F. D. SHAW.

DOWNDRAFT CONTINUOUS K[illegible].

APPLICATION FILED MAR. 9, 1912

1,133,582.

Patented Mar. 30, 1915.

4 SHEETS—SHEET 1.

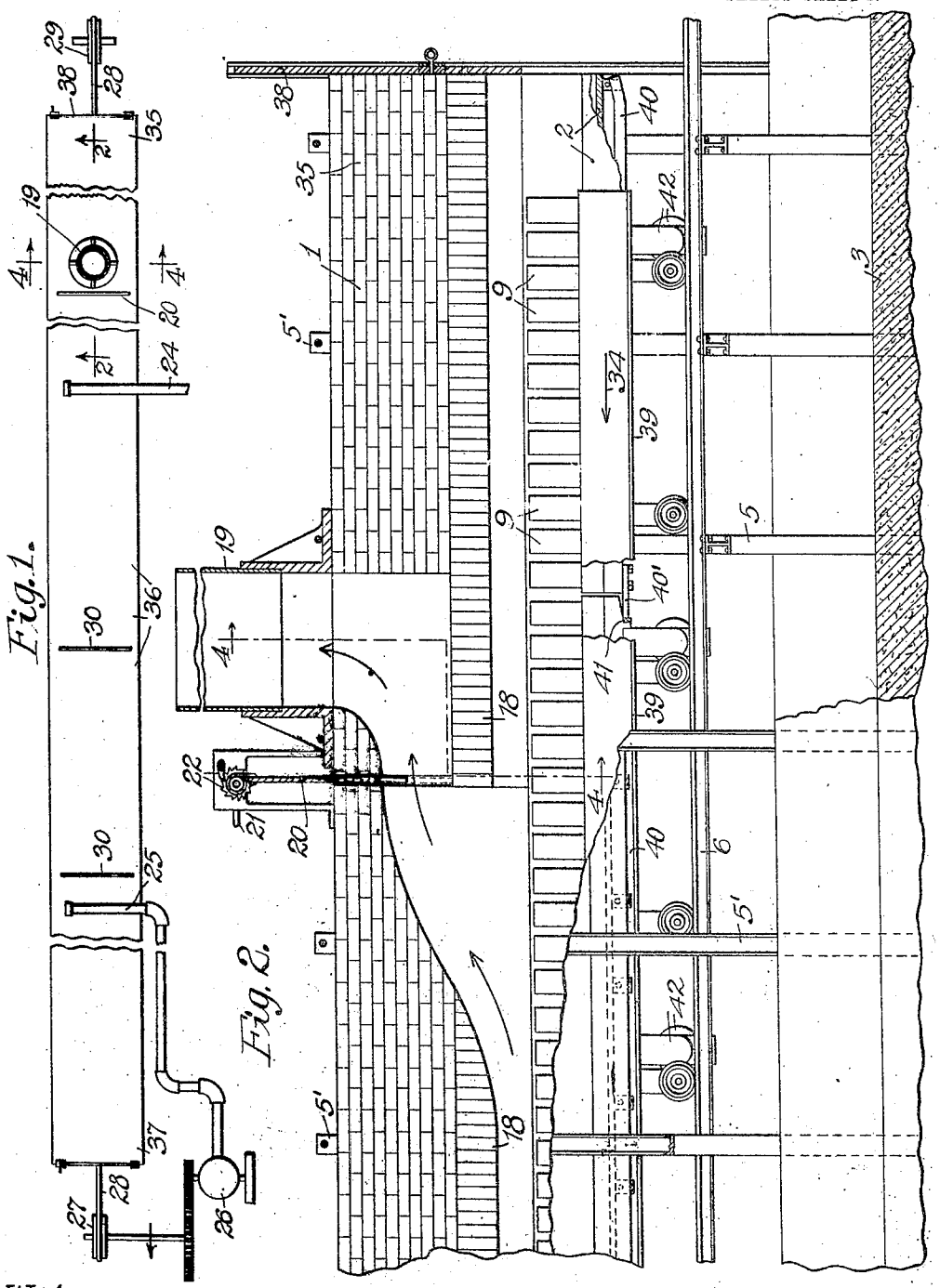


Fig. 1.

