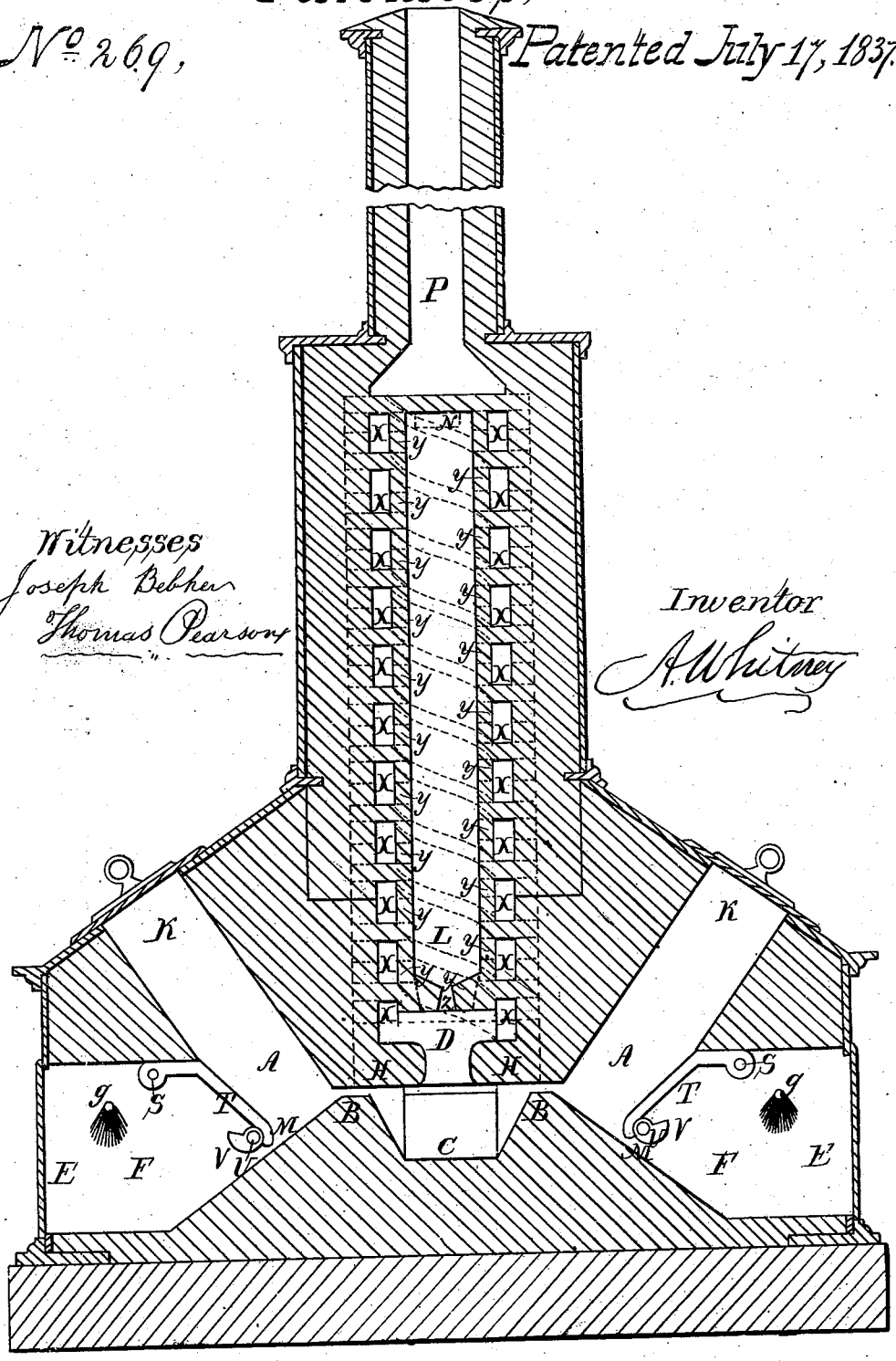
4 Sheets - Sheet 1

A. Whitney,

Furnaces,

No. 269, Patented July 17, 1837.



