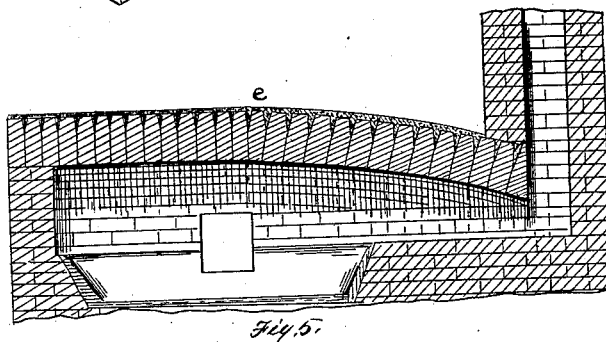


W. G. BELL.

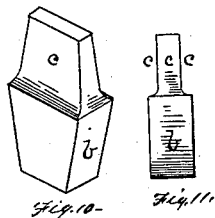
BRICK FOR BUILDING ARCHES AND FURNACE ROOFS.

No. 266,010.

Patented Oct. 17, 1882.



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UNITED STATES PATENT OFFICE.

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BRICK FOR BUILDING ARCHES AND FURNACE-ROOFS.

SPECIFICATION forming part of Letters Patent No. 266,010, dated October 17, 1882.

Application filed March 30, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. BELL, of Allegheny City, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Bricks for Building Arches and Furnace-Roofs; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a perspective view of my improved brick. Figs. 2 and 3 are side and edge views, respectively, of the same. Fig. 4 is a cross-section, in perspective, of a furnace-roof, illustrating the manner of building arches with my improved brick. Fig. 5 is a longitudinal section of such furnace-roof. Fig. 6 is a view of the triangular capping-bricks. Fig. 7 is a view of an elongated brick of my improved shape. Figs. 8 and 9 are views of the combined double wedge and key brick, and Figs. 10 and 11 are views of a brick having another form of upper end.

Like letters of reference indicate like parts in each.

My invention relates to the building of arches or arched roofs or crowns, and has special reference to the building of the arched roofs or crowns of puddling or heating furnaces used in the metallurgy of iron. These furnaces, as at present constructed, are formed of fire-brick side and end walls built up in the usual manner, and arched roofs or crowns formed of the common bricks built over a templet of the proper arch and set on end between mortar and supported by means of a key-shaped brick in the center, the furnace being braced firmly together by means of heavy cast-iron side plates on each side of the furnace and iron rods connecting the side plates. As the arch of the roof is made as flat as possible, so as to hold the heat and flame down onto the metal, and the mortar is frequently made of inferior clay, or clay not sufficiently kiln-dried or shrunk, the mortar has a tendency to shrink away from the brick under the intense heat of the furnace, and if a brick should be cracked by the heat, as it has little or no support from the mortar, it will fall; and where two or three bricks have so dropped out the arched roof is so weakened that it is necessarily taken down and rebuilt, this rebuilding being often neces-

sary before the brick are at all injured or weakened by the action of the heat.

The object of my invention is to provide brick for building these flat arched roofs for furnaces and other purposes by which each brick is supported within the arch by its own shape, and the mortar binding the brick together is not so exposed as to be shrunk or injured by the action of the heat or atmosphere, so that the difficulties in building such arches are entirely overcome.

My invention consists essentially in a special form of brick, having combined therein both a key shape on the edge in one direction and a wedge shape or narrowed portion on the flat or face in the other direction, the key-shaped end of the brick forming a segment of the circle at which the arch is projected, so that each brick is held in position by the arch, and the wedge-shaped or narrowed end forming a space between the rows of brick, or entirely around the upper part of the bricks composing the arch, for the reception of the mortar or binding material.

It also consists in such a combined wedge and key brick wherein the key and the wedge or narrowed part extend only part way along the brick, so that the brick is the full thickness at the base across the key end, giving a greater surface for the wearing of heat and flame, and at the upper end a greater space is formed for the reception of the binding material.

It also consists in a brick having the combined wedge and key shape, as well as a special wedge shape at the key end to form an angle in the arch.

To enable others skilled in the art to make and use my invention, I will describe the same more fully.

In the drawings referred to, *a* represents my improved brick, which is formed, for metallurgical and other furnaces, of fire-clay, and for ordinary arches of the common clay, or is cut out of stone. For furnace purposes the common bricks are generally made nine inches long, four and a half inches wide, and two and a half inches thick. The lower end of my improved brick is made key-shaped, as at *b*, the edges of the brick being tapered at the desired angle, which is generally in the line of a segment of the circle on which the arch is pro-

jected. The upper end of the brick is formed wedge-shaped, as shown at *c*, the sides or flat part of the brick being tapered for this purpose, and the amount of the taper depending on the space to be left between the upper part of the bricks for the reception of the mortar. The tapers of the key or wedge faces may extend the entire length of the brick or only part way, as desired, this latter form being preferred, as the base of the brick is its full thickness up to the top of the key, and presents a solid surface of brick for this depth for the wearing of the heat and flame, and spaces are formed at the top between each brick in the course instead of only between each course of bricks, as would be the case where the taper of the key extended for its entire length. To this end I usually commence the taper of the key end *b* at a point or line some distance below the top of the brick, as at *d*, and form a regular taper therefrom to the base of the brick, and commence the taper of the wedge end *c* at the same point, continuing it therefrom to the top, so that the brick is the usual thickness from this line to the base, and the usual width from this line to the top.