Fig. 2.

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4 SHEETS—SHEET 2.

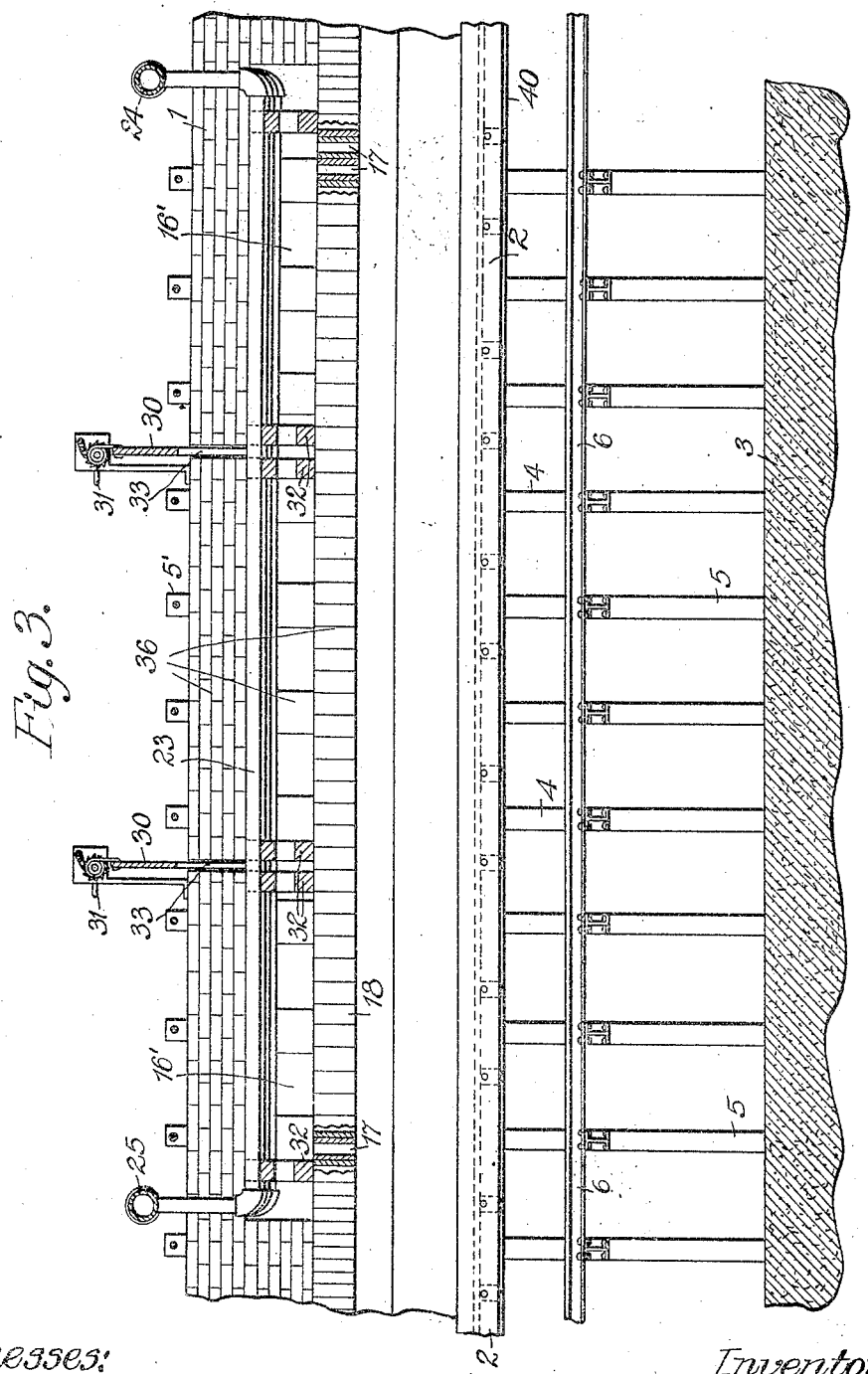


Fig. 3.

