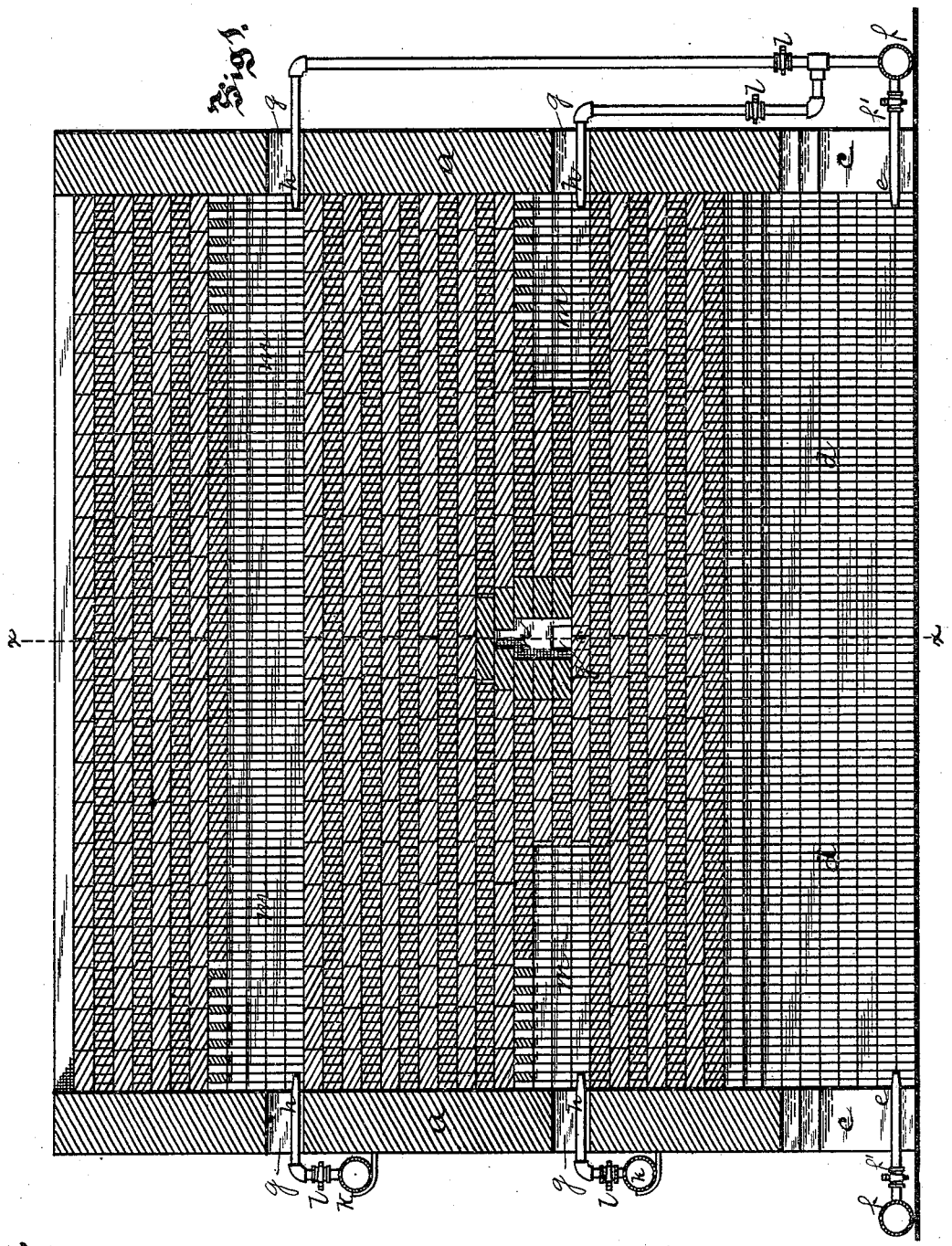
(No Model.) 2 Sheets—Sheet 1.

O. O. PHILLIPS.

BRICK KILN.