As it is often desired to form an angle in the roof of metallurgic furnaces, as shown at *e* in the furnace-roof shown, and it is preferred to present no mortar to the action of the flame, even after the bricks have worn away, I find it desirable to form a brick that can be used in one or more courses at the point of the angle. This I accomplish by tapering off the lower face of the brick, according to the angle to be formed, in addition to the key and wedge tapers, as shown at *f* in Figs. 8 and 9, this additional wedge taper enabling the course of bricks at the angle to fit tightly against the horizontal course, and thus change the angle of the course. Triangular capping or abutment bricks *g* may, if desired, be employed on top of the side walls, against which the end bricks of the arch fit, thus giving the proper angle for the commencement of the arch.

In building furnace-roofs my improved bricks are employed in the following manner: The cast-iron side plates are placed in position and the side walls built up against them. The side walls should be made very level and true, and after reaching the proper height the triangular bricks *g* are then laid on top, or the common bricks built to give the proper angle for the arch. After adjusting the templet over which the roof is built the bricks *a* are laid in courses across the templet, the key ends *b* resting on the templet and the key-faces fitting against each other, and an entire course is thus laid extending across the furnace-roof, the end bricks of the course resting against the triangular bricks *g* or angle on the side walls. The courses are laid so that the bricks break joint by the use of half-bricks at the end or ends of the courses. After sufficient courses are laid to cover the templet they are bound tightly by tightening up the side plates, and the mortar or other binding material is spread

over the whole mass so laid and enters between the courses in the space formed by the narrowed or wedge-shaped ends *c* of the bricks, and between the straight faces of the bricks composing the courses, thus filling entirely around the upper parts of the bricks and binding the whole mass firmly together.

If desired, the entire roof of the furnace can be laid in the manner above described before the mortar is applied, and the mortar afterward spread over and worked in between the bricks. Other layers of brick-work may then be built above the arch or arched roof so formed, if desired.

Where it is desired to have an angle in the roof, as at *e*, the double wedge bricks shown in Figs. 8 and 9 are employed, being laid in the manner above described.

I find that arches and furnace-roofs built as above described of my improved bricks are compact and strong, being held in place by their key-shaped ends in the arch, and bound firmly together by the binding material extending entirely around their upper ends.

In furnace-roofs, as no mortar is exposed to the action of the heat and only the highly-refractory fire-brick is acted on thereby, there are no weak points through which the heat can penetrate or cut into the roof. If any bricks should be cracked by the heat, instead of dropping out, as the ordinary bricks, it will be held in place by its taper or key shape, and so retain the arch of the roof intact.

My improved bricks may be made longer than the ordinary brick, if desired, and have a proportionately longer key end, as shown in Fig. 7, and so cause the furnace-roofs to wear much longer.

I have described the upper ends of my improved bricks as wedge-shaped; but it is evident that the same result would be accomplished by narrowing down their sides, or their sides and edges, for the reception of the mortar, as shown in Figs. 10 and 11, instead of forming them wedge-shaped, and any such means for admitting the mortar between or around the upper ends of the bricks is considered within my invention.

While I have also described the building of arches and roofs with my improved bricks without the employment of mortar or binding material behind the key-faces thereof, it is evident that mortar can be so employed, if desired. I find, however, that the action of the heat or atmosphere is often deleterious to it, and if it shrinks or drops out the arch will be loosened thereby, and that the binding material around the upper ends of the bricks holds the whole together in a solid structure.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A brick for building arches and furnace-roofs, having its edge key-shaped in one direction and its face wedge-shaped or narrowed in the other direction, substantially as set forth.

2. A brick for building arches and furnace-

roofs, having its edge key-shaped for part of its length in one direction and its face wedge-shaped or narrowed for part of its length in the other direction, substantially as set forth.

5 3. A brick for building arches and furnace-roofs, having a combined key and wedge shape in one direction and wedge shape or narrowed in the other direction, substantially as and for the purposes set forth.

10 4. An arch or furnace-roof formed of brick having a key-shaped lower end and a wedge-

shaped or narrowed upper end, and mortar or other binding material entirely surrounding the upper ends of the brick, substantially as set forth.

In testimony whereof I, the said WILLIAM G. BELL, have hereunto set my hand. 15

WILLIAM G. BELL.

Witnesses:

JAMES I. KAY,
F. G. KAY.