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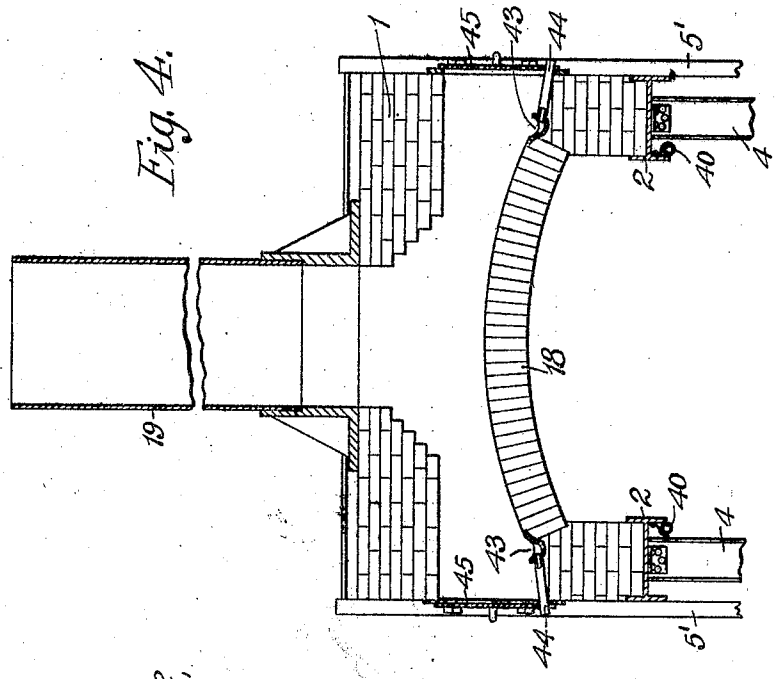
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4 SHEETS—SHEET 3.

Fig. 4.



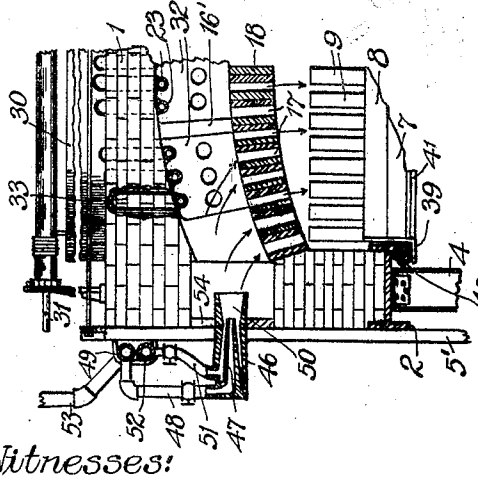


Fig. 7.

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4 SHEETS—SHEET 4.

Fig. 5.