No. 342,926. Patented June 1, 1886.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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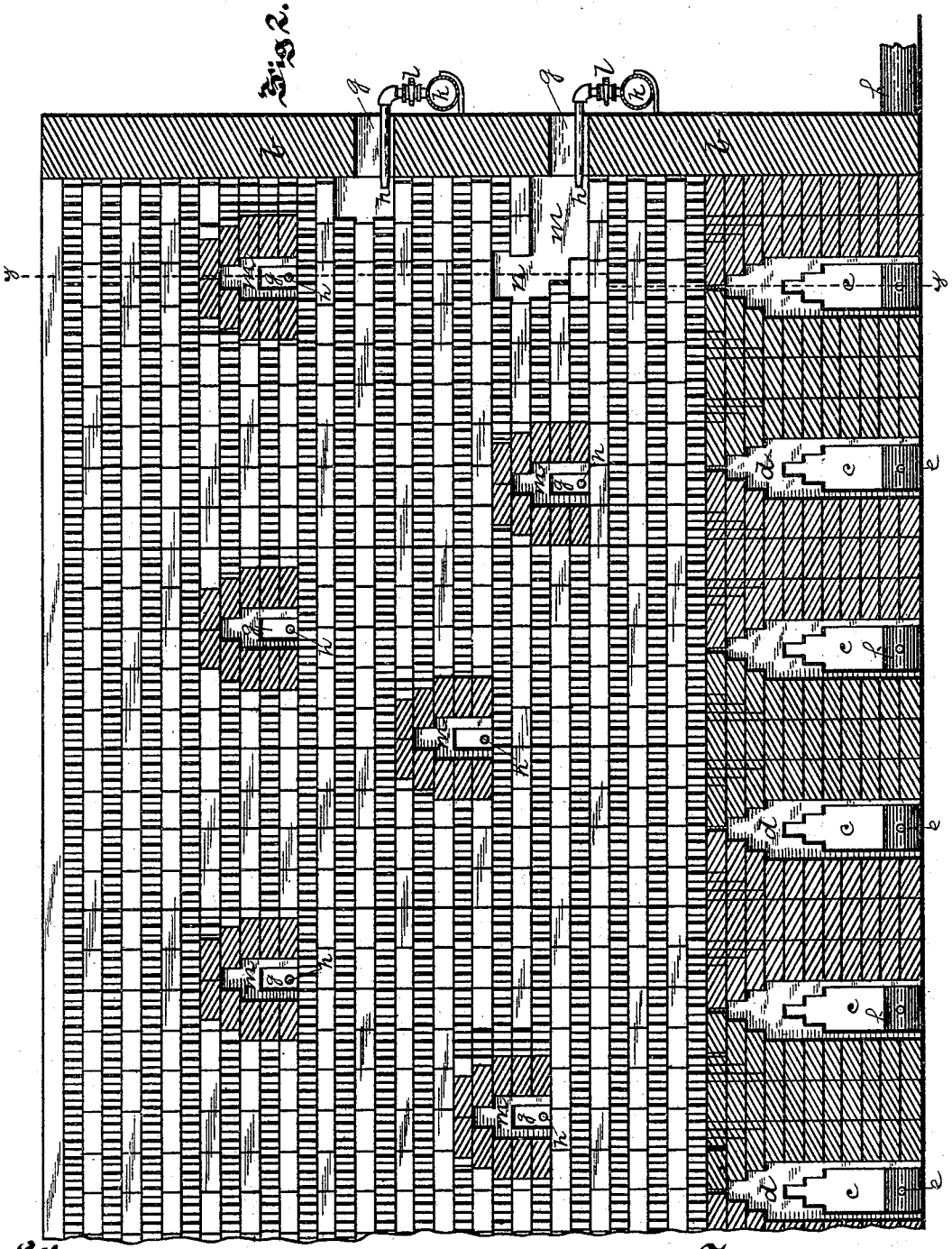
Fig 2.



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UNITED STATES PATENT OFFICE.

OLIVER O. PHILLIPS, ALLEGHENY, PENNSYLVANIA.

BRICK-KILN.

SPECIFICATION forming part of Letters Patent No. 342,926, dated June 1, 1886.

Application filed October 10, 1885. Serial No. 179,501. (No model.)

