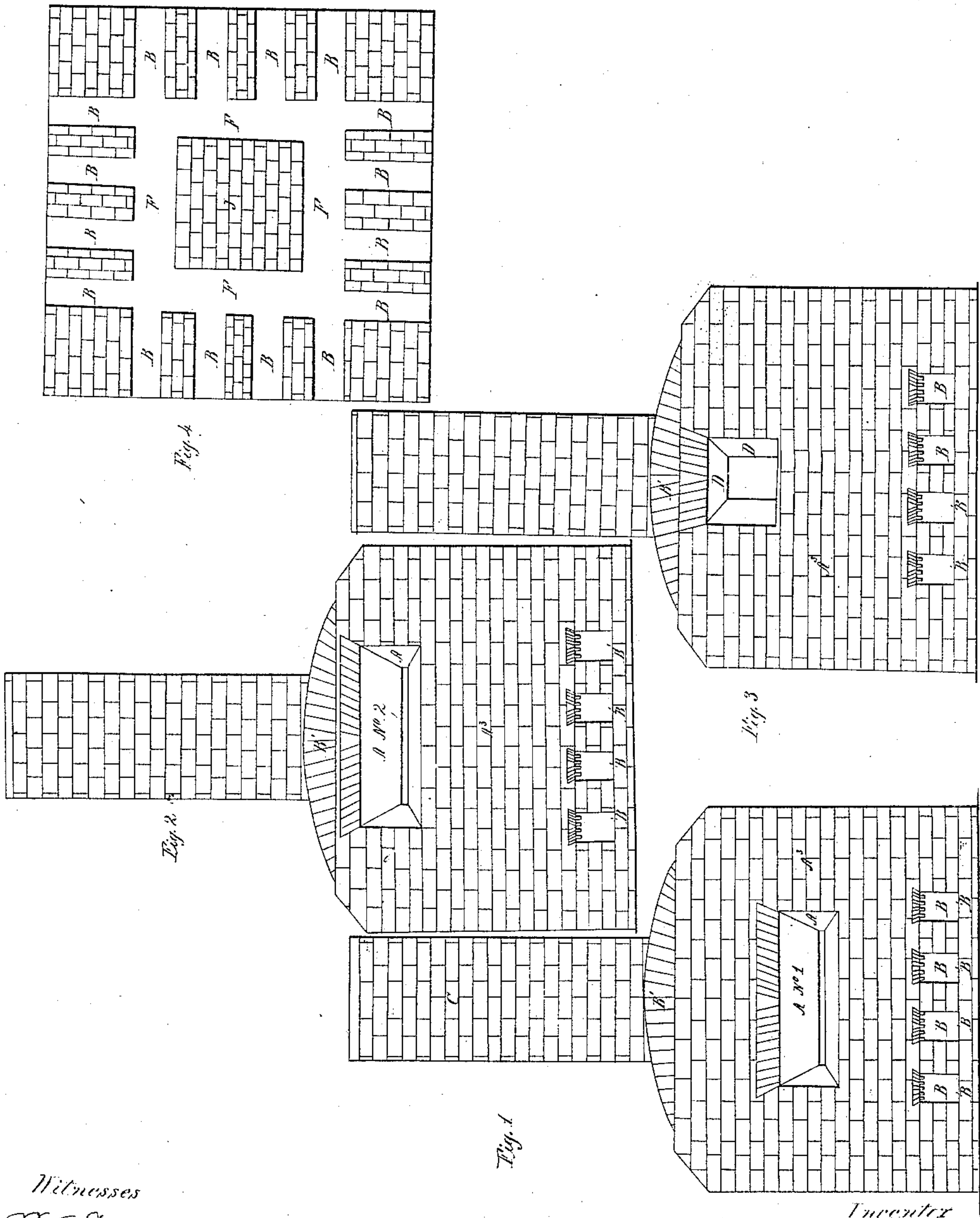


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FURNACE FOR PLATING IRON.

No. 27,254.

Patented Feb. 21, 1860.