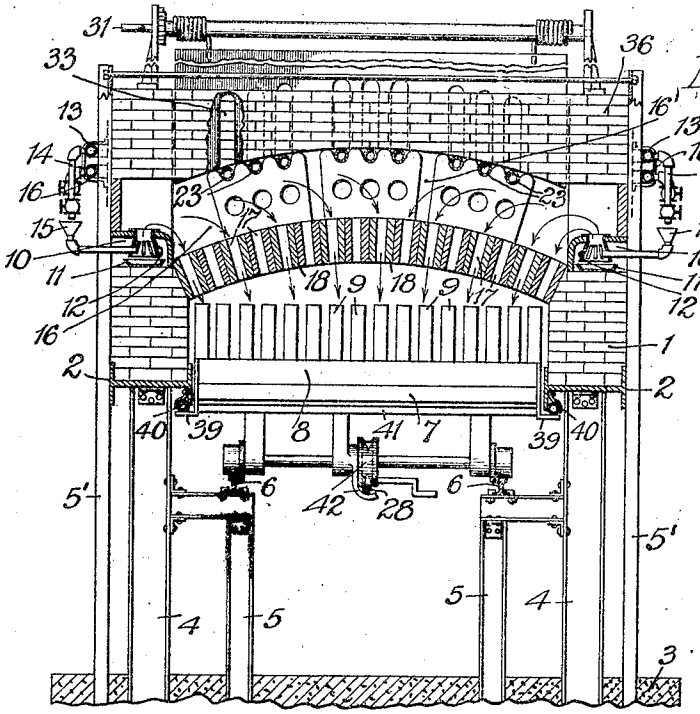
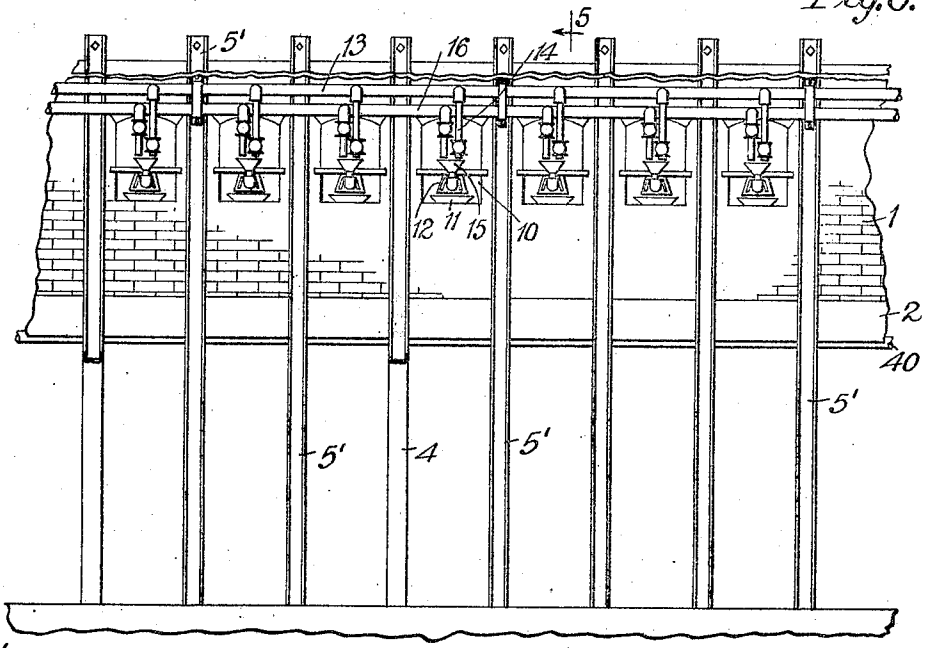


Fig. 6.



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UNITED STATES PATENT OFFICE.

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DOWNDRAFT CONTINUOUS KILN.

1,133,582. Specification of Letters Patent. Patented Mar. 30, 1915.

Application filed March 9, 1912. Serial No. 682,733.

To all whom it may concern:

Be it known that I, FRANCES D. SHAW, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Downdraft Continuous Kilns, of which the following is a full, clear, concise and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to down draft kilns and has for its object a more improved and simplified construction than has heretofore been attained.

My invention primarily consists of a superstructure of masonry supported by suitable steel-work from a foundation. This particular arrangement minimizes to a great extent the amount of work necessary in building the kiln as well as provides a cheaper construction than has been possible heretofore.

In conjunction with the kiln I have employed heating means which are adapted to cause a heating medium to be directed from above against objects or material being passed through the kiln. This has the advantage of directing the greatest heat where there is the least amount of weight. That is, the upper portions of the objects receive more heat than the lower portions. Further, that when the heat is directed from above it is more evenly distributed upon the parts that are to be vitrified or burned.

