(No Model.) 2 Sheets—Sheet 1.

C. F. T. KANDELER.

BURNING BRICK.

No. 305,599. Patented Sept. 23, 1884.

Fig. 1.

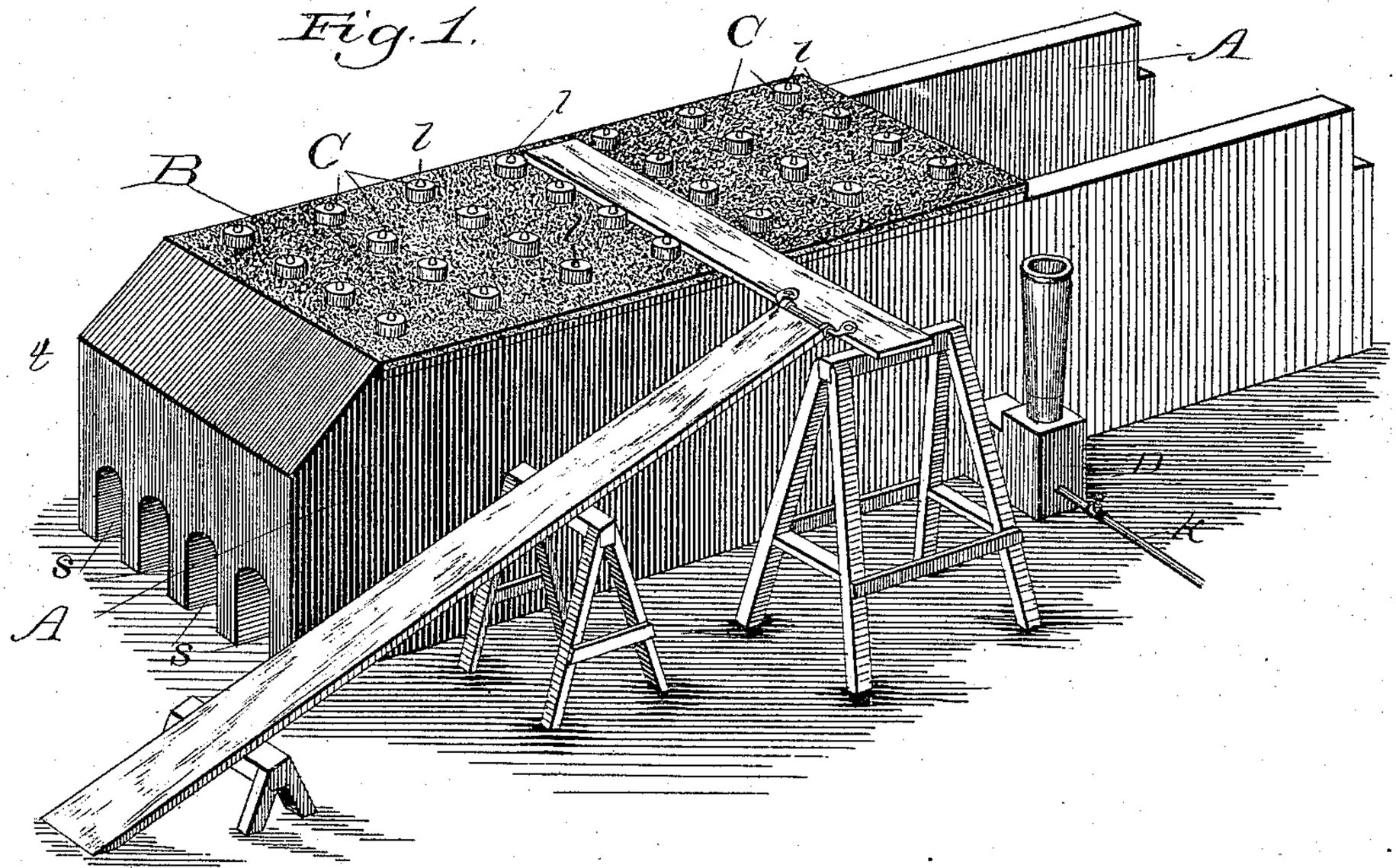
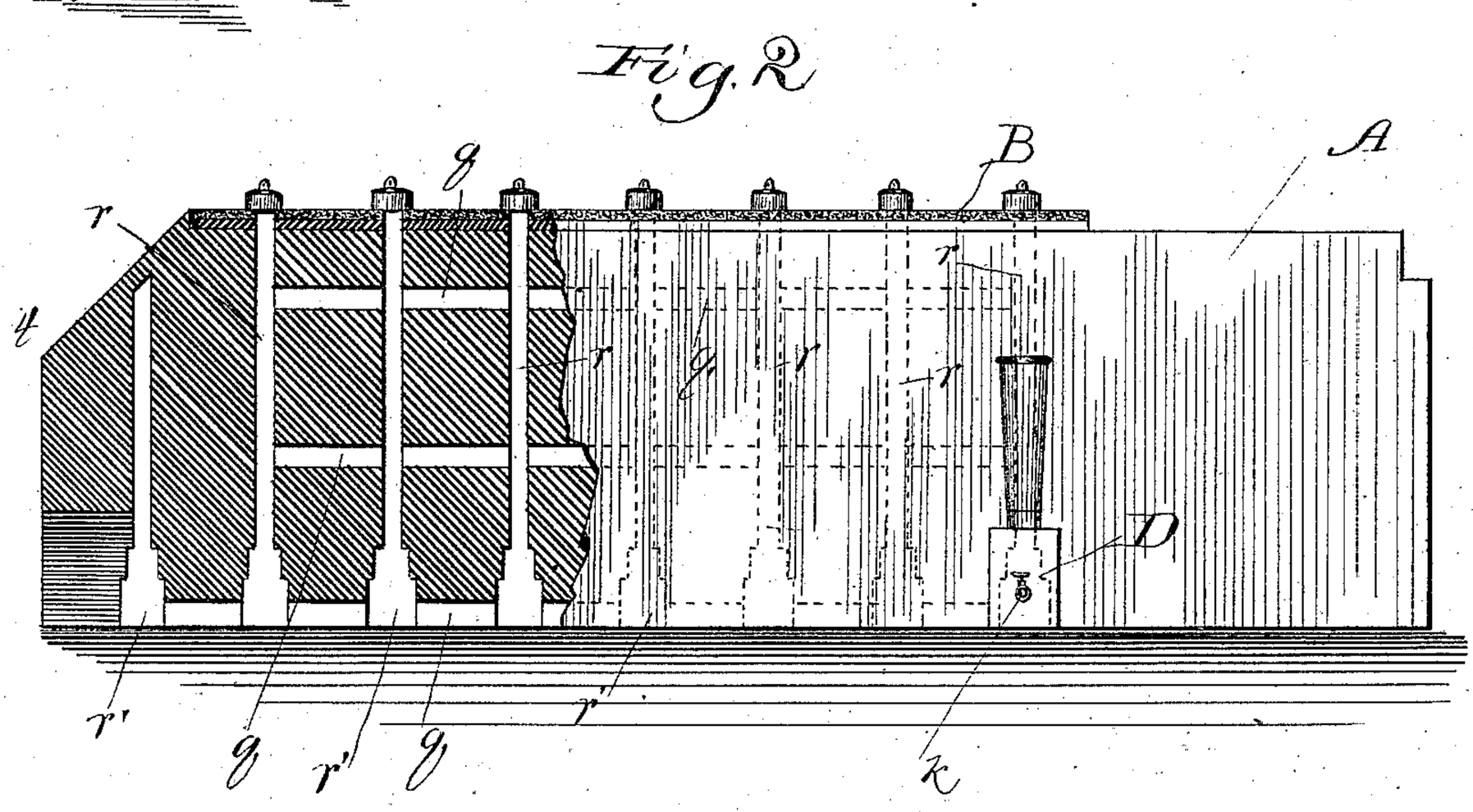


