CAMPBELL & RAYMOND.

Hot-Blast Oven.

No. 94,709. Patented Sept. 14, 1869.

Fig. 1

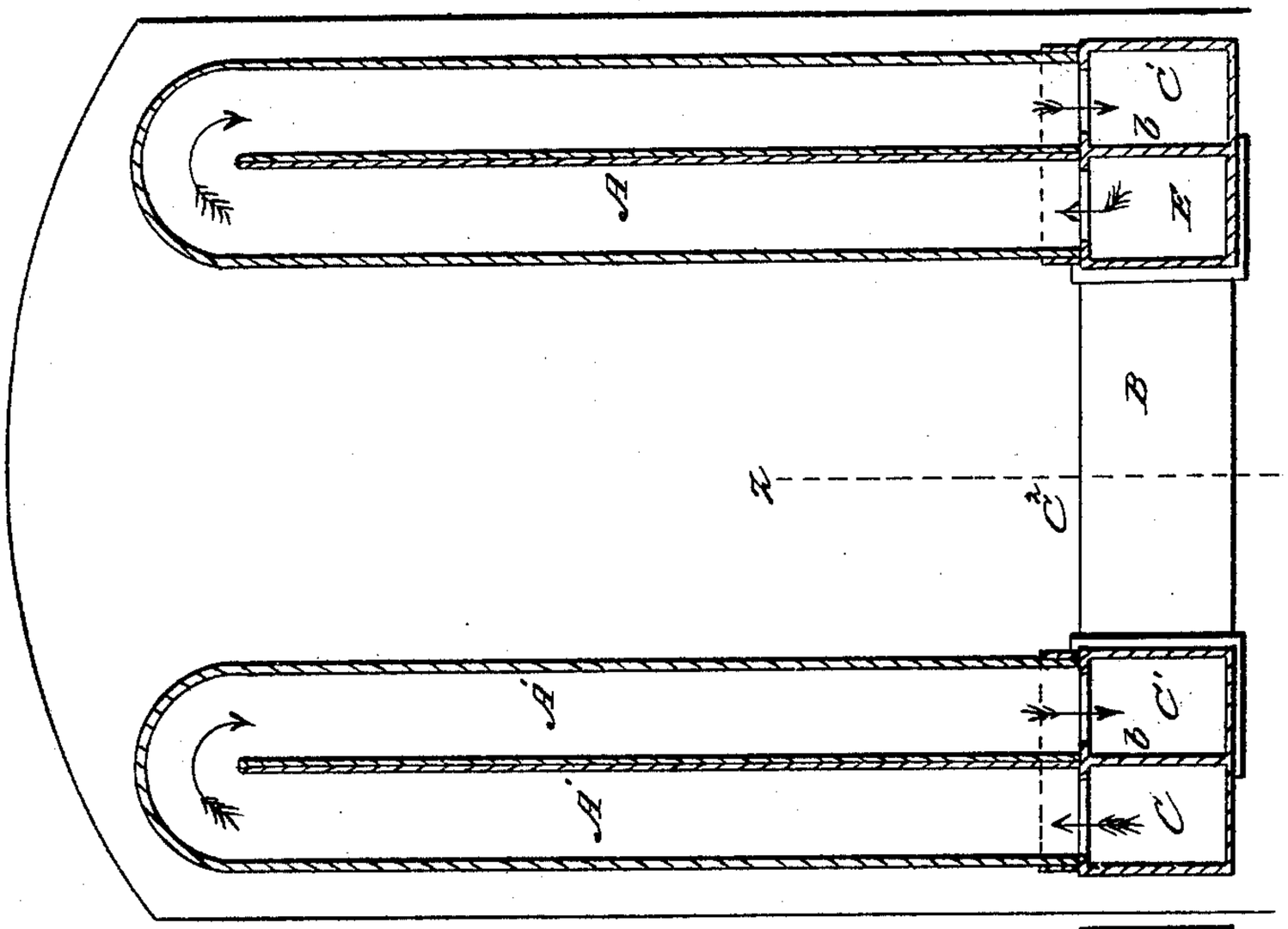

Fig. 2

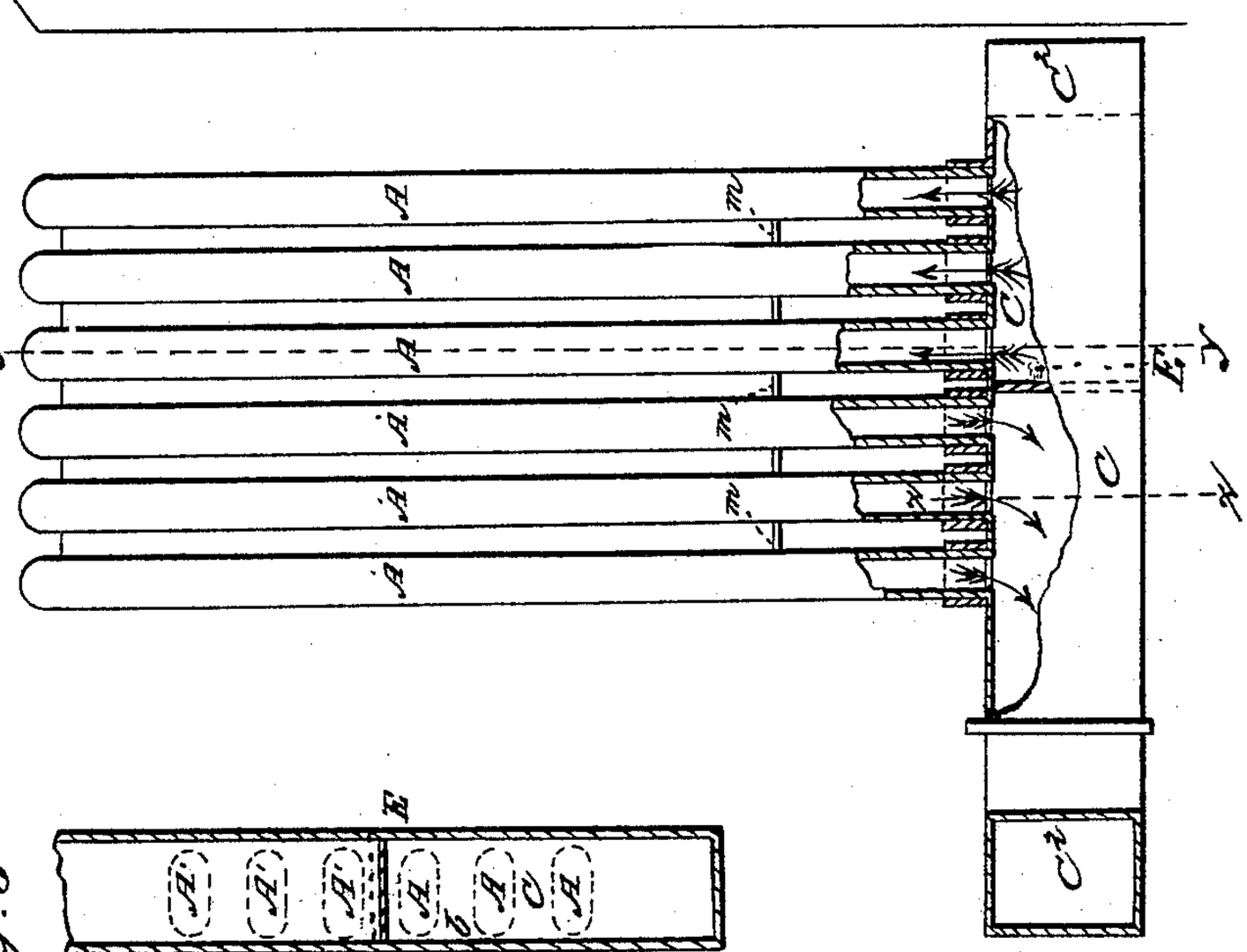

Fig. 3

Witnesses:

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DAVID CAMPBELL, JOSEPH CAMPBELL, AND SEYMOUR RAYMOND.
OF MIDDLETOWN, PENNSYLVANIA.

Letters Patent No. 94,709, *dated September* 14, 1869.

IMPROVED HOT-BLAST OVEN.

The Schedule referred to in these Letters Patent and making part of the same.

To all to whom it may concern:

Be it known that we, DAVID CAMPBELL, JOSEPH CAMPBELL, and SEYMOUR RAYMOND, of Middletown, in the county of Dauphin, and State of Pennsylvania, have invented a new and improved Hot-Oven; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a vertical section through lines *x y* of fig. 2.

Figure 2 is a vertical section through line *z* of fig. 1.

Figure 3 is a horizontal section.

This invention relates to that class of furnaces or "ovens" employed to heat air for the blast of hot-blast furnaces, and consists in a new and improved arrangement of air-pipes, conductors, and deflectors, by means of which the air is caused to circulate in such a manner as to travel a great distance in an arrangement of pipes occupying but little space. At the same time the shape and construction of the pipes are such that they can expand or contract to any extent without injury, while they will endure a greater degree of heat, present more heating-surface in proportion to the weight of metal, and cause the blast to come more directly in contact with the hot iron, than any other form of pipes for a similar purpose hitherto brought into use.

In the drawings—

A A′ indicate the pipes, they being in the form of an oval tube doubled at its centre, with its two open ends brought together as shown in fig. 1.

