

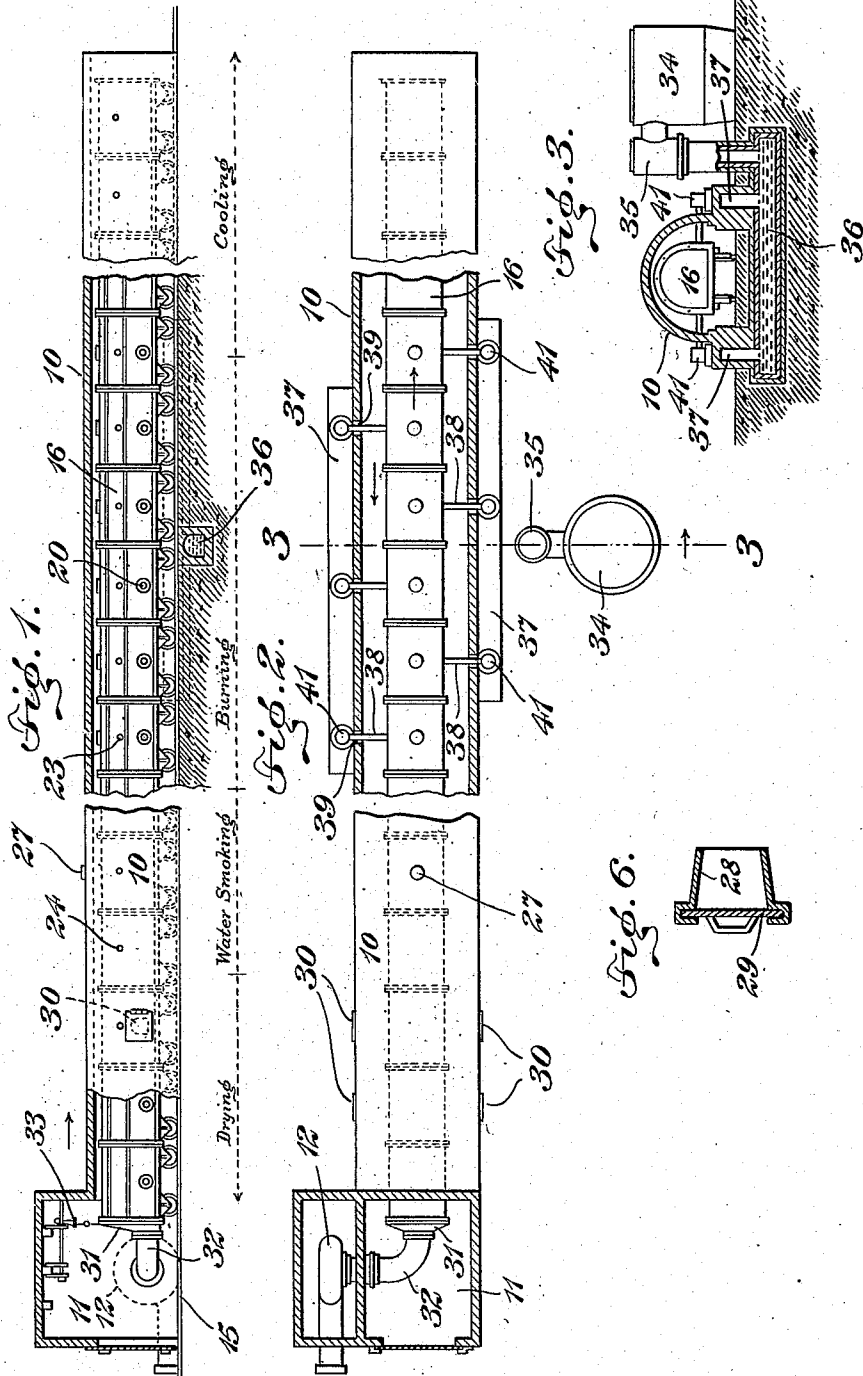
W. B. CHAPMAN.
APPARATUS FOR BURNING BRICK.