To all whom it may concern:

Be it known that I, OLIVER O. PHILLIPS, of Allegheny City, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Brick-Kilns; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to kilns for burning brick and similar articles, these kilns being generally formed of two side walls and an end wall, and the brick to be burned being built within these walls, the brick at the base of the kiln being formed into arches, through which the heat and flame enter from grates or fire-places placed in the side walls of the kiln at the end of these arches, or from gas-burners entering through ports at the end of the arches, and the bricks being laid on their edges in open courses above these arches to the top of the kiln, the open end of the kiln being closed by means of boards extending across it and supported in suitable manner, and sand or similar material being filled in between these boards and the courses of brick close thereto, so closing that end of the kiln. In operating these kilns both with the ordinary coal or wood and with gaseous fuel it has been found that on account of the uneven distribution of the heat within the kiln there were a large number of bricks which were not sufficiently burned, the heat and flame naturally passing up through the central portion of the body of the brick within the kiln, so that when the bricks in the center of the kiln were burned sufficiently the bricks close to the sides and at the ends of the kiln were only partially burned, and these bricks were not so salable, there being in the ordinary kiln from eight to ten thousand of these partially-burned brick which had to be sold at a low figure, and were even then hard to dispose of. It was also found that as the brick in the center of the kiln were dried and burned more rapidly they would shrink more than the brick at the sides or ends thereof, and consequently would throw the brick within the kiln upon a strain, this sometimes causing the breaking of the brick or their bending out of shape.

The objects of my invention are to obtain more uniformity in the heating of the brick within the kiln, and in this manner to relieve the brick from the strain on account of the uneven burning; to reduce the number of soft or partially-burned brick within the kiln; to reduce the time necessary in burning the brick, and to cause a saving in the amount of fuel required.

To these ends my invention consists, generally, in a brick-kiln having, in addition to the firing ports or entrances extending through the kiln-walls at the base thereof and communicating with the ordinary arches in the base of the brick to be burned, similar firing ports or entrances extending through the kiln-walls at any desired points above these ports at the base of the kiln, in combination with gas-burners entering through these firing-ports, whereby the heat and the flame may be applied directly to the brick to be burned in any part of the kiln, and the brick can thus be burned uniformly, the heat being applied through these ports above the base to any part of the kiln where there is liability of the partial burning of the brick and regulated as desired, and on account of the greater heat obtained within the kiln the brick being more rapidly burned, and substantially all the brick being burned to a uniform color and hardness, while the heat necessary in burning the bricks is applied without injuring the bricks below these ports, as would be the case where coal or wood or similar solid fuel were introduced through the ports.

It also consists in combining with the brick-kiln walls above the base thereof and the gas-burners entering through these firing-ports arches extending from these ports into or through the body of the brick to be burned, so as to direct and distribute the heat and flame into any desired part of the kiln and cause the more even burning of the brick therein.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a cross-section of my improved kiln, and Fig. 2 is a longitudinal section of a portion thereof, the said sectional views being taken on the lines *x x*, Fig. 1, and *y y*, Fig. 2.

Like letters of reference indicate like parts in each.