Fig. 2



Witnesses:
Chas. E. Gaylord.
Douglas Dyrenforth.

Inventor:
C. F. Theodore Kandeler.
By Dyrenforth and Dyrenforth,
Atty's

(No Model.)

2 Sheets—Sheet 2.

C. F. T. KANDELER.

BURNING BRICK.

No. 305,599. Patented Sept. 23, 1884.

Fig. 3.

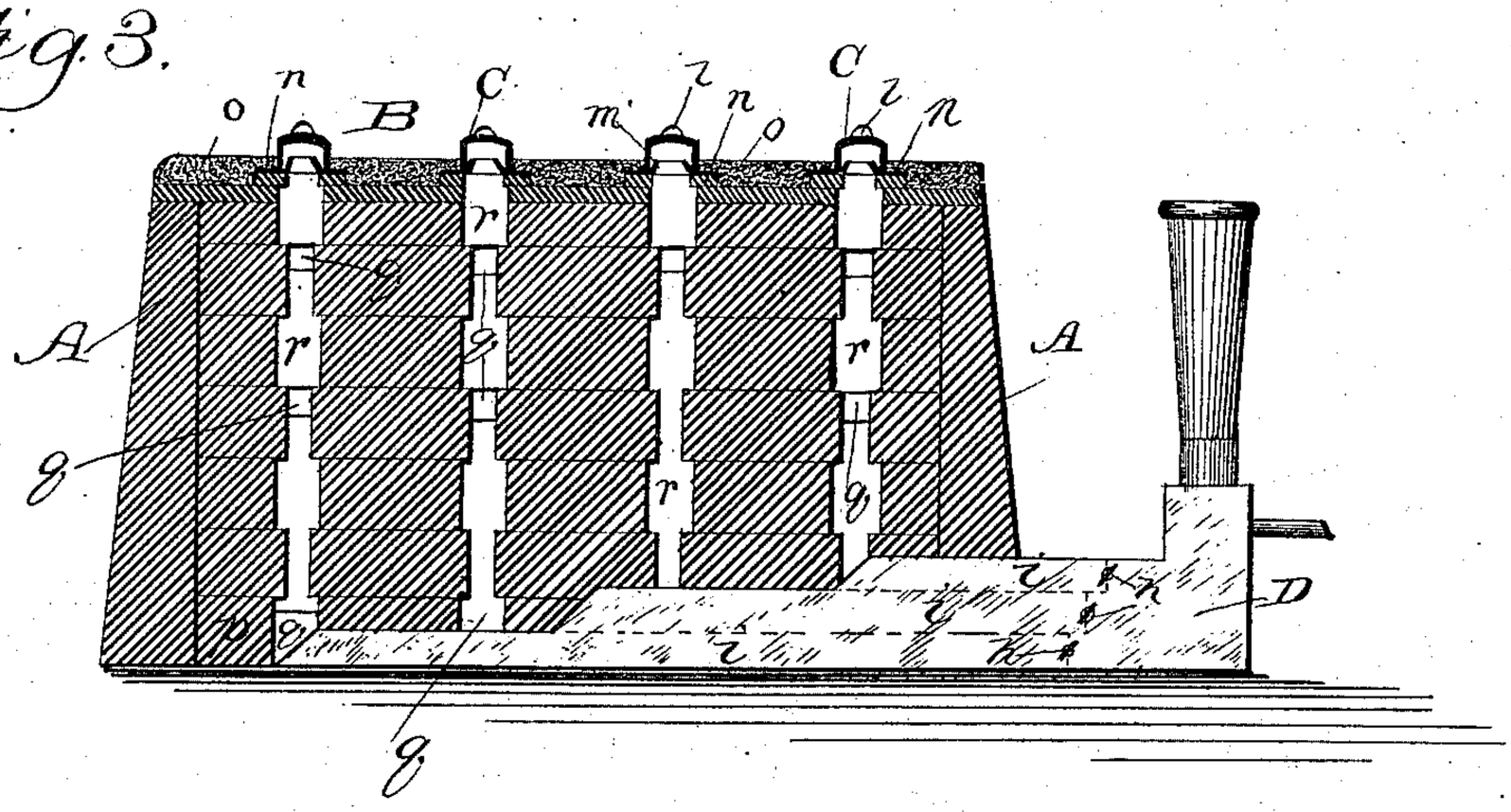


Fig. 4.