My invention also comprises sealing means for use preferably between the steel-work of the kiln and the cars as they pass through the kiln. This particular sealing mechanism preferably consists of a canvas hose or similar material fastened in such a way as to engage a projecting shelf upon each le of the car.

My invention also contemplates in addition to the above features means for utilizing the heat in the central burning chamber for the generation of steam that may be used either in the power plant that propels the cars through the kiln or the steam so generated may be employed as part of the burning mixture in order to secure the require amount of heat for the burning process. I have also disposed suitable dampers in the central burning section of the kiln so that different portions of this chamber may be put out of commission if desired.

My invention will be clearly understood by reference to the accompanying drawings in which—

Figure 1 is a more or less diagrammatic plan view of the kiln embodying features of my invention. Fig. 2 is a longitudinal sectional view taken along the line 2—2 of the entrance end of the kiln. Fig. 3 is a longitudinal sectional view taken through the central burning chamber. Fig. 4 is a sectional view taken along line 4—4 of Fig. 1 illustrating particularly the stack and the drains for the same. Fig. 5 is a cross sectional view taken through the burning section of the kiln. Fig. 6 is a side view of the parts shown in Fig. 5. Fig. 7 is a view illustrating particularly the modified arrangement for a mixture of steam and oil to be used as a burning medium.

At the outset it may be well to state that the kiln of my invention is constructed preferably of a superstructure 1 of masonry built upon I beams 2—2 running longitudinally of the kiln. These beams are supported from the foundation 3 by means of suitable steel columns 4—4 which may be properly riveted or secured to the I beams. In addition to these columns 4—4 there are employed reinforcing members 5—5 of steel which are used primarily for the support of the rails 6—6. The members 5—5 are reinforced from the members 4—4 as shown in the drawings. The rails are adapted to support cars 7 which may be suitably arranged with a platform of fire brick 8 upon which are placed the bricks 9—9 that are to be vitrified or burned. In order to secure as rigid a construction as possible buck stays 5′ are embedded in the foundation and extend upward and are connected by means of bolts at the top. The buck stays are disposed at suitable intervals lengthwise of the kiln.

Each side of the kiln has a series of pockets 10 each of which contains a gas generator for the production of a burning medium. This gas generator consists preferably of a pan 11 and a conical shaped member 12 having slots therethrough. In order to secure the proper mixture for burning the brick that are being passed through the kiln, I have disposed an oil pipe 13 on each side of the kiln which is connected with a small lead pipe 14 directed to a funnel 15 which is connected with a pipe running into the member 12. A suitable valve is connected with this pipe so that the amount of oil

may be regulated. In addition to the oil I employ water which may be supplied from the pipe 16 and which may be directed into the funnel in a manner similar to that of the oil. This water may contain a mixture of ammonium nitrate or any analgous chemical so as to facilitate the burning action upon the brick. The generator may be lighted by allowing a small amount of oil to drip into the pan 11. The oil is then lighted by waste or otherwise and after the pan has become sufficiently heated more oil is supplied together with a proper proportion of the water. This in combination with the air supplied produces a proper combustion medium which is drawn up through the neck of the conical shaped member 12 and into the central burning chamber 16'. The products of combustion then are drawn downwardly by the natural draft through openings 17—17 in the arch 18 which may preferably be constructed of a special kind of fire brick and after passing through these openings the products of combustion or heat will strike the brick 9—9 and be drawn toward the entrance end of the kiln and out through the chimney 19. This chimney, it may be stated, causes sufficient draft so as to draw the products of combustion through the openings in the arch. In order to regulate the amount of draft through the chimney I have disposed in proximity thereto a suitable damper 20 which may be raised by handle 21 and held in any desired position by means of the pawl and ratchet mechanism 22 associated with a drum.

The central burning chamber is provided at the upper portion thereof with a series of steam pipes 23 which receive their supply of water from a suitable source and which are heated by the products of combustion as they are drawn into this chamber from the individual generators disposed on the sides of the kiln. The steam so generated may be used in the power plant of the system or otherwise as will be later described.