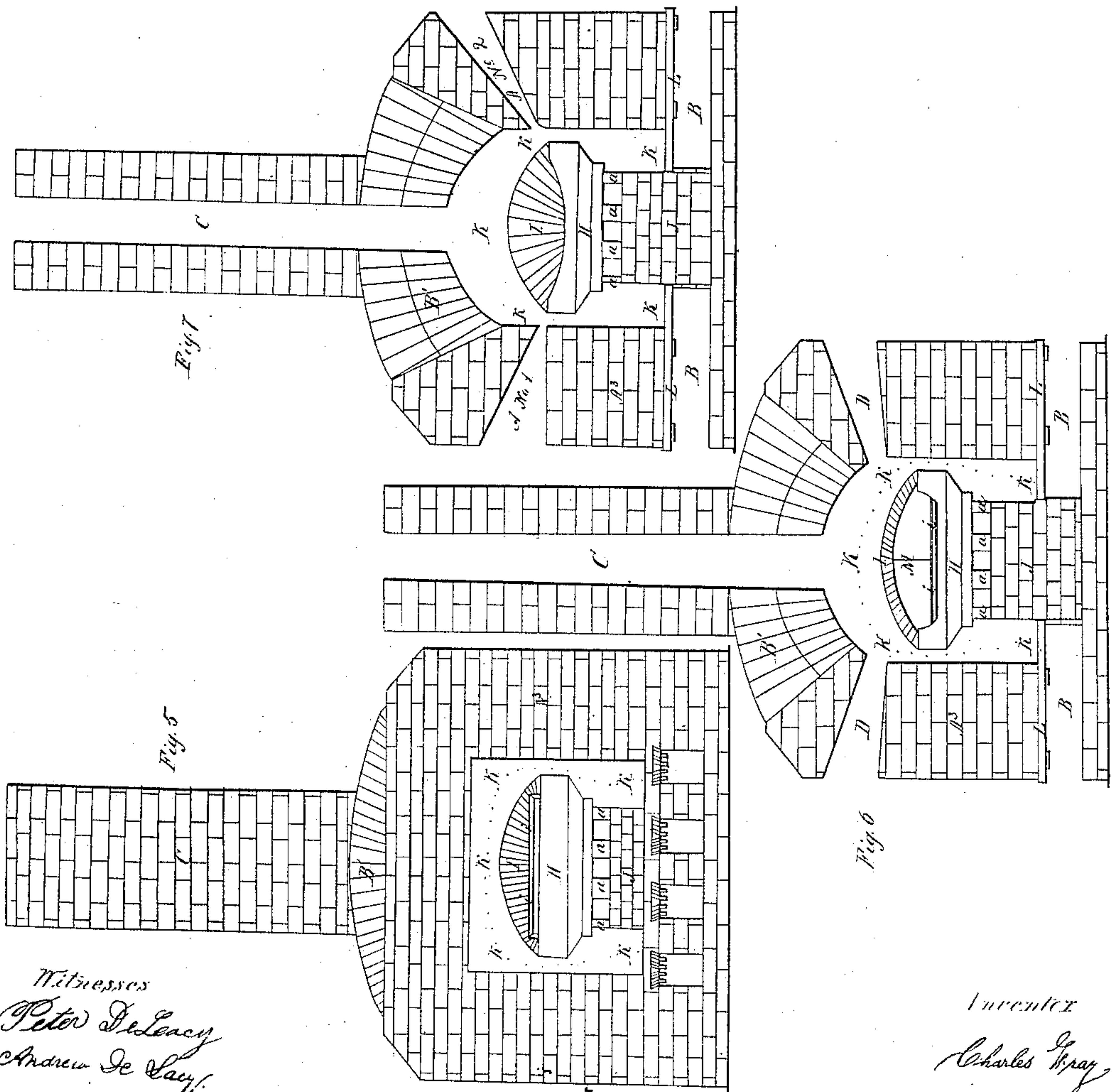
Witnesses  
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# UNITED STATES PATENT OFFICE.

CHARLES WRAY, OF SAN FRANCISCO, CALIFORNIA.

## IMPROVEMENT IN FURNACES FOR PLATING IRON.

Specification forming part of Letters Patent No. 27,254, dated February 21, 1860.