APPLICATION FILED AUG. 15, 1906. RENEWED JUNE 18, 1909.

933,419.

Patented Sept. 7, 1909.

3 SHEETS—SHEET 1.



WITNESSES

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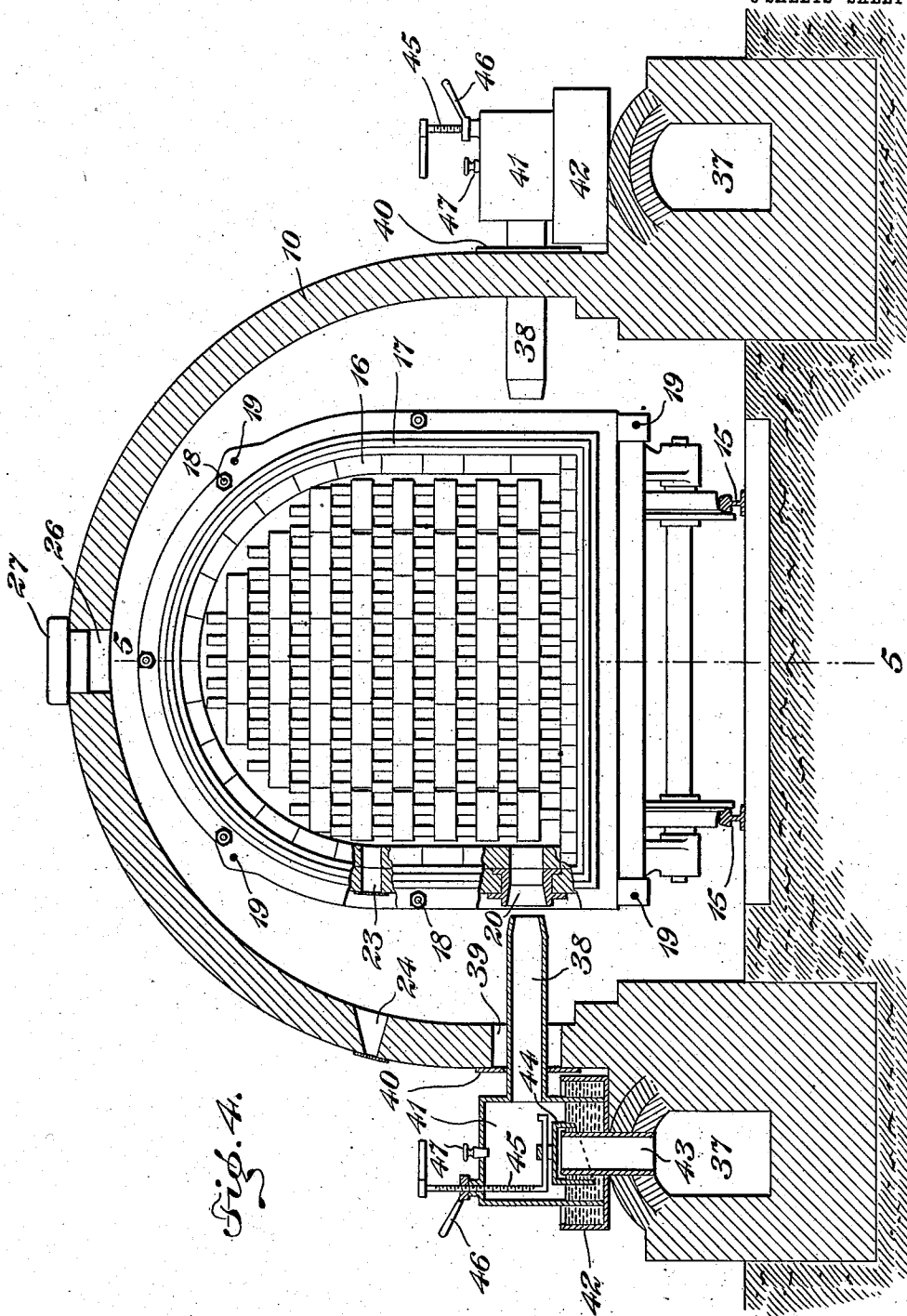


Fig. 4.

