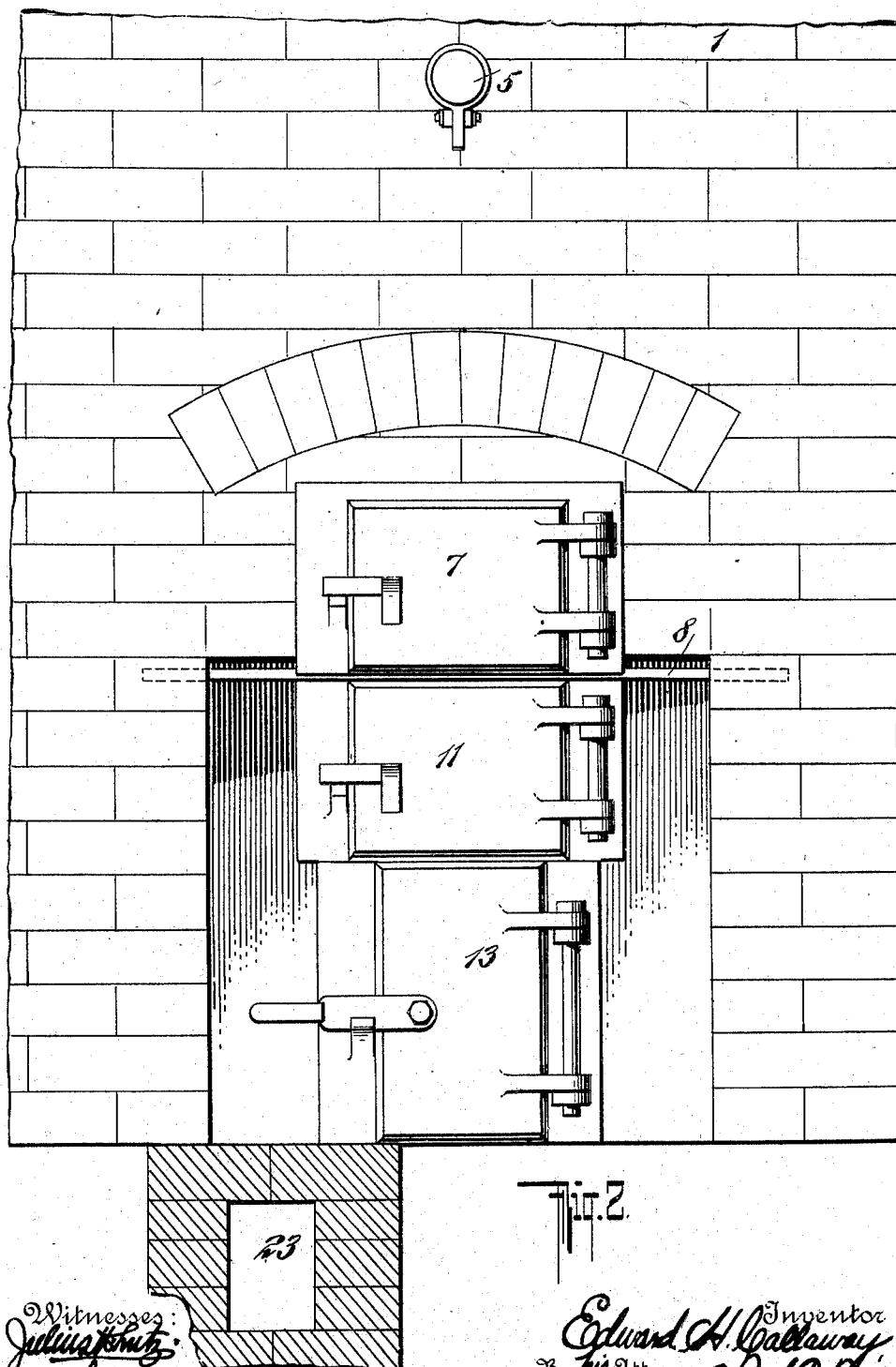


E. H. CALLAWAY.
BRICK KILN FURNACE.
APPLICATION FILED MAY 8, 1907.

967,607.

Patented Aug. 16, 1910.

