate in the heating-flue 5, the passage 8 delivering the heat into this flue at an elevation somewhat higher than that at which it was received from the flue by the passage 10. The purpose of this arrangement is to cause different portions of the furnace to expand and contract equally. Were it not for this provision those parts in immediate contact with the flames would expand more rapidly than the parts remote from the flames; but by

having the heated gases pass out directly into the walls of the furnace this difficulty is obviated, as will be understood from Figs. 2 and 3. The base 7 is also provided with passages 11, which extend from the heating-flue 5 to the outer atmosphere. These passages may be used for admitting natural gas to the heating-flue 5, in which event the heating-flue serves to admix the gas with the air arriving through the air-flues. In case natural gas is not used the passages 11 may be either closed or left open, as desired. If left open, they serve as air-ducts for supplying small quantities of air to the heating-flue 5. If desired, the smoke and gases from an ordinary coal-burning stove or furnace of any kind may be directed into the front end of the heating-flue 5 and carried back through this flue, so as to furnish the required degree of heat. A ground-plate 12, preferably quite thick, rests upon metallic plates 13, which are supported upon the base 7. Mounted upon the plates 13 are I-beams 14 15, disposed parallel with each other, as indicated in Fig. 2. The outer I-beams 15 are provided with stuffing-boxes 16 and at their front ends abut against the wall 17. Pillow-blocks 18 support a number of rollers 19 and 31, the rollers 19 being disposed within the bluing-chamber and provided with water-receptacles 20, made by rendering the ends of the rollers tubular. Water is supplied to the receptacles 20 by means of nozzles 21 22, which are connected with water-pipes 23 for supplying the water. Troughs 24 25 are disposed adjacent to the outer ends of the rollers 19 and serve to catch and convey away the heated water which may flow from the rollers. Pillow-blocks 26 may be mounted directly in the trough 25, as indicated in Fig. 2.

Mounted upon the I-beams 14 15 are metallic plates 27, connected together by arch-plates 28. The arch-plates abut against each other, so as to form a continuous series, as indicated in Fig. 3. A fireproof covering 29, made, preferably, of asbestos, may be placed upon the bluing-chamber, as shown. The rollers 31 do not differ materially from the rollers 19 except that being outside of the bluing-chamber, and consequently not being subjected to high degrees of heat, it is not necessary to provide them with the water jackets or receptacles 20. The bluing-chamber 4 is provided with sliding doors 32, (see Fig. 4,) arranged in a slideway 33 and adapted



to move apart, so as to leave a passage 34, through which may be inserted the metallic plates to be operated upon. A chimney or smoke-stack 30 is provided for the purpose of carrying away the gases of combustion which pass out of the heating-flue 5. A side passage 35 is provided in the front end of the furnace, preferably below the plates 13, so as to form an entrance for the heated air and gases should it be preferred to use them and also to allow access to the heating-flue 5. A tubular member 36 pierces the front wall 17 and is provided with a glass disk 37, thus constituting a peep-hole through which observations may be made from the outside. A funnel 38 opens downwardly toward the rollars 31 and is used for conveying away the heated air and steam which may chance to accumulate in the region immediately in front of the wall 17. Of course the draft through the funnel may be forced, if desired, in any manner well known in the art. The top of the bluing-chamber is provided with man-holes 39, which are covered by closure members 40, of fireproof material, preferably asbestos.

The cooling-chamber 6 consists of a pan 41, provided with pipes 42 43, used, respectively, for filling the pan 41 with water and for allowing any excess thereof to pass off without an overflow. Over the pan is a top 45, provided with an opening covered by closure 45<sup>a</sup>, and is also provided with a shield 46 and with a flange 47, connected upon the rear end of the bluing-chamber. Mounted upon a bracket 48, carried by the shield 46, are rollers 49, suitably geared together.

The rollers 19 are provided at one end with a collar 50 and with a bevel-gear 51, which engages another bevel-gear 52, mounted upon a longitudinal shaft 53 or 53<sup>a</sup>. (See Figs. 1 and 2.) A number of rollers 54 are mounted in the pan 41 and arranged in the arc of a circle, as indicated in Fig. 1, these rollers being propelled by sprocket-gearing 55, actuated by the shaft 53<sup>a</sup>, through the medium of a bevel-gear 56. The shafts 53 and 53<sup>a</sup> are driven by any suitable motor mechanism and are turned in such direction that the upper parts of the rollers move toward the rear of the furnace or in the opposite direction, according to the particular purpose for which the furnace is used. Within the pan 41 is a liquid 44, which may be oil, water, or any other liquid used for purposes of cooling or otherwise treating the plates. With the construction above described I preferably employ water, but, as will be seen below, it is sometimes desirable to use oil or even other liquids. The passages 9 are preferably a little nearer together than are the I-beams 15, as will be understood from Fig. 2. My purpose in so placing the I-beams is to enable them to vaporize any water which may condense upon the ends of the rollers 19, due to the chilling effect of the cooling-pas-

sages 20. In other words, should steam condense upon the ends of the rollers 19 and in the form of water run down upon the plates 13 I desire to heat these plates so that the water will be immediately reconverted into steam.

