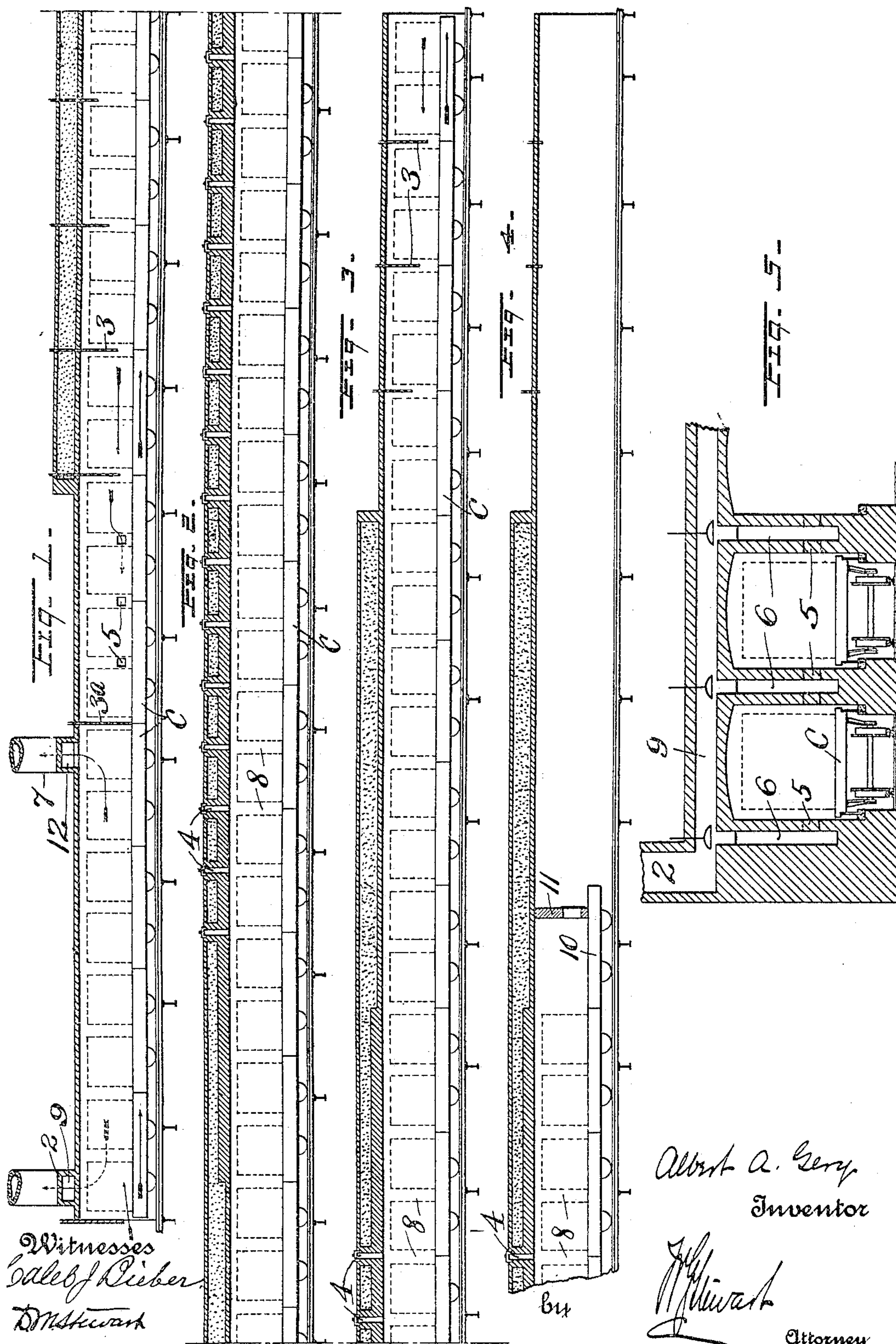


No. 793,291.

PATENTED JUNE 27, 1905.

A. A. GERY.
METHOD OF BURNING BRICK, &c.
APPLICATION FILED OCT. 26, 1904.



UNITED STATES PATENT OFFICE.

ALBERT A. GERY, OF READING, PENNSYLVANIA.

METHOD OF BURNING BRICK, &c.

SPECIFICATION forming part of Letters Patent No. 793,291, dated June 27, 1905.

Application filed October 26, 1904. Serial No. 230,001.

To all whom it may concern:

Be it known that I, ALBERT A. GERY, a citizen of the United States, residing in the city of Reading, county of Berks, State of Pennsylvania, have invented certain new and useful Improvements in Methods of Burning Brick, &c., of which the following is a specification.

My invention relates to the burning of brick or other articles in tunnel-kilns.

In my improved method I provide a continuous and unbroken reverse current of air and products of combustion directly through the tunnel, heat the incoming air sufficiently before reaching the inner or burning portion of the tunnel to insure combustion of fuel which is supplied directly to the passing bricks therein, at the same time by means of said incoming current extracting the heat uniformly from the outgoing burned brick, use the outgoing current so as to properly heat the incoming brick and thereafter expel the moisture from the green brick without contact of said current therewith and separately withdraw the expelled moisture from the incoming end of the tunnel, all of which is fully described in connection with the accompanying drawings, illustrating means for carrying my invention into effect, and the novel features of which are clearly set forth, and specifically pointed out in the claims.