WITNESSES

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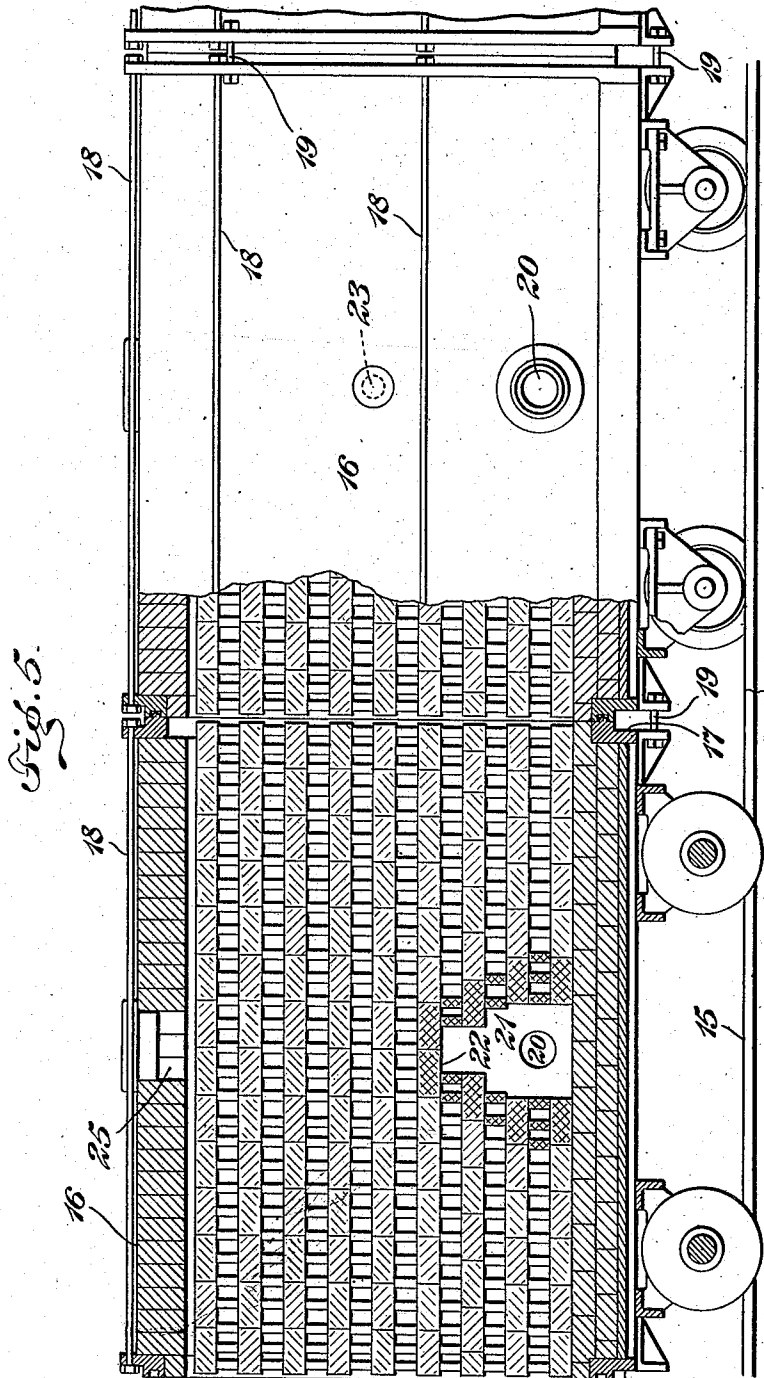
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3 SHEETS—SHEET 3



WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM B. CHAPMAN, OF BROOKLYN, NEW YORK.