My purpose in gearing together a plurality of the rollers 49 in the rear of the cooling-chambers is based upon my discovery that when plates enter the liquid 44 they tend to produce vapor which buoys them up, causing them to float. The rollers 49 tend to prevent the plates from moving improperly, because should they have any tendency to float they will strike some one of these rollers, and thus be guided back into position.

A by-pass flue 57 is disposed within the wall 7 and is provided with an end 58, which merges into the heating-flue 5. The other end of the by-pass flue terminates in a doorway 59, closed by a door 60, the latter being operated by means of a hand-lever 60<sup>a</sup>. Mounted at the back of the heating-flue 5, preferably at a point near the pan 41, is a door way 61, closed by a door 62, having the form of a butterfly-valve and operated by means of a hand-lever 63. Farther back in the furnace immediately to the rear of the pan 41 is another doorway 64, closed by a door 65, having also the form of a butterfly-valve and operated by means of a hand-lever 66. It will thus be seen that the doors 60, 62, and 65 may be opened and closed independently of each other. A number of air-holes 67 are provided immediately adjacent to the pan 41, and mounted within these air-holes are dampers 68, which may be used for closing and opening the holes 67 at pleasure.

My invention is used as follows: The plates of iron or steel to be operated upon are usually placed upon the rollers 31 at the front end of the furnace. This may be done in any approved manner, but preferably by means of a truck which I have specially constructed for the purpose. If water is employed in the pan 41, its vapor in the form of steam passes into the cooling-chamber 6. The temperature of this steam at first approximates the boiling-point of water—to wit, 212° Fahrenheit. The steam in passing from the cooling-chamber into the bluing-chamber is gradually raised to a higher and higher temperature as it approaches the front end of the furnace. In the extreme front end of the bluing-chamber the steam carries a temperature of 900° to 1,600° Fahrenheit. At the higher temperature just mentioned the steam first rapidly heats the plates to a dull cherry-red. The incandescence gradually dies down as the plates are moved along. When the plates arrive at the cooling-chamber they are of a temperature not much higher than 212° Fahrenheit. They then pass through the water 44 and back toward the chimney, resting upon the rollers, from which they may be removed. The passage of the plates through the water insures



their cooling to a point at which the atmosphere does not readily attack them.

It is sometimes desirable to reverse the direction of travel of the plates. For this purpose they are started from the rear end of the furnace at a point adjacent to the chimney 30. Being placed upon the rollers, the latter are given a direction of rotation contrary to that first assumed, with the result that the rollers travel toward the pan 41, moving in the direction of the front of the furnace, and are submerged in the liquid 44. This occurs when the plates are cooled, and consequently they have little or no tendency to float. The plates are next passed to the rollers 19 and are carried forward through the furnace, the heat gradually increasing. By this means each plate is first given an oxid in which the atmosphere plays no part, the oxidation occurring in the bluing-chamber, where the plate is surrounded by steam. The plate emerging into the atmosphere at a comparatively high degree of heat now oxidizes under the influence of the atmosphere, with the result that it acquires an oxid of a very peculiar kind and one which will not readily change in color by subsequent oxidation. It will be understood that if the furnace is operated as just described the plates go through what is called a "toning process." The idea is to give the plates at the start such a color, due to oxidation, as they would ultimately acquire when heated up under atmospheric conditions, so that the plates are afterward unable to change color. Plates made in the manner just described may be subjected to severe use in stove-body work, and when they become red-hot, whether the heat be uniform or otherwise, their color when afterward cooled remains substantially the same for an indefinite length of time. It follows, therefore, that these plates are not easily disfigured.

I endeavor to heat the plates while passing through the furnace from the rear to the front to as high a temperature as they will preferably be subjected to afterward in actual use—as, for instance, when they afterward form the walls of a stove.

When water is used in the pan 41, the doors 62 and 65 are opened, while the door 60 is preferably closed. This causes the heated gases to heat the pan 41 in order to generate the steam in the heating-flue 6. Where it is desirable to use oil or liquids other than water in the pan 41, the butterfly-valves 62 and 65 are closed and the door 60 opened. This causes the gases of combustion in passing through the heating-chamber to go through the by-pass flue 57, and thus avoid heating the pan 41. The pan is thus kept comparatively cool. When this is done, steam is admitted through a pipe 47<sup>a</sup> by turning the valve 47<sup>b</sup>, with which said pipe is provided. (See Fig. 1.) This valve is of course closed when water is used in the pan 41, and consequently when

the butterfly-valves 62 and 65 are opened. In order that the pan 41 may be kept at a comparatively low temperature, so as to avoid vaporizing the oil, the air-holes 67 are left open, the dampers 68 being turned edgewise for this purpose, as will be understood from Fig. 1. Whether oil or water be used in the pan 41 and when the travel of the plates are forward or backward, as above described, the shield 46 of the cooling-chamber always projects into the liquid, and thus effectively seals the rear end of the bluing-chamber and the heating-chamber which merges therewith.