4 SHEETS—SHEET 2.



Witnesses:
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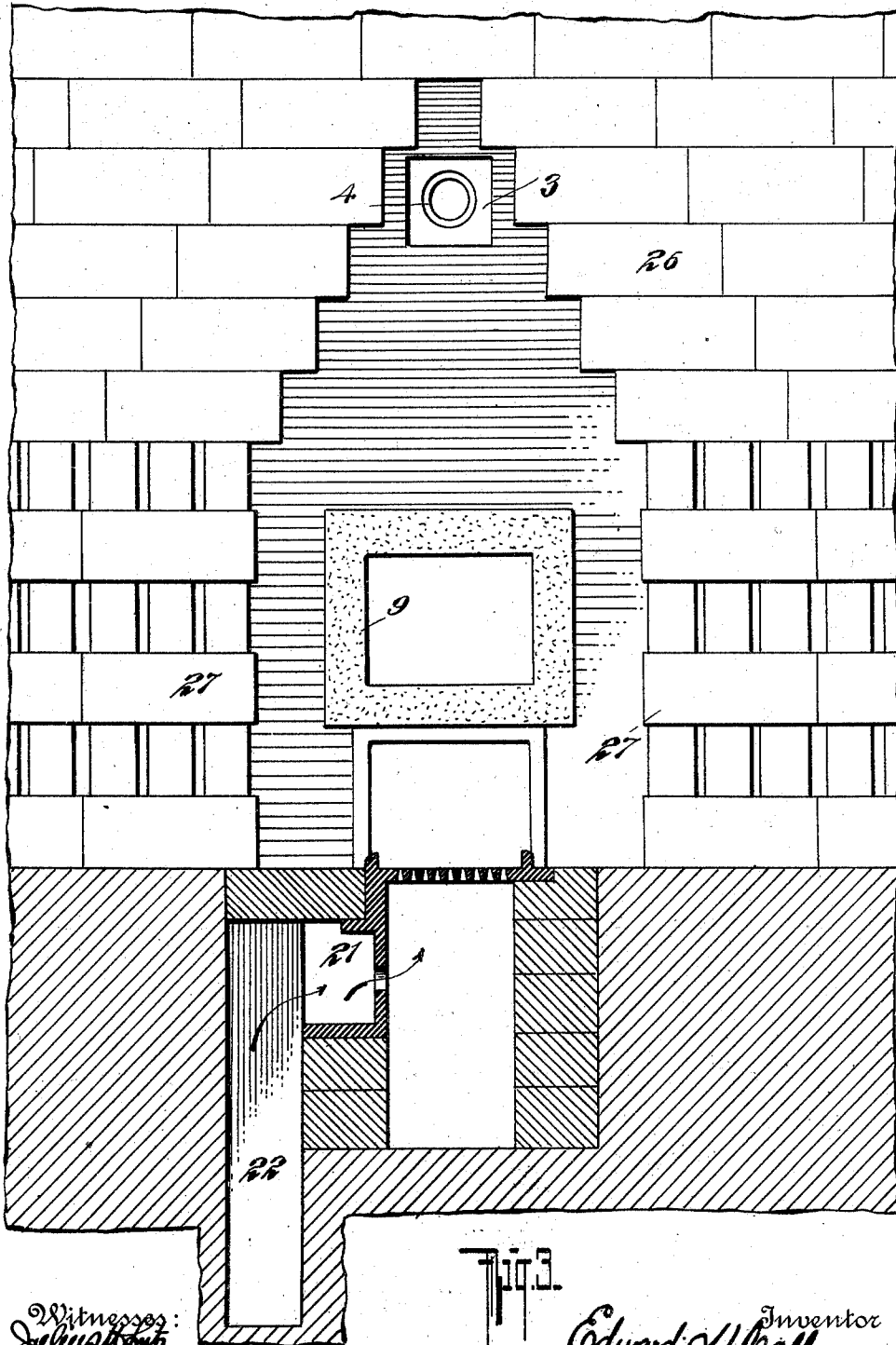


FIG. 3.