The difference in the several diameters of each pipe will be fully understood from fig. 3. As a practical matter of construction, however, the pipes are not bent tubes, but castings, the cross-section of which below the elbow resembles the numeral **8**, as shown in fig. 3, the object of such construction, in preference to a tube divided in the middle by a vertical partition extending nearly to its top, being to increase the radiating-surface, and thereby heat the air more rapidly as it passes up one branch of the tube and down the other.

Our object in making the pipes oval (as shown in cross-section) is to bring the centre of the air-current flowing through them nearer to their heated wall than would be the case were they round or square, and thereby more quickly and completely utilize the heat conducted in through their walls.

Thus constructed, the pipes are arranged in sets of six, ten, or more, as shown in figs. 1 and 2, in a vertical position, with their bent ends up and their open ends down, resting upon air-conductors B B, which introduce the air to and convey it through the entire set, and then conduct it away to the adjacent set, where they perform a similar service, after which they convey it to another set, and so on indefinitely, until it becomes sufficiently heated for the purpose to which it is to be applied.

In fig. 1 a portion of two sets of pipes is seen.

That part of the air-conductors under each set of pipes is in the shape of an oblong box, divided into two passages, *c c′*, by a longitudinal partition, *b*.

The air enters the set at one end of the passage *c*, and leaves at the other end, having passed through the pipes A A′, and become thoroughly heated in its course. It does not, and cannot, pass directly through the passage *c*, on account of a deflector, or transverse partition, *e*, across the centre of such passage, interrupting all communication directly through the same.

The current of air entering passage *c*, as shown by the arrows, figs. 1 and 2, meets the deflector *e*, and is forced up into pipes A A, (half of the set,) one end of which communicates with the passage *c*.

Passing up over the bend of these pipes, it descends through their other branch, and is discharged into the chamber *c′*, which occupies the opposite side of the box or conductor B, and communicates with the opposite end of all the pipes of the set.

Thus discharged into chamber *c′*, it finds no escape except through pipes A′, (the other half of the set,) and it consequently rises through these, passing over the elbow and down on the opposite side, where it is emptied into the other end of the passage *c*.

After this, having thus traversed one entire set, it is conveyed away to another set, by the curved continuation c^2 of passage *c*, as fully shown in figs. 1 and 3. In other words, the air, entering passage *c* from the connection c^2, goes over, through pipes A, into chamber c^1, thence, along chamber c^1, into pipes A′, and through these pipes back into passage *c*, on the other side of the partition *e*, and after this to another set, where it goes through the same course.

The pipes, conductors, and deflectors, thus constructed and arranged, are placed in a furnace or oven, the outlines of which are shown in red, figs. 1 and 2, where the heat, &c., can rise around and among them, coming thoroughly in contact with every part of the pipes and conductors.

A current of cold air is then introduced and passed through the conductors and pipes of the several sets, as above set forth, in its passage becoming so thoroughly heated that it may be applied to any purpose for which hot air is employed.

It will be observed that in consequence of the peculiar form of the pipes A A′, unlimited room for expansion and contraction is allowed them, without dan-

ger of fracture of any part of the apparatus thereby. It may be observed, also, that by arranging horizontal deflectors *m m* among the pipes, the hot draught which heats them may be caused to wind back and forth as it ascends, thereby coming more thoroughly in contact with the pipes, and imparting its heat to them more effectively.

The current of air that passes through the tubes may be induced either by the action of a fan-blower or other apparatus for a similar purpose, or simply by the expansion of the air in the tubes, caused by the heat of the enclosing furnace.

We are aware that arched pipes, arranged side by side upon a common base-flue or conductor, have been long in use, and we are acquainted with the nature of the devices patented by S. and J. Thomas, in 1859, W. B. Pollack, in 1865, A. Hamar, in 1868, and J. C. Kent, in 1869, all for a similar purpose. Their arrangements are all different from ours, in not containing both the longitudinal partitions *b* and the transverse partitions *e*, while their construction of the tubes is different from ours in that their tubes, in cross-section, do not show the figure 8 form.

We do not claim their devices as our invention; but, having thus described our invention,

What we claim as new, and desire to secure by Letters Patent, is—

1. In connection with the pipes A A′ and conductors B, arranged as shown, the arrangement and combination of the longitudinal partitions *b* and transverse partitions *e*, when constructed and employed as and for the purposes herein set forth.

2. The pipes A A, formed of two parallel branches, connected at one end and open at the other, and having a cross-section in the form of the numeral 8, substantially as and for the purposes set forth.

To the above specification of our improvement, we have set our hands, this 21st day of April, 1869.

DAVID CAMPBELL.
JOSEPH CAMPBELL.
SEYMOUR RAYMOND.

Witnesses:
W. M. WEST,
L. F. STEINMETZ.