Witnesses
Joseph Bebber
Thomas Pearson

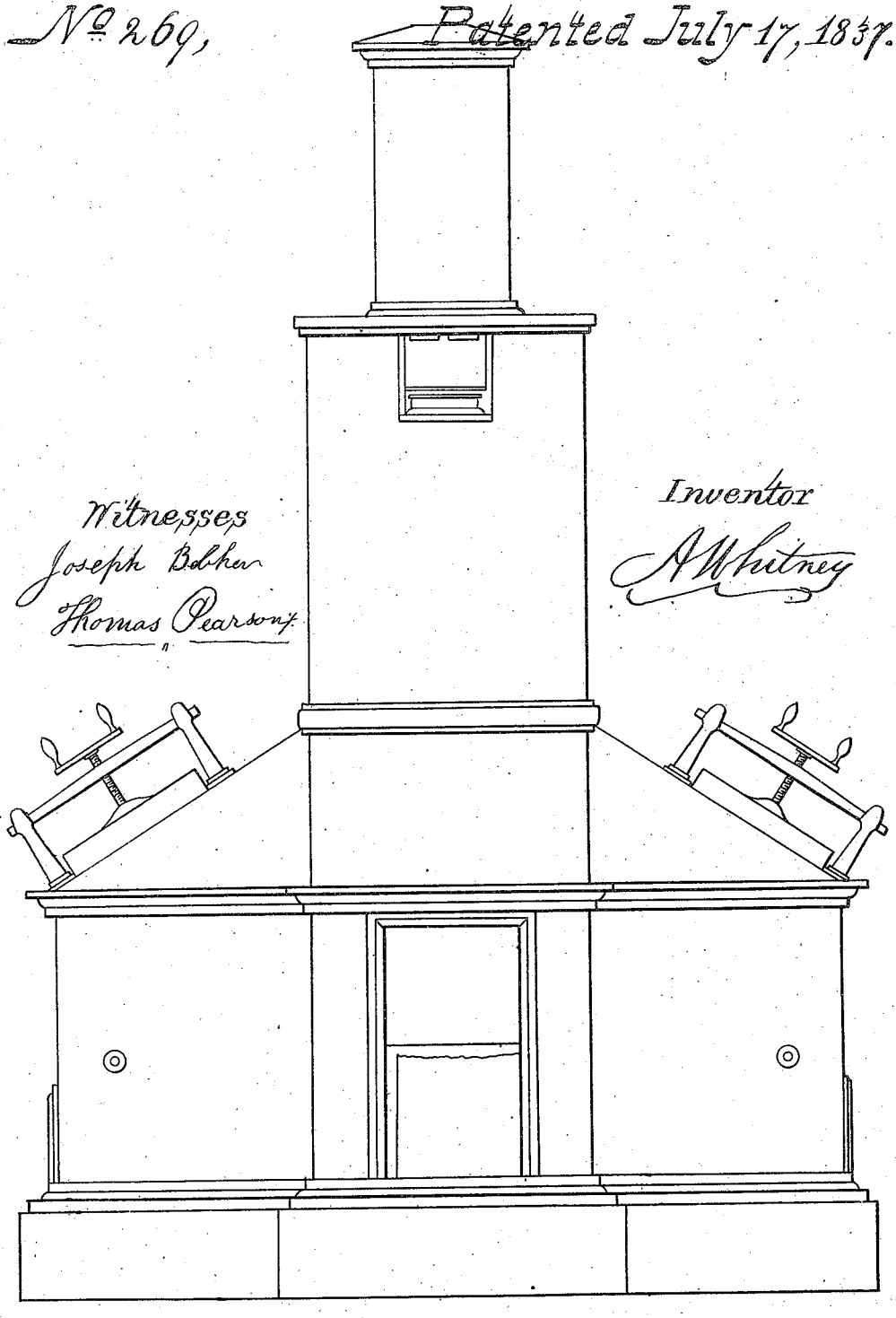
Inventor
A. Whitney

4 Sheets - Sheet 2.

A. Whitney,

Furnaces,

No. 269, Patented July 17, 1837.



Witnesses
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Thomas Pearson Jr.