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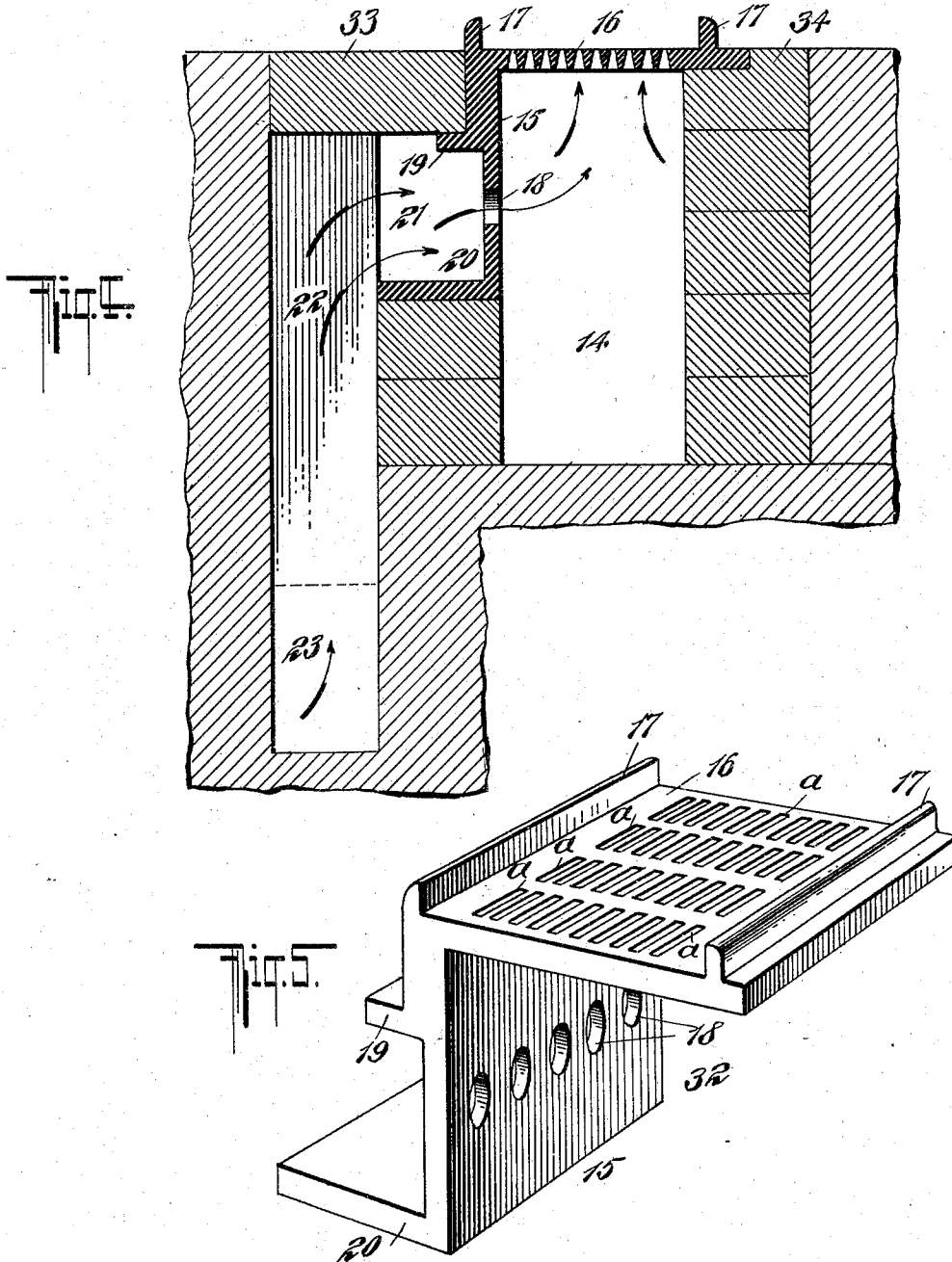
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

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BRICK-KILN FURNACE.

967,607.

Specification of Letters Patent. Patented Aug. 16, 1910.

Application filed May 8, 1907. Serial No. 372,527.

To all whom it may concern:

Be it known that I, EDWARD H. CALLAWAY, a citizen of the United States of America, and a resident of Westfield, county of Union, State of New Jersey, have invented certain new and useful Improvements in Brick-Kiln Furnaces, of which the following is a specification.

The invention relates to a furnace for kilns of various kinds, especially brick, and a furnace which is smoke consuming.

The object is to so construct and arrange the grate or grates, fuel supply, air draft, and other constituent elements that the best possible results may be attained in the way of the production of heat, and in the manner of controlling the combustion, etc., the furnace being at the same time simple, economical and easy of supervision, requiring far less attention than is necessary with other forms of furnace now in common use, and having its parts so conveniently and effectively applied that the most important features may be with little change conjoined to many furnace or kiln structures now in common use, thereby inexpensively providing my improved furnace in lieu of the much less effective forms in previous use.

The invention consists essentially in the construction and combination of the various parts, and in numerous details and peculiarities of combination and arrangement, all as will now be hereinafter fully described and explained, and then specifically pointed out in the claims.