APPARATUS FOR BURNING BRICK.

933,419.

Specification of Letters Patent.

Patented Sept. 7, 1909.

Application filed August 15, 1906, Serial No. 330,637. Renewed June 18, 1908. Serial No. 502,967.

To all whom it may concern:

Be it known that I, WILLIAM B. CHAPMAN, of the borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Apparatus for Burning Brick, of which the following is a full, clear, and exact specification, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its primary object the provision and means for effectually and economically burning brick and other ceramic manufactures with the use of producer gas as fuel. In attaining this end I provide a tunnel which is built preferably on the surface of the ground and which is adapted to have moved through it a train of kiln-cars, these cars being open at the end and bolted together to receive the brick and to form, so to speak, a second or kiln-tunnel within the first tunnel. Air is circulated through these outer and inner tunnels and gas is supplied from a producer to an intermediate point in the inner or kiln-tunnel, allowing me to subject the brick successively to the operations of drying, water smoking, burning and cooling.

It is also an object of my invention to provide means facilitating the control of the air and gas currents so that the brick may be so subjected to the air and flame as to bring about, first correct preparation of the green or wet brick for the burning process, second, the burning of the brick and third, the rapid cooling of the same, enabling them to be quickly handled after the operation is complete.

A further object of the invention is to improve the construction of the gas supply nozzles by means of which leakage of gas is effectually prevented and the nozzles are allowed a wide range of adjustment enabling them to be engaged with the kiln-cars or disengaged therefrom at will.

My invention involves various other features and all will be fully set forth hereinafter and particularly pointed out in the claims.

Reference is now had to the accompanying drawings which illustrate as an example one manner of practically embodying the principles of my invention, in which drawings,

Figure 1 is a side elevation of the apparatus with parts in section; Fig. 2 is a plan view also with parts in section; Fig. 3 is a

cross section on the line 3—3 of Fig. 2; Fig. 4 is an enlarged cross section through the kiln at the point of one of the gas nozzles; Fig. 5 is an enlarged longitudinal section of the kiln-cars; and Fig. 6 is a sectional view of one of the plugs used for closing the gas openings in the kiln-cars.

10 indicates the outer tunnel or inclosing wall. This is preferably constructed of masonry and extends horizontally on the surface of the earth. At the receiving end a housing 11 is arranged and in this is located a fan 12 or other form of pump for causing a current of air to pass through the apparatus as will be fully set forth hereinafter. As shown best in Fig. 4, rails 15, are laid in the tunnel 10, to form a track and on this track the kiln-cars 16 run. These cars as shown best in Fig. 5, are formed of fire brick or other refractory material. At the ends of the kiln-cars metallic rings or bands 17 are located and these are clamped firmly in place by longitudinal tie rods 18. These rings or bands 17 serve the double purpose of permitting practically hermetic connection to be effected between the cars, as shown in Fig. 5, but with the tie rods 18 serve also to strengthen the car, holding the fire brick of which the car is constructed firmly in place. The rings 17 are provided with matching tongues and grooves and the cars are adapted to be fastened together by means of bolts 19 as shown. This construction enables me to form by building up a number of cars, a moving tunnel-kiln which is arranged to move with a step by step motion through the outer or main tunnel and which, during this progress through the outer tunnel, enables the brick to be subjected to the burning action, fuel being supplied by relatively stationary nozzles and appurtenant devices which will be fully set forth hereinafter.