*To all whom it may concern:*

Be it known that I, CHARLES WRAY, of San Francisco, California, have invented certain new and useful Improvements in Furnaces for Plating Iron with Copper; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is an exterior view; Fig. 2, an elevation of the exterior of the side opposite to Fig. 1; Fig. 3, an end elevation; Fig. 4, a ground plan; Fig. 5, a side elevation, with what is termed the "movable section" removed to exhibit the internal arrangement; Fig. 6, a longitudinal vertical section, and Fig. 7 a cross vertical section.

My said invention relates to improvements on a furnace for this purpose invented by William H. Thoss, in which the plating metal is melted and kept in a molten state in a crucible or basin within a furnace, which exposes the molten metal to the action of injurious gases evolved from the fuel to the oxidizing action of the atmosphere whenever the fuel-doors are opened to feed the fire, and leads to serious injury from the dropping of solid impurities into the molten copper, which become attached with the copper to the metal being plated, while at the same time such mode of construction renders it difficult to apply heat economically and advantageously to the metal in the crucible; and the first part of my invention of improvements on such furnaces consists in covering the crucible with a muffle or roof, leaving a narrow opening on opposite sides for introducing the sheets of iron or other articles to be plated and for drawing them out of the molten metal to admit of applying heat to the top of such crucible, and at the same time protect the molten metal and the plates or other articles under treatment against the action of injurious gases evolved from the fuel, and from the action of atmospheric air whenever the fuel-doors are opened to feed the fire, while at the same time it affords ample protection against solid impurities, which otherwise would fall into the molten copper, and thereby do serious injury to the copper surfaces. In the said original furnace the fuel-door was placed on or below the level of the molten

metal in the crucible, so that whenever the said door was opened for the supply of fuel atmospheric air was freely admitted and would act injuriously upon the molten metal in the crucible. My invention of improvements in this particular consists in combining with the covered or muffled crucible in such furnaces the placing of the fuel door or doors above the roof or muffle of the crucible, so that when opened for the supply of fuel the cold air entering will have no tendency to descend to enter the crucible through the openings for the passage of the articles to be plated, and in throwing in the fuel to feed the fires portions of such fuel will lodge on the top of such roof or muffle, where it will be ignited to heat the crucible from above, as it is very important in such furnaces to keep the upper part of the molten metal in a highly-heated state. In the said original furnace the two openings through the wall of the furnace for introducing the articles to be plated and withdrawing them when plated are on a level with the molten metal in the crucible. I have discovered that in consequence of this the plating of copper is very uneven, and so thick that iron so plated costs very nearly as much as solid copper. My invention of improvements on this part of such furnaces consists in making the opening through the outer shell of such furnaces inclining upward and outward from the opening in the crucible through which the plates, sheets, or other articles are drawn out of the molten copper, so that the molten metal instead of becoming solidified of too great and uneven thickness will run off and back into the crucible, thus enabling the operator to make the plating as thin as he may wish. The said original furnace was constructed of one solid mass of masonry, and as the crucible and the parts immediately surrounding it are exposed to a much higher and destructive heat than the outer shell whenever the parts inside were injured by the high heat it was necessary to pull down the outer shell for the purpose of repairing the inside.

My invention of improvements on such furnaces consists in constructing the side walls with an opening equal in area to the sectional capacity of the internal chamber of the furnace which contains the crucible and



surrounding fire-chamber, which openings are to be closed with sections which can be readily removed to give access to the inside for repairs.

In the accompanying drawings, A<sup>3</sup> represents the outer shell or body of the furnace, constructed of masonry in a quadrangular form, and with an inside chamber of corresponding form. The inner lining of said masonry should be made of fire-brick or other refractory substance capable of resisting a very intense heat. The upper part of this masonry should be arched in the form of a flat dome B', surmounted by a stack or chimney C, with a flue of sufficient capacity to carry off the products of combustion and induce the required draft.