A baffle-plate 41<sup>a</sup>, made, preferably, of copper and provided with a central row of perforations 41<sup>b</sup>, is secured within the pan 41 by means of rivets 41<sup>c</sup>. This baffle-plate is further provided with spacing-lugs 41<sup>d</sup>, provided with upturned portions 41<sup>e</sup>, which may be riveted to the pan 41, as indicated in Fig. 6. The pan 41 is provided with lugs or rests 41<sup>f</sup> whereby it is supported. One of the plates to be operated upon is shown at 41<sup>g</sup>. By means of the baffle-plate 41<sup>a</sup> the bubbles when formed below the surface of the liquid 44 are for the main part guided outwardly, so as to escape between the lugs 41<sup>d</sup>. By this means comparatively few bubbles come into contact with the plate 41<sup>g</sup>, and the latter is thus in a great measure prevented from floating. In other words, the baffle-plate 41<sup>a</sup> so distributes the bubbles as to carry them around the plate 41<sup>g</sup>. The baffle-plate 41<sup>a</sup> being used as above described, any plate 41<sup>g</sup> naturally tends to keep in the center of the pan.

I do not limit myself to any particular means for admitting steam into the rear of the bluing-chamber. Neither do I limit myself to the use of any particular fluid in the cooling-chamber, nor to any particular direction in which the rollers may be rotated, nor to any exact manner in which these rollers are geared together. Neither do I limit myself to any particular group of parts nor to the materials of which any of the parts are constructed.

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

1. In a furnace, the combination of a heating-chamber, a pan, and a wall disposed adjacent to said pan and provided with a by-pass merging into said heating-chamber, means for closing said heating-chamber so as to divert the gases of combustion through said by-pass, thereby avoiding the heating of said pans.

2. In a furnace, the combination of a heating-chamber, a pan disposed adjacent thereto, a by-pass connected with said heating-chamber and extending around said pan for the purpose of preventing the latter from being heated, and means for closing said by-pass at will.

3. In a furnace, the combination of a heating-chamber, a pan disposed adjacent thereto and provided with a liquid normally heated by the gases of combustion from said heating-



chamber, and means for diverting said gases of combustion around said pan for the purpose of avoiding heating the same, at will.

4. In a furnace, the combination of a pan, 5 a heating-chamber for elevating the temperature thereof, doors controllable at will for closing said heating-chamber so as to avoid heating said pan when desired, and means for supplying air to said pan for the purpose of 10 rendering the same cool.

5. In a furnace, the combination of a bluing-chamber, a receptacle disposed adjacent thereto and adapted to contain a liquid, a heating-chamber disposed adjacent to said bluing-chamber and to said receptacle for heating the 15 same, means for temporarily diverting gases of combustion from said heating-chamber around said receptacle so as to avoid heating the latter while heating said bluing-chamber, 20 and means for supplying steam to said bluing-chamber independently of the liquid contained within said receptacle.

6. In a furnace, the combination of a bluing-chamber, rollers for conveying metal 25 plates thereinto, means for supplying steam to said bluing-chamber, mechanism for cooling said rollers, and means for applying heat locally to the water condensed by the cooling of said rollers.

30 7. In a furnace, the combination of a bluing-chamber, rollers for conveying plates there-through, I-beams for supporting said rollers, means for supplying steam intermediate of said I-beams, mechanism for cooling said rollers, and means for applying local heat to the 35 water of condensation produced by cooling said rollers.

8. In a furnace, the combination of a pan adapted to hold a liquid, a bluing-chamber dis- 40 posed adjacent to said pan, rollers mounted within said pan, and a baffle-plate submerged

beneath the surface of said liquid and located below said rollers.

9. In a furnace, the combination of a pan adapted to hold a liquid, a bluing-chamber dis- 45 posed adjacent to said pan, rollers mounted within said pan, and a baffle-plate mounted within said pan and below the upper surface of said liquid, said baffle-plate being provided with apertures for distributing bubbles. 50

10. The combination of a pan, a bluing-chamber connected therewith, steam-pipes connected with said bluing-chamber so as to heat the same without materially heating said pan, and means for conveying plates through 55 said bluing-chamber and through said pan.

11. The combination of a pan adapted to contain a liquid, a bluing-chamber connected therewith, means for introducing steam into said bluing-chamber, dampers for cooling said 60 pan, and mechanism for conveying plates through said bluing-chamber and through said pan.

12. The combination of a pan adapted to contain a liquid, a plurality of rollers mounted 65 within said pan, and disposed in the general form of the arc of a circle, a baffle-plate mounted within said pan and below said rollers, said baffle-plate having also substantially the general form of the arc of a circle, a blu- 70 ing-chamber connected with said pan, means for introducing steam into said bluing-chamber, and mechanism for conveying plates relatively to said pan and to said bluing-chamber.

In testimony whereof I have signed my name 75 to this specification in the presence of two subscribing witnesses.

HARRY HOMER GOODSSELL.

Witnesses:

D. P. TROUT,

JAMES J. ARTMAN.