On each side 17 the cars 16 are provided with gas supply openings 20 which are located preferably at the middle of the cars, in the lower portion thereof. Extending between said openings 20, across the bottom of the car, is a combustion chamber 21, made up of fire brick or other refractory material 22 reaching over the floor of the car from side to side. This combustion chamber is of checker work so that the gases may pass freely from it and by building the combustion walls of the chamber permanently within the kiln-car, I prevent injury to certain

kinds of brick which injury would otherwise arise due to direct contact of the brick with the flame. This chamber 21, need not, however, be permanently constructed, but may, if desired, be formed of fire brick or other suitable material placed loosely in the car. Each car is provided in its sides with peek holes 23 covered with mica or the like and the outer tunnel 10 is provided with similar holes 24 enabling operations within the kiln to be inspected during the process of burning the brick. I also provide an opening 25 in the top of each car (see Fig. 5) which enables the "settle" of the brick to be measured, as will be fully understood by persons skilled in the art; and for the purpose of facilitating the introduction of a rule to measure this "settle" the outer tunnel 10 is provided with openings 26 having suitable closures 27. When gas is not being supplied to the kiln cars through the openings 20 said openings are closed by plugs 28 shown in Fig. 6, these plugs having sliding doors 29 enabling the openings to be more or less uncovered as desired so as to regulate the air supply. At the receiving end the tunnel 10 is provided with a number of openings 20 having suitable doors or closures. These openings are in the side of the tunnel and are located at the drying section thereof, as indicated by the broken line and legends thereon in Fig. 1. The end of the last car at the receiving end of the tunnel 10, is covered by a hood 31 and this is connected by an elbow 32 with the fan 12. If desired a hoisting means 33 may be provided to facilitate handling the hood 31 and elbow 32.

Situate intermediate the ends of the outer tunnel 10 in the middle of the burning section thereof (see the legends on Fig. 1) is a producer 34, for supplying gaseous fuel to the kiln. This producer may be of any improved type; and the discharge conduit 35 thereof passes downward to a transverse main 36 crossing under the tunnel 10 (see Fig. 3). At each side of the tunnel 10 are longitudinal mains 37 which are built outside of the tunnel and each of which is fitted with a number preferably three gas supply nozzles 38 (see Figs. 2 and 4). As shown in Fig. 4 the nozzles 38 project through openings 39 in the tunnel 10 and are adapted to be fitted snugly in the gas supply openings 20 of the kiln-cars. Fig. 4 shows the nozzle drawn back to allow the cars to be moved ahead, but when burning the brick, the nozzles are projected so that they fit snugly in the openings 20.

40 indicates a closure plate which is fitted to each nozzle, the closure plates surrounding the nozzles loosely and bearing against the outer walls of the tunnel 10 to cover the openings 39. At their outer ends each nozzle communicates with a bell 41 and these

have their open lower ends fitted in water pans 42 effecting hermetic connection therewith. Projecting upward from the main 37, through the bottoms of the water pans 42, are gas pipes 43 the upper ends of which clear the water level in the pans and are commanded by bell-valves 44. These bell-valves 44 have their lower ends closed by the water in the pans and said bells have diagonal lower edges so that by raising the bells 44 to different elevations, different quantities of gas are allowed to pass from the pipes 43 into the bells 41 and from thence to the kiln-cars by way of the nozzles 38. For raising the bells 44, threaded arms are provided these operating in the upper walls of the bells 41 and being provided with nuts 46 or the like allowing them to be operated and held at the desired adjustment. In openings in the top walls of the bells 41 plugs 47 are arranged, these plugs closing holes in the bells so that upon raising the bells 44 and swinging them sidewise to clear the pipes 43, pokers may be introduced through the openings in the tops of the bells 41 and projected downward into the pipes 43 to clear them of soot, tar and similar objectionable accumulations. It will be seen that this construction for supplying gas to the nozzles allows the nozzles to be rapidly adjusted toward and from the kiln-cars, the bells 41 sliding freely over the bottoms of the water pans. It further effects a hermetic or water sealed joint preventing the escape of gas and it places all of the parts outside of the main tunnel where they may be easily reached for inspection and repair.