In the accompanying drawing, illustrating my invention, Figure 1 is a transverse section of my improved furnace, showing both sides and indicating two furnaces located opposite to each other in the opposing kiln walls. Fig. 2 is a front elevation. Fig. 3 is a partial sectional view on the line 3 3 of Fig. 1, and shows in elevation one of the arches of green brick. Fig. 4 is an enlarged cross section of the grate and the adjoining parts. Fig. 5 is an enlarged detail perspective view of the grate.

Similar characters of reference designate corresponding parts throughout the different figures of the drawing.

My improved furnace is built into the wall of the kiln in the manner I shall presently set forth, and obviously the furnace

may be multiplied as many times as is found desirable, it being customary to provide a series of furnaces on one or both sides of the kiln after the fashion of many kiln structures now in common use.

1 denotes the permanent wall of the kiln structure, the same being of brick, concrete, stone, masonry, or other material. Opposite to this wall is a parallel wall 1^a on the other side of the kiln structure, and these walls 1, 1^a, rise to the desired height and are provided with any desired superstructure which will be of the common form, and need not be described in detail here. Arranged in each of these walls 1 and 1^a is a series of furnaces, and in order to secure the best results, it is common to place the furnaces in one wall opposite to those in the other, as I have shown in the example or specimen arrangement illustrated in Fig. 1, there being between the members of each pair of opposite furnaces a suitable ground space or flooring, as 30. Between every two adjacent furnaces, and arching over the grates of said furnaces, is piled a mass of green brick or other articles to be burned, as illustrated in Fig. 3, the upper overhanging parts of the pile being designated 26, and the columns on which the arch is built being denoted by 27, this arching being illustrated merely by way of example.

I will now proceed to particularize with reference to the detail construction of a single furnace, it being understood that as many of these furnaces as may be wished can be utilized with a single kiln.

Above the furnace, the wall 1 is provided with a peep-hole, consisting of a passage 3, at the outer end of which is a short tube 4 having a hinged cover 5. By opening the cover the attendant, who is commonly called the burner, can look through into the interior of the kiln and observe the effect of the heat upon the bricks or other articles being burned, and can easily determine the probable requirements as to temperature, draft, and the like, and make such changes as need be to accomplish the best results.

In the wall 1 is a horizontal fuel box 6 provided with an outside door 7 and supported on horizontal bars 8 which are held in the wall 1, as shown in Figs. 1 and 2. Likewise in the wall 1, and coinciding with

the fuel box 6, and projecting a short distance into the kiln, and consequently into the brick arch, is a box of tiling 9. The door 7 is suitably hinged and furnished with a latch, as indicated in Fig. 1. Through this door fuel is introduced into the fuel box 6, and passed through it into the tile 9, and thence to the grate. Box 6 and tile 9 together constitute what I designate as the fuel superheater, for thereby the fuel is held in such a position relatively to the grate and the fire that the latter will heat the fuel to a high degree and cause it to become disintegrated and incandescent, and ready for instant ignition and combustion the moment it is passed over to the grate. The superheater will be kept filled all the time with fuel which usually is coal of the proper kind and size. At certain times the door 7 will be open, and the fuel in the superheater fed through it to the grate, while the superheater itself will be filled with fresh fuel. This is found to be of great advantage in the operation of my furnace. The effectual superheating of the fuel before delivery to the grate permits the combustion on the grate to be kept up constantly and intensely, so that a high degree of heat is being uniformly generated, and the kiln kept incessantly hot, and thus there is an evenness of burning imparted to the bricks and far better results are secured than could possibly be attained if the superheating feature were dispensed with, and if it were necessary to feed the fuel directly to the grate and allow those extreme variations of temperature to occur which are always incidental to the adding of fresh fuel in the ordinary state to a fire.

