2 Sheets--Sheet 1.

# W. S. McKENNA.
## Annealing-Furnace.

No. 168,513. Patented Oct. 5, 1875.

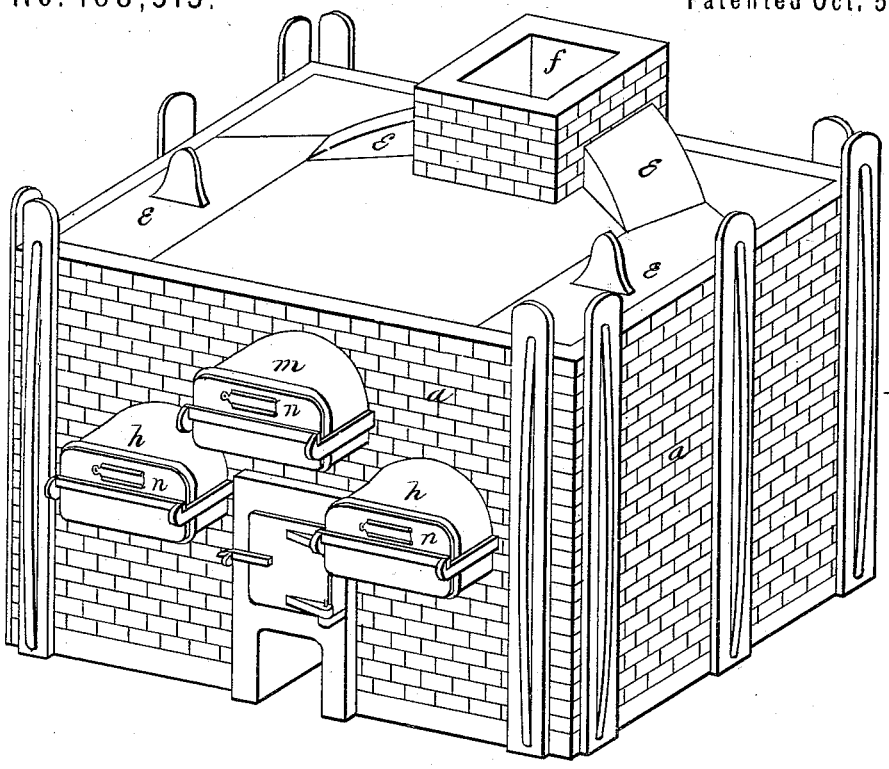


Fig. 1.

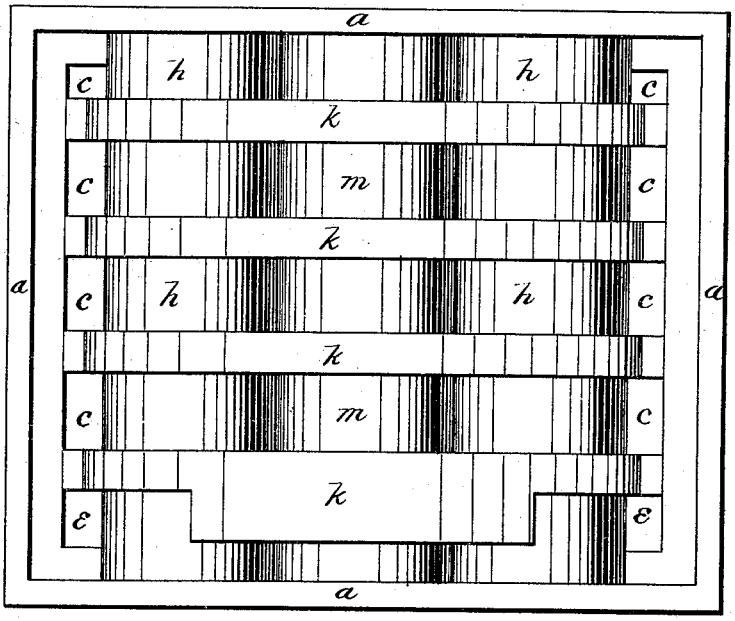


Fig. 2.

Witnesses

A. Corcoran

H. McTighe

William Stephen McKenna Inventor

By Connolly Bros & McTighe Attorneys

2 Sheets--Sheet 2.

# W. S. McKENNA.

## Annealing-Furnace.

No. 168,513. Patented Oct. 5, 1875.