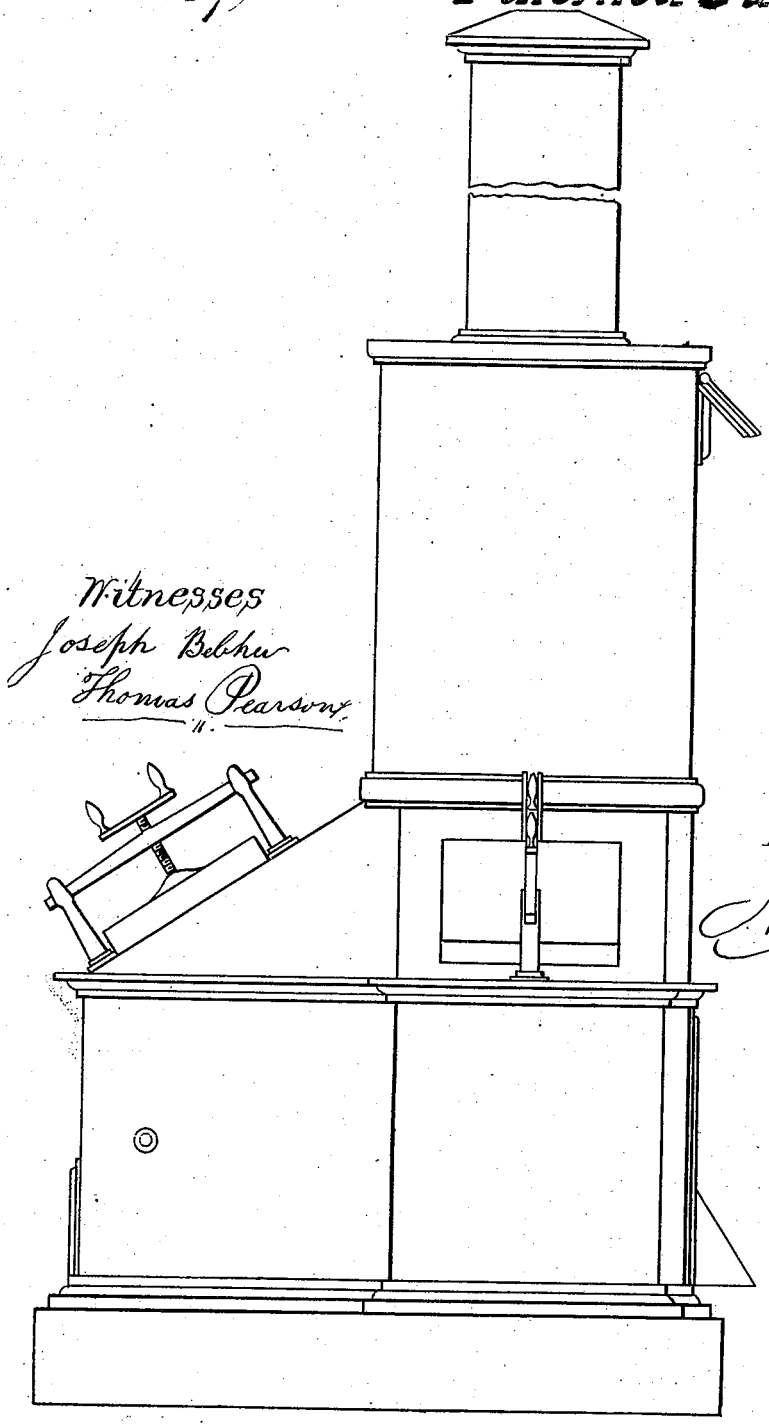
Inventor
A. Whitney

4 Sheets-Sheet 3

A. Whitney,

Furnaces,

No. 269, Patented July 17, 1837.