In the operation of the apparatus the green brick are set in checker work in the kiln-cars around the combustion chambers 21 thereof and the cars are bolted up together to form a train as described, producing a continuous tubular kiln which being mounted on wheels may be rolled readily through the outer or stationary tunnel 10. The train is thus advanced through the tunnel, and as one car emerges from the discharge end 14 of the tunnel 10 with its brick burned, another car, loaded with green brick, is attached to the receiving end of the train and the train is moved ahead for a car length and the hood 31 again applied. This operation may, therefore, go on continuously, the train advancing with a step by step motion each advance being equivalent to the length of one of the kiln cars. When the train is being advanced the nozzles 38 are drawn back to clear the cars after which they are projected into engagement with the cars and during the time that the train is at rest the brick burning operation takes place. Since in the construction illustrated in the drawings, there are six nozzles 38 it follows that the brick in each car are subjected to six distinct burning operations, one for each nozzle, these operations being interrupted by

the successive movements of the train. The six gas nozzles 38 being in operation to supply gas to six adjacent kiln-cars as shown in Fig. 2 the gas burns with a bright flame in these cars subjecting the brick therein to intense heat. A draft is exerted continually through the kiln-cars by the fan 12 and air is thus drawn in through the discharge end of the train. This air passes through the train between the gas nozzles and the discharge end and cools the brick which have already been burned. At the same time this air is preheated and reaches the burning section in such a state as to greatly increase the efficiency of the burning operation. Following the current through the kiln-train, the intensely hot gases of combustion pass into the water smoking section there subjecting the brick to what is termed the water smoking action, by which moisture chemically combined with the ceramic material of which the brick is formed, is disassociated and driven from the brick thus preparing the brick effectually for the burning process. Finally the hot gases of combustion somewhat cooled, however, owing to the water smoking process, pass into the drying section of the apparatus and there serve to dry off the green brick preparatory to the water smoking action. It is found in practice that these hot gases passing into the drying section, are not sufficient to absorb all of the moisture in the brick and it is desirable to introduce an access of air at this point. To facilitate this, the openings and closures 30 in the main tunnel 10 are provided, these openings permitting the attendants to reach into the main tunnel and open, to any desired degree, the sliding doors 29 of the plugs 28, after which the doors 30 are closed. This allows an extra quantity of air to be drawn between the two tunnels from the discharge end of the main tunnel into the tunnel-kiln at the drying point and I am thus enabled to take up all of the moisture from the brick, the gases of combustion passing finally through the fan 12 and into the atmosphere comparatively cool and laden with the moisture extracted from the kiln brick. Therefore, my invention provides for the most effectual utilization of the fuel; it first dries off the green brick, then subjects them to the water smoking action, then subjects the brick to the burning process and finally cools off the brick to enable it to be handled immediately, at the same time preheating the air which is supplied to support combustion during the burning process, and in addition utilizing the heat radiated from the inner tunnel-kiln for drying purposes. In Fig. 1 I have indicated by a broken line and legends the several divisions of the kiln from the drying section, next the water smoking section, next the burning section and finally the cooling section.

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

1. An apparatus for burning brick having a relatively stationary gas producer and a tunnel-like kiln movable past the gas producer and adapted to have the gaseous fuel ignited and burned therein. 70

2. An apparatus for burning brick having a relatively stationary gas producer and a tunnel-like kiln adapted to move past the gas producer to receive the fuel therefrom said kiln having side walls with openings therein to permit the introduction of the gaseous fuel. 75 80

3. An apparatus for burning brick having a stationary outer tunnel, a tunnel-like kiln adapted to move through the outer tunnel and receive the brick and means for supplying fuel to the interior of the kiln at a point intermediate the ends of the outer tunnel. 85

4. An apparatus for burning brick having a stationary tunnel, a gas producer located intermediate the ends thereof, a continuous tunnel kiln adapted to move through the outer tunnel and means for conducting gas into the tunnel kiln from the gas producer. 90