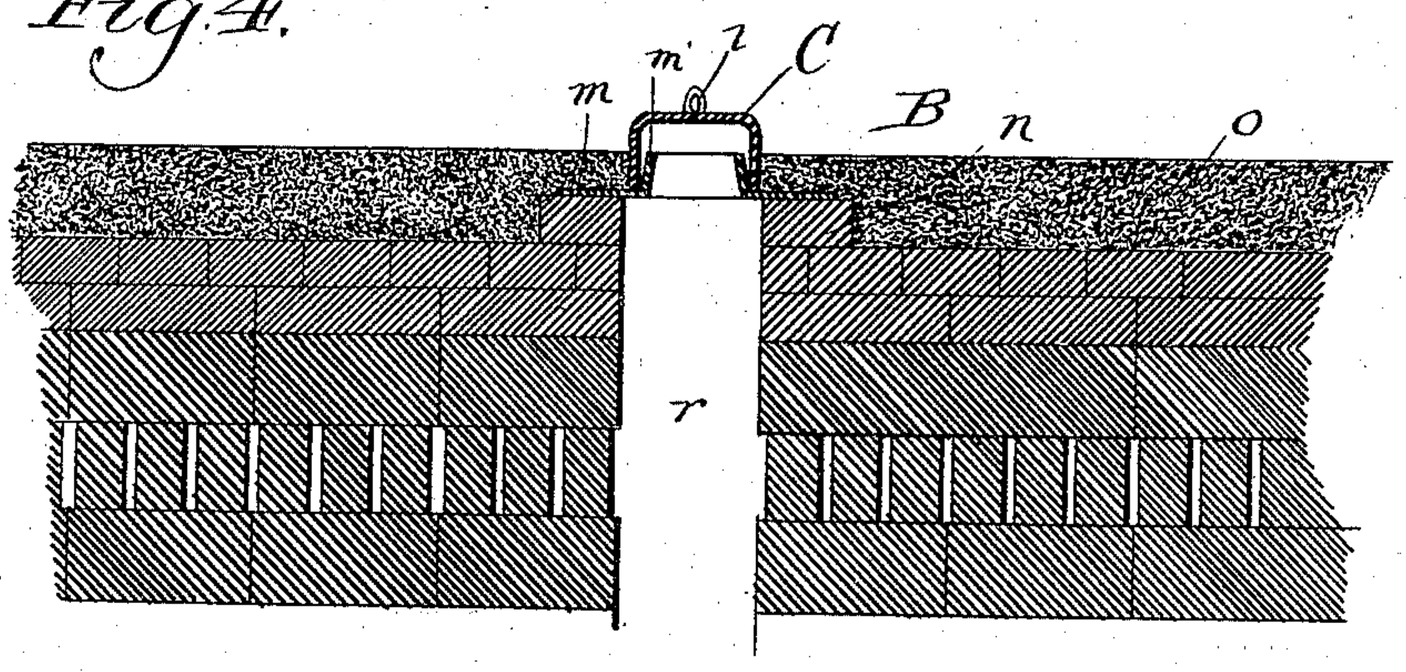
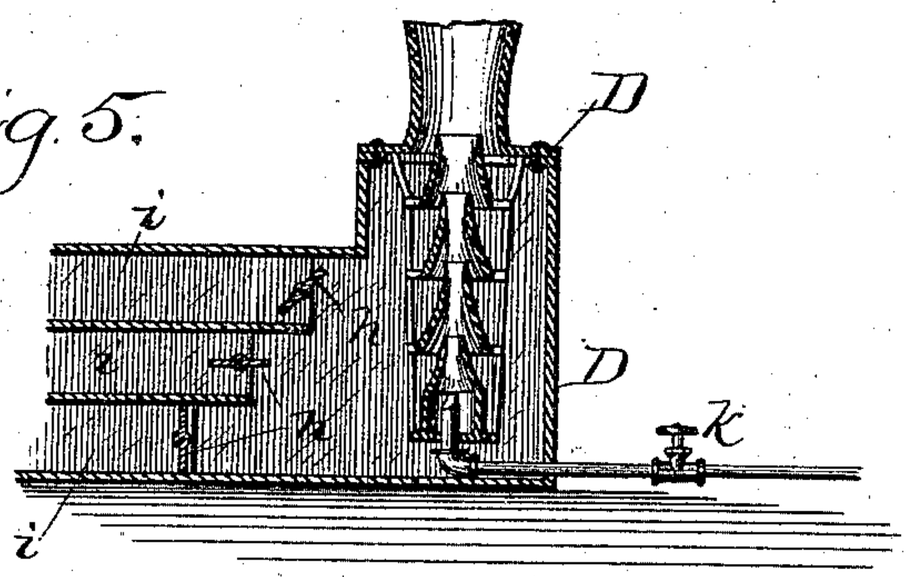


Fig. 5.