At a proper point inside of the wall 1, and on a level with floor 30, proximate to the fuel superheater, is located the grate 15, which is shown in detail in Fig. 5. Its relative location is brought out by inspection of Figs. 1, 3 and 4. Access is had to it through a door 11, supported in a frame 10, which is located below the superheater. Below the grate 15 is the ash-pit 14, to which access is had through the door 13 supported in a frame 12, the ash door 13 being immediately below the grate door 11. It will be noted that in the wall 1, below the superheater and in front of the doors 11 and 13, is a recess or vestibule 31 having a floor 25. The object of this is to enable access to be had more quickly and with greater facility to the surface of the grate and to the ash-pit than would be possible if these doors were placed below door 7 on the outer surface of the wall 1. In order to provide the proper amount of room for the superheater, it is necessary that the chamber or chambers, of which it is composed, should extend through the wall 1 from the outside face thereof to the inside of the kiln. It is not necessary, however, that there should be any

long entrance passage into the grate and ash-pit, but long passages of this kind should be eschewed, and direct entrance given, and more especially is this true since it is necessary that the grate be located immediately inside the wall 1 where it is in convenient proximity to the discharge end of the superheater. Hence by setting in the entrance doors 11 and 13, and leaving the recess or vestibule 31, I am enabled to arrange the parts of my furnace so as to contribute to the most satisfactory operation of the furnace. As the said vestibule extends into the front furnace wall in contradistinction to a projecting vestibule, it will, for convenience, be called an indented vestibule.

The grate 15 consists of a casting having a horizontal part 16 provided with a number of rows of parallel slots *a*, also a vertical part 32 having a row of draft openings 18. The vertical part 32 is provided on the side opposite to the horizontal part 16 with a wide bottom flange 20 and a narrower upper flange 19. Furthermore, the horizontal part 16 is furnished with parallel guide ledges or flanges 17 to guide the fire tool which distributes the fuel over the surface of the grate. The grate may consist of a single one of these castings 15, or a plurality of them. Commonly it consists of several of these placed together as sections of the complete grate. This is indicated in Fig. 1. The parallel slots *a* give to the integral casting 16 the aspect and function of the multiple grate bar arrangement commonly used in furnaces, but provides a substitute in a single piece which is far better than the old form, and which is equally lasting and much more serviceable in every way.

Alongside of the grate is an air duct 21 formed by means of masonry of any suitable kind, or some substantial brickwork, it being so shaped that the horizontal flange 20 of the grate casting 15 may form the bottom of the duct 21, while the parallel horizontal upper flange 19 of the grate casting 15 may occupy a position at the top of the duct 21 and support the brickwork or masonry at 33 which lies alongside of one edge of the grate, near one of the flanges 17. The opposite edge of the grate, that is to say, the opposite edge of the horizontal portion 16 of the grate which carries the other guide flange 17, rests upon suitable masonry or brickwork at 34, (see Fig. 4), so that thus the grate castings 15 are supported and held in such a manner that the horizontal section 16 is barely on a level with the floor 30 of the kiln, and the air duct 21 is below and at one side of the grate so that air may be easily introduced through the holes 18 to the grate for the purpose of promoting combustion. As I have already said, the ash-pit 14 is located below the grate.

By referring to Figs. 3 and 4, it will be seen that it drops to some distance below the air duct 21, thus allowing the discharge of the air from the duct 21 to take place against the fire through the upper part of the space occupied by the ash-pit, so that the ashes in falling pass down below the air draft, and hence there is no interference with said draft when the door 13 is opened for the purpose of removing ashes. The horizontal longitudinal air box 21 connects at one end with a vertical duct 22 which leads downwardly to a point below the ash-pit door and the bottom of the ash-pit, and at its lower end extends under or below the floor of the vestibule where it connects with another horizontal duct 23 having therein a controlling valve 24 of any suitable construction, as, for instance, the construction shown and described in my co-pending application for Letters Patent filed April 15, 1907, Serial No. 368,260, and this duct 23 runs to a blower, air compressor, or other suitable means for generating an air blast. By manipulating the valve 24, the draft can be made greater or less, and consequently the combustion of the fuel on the grate controlled at all times.

In Fig. 1, as I have already stated, will be found an illustration of two furnaces located opposite to each other, constituting a pair of furnaces between which the arch of green brick is placed. These two furnaces correspond in all respects. That situated in the kiln wall 1^a has a peep-hole 3^a provided with a tube 4^a and cover 5^a. It also has a superheater consisting of a metallic box 6^a, tile box 9^a, and the cover 7^a. Below the superheater is the grate consisting of the horizontal part 16^a, as well as the other parts which I described in connection with the opposite furnace, said grate having the entrance door 11^a, below which is the ash-pit door 13^a; and in brief it may be said that the parts of this furnace correspond as nearly as may be desirable to those of the other furnace.