In the center of the chamber and on the floor thereof is constructed a solid square block of masonry J, with sufficient space between it and the inner facing of the outer wall to form a continuous fire-chamber k, Figs. 5, 6, and 7, extending all around with grate-bars L, and with a continuous ash-pit F under the grates, having a series of branch ash-pits B extending to the outside. On top of this block J are erected a series of small columns a, on which is placed a flat crucible H to contain the copper to be melted and kept in a molten state, the fire having free access to the bottom thereof by passing between the columns a on which it is sustained. This crucible, as also its roof or muffle, should be constructed of fire-brick or other refractory substance, such as black-lead or other substances which will resist the high heat required. The said crucible is covered with an arched roof or muffle I, inclosing the crucible-chamber M, in the manner represented. Two openings *i i* are made through the sides of the said crucible—one in each of the two opposite sides. These openings are narrow and long, and so long as to extend about the whole width of the inside of the crucible. They are made near the bottom of the crucible, as represented in Fig. 6, and incline upward and outward, so as to rise a little above the rim of the crucible, as represented in Fig. 5, so as to prevent the molten metal from running out, and yet admit of passing sheets and other articles to be plated below the surface of the molten copper, the purpose of the said openings being to admit of putting in and taking out of the molten copper the articles desired to be plated. On each side there is an opening A' A<sup>2</sup> made through the masonry A at least as long as the openings *i i* in the crucible. The bottom of the opening A', through which the articles to be plated are inserted, is about on a level with the bottom of the opening *i* at the outside of the crucible, and the top inclines outward and upward, as represented, and the other A<sup>2</sup>, on the opposite side, is made with its bottom inclining upward from the inside to the outside of the masonry, so as to be about on the same plane as the inclination of the opening through the side of the cruci-

ble, and the top should be at a greater inclination, so that the outside will be larger than the inside. The inclination of this aperture, as before stated, is for the purpose of drawing the plates out of the crucible in an inclined direction, that the surplus molten copper may run off and into the crucible, and thus admit of putting on as thin a plating of copper as desired.

Through the front and back walls of the masonry A are made two large openings D D—one in each—through which the fuel is to be supplied to the fire-chamber k. These openings should be above the crucible, for the reason before stated, and should be provided with suitable means for closing them when desired, such as luted blocks of stone or brick, or hinged doors. The two side walls of the masonry are constructed each with a large square open space about equal in area to the section of the fire-chamber, so that when open free access can be had to every part of the fire-chamber and what it contains for repairs or for any other purpose, and then to these open spaces are fitted sections to close them, which sections can be readily taken out when it is required to have access to the inside, and replaced when required without the necessity of taking down the permanent parts of the structure.

The crucible being suitably charged and the fire made and started in the fire-chamber all around the crucible, the heat passes all around and under and over the crucible, heating it to a very intense heat. The products of combustion, after passing over the roof, escape through the central chimney. When the charge of copper or other plating metal has been melted and rendered sufficiently liquid, the sheets of iron or other articles to be plated, after having been suitably prepared for the purpose, are introduced through the aperture A' in the wall, and into and through the molten metal in the crucible, and out at the other side, where it is taken and drawn out in an inclined direction through the other aperture A<sup>2</sup>, the surplus molten metal running off and back into the crucible.

When the fires require feeding, the fuel is introduced through the feeding apertures or doorways D D in the front and back walls, a portion of which fuel will fall and remain on the roof or muffle of the crucible, where it is soon ignited, giving an intense heat to the top of the crucible, and as these doorways are above the crucible and the draft in the fire-chamber is upward to the chimney whenever the said doors are open for the supply of fuel the entering air cannot descend sufficiently to pass around and enter the crucible to chill the molten metal.

What I claim as my invention of improvement on the furnace herein specified as having been invented by William H. Thoss, is—

1. Combining with the crucible and the means of applying heat thereto, the employment of a muzzle or roof to the crucible, leav-



ing a narrow opening on opposite sides for introducing the sheets of iron or other articles to be plated, and for drawing them out of the molten metal, substantially as and for the purpose specified.

2. In combination with the crucible covered with a muzzle or roof and heated in the manner herein described, the placing of the fire door or doors above the muzzle or roof, substantially as and for the purpose specified.

3. In combination with the crucible covered with a muzzle or roof and heated as herein described, making the openings through the outer shell of the furnace inclining upward and outward from the opening in the cruci-

ble, through which the articles being plated are drawn out of the crucible, substantially as and for the purpose specified.

4. In combination with the crucible and the surrounding fire-chamber, constructing the side walls of the surrounding masonry with an opening in area equal to the sectional capacity of the internal chamber which contains the crucible, and closing such opening with movable sections, substantially as and for the purpose specified.

CHARLES WRAY.

Witnesses:

GEO. A. VAN BOKKELEN,  
MARTIN BARRETT.