5. An apparatus for burning brick having a kiln adapted to contain the brick a gaseous fuel supply means past which the kiln is movable and means for introducing the fuel unburned into the kiln. 95

6. An apparatus for burning brick having a kiln and a series of gaseous fuel supply means past which the kiln is movable, such means serving to introduce unburned gaseous fuel into the kiln. 100

7. An apparatus for burning brick having a kiln made up of a number of communicating kiln-cars and a fuel supply means past which the kiln-cars are movable. 105

8. An apparatus for burning brick having a kiln constructed of a number of communicating kiln-cars forming a continuous tunnel-like structure and a series of fuel supply devices past which said cars are adapted to move successively to subject the brick to the burning process. 110

9. An apparatus for burning brick having a wheeled kiln car with inclosing side walls adapted to have a gaseous fuel burned within the same. 115

10. An apparatus for burning brick having a kiln-car with inclosing side walls, the car open at its ends and provided with means for connecting it with other cars to form a continuous tunnel-kiln. 120

11. An apparatus for burning brick having a kiln-car with inclosing side walls of refractory material the car open at its ends. 125

12. An apparatus for burning brick having a kiln-car formed of refractory material and open at its ends, rings or bands of metal at the ends of the car and tie-rods extended longitudinally of the car and clamping said 130

rings or bands against the refractory material.

13. An apparatus for burning brick comprising a kiln-car with a fuel supply opening in its side and a refractory combustion chamber in the car communicating with the opening.

14. An apparatus for burning brick having a kiln-car with fuel supply openings in its opposite sides and a refractory combustion chamber in the car and extending transversely across the same from one opening to the other.

15. An apparatus for burning brick having a kiln-car with metal bands or rings at the ends thereof said bands or rings having tongue and groove formation for the purpose specified.

16. An apparatus for burning brick having a main or outer tunnel, a tunnel-kiln adapted to move through the main or outer tunnel and formed of a number of kiln-cars communicating with each other the front end of the tunnel being open, a suction means communicating with the rear end, a fuel supply means located intermediate the ends of the outer or main kiln and adapted to communicate with the interior of the tunnel kiln and means for regulating the air supply to the interior of the tunnel kiln between the rear end thereof and the fuel supply means.

17. An apparatus for burning brick having a tunnel kiln open at the ends and adapted to have the brick placed therein, means for supplying the fuel to the tunnel kiln at a point intermediate its ends and means for exerting an air and gas current through the tunnel kiln.

18. An apparatus for burning brick having a tunnel kiln open at the ends and adapted to have the brick placed therein, means for supplying fuel to the tunnel kiln at a point intermediate its ends and means for exerting an air and gas current through the tunnel kiln, said means being located between the suction end of the kiln and the fuel supply means for the purpose specified.

19. An apparatus for burning brick having a tunnel kiln adapted to have the bricks placed therein, said kiln having gas supply openings in the sides thereof, means for supplying gas to the kiln through said openings and removable closures for the gas supply openings.

20. An apparatus for burning brick having a tunnel kiln adapted to have the bricks placed therein, said kiln having gas supply openings in the sides thereof, means for supplying gas to the kiln through said openings and removable closures for the gas supply openings.

21. An apparatus for burning brick comprising a main or outer kiln, a gas producer located intermediate the ends thereof, a

transverse gas main passing under the tunnel and communicating with the gas producer, longitudinal mains located on each side of the outer tunnel, a tunnel kiln adapted to move through the outer tunnel and gas supply devices communicating with the longitudinal mains and passing through the walls of the outer tunnel to communicate with the interior of the tunnel kiln.

22. An apparatus for burning brick comprising a main or outer tunnel, a tunnel kiln adapted to move through the same, a gas main located adjacent to the outer tunnel, an adjustable gas supply means communicating with the main and with the tunnel kiln and means for effecting a water seal for said gas supply means.