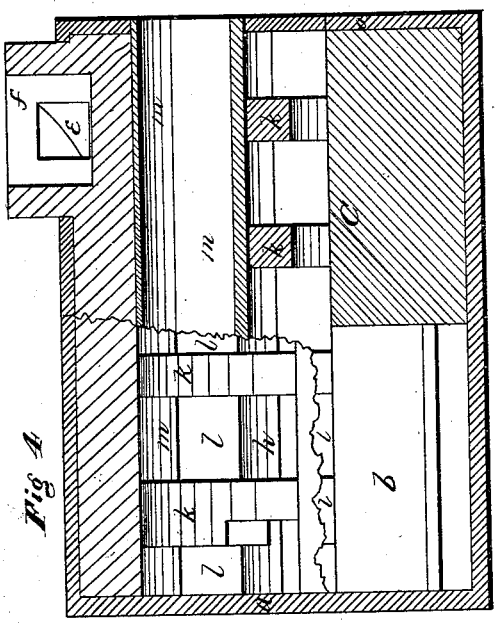

Fig. 4.

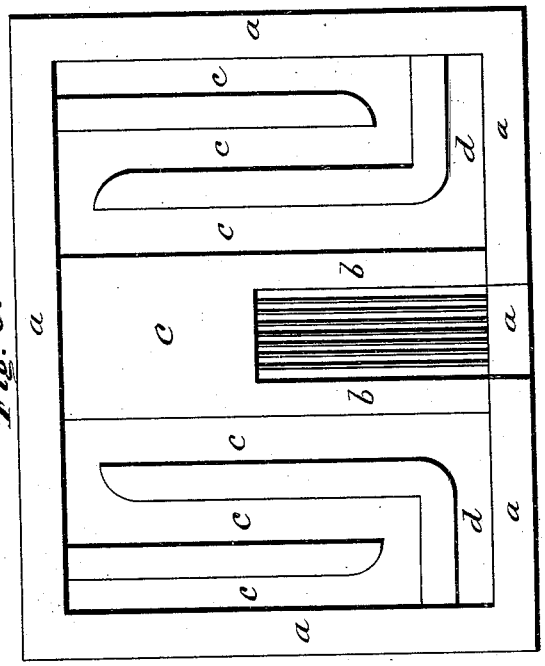

Fig. 5.

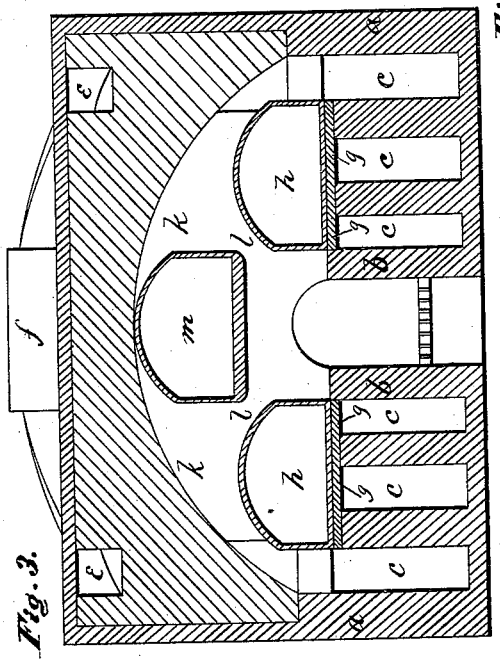

Fig. 3.

Witnesses

A. Corcoran

K. M. Fyfe

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By

Connolly Bros & McKenna Attorneys

# UNITED STATES PATENT OFFICE.

WILLIAM S. McKENNA, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF ONE-HALF HIS RIGHT TO JOHN C. RIDGWAY, OF SAME PLACE.

## IMPROVEMENT IN ANNEALING-FURNACES.

Specification forming part of Letters Patent No. **168,513**, dated October 5, 1875; application filed May 14, 1875.

*To all whom it may concern:*

Be it known that I, WILLIAM STEPHENS MCKENNA, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Annealing-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is an isometrical perspective view. Fig. 2 is a plan of furnace with its cover and solid arch removed. Fig. 3 is a vertical transverse section through the middle. Fig. 4 is a view showing longitudinal vertical sections, one through the central oven and one inside exterior walls. Fig. 5 is a plan of walls for fire-pit and smoke and heat passages.

This invention relates to improvements in furnaces for annealing iron, glass, porcelain, &c., and its purposes are chiefly intended to be accomplished in cases where the articles are to be annealed in bulk; but my chief object is to construct an annealing-furnace for cut-nails, so arranged that the nails may be annealed in bulk with unusual facility, without the usual impediments of annealing-boxes, spoiled nails, or only half-annealed, and at the same time double or treble the quantity with the same amount of heat. My invention, accordingly, consists in the novel construction of an annealing-furnace, having the characteristics of form and arrangement as hereinafter described and claimed.

In practice I find that the greatest economy lies in the use of three cylinders or ovens, and recommend that as the best form.