Witnesses
Joseph Bebbu
Thomas Pearsons

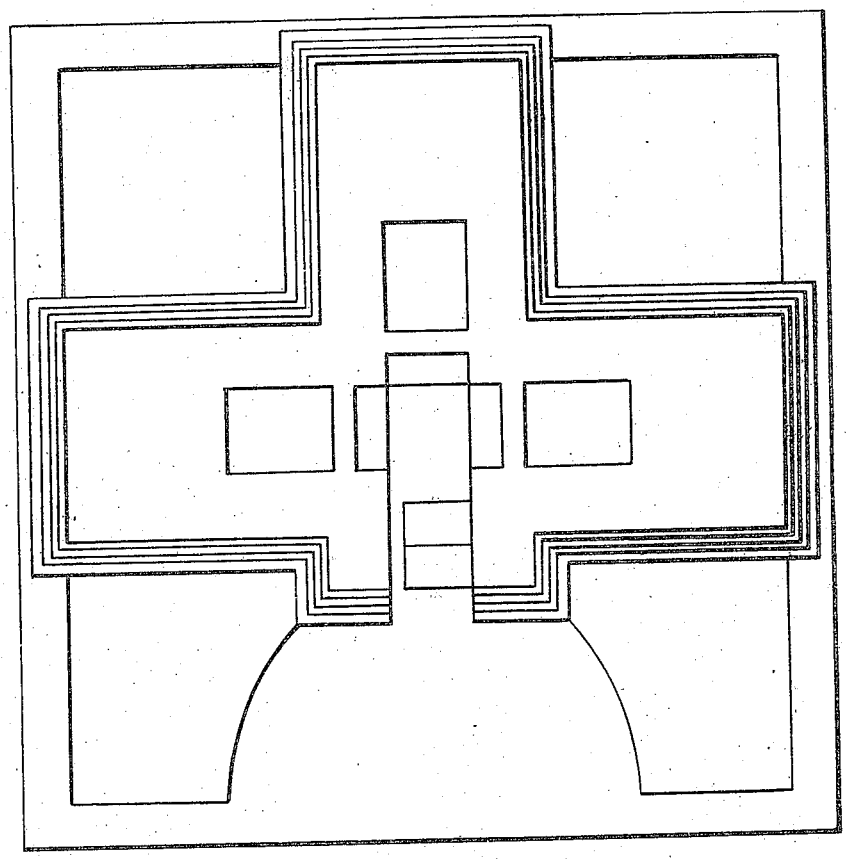
Inventor
A. Whitney

4 Sheets - Sheet 4

A. Whitney,

Furnaces,

No. 269, Patented July 17, 1837.



Inventor

A. Whitney.

Witnesses

Joseph Bobbes

Thomas Pearson

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ASA WHITNEY, OF SOUTHFIELD FURNACE, NEW YORK.

IMPROVED METHOD OF CARBONATING AND SMELTING IRON.

Specification forming part of Letters Patent No. 269, dated July 17, 1837.

To all whom it may concern:

Be it known that I, ASA WHITNEY, of Southfield Furnace, in the county of Orange and State of New York, have discovered and invented a new and useful Improvement in the Method or Art of Carbonating and Smelting Iron Ore; and I do hereby declare that the following is a full and exact description thereof—that is to say, I build within the stack of a blast-furnace a cementing chest or tube, which I can close at the top, and has an aperture in the bottom through which the prepared ore descends as it melts in the crucible of the furnace. I surround the said cementing tube or chest by spiral flues, through which I cause the heat of the furnace to pass, all which will be better understood by reference to the accompanying drawings.

The cross vertical section and elevation represent two applications of heated air for smelting the ore when prepared in the cementing tube or chest.

A A are the flues for heating the air.

B B are the dams for keeping the slag of the fires separate from the metal in the hearth.

T T are suspended grates for blowing through, each hanging upon a bar, S, and resting near their bottom ends on a revolving bearer, U, upon which wipers or arms V are placed, for clearing out any slag that may accumulate near to the bottom of the grate.

F F are the ash-pits.

E E are doors of the same, kept perfectly close shut and tight during the time that the furnace is working, and are only opened to remove any slag or scoria that may from time to time accumulate.

C is the hearth of the furnace; D, the crucible, from which the flues X X, &c., take their start, to wind by a double spiral round the cementing-chamber Y Y Y Y, &c., and merge into the smoke-chimney P after having passed round said chamber, up to the top of it.

Z is an aperture at the bottom of the cementing-chamber for the prepared ore to pass down into the crucible D, and thence into the hearth C.