In Fig. 1 is diagrammatically shown means by which these steam pipes 23 are connected at one end with a water supply pipe 24 and at the other end to a pipe 25 which is used to direct the steam generated to an engine 26 which is suitably geared to a sheave 27 which in turn is connected by means of a cable 28 to another sheave 29 at the entrance end of the kiln. The central burning chamber is preferably divided into three sections so as to secure different degrees of heat if necessary. In other words, it may become desirable at times to cut down the capacity of the kiln either one-third or two thirds and in my system provision is made for doing this by arranging dampers 30 adapted to be operated by handles 31—31 secured to drums and held in position by pawl and ratchet mechanisms as clearly shown in the drawings. These dampers are preferably made to pass between the supports 32—32 for the pipes 23. Suitable slots 33 are provided in each of the dampers so that it can be lowered to the top of the arch 18 when desirable. When a part of the central burning chamber is cut out of use by the dampers 30, the corresponding burners are extinguished. It may be here stated, that the supports 32—32 may be of any desired construction, such as a checker work or brick or they may have special construction as shown in the drawings, the main object to be attained being, of course, to have the steam pipes suitably supported. When the bricks are being burned they are subjected to a gradual heat and to this end the bricks are loaded upon the cars and drawn into the kiln in the direction shown by the arrow 34 in Fig. 2. The bricks are drawn gradually to that section of the kiln where the central burning chamber is located so that the bricks are gradually heated before passing into the zone where the greatest amount of heat occurs. In other words, the green brick are drawn into the entrance end 35 and are then gradually passed into the burning section 36 and after being burned are gradually cooled before they emerge at the outlet end 37 of the kiln, the object being not to cause too sudden changes to be made as regards the heat and cooling, otherwise warping of the brick will be caused. A door 38 is arranged at the entrance end of the kiln so as to close the entrance at times when it becomes desirable, such as when the last car has passed beyond the entrance of the kiln.

A similar door is provided at the opposite end of the kiln. Any means may be used for holding these doors up above the brick as the cars are being passed underneath.

It may be well to explain here, that as the cars are passing through the kiln it is desirable that there be a seal between the cars and the kiln so as to prevent the dissipation of heat and for the further object that the products of combustion may always pass out through the chimney after passing through the openings 18 and into the kiln chamber proper. To this end the cars are provided with horizontal shelves 39 at each side thereof which are adapted to engage resilient members 40—40 fastened in any suitable manner to the steel-work of the kiln. In this instance, the resilient members 40—40 are shown as being secured to the I beams 2 running lengthwise of the kiln. The sealing means may be in the form of a canvas hose or it may be any other similar arrangement to effect the desired result. This hose at the entrance of the kiln is turned up so as to permit the cars to readily pass underneath and engage the hose without any difficulty; one of the objects being to obtain a good sealing ar-

rangement in combination with the cars and further to have a construction which causes very little friction. Heretofore the sealing means used in kilns have used up a great deal of power and caused consequent increase in the cost of operation of the system. My arrangement reduces the amount of friction between the cars and the sealing means to a minimum and yet secures excellent results in the way of preventing the dissipation of the heat required for the burning action of the brick.

In addition to the above means for the sides of the car I have employed at the front end of each car a metal extension plate 40′ which is secured in any way to the car and which projects forwardly and underneath the hind end of the preceding car and engages a seal in the form of a canvas bumper 41, the object being to have these members come into engagement to prevent the ends of the cars striking together violently. Each of the cars is supplied with suitable mechanism 42 for engagement with the cable 28 so that it may be properly propelled through the kiln.

It will be apparent that from the foregoing description that all of the heat is distributed evenly upon the brick as it passes through the kiln. In other words, the heat is applied where it is needed the most and where there is the least amount of weight. That is, the upper portions of the brick receive more heat than the lower portions which sustain the weight. As the lower part of the kiln is composed of steel work which permits the exposure of the car to the atmosphere, it will be seen that practically no part of the car is heated where it is not necessary. The only part receiving any heat would be the fire brick on top and possibly part of the sides of the car.