Witnesses:
Chas. E. Gaylord.
Douglas Dyrenforth

Inventor:
C. F. Theodore Kandeler,
By Dyrenforth and Dyrenforth,
Att'ys

UNITED STATES PATENT OFFICE.

C. F. THEODOR KANDELER, OF CHICAGO, ILLINOIS.

BURNING BRICK.

SPECIFICATION forming part of Letters Patent No. 305,599, dated September 23, 1884.

Application filed August 20, 1884. (No model.)

To all whom it may concern:

Be it known that I, C. F. THEODOR KANDELER, a subject of the Emperor of Germany, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Burning Brick; and I hereby declare the following to be a full, clear, and exact description of the same.

My present invention is in the nature of an improvement upon that described and claimed in Letters Patent of the United States No. 283,402, granted to me August 21, 1883. Since making the application for my aforesaid patent practical experience in burning brick upon the plan and with the means set forth therein has suggested to me the improvements hereinafter described and claimed.

Reference to my aforesaid patent will disclose the object of the invention to be to burn brick progressively and to provide means whereby the burning may be carried on in a manner to produce a better quality of brick at a cost much lower than it had hitherto been possible to do by the methods and with the devices then hitherto employed, by building on section after section of kiln as the contents of previous sections are undergoing the process of burning, whereby the utmost effect of the products of combustion is attained by drawing the heat from the piles of brick in a burning portion into another portion containing green brick, to cause the heat to come into contact with the latter, means being also provided to prevent the admission of cold air into the interior of the kiln, and thus avoid its injurious effect upon the product. By the above method the heat from the burning brick is utilized in heating the air for the fire; the products of combustion impart to the brick almost their entire heat before escaping from the kiln, and the brick are heated and cooled evenly and gradually. The advantages attained by my invention, disclosed in my aforesaid patent, are likewise attained, but in a higher degree, by my present improvement, in which the construction of the device enables a still further decrease in the cost of production over the old device.

An important improvement in my present over my former invention consists in the omission of one step in the construction of the kiln—viz., that of adding temporary side walls in forming new sections of piled brick. This step, which was formerly thought necessary in order to produce the best results, may, it is now found, be dispensed with to advantage, and permanent side walls may be provided instead throughout the whole extent of the kiln, which walls may be made more nearly air-tight than temporary ones and thus prevent waste of heat. Only a temporary covering and a temporary end wall are provided for the piled sections of brick as they are formed within the side walls.

A further improvement in the kiln consists in the employment of a temporary covering for the top in connection with the permanent side walls.

To disclose, in this connection, the state of the art to which my invention relates—viz., to burning brick progressively, so far as it is known to me, and to distinguish it from other inventions of which I am cognizant, I will state that it is old to employ a permanent air-tight covering upon permanent side walls, as it is also old, as will be seen by reference to my aforesaid patent, to employ a temporary covering with temporary side walls. The reason why my present construction is preferable to that in which permanent side walls and a permanent covering are employed are, that a permanent covering, being necessarily arch-shaped, is expensive to construct, and is readily destroyed by the expansion and contraction produced by the heating and cooling of the material composing it, and that it is absolutely impossible to build large arches that will remain intact under the effect of the heating and cooling of a brick-kiln, owing to the increase of expansion and contraction with the increase of size. The structure is crushed by its own weight. In the ordinary form of kiln now in use the temporary covering, composed of brick, rests upon the material being burned, but, owing to its construction, permits the escape from the kiln of the products of combustion. I provide each section as it is built with an air-tight covering to rest upon the material being burned and form the air-tight covering of brick having the spaces between them carefully sealed.

A still further improvement consists in providing longitudinal passages in the upper por-

tion of the kiln, beside those which are provided in the bottom, whereby better circulation of the products of combustion is attained.

A fan is shown in my aforesaid patent, to be used for the purpose of drawing the heat from the portions containing burning brick through those upon which the heat from the former is to be utilized. I attain better results by employing steam-jets for the purpose, which draw the products of combustion from different parts of the kiln at the same time.