23. An apparatus for burning brick comprising a main or outer tunnel, a tunnel-kiln adapted to move through the same, a gas main located adjacent to the outer tunnel, an adjustable gas supply means communicating with the main and with the tunnel-kiln and means for effecting a water seal for said gas supply means.

24. An apparatus for burning brick comprising a main or outer tunnel, a tunnel-kiln adapted to move through the same, a gas main located adjacent to the outer tunnel, an adjustable gas supply means communicating with the main and with the tunnel kiln and means for effecting a water seal for said gas supply means, said water seal devices being located outside of the outer tunnel.

25. An apparatus for burning brick having an outer tunnel, a gas main adjacent thereto, a tunnel-kiln adapted to move through the outer tunnel, a gas nozzle projecting through the outer tunnel, and adapted to communicate with the interior of the tunnel kiln, means placing said gas nozzle in communication with the gas main and a water pan sealing the connection between the nozzle and said means placing it in communication with the main.

26. An apparatus for burning brick with gaseous fuel having a gas supply pipe, a water pan surrounding same, a gas nozzle with a bell communicating with the receiving end thereof and resting in the pan in inverted position.

27. An apparatus for burning brick with gaseous fuel having a gas supply pipe, a water pan surrounding same, a gas nozzle a bell communicating with the receiving end thereof and resting in the pan in inverted position, a valve commanding the discharge end of said gas supply pipe and located within the bell and means for adjusting the valve.

28. An apparatus for burning brick with gaseous fuel having a gas supply pipe, a water pan surrounding same, a gas nozzle and a bell communicating with the receiving end thereof and resting in the pan in in-

verted position, a valve commanding the discharge end of said gas supply pipe and located within the bell and means for adjusting the valve, said means for adjusting the valve comprising a rod adjustably held in the outer wall of the bell and having connection with the valve.

29. An apparatus for burning brick with gaseous fuel comprising a gas supply pipe, a water pan surrounding same, a gas nozzle, an inverted bell communicating therewith and resting in the water pan, a valve commanding the gas discharge end of the supply pipe and means for operating the valve, such means permitting the valve to be thrown sidewise out of the line of the gas supply pipe to allow the introduction into said pipe of a cleaning tool.

30. An apparatus for burning brick comprising a main or outer tunnel, a tunnel-kiln adapted to move through the same, a gas supply main outside of the outer tunnel, a gas pipe passing outward from said main, a water pan surrounding the gas supply pipe, a gas nozzle projecting through the outer tunnel and adapted to communicate with the tunnel-kiln, an inverted bell communicating with the outer end of the gas nozzle and resting in the water pan and the valve located in the bell and commanding the gas pipe.

31. An apparatus for burning brick comprising a main or outer tunnel, a tunnel-kiln adapted to move through the same, a gas supply main outside of the outer tunnel, a gas pipe passing outward from said main, a water pan surrounding the gas supply pipe, a gas nozzle projecting through the outer

tunnel and adapted to communicate with the tunnel-kiln, an inverted bell communicating with the outer end of the gas nozzle and resting in the water pan and a valve located in the bell and commanding the gas pipe, said valve being in the form of a bell with a diagonal lower edge adapted to be submerged in the water of the pan for the purpose specified.

32. An apparatus for burning brick comprising a continuous tunnel-kiln made up of separably connected sections, a hood engaging one end of said tunnel-kiln, a suction means communicating with the hood and means for supplying the fuel to the kiln.

33. An apparatus for burning brick having a kiln composed of a number of individual sections independently movable and means for separably connecting said sections to form a continuous kiln.

34. An apparatus for burning brick having a tunnel-like kiln adapted to advance with a step by step motion, an outer tunnel through which said kiln is movable and means for supplying the fuel to the interior of the kiln.

35. An apparatus for burning brick having a tunnel-like kiln adapted to advance with a step by step motion, an outer tunnel through which said kiln is movable and means for supplying fuel to the interior of the kiln at a point intermediate the ends thereof.

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Witnesses:

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