The operation of the furnace will be evident from the foregoing description. The superheating of the fuel, a process which is going on all the time for the purpose of having a supply ready for delivery to the grate in such a manner as to maintain uniformity of combustion, is preëminently important. Also, the control of the air supply, which is regulated by means of a valve in the air duct, must be attended to scrupulously, in order to secure the best results. But it will be found that by the use of these features combined in a furnace in this manner, bricks and other articles to be burned can be treated uniformly and systematically, so that the results will be far superior to what have heretofore been possible with other forms of furnace. In a word, I provide an adequate

means for burning brick economically without the waste of any fuel in smoke, and without ruining or spoiling any brick in the operation through unevenness or irregularity in the application of the heat.

Obviously, the arch of green brick is situated in the combustion chamber and the heat generated by the fire on the grate affects this brick arch, dries and burns the same.

Referring again to the supply of air to the fire and the means for draft regulation, consisting of a plurality of openings in that part of the grate which depends vertically below the horizontal part, it is to be noted that the sum of the areas of these different rows of holes in the series equals the area of the cross-section of the air duct through which the air comes and is supplied to said holes. In this way the whole air draft has an opportunity to emerge from the duct through the holes into the space below the grate, but in so doing it is sub-divided into a plurality of streams, and this feature is found to be of great advantage in promoting the draft, for it enables the air to be directed to different parts of the grate or spread more or less uniformly over the entire under surface thereof, so that a substantially uniform effect is produced upon the fuel lying on the grate, and the combustion ensuing in consequence is very much the same at all points on the grate.

In the construction and installation of a furnace of this character, it may be found necessary to somewhat modify the details of construction and arrangement, or to combine the parts somewhat differently from the specific example herein explained, or to diversify the form and appearance of some of the features, but I reserve the liberty of doing all these things without exceeding the scope of the invention.

A further word with reference to the operation will bring out its distinctive and valuable character more prominently.

The office of the superheater, as I have described it, is to pre-heat the fuel and prepare it for immediate combustion upon being delivered to the grate. The furnace, moreover, as well as the particular part called the superheater, serves to superheat the air as well as the coal or fuel, so that there is a steadiness and evenness in the draft and in the temperature of the air of the furnace allowing evenness of burning. It is obviously an important thing to be able to clean or clear the grate without disturbing the temperature inside of the kiln. My construction and arrangement enables this to be done, and gives perfect control of the temperature and the draft. When it is found desirable to clean the grate and to remove ashes, the following course will be pursued: The valve in the air duct will be closed. Then the door 11 of the grate will

be opened, and the clinkers removed from the grate. The superheated fuel will then be supplied to the grate, the latter being neatly and nicely covered. Then the grate door 11 will be closed, and the ash door 13 opened for the purpose of removing ashes. By leaving the door 13 closed until after fresh fuel has been spread over the grate, and the door 11 has been closed, the draft will not be disturbed sufficiently to destroy the evenness of the temperature and the uniformity of the burning. With an arrangement of this kind and the use of a forced draft, it is possible to secure a very good draft in the kiln when the latter is of the open top construction.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a brick-kiln furnace, the combination with a removable horizontal grate having a longitudinal side-wall depending therefrom and provided with a longitudinal series of openings, of an ash-pit provided with a permanent wall, said ash-pit being provided with an air-supply duct below the top of the grate and through which air is conveyed to said series of openings to be supplied to the fire.

2. In a brick-kiln furnace, a recessed wall, a pit, a stationary grate over the pit and having an integral surface provided with a series of parallel slots, and with a depending longitudinal wall containing a series of

openings through which air is furnished to the fire.

3. In a brick-kiln furnace, the combination with a grate having a horizontal portion suitably slotted, and having also a depending vertical portion provided with a horizontal series of air delivery openings, said latter portion having suitable flanges, of an ash-pit provided with an air duct through which the air is supplied to the said delivery openings and to the fire, said ash-pit being formed in part by the depending vertical portion of the grate, and said air duct being formed in part by the aforesaid flanges.

4. In a brick-kiln furnace, the combination with a recessed vertical kiln wall, a horizontal grate extending into the kiln, a parallel elongated ash-pit below the grate, said pit being provided with a longitudinal air duct extending along its side, and said grate having a depending vertical wall-portion separating the duct from the upper part of the pit, and constituting part of the pit-wall and having perforations throughout its length for subdividing and distributing the air feed uniformly to the grate.

Signed at New York city, this 27th day of April, 1907.

EDWARD H. CALLAWAY.

Witnesses:

RICHARD CONDON,
C. B. SCHROEDER.