More particularly, my construction is as follows: The fire is in the center of one end, but, if necessary, may be the entire length of the furnace. On either side of this are built walls to a certain arbitrary height. Then, outside these containing-walls of the fire-place are constructed several walls, rising nearly, but not quite, to the height of the former, and so disposed in relation to their ends that they form a sinuous passage backward and forward—*i. e.*, one wall extending from the front nearly to the back of the furnace, the next nearly from the back to the front, so that when covered by tiles they form a continuous serpentine passage-way for the heat and smoke backward and forward, or from side to side, under the tiles, and finally ending in a passage leading to the smoke-stack. One large or several small tiles are then laid on these walls, so as to leave the outside passage-way uncovered. The object of this will be seen. When the tiles are laid on, a cast-iron or fire-clay oven of uniform bore is then laid, one on each side of the fire-place, and immediately over the tiled passages, also leaving free entrance to the extreme side passage on each side. Then, between the side ovens, and on top of them, brick or other arches are built up at intervals laterally, also arched on their top and arched underneath where they rest on the hearth. These retain the side ovens in place, and furnish underneath a pass to the flames the length of the oven, and laterally a series of flues between the two side ovens and the upper one, which is then placed on a bed formed in each of the cross-arches, and at a slight distance from the side ovens, so as to afford passage-ways or flues for the flames and smoke between the ovens and cross-arches. I speak now of the plan of three cylinders or ovens, it being the best form. A solid top is then built upon the cross-arches, leaving no connection between sides at the top of middle oven, while the flues leading to the smoke-stack are built in this top, to make a compact body of all. The cylinders are provided with luting-doors, which have small slides in them to observe the stages of annealing. The flues and passage-ways are all provided with suitable openings for cleaning and draft-regulating purposes.

The operation is as follows: The caloric rises from the coals, part passing along the archway on the hearth, and then, with the rest, rising up through the flues between the top and side ovens, between the arches, over the side ovens, then dives down into the respective outside or extreme flue of the sinuous passages under the side ovens, where it threads along back and forth, or from side to side, until it reaches the interior passage,

then down along this to the lateral flue, to the chimney-flue, thence to the smoke-stack. All this is outside the cylinders, and the two outside ovens are protected underneath by tiles, while the top one is made thicker at the bottom for like protection. When the cylinders or ovens are properly heated, the nails are shoveled in simply in bulk, the doors are closed and luted air-tight, and all remain until a cherry-red heat is reached, which is known by looking in at the slide-openings, which may be protected by mica or other material. When the proper degree of heat is reached, the doors are opened, nails raked out into bins, and allowed to cool as they stand, when they are kegged and ready for market.

In ordinary construction the heat is necessarily greater in some parts than in others, and for that reason the process of cooling must be gradual, whereas, by my plan, all being heated exactly to the same degree, and the nails being in large masses, they may be at once removed and allowed to cool outside, which gives them a slight degree of hardness, combined with the flexibility and toughness required in a good nail.

Referring to the accompanying drawings, *a a* are the surrounding walls of the furnace; *b b*, the walls of the fire-pit, with its hearth *c* between them. On either side of these walls *b b* are built the walls forming the serpentine flues *c c*, which end in the lateral flues *d d*, leading to the chimney-flues *e e*, passing into smoke-stack *f*. On top of the walls forming flues *c c* are laid tiles *g g*, covering all but the extreme outside passage on either side of the furnace. Then the two side ovens *h h* are placed in position over the tiles *g g*, also leaving the outer passage open and free. Then the cross-arches *k k* are built at intervals apart to allow room for the passages between the side and top cylinders or ovens. These arches *k k* form between them the flues *l l*. The top oven *m* is then placed, and a solid arched top built over all. This causes the formation or continuation of the flues *l l* down over the side ovens and into the side passages *c c*, and so on, as described. The slide-openings are shown by *n n*.

Having fully described my invention, what I claim is—

1. In a furnace for annealing solids, the combination, with the retorts *h m h*, one or more, and the arches or walls *k*, forming flues *l*, of the sinuous horizontal flues *c c*, &c., substantially as shown and described.

2. The combination, with the annealing-ovens *h m h*, one or more, of the diving-flues *l* and sinuous flues *c c*, substantially as described.

3. The tiles *g*, in combination with the horizontal annealing-ovens *h h* and sinuous flues *c c*, substantially as described.

4. In an annealing-furnace for solids, the horizontal annealing-oven of uniform bore, and made in one piece, substantially as specified.

5. The combination, with an annealing-oven, of a door or cap at one end, having a covered aperture, *n*, as and for the purpose set forth.

6. The improved annealing-furnace, consisting of and comprising the internally-arched body *a*, the ovens *h h m*, one or more, of uniform bore, the ovens *h h* being arranged at the sides of, and the oven *m* above, the fire-place, and against the furnace-arch, the arches *k* supporting said oven *m*, and resting on ovens *h*, forming the lateral flues *l*, and the sinuous flues *c c* passing underneath the ovens *h h*, all as shown, and for the purpose specified.

In testimony that I claim the foregoing I have hereunto set my hand this 10th day of May, 1875.

WM. S. McKENNA.

Witnesses:
F. J. McTIGHE,
A. CORCORAN.