The several improvements above described are clearly shown in the drawings, and are more particularly described further on with reference to the drawings, in which—

Figure 1 is a perspective view of my improved kiln; Fig. 2, a side elevation, partly in section, showing, by full lines in the sectional portion and by dotted lines in the portion not sectional, details of construction; Fig. 3, a transverse section showing the various passages formed in piling the brick within the permanent side walls and showing the application of the exhauster; Fig. 4, an enlarged sectional view of a portion of the kiln, showing in detail the preferred construction of the temporary covering; and Fig. 5, a longitudinal sectional view of the form of exhauster which I prefer to employ, provided with my improved attachment.

A A are the permanent side walls of the kiln, which may be built in a straight line, as indicated in the drawings, or in a curve or any other desired form. Green brick previously dried sufficiently to permit handling without changing their form or injuring them are piled within the permanent side walls toward the closed end *t*, provided with fireplaces in the form of arches *s*, in a section preferably about twenty-four to twenty-seven feet long, and in a manner to produce series of vertical fire-shafts *r*, preferably from three to four feet apart, and enlarged at the bottom to form receptacles *r'* for the ashes, longitudinal passages *q*, formed in horizontal series, one above the other and in any desired number, and transverse passage *p*, provided, preferably, at each of the fourth transverse series of fire-shafts. The bricks are piled within the permanent side walls in a manner to produce spaces between them. When piled within the permanent side walls in the manner above stated, the temporary covering B is provided to lie upon the material to be burned, and comprises one layer of brick placed flatwise, each brick supporting three bricks upon their flat sides, but placed transversely to the first in a manner to cause one to cover the seam between the flat surface of the brick upon which it rests and the one next to it, to prevent any of the earth *o*, with which the whole is covered, from entering the kiln. In forming the covering B openings are provided which lead to the fire-shafts *r*. Each opening is surrounded with a layer of brick, *n*, laid flatwise and supporting a rim, *m*, having an upward-projecting flange, *m'*, over which a bell-shaped covering, C, provided with a handle, *l*, is fitted. After the piling of the brick has been accomplished the end of the piled section opposite the starting-point or end containing the arches *s* is closed with a paper wall.

D is the exhauster, represented in the drawings in the form which I prefer to use. Its construction is clearly represented in Fig. 5 of the drawings, but it requires no particular description, as it is old and well known, and, as various other forms might be selected which would answer my purpose, steam is fed to it from a suitable supply through the steam-pipe *k*. The novel feature of this part of my device consists in providing suction-pipes *i*, of varying lengths, leading from the chamber of the exhauster to enter different portions of the kiln at the same time, to produce an effect hereinafter described.

The preliminary steps above set forth having been taken, the whole is ready for the burning.

To start the kiln, light fires are built within the arches *s* at the end of the kiln, and bells C in the transverse row nearest the arches are removed. When the fire, started as above described, shall have become sufficiently intense—say after the expiration of twenty-four hours—the exhauster D is applied by inserting the suction-pipes into the second transverse passage *p* of the section first formed, to draw the air and products of combustion from the kiln, the bells C being at the same time replaced over the openings to the fire-shafts *r*, and the fires in the arches *s* increased. After the lapse of another period of twenty-four hours the exhauster is withdrawn from the transverse passage *p* in which it was placed, and removed to the next transverse passage *p*, and the fire in the arches *s* is again increased, and so on until the material surrounding the vertical shafts *r* nearest the arches *s* of the kiln is red hot from top to bottom. This condition is ascertained by looking into the fire-shafts from the top, the coverings being removed for the purpose and afterward replaced. When such condition has been attained, fuel in the form of coal (no wood being required when the kiln has once been started) is dumped into them from the top. Coal-oil may also be used to advantage as fuel. This, however, need not be fed from the top of the kiln. After the pile shall have attained a red heat throughout about twenty-four feet of its longitudinal extent the fires in the arches *s* may gradually be reduced, though they should not be allowed to go out. Great care should be taken to prevent extinguishment of these fires before the red heat shall be at least fifteen to twenty feet distant from the end of the kiln, as otherwise the cold air which enters from the end provided with the arches *s* will crack the bricks. When or before the end of the first section of piled brick shall have been reached with the exhauster D, a new section of green brick may be added to the one being burned, which added

section is formed between the permanent side walls, A, exactly in the manner as to passages, covering, &c., already described of the first section; or, if it is not desired to burn more brick, the last end of the kiln may, like the first end at starting, be burned off through arches from below.