The kiln is provided with the side walls, *a*,

and end wall, *b*, the walls being built of the ordinary thickness and extending up to the ordinary height, though in some cases, on account of my improvements, the kilns may be made of greater height than the ordinary brick-kiln now in use. Extending through the brick-kiln at the base thereof are the ports *c*, communicating with the arches *d* at the base of the kiln, the arches being built of the green or unburned brick and supporting the body of brick to be burned within the kiln. Entering through these firing-ports *c* are the gas-burners *e*, or, where gaseous fuel is employed, the gas-burners *e* entering through the ports, suitable gas-supply pipes, *f*, extending along the kiln-walls and communicating with the burners by suitable pipes having the valves *f'*, therein to control the supply of gas to the burners. Extending through the kiln-walls at any desired points above these ports *c* are the firing ports or entrances *g*, these firing-ports being located in such position that the heat and flame from the burner extending into the same shall rise into and be distributed through the parts of the brick to be burned, which, in the construction of the kilns heretofore in use, have not been thoroughly burned, these ports being generally located both in the side walls, *a*, and in the end walls, *b*, and the heat and flame generated at these ports acting to heat the brick close to the side walls and end walls of the kiln, and so acting to burn the brick in these parts of the kiln, while the heat from the ports at the base of the kiln passes up principally through the central portion thereof and acts to burn the bricks in this center portion of the kiln. I generally locate these firing-ports *g* in one or more series about from one-half to two-thirds the height of the kiln, the ports being located between the ports at the base of the kiln, so that the heat and flame therefrom are distributed between said ports *c* and rise within the body of the brick, where the heat from the base-flues has not heretofore acted to thoroughly burn the brick. Through these ports *g*, above the base of the furnace, I employ gaseous fuel, what is termed "natural gas" being well suited for the purpose, as, if coal or wood were employed at these points in the upper portion of the kiln, the ashes or cinder from the kiln would be liable to drop through, and so mar the bricks to be burned through these ports, and, as it is desired to carefully regulate the amount of heat introduced into the body of the brick from these ports in the upper part of the kiln, a better control of the heat may be obtained by the employment of gaseous fuel. For this purpose I employ gas-burners *h* at the ends of pipes entering through the ports and communicating with suitable gas-supply pipes, *k*, extending along the walls of the kiln, the supply of gas to the burners *h* being regulated by suitable valves, *l*. If desired, however, these burners *h* may be supplied directly from the supply-pipes *f* at the base of the furnace, and in some cases this is preferable, as the heat in the furnaces can be regulated and controlled by the operator at the base of the kiln, and where, as in some cases I find it desirable, the ports are located at irregular intervals, the pipe-connections can be better made from this lower pipe, *f*. In order to distribute the heat from these upper ports, *g*, through a special part of the body of the brick which it is desired to heat therefrom, I employ arches *m*, extending into or through the body of the brick to be burned, these arches acting to direct the heated products into the special part of the kiln desired. The arches are generally made horizontal, but they may be sloping, as shown at *n*, being built of steps in the brick-work, as illustrated, and the heat from these upper ports can thus be directed into any part of the body of brick within the furnace.

When my improved kiln is employed for burning brick, the green brick to be burned is built up within the kiln in any suitable manner, the ports *g* extending through the kiln-walls at any suitable points, and the arches leading from these ports being built to direct the heat and flame from these ports to any special part of the brick within the kiln as experience in burning the brick will show to be most efficient. The heat and flame from the ports *c* at the base of the kiln enter through the arches *d*, at the base thereof, and rise through the open courses of brick in such manner as to burn the same, the heat from these lower arches being principally distributed through the central portion of the body of the brick and acting to burn them, as has been the case with the brick-kilns heretofore in use. The heat and flame from the ports *g*, extending through the kiln-wall above the base thereof, are so distributed that they will act to burn the brick in the parts of the kiln not sufficiently heated by the heat and the flame entering at the base thereof—such as close to the kiln-walls or at the ends of the kiln—and the arches leading from these ports *g*, carrying the heat and flame more directly into these parts of the kiln which are not sufficiently heated by the heat and flame at the base thereof. As the heat and flame thus enter the body of brick at different points in the upper part of the kiln as well as the base thereof, it is evident that the bricks are dried more rapidly and uniformly, and therefore shrink more uniformly, within the kiln, so that there is not the liability of straining the brick during burning, and, as a more direct and higher heat can be applied in all parts of the kiln, it is also evident that the bricks can burned more rapidly, a saving of from one-fourth to one-third of the time necessary to burn the brick being thus obtained.

On account of the distribution of the heat from the ports in the upper part of the kiln through the parts of the brick not heated from the base of the kiln, it is evident that I am by my invention enabled to burn all the brick to the proper color and hardness,

and that I thus reduce or do away with the formation of soft brick within the kiln. Though a higher heat and greater proportion of fuel are employed during the baking of the brick, yet, as this fuel is utilized to a greater advantage and the time necessary to burn the brick is greatly reduced, it is evident that I make a large saving in fuel.

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

1. A brick-kiln having a series of firing ports or entrances extending through the kiln-walls at the base thereof, and firing ports or entrances extending through the kiln-walls at any desired points above said series of ports, in combination with gas-burners entering through said ports, substantially as and for the purposes set forth.

2. A brick-kiln having firing ports or entrances extending through the kiln-walls above the base thereof, in combination with gas-burners entering through said ports, and arches extending from said ports into or through the body of the brick to be burned, substantially as and for the purposes set forth.

In testimony whereof I, the said OLIVER O. PHILLIPS, have hereunto set my hand.

OLIVER O. PHILLIPS.

Witnesses:
JAMES I. KAY,
J. N. COOKE.