N shows the feeding-box, through which the ore-fluxes and carbon are introduced into the cementing-chest.

k k are the lids for closing the fire-places.

M M are spaces under the ends of the grates for any slag that may form in the fire to pass through into the ash-pits when the furnace is working.

The drawings to which this description refers are made on a scale of one inch to the foot, and from them all information as to size may be obtained by reference. The smoke-chimney is represented broken, to indicate that it may be elevated or built lower, as circumstances or experience may require. It is my opinion that by elevating the chimney sufficiently a draft might be obtained which would be powerful enough to smelt the iron without the aid or expense of a blowing apparatus.

Having described the parts shown in the section, and supposing the furnace to be well dried and ready for commencing work, having good fires in A A A, and the cementing-chest nearly full of charcoal or coke, &c., which is burning out or slowly passing down the aperture Z into the center or confluence of the three currents of heated air in the crucible D, I begin to charge the cementing-tube with such proportions of ore and fluxes as may be proper for smelting and promoting good separation of the metal from the scoria, with just so much carbon as may be necessary for carbonating the same; and as it settles down I continue to add more at the top through the feed-box N, which I close immediately after each charge until the cementing-chest is full, or, to speak more correctly, perhaps, until the ore and fluxes have descended to the aperture Z, at which place I expect the ore to be perfectly carbonated and that it will smelt easily as it passes into the crucible D, with good separation of the metal from the scoria, and thus continue working with regular *seriatim* charges. When the ash-pits F F require to be cleared out, the blast must be softened or taken off altogether until they are cleared and the doors E E are closed again, when the full blast may be resumed.

The benefits to be derived from this shape and construction of furnace, application of heat, and method of carbonating the ore may be enumerated by stating that anthracite coal or any fuel that will maintain the requisite degree of heat may be used in the fire-places A A, as any scoria made by them will pass down to the ash-pits F F of the furnace and not interfere with the iron in the hearth C; and by

preparing the iron in the chamber here described it is perfectly free from the influence of any oxygen of the atmosphere that may pass unconsumed through the crucible; secondly, by making the flues wind round the chest I get a longer and more perfect application of all the heat that is generated; and, thirdly, by having only a small aperture at the bottom of the chest I relieve the melted metal in the hearth from the burden of the charge contained in the cementing-chest, thus allowing the melted material a better chance of separation into cast-iron and scoria. I also obtain the advantage of using no more charcoal or other carbon than is necessary to carbonate the material put into the cementing-chamber. When perfect combustion takes place in the fires A A, &c., (I mean when all the oxygen of the atmosphere blown in combines with its equivalent of carbon,) there is only the resulting intensely-heated gases passing into the crucible of the furnace and confluent immediately under the aperture Z, down which the prepared materials from the cementing-chest are passing, thus presenting at this point the concentrated heat of the three fires, and thereby smelting and reviving the iron almost at one instant of time, leaving whatever specific heat may not be carried off by the combinations here produced to pass through the flues which wind round the cementing-chamber, and by permeating the sides thereof prepare the materials as they are added and pass down from the feed-box N.

I build the whole bottom part of the furnace and for four feet up above the top of the hearth with fire-sandstone, and then commence with fire-bricks for the remaining length of the cementing-chamber. The smoke-chimney I build of common bricks.

The advantages to be derived by using the before-described furnace are particularly prominent in situations where charcoal is scarce and other fuel—as anthracite coal, &c.—is abundant, or where ores are abundant and the quantity of charcoal is limited in proportion to the supply of ore.

What I claim as my own invention or discovery in the foregoing description and not before known is—

The building of a cementing oven or chamber within the stack of the furnace, and thereby carbonating the ore free from the influence of oxygen—as much so as possible—also the form of the crucible, and the application of heat for carbonating and smelting of the ore by making the current of air pass in a spiral manner round the cementing-chamber up to the smoke-chimney.

In witness whereof, and that the foregoing description is a full and clear explanation of my invention or discovery, I have hereunto set my hand this 20th day of January, A. D. 1837.

ASA WHITNEY.

Witnesses:
THOMAS PEARSON,
WILLIAM P. BOYDEN.