It may be here explained that as the products of combustion pass out of the chimney a great deal of moisture is condensed and in order to provide for this I have employed in conjunction with the chimney and at the side of the arch 18 suitable drains or gutters 43 which are adapted to receive any dirt or water which is dripped on to the arch from the chimney. Drain pipes 44—44 are connected with these gutters and permit the dirt, etc., to be drained out. These pipes may pass through openings in the door 45—45 used in connection with the chimney.

I shall now describe the construction used in the modified arrangement illustrated in Fig. 7. As above stated steam is generated in the pipes 23 and one way in which this steam may be used is to have it piped to the pipes running at each side longitudinally of the kiln and to this end I employ a steam jet burner 46 which is of a construction such that steam will be led in through the nozzle 47 from the pipe 49 which has connections with the steam pipes 23 through a pipe 53. The nozzle 50 is connected with a pipe 51 to an oil pipe 52 which is supplied from a suitable source. Valves are employed to regulate both the flow of oil and steam so that the desired proportion for combustion is secured. A proper amount of air is allowed to flow into the central burning chamber 16′ through openings 54 in proximity to the nozzles 46. These openings serve the further purpose of permitting the lighting of the oil before the steam is admitted when it is desired to start the burning process. As soon as the nozzle 50 has been heated sufficiently the steam is allowed to pass into the nozzle 47 when a desired heat is secured owing to the addition of the proper amount of air. This heat is projected into the central chamber 16′ and is drawn down through the openings or twyers in the arch by means of the natural draft and the heat will then strike the brick as above explained, thence it will pass toward the entrance end of the kiln and out through the chimney. The only difference in construction of the mechanism shown in this modified form is the heating means which are used for burning the brick.

It will be noted from the foregoing description that my invention comprises means for utilizing the heat in the best possible manner by having a down draft arrangement through the arch constructed of special fire brick in the burning section of the kiln but which may be otherwise constructed in the usual manner. Furthermore, a very strong construction of the arch is secured owing to the improved arrangement. In addition to these features I make use of the heat to generate steam for use in the power plant or to utilize that steam in the heating means for burning the brick.

My invention also provides a very simple arrangement of the construction of the kiln.

I desire to secure the following claims:

1. In a kiln, the combination of an inclosed burning chamber, a burning zone below said chamber, heat producing devices, and passages extending from the heat producing devices to deliver the heat produced thereby downward through the top of the burning chamber to the burning zone below throughout the length of said zone.

2. In a kiln, the combination of an inclosed burning chamber, a burning zone below said chamber, oil burners, and passages extending from the oil burners to deliver the heat produced thereby downward through the top of the burning chamber to the burning zone below throughout the length of the zone.

3. In a kiln, the combination of an inclosed burning chamber, a burning zone be-

low said chamber, oil burners each having a steam blast, and passages extending from said oil burners to deliver the heat produced thereby downward through the top of the burning chamber to the burning zone below throughout the length of the zone.

4. In a down draft continuous kiln, the combination of a kiln chamber, an arch of fire brick forming the top of said kiln chamber, said arch having openings extending therethrough throughout the length of the burning zone, there being a central heating chamber above said arch, steam jets for delivering steam into said kiln chamber, and a stack for causing hot gases to pass downward through said openings in said arch and against material in said kiln chamber.

5. In a down draft continuous kiln, the combination of a kiln chamber, an arch of fire brick forming the top of said kiln chamber, said arch having openings extending therethrough throughout the length of the burning zone, there being a central heating chamber above said arch, steam jet burners for forcing hot gases into said central heating chamber, said gases passing from said central heating chamber and downward through said opening in said arch and against material being passed through said kiln chamber, and sealing means for preventing dissipation of said heat.

In witness whereof I hereunto subscribe my name this 3rd day of February, 1912

FRANCES D. SHAW

Witnesses:
LEONARD W. NOVANDER,
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