The fire-shafts *r* are preferably formed with irregular sides by allowing at intervals brick to project into them, thereby to provide shelves to retain portions of the fuel that is thrown in, which thus affords the advantage attained by its burning at various stages of elevation within the pile.

As before stated, the condition of the burning pile in any section of the kiln is ascertained by inspection through the fire-shafts viewed from the top or covering B. It is of course desirable that the fire should as far as possible burn with equal intensity throughout the portion of the kiln being burned, to effect which, since this condition of the fire is not self-sustaining, the suction-pipes *i* of varying lengths are provided in connection with the exhauster D. These comprise tubes extending, as before stated, from the chamber of the exhauster D, and which are inserted from the side of the kiln into a cross-passage, *p*, wherein they extend to varying distances, as shown in Fig. 3 of the drawings. Each tube *i* is provided toward its end nearest the exhauster with a valve or damper, *h*, whereby communication of the exhauster with the interior of the kiln, or portions of it, may be opened or closed. The object of this construction is to provide means for enabling the condition of the fire in different parts of the burning kiln to be controlled. If, for instance, it shall be found on looking down a fire-shaft in one longitudinal series that the heat is too intense in comparison with that in the others, the operation of the exhauster upon this portion may be checked until the heat shall have been sufficiently equalized by closing the communication of the exhauster with such portion by means of the proper valve or damper, *h*. It will readily be seen that manipulation of these dampers within the tubes *i*, of which any desired number may be provided, permits control of the condition of the heat within the kiln.

It will be understood from what has hereinbefore been stated with regard to the exhauster D that it is easily removable, the opening in the permanent wall A, leading to the cross-passage, which it occupies, being closed by sealing on its removal. When the tubes *i* of the exhauster are inserted into a cross-passage, *p*, of a newly-added section of brick piled within the permanent side walls, A, there is no necessity for removing by hand the paper covering hereinbefore referred to as forming the end wall, as this will be ruptured by the suction action of the exhauster and consumed by the heat which the exhauster draws.

In addition to the advantages hereinbefore stated to be attained by the use of my invention the following may be mentioned: The bricks need not be removed from the position occupied by them while being burned until they are required to be shipped. They have a uniform quality, if desired, though it is within control to produce them hard, medium, or soft, while loss from spoiled bricks amounts only to from one to five per cent. The firing of the kiln presents no difficulties, and great saving of fuel is afforded. All hands perform the same work throughout the season, and no smoke escapes from the kiln, but only steam and harmless fire-gases.

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

1. The combination, with a brick-kiln having permanent side walls between which the brick are piled and burned progressively, of an air-tight temporary covering provided in piling the brick to rest upon the material to be burned, substantially as described.

2. The combination, with a brick-kiln, of an exhauster having a suction-pipe running into the said kiln, as and for the purpose set forth.

3. The combination, with a brick-kiln, of an exhauster, D, having a suction-pipe provided with longitudinal compartments *i*, to lie within and extend each to a different portion of the kiln, as and for the purpose set forth.

4. The combination, with a brick-kiln having permanent side walls to contain brick to be burned progressively, and piled to produce longitudinal and transverse passages and vertical fire-shafts within the kiln, of a temporary air-tight covering to rest upon the material, and having openings provided with removable air-tight covers, said openings leading to the said fire-shafts, and means, adjustable within the said pile, for drawing the heat from the burning portions through the said longitudinal passages and between the bricks, as and for the purpose set forth.

5. In a brick-kiln containing brick piled to produce longitudinal and transverse passages and vertical fire-shafts, and to be burned progressively, and sealed at one end, a temporary air-tight covering to rest upon the material to be burned, and having openings provided with removable air-tight covers, the said openings leading to the said fire-shafts, and one or more steam-nozzles adjustable within the said pile, and through which steam is forced to draw the heat from the burning brick through the said longitudinal passages and between the bricks, as and for the purpose set forth.

6. The combination, with a brick-kiln containing piled brick to be burned progressively, of a temporary air-tight covering comprising one or more layers of brick having the spaces between them sealed and provided with openings, substantially as and for the purpose set forth.

C. F. THEODOR KANDELER.

In presence of—

HORATIO ANDERSON,

DOUGLAS DYRENFORTH.