Figures 1, 2, and 3 jointly indicate in longitudinal section a tunnel-kiln adapted to carry my invention into effect, the same being shown fully charged with loaded cars of brick in process of burning by my improved method. Fig. 4 shows the outgoing portion of the tunnel, as in Fig. 3, but only partially charged with loaded cars for the starting of the burning operation by my improved method. Fig. 5 is a cross-section on the line 5 5 of Fig. 1, showing the side-wall flues provided at the ingoing portion of the tunnel for utilizing the products of combustion indirectly in drying the green brick.

It will be understood that the several tunnel portions shown in separate Figs. 1, 2, and 3 are in fact alined to form a single tunnel through which an abutted line of loaded cars is continually passing during the normal op-

eration of the kiln, the abutted car-floors forming jointly a movable tunnel-floor and the whole train being periodically advanced by the introduction at one end of a new car of green brick and the withdrawal at the other end of a car of finished brick. Fig. 1 shows the portion of the tunnel which is occupied by the ingoing brick. Fig. 2 shows the intermediate portion or inner tunnel in which the brick are subjected to the intense heat required for burning, and Fig. 3 shows the forward portion which is occupied by the outgoing burned brick. The cars ride as usual upon a track extending through the tunnel and are closely abutted and provided with depending side plates which slide in sandways in the tunnel, so as to form a sealed tunnel-way above the car-floors, in which the piled bricks upon the latter are subjected in succession to the drying, burning, and cooling operations required during their passage through the tunnel. A stack or exhaust-fan is provided at the ingoing end of the tunnel to create a current through the tunnel in a reverse direction to the travel of the brick, a regulated inflow of air being provided for at the opposite or outgoing end of the tunnel. The flow of this current through the loosely-piled brick upon the cars is regulated by means of vertically-adjustable transverse plates, depending from the roof of the tunnel at proper points in the length thereof, said plates being adapted to deflect the current, so as to insure proper contact of the inflowing air with the outgoing burned brick and of the outflowing gases with the advanced incoming brick, to respectively extract the heat from the former and impart it uniformly to the latter. The burning of the brick, which takes place as usual in the inner tunnel, is provided for by utilizing the cars therein as a movable furnace-bed to which fuel is directly supplied through a series of fuel-inlets, arranged at suitable points in the inner tunnel-wall. These inlets are preferably located, as shown, so as to deliver the fuel to the spaces intervening between the separate piles of spaced brick. (Indicated by dotted lines in the drawings.)

In further describing my improved method

of burning it will be necessary to refer first to the manner of starting the kiln, which necessarily differs somewhat from the normal operation thereof so far considered. In starting a tunnel it is first charged with abutting cars loaded with unburned brick, preferably previously dried, until the inner tunnel is about filled, as indicated in Fig. 4. In advance of the forward car of brick and forming the head of the train is a car 10, in the main similar in construction to the other cars, but arranged to serve as a movable furnace. This car, as shown, carries near its forward end a fire-wall 11, which serves as a movable closure-wall to the tunnel, and this fire-wall is provided with a fire-door through which fuel is supplied to the floor of the car and an ingoing current of air is admitted, the space between the periphery of said fire-wall and the walls of the tunnel being preferably sealed with loosely-packed clay at the several stopping-points of the car in its passage through the outgoing portion of the tunnel. In the position shown in Fig. 4 a brisk fire is maintained upon this fire-car for a considerable time to heat the following train of brick sufficiently to cause combustion of fuel introduced through the fuel-inlets 4 in the tunnel directly to the loaded cars. The inner tunnel is thus converted into a furnace having a movable floor formed by the cars therein. The latter are then moved forward by the introduction of new cars of green brick at proper intervals of time, the fire-car being advanced with them and a fire of decreasing intensity being maintained thereon until finally the advanced cars of burned brick occupy the previously-empty outgoing portion of the tunnel and serve to properly heat the inflowing air, the fire-car being entirely removed from the tunnel and the normal operation of the tunnel thereafter proceeding continuously without it.

The deflector plates or valves 3 are regulated after each passage of a car, so as to provide proper inlet of air through the outgoing burned brick, which are gradually cooled thereby, while the correspondingly-heated air flows directly rearward and maintains combustion of the fuel fed to the inner tunnel. As shown in the drawings, approximately one-third of the whole length of the tunnel is thus constantly utilized as a furnace, the moving floor of which is constantly carrying the bricks through it and constantly presenting new brick and a new bed upon which to consume the fuel supplied through the fixed fuel-inlets. The maximum heat required (say $2,500^{\circ}$) is attained about midway of the length of the inner tunnel and is gradually reduced in each direction therefrom. The reverse current carries the products of combustion from the inner tunnel directly through the nearer incoming brick, and thence rearward beneath the vertically-adjustable deflector-plates 3,

which are arranged to lower the current, so as to insure the proper heating of the lower courses of piled brick. In order that the heat remaining in the products of combustion may be made use of in drying the green brick upon the last-introduced cars, it is necessary that it be so conducted as to heat said brick indirectly, inasmuch as direct contact thereof with the wet brick would cause the cooled gases to condense thereon instead of drying them. I therefore provide side exits 5 in the walls of the tunnel forward of the last deflector-plates 3, through which the partially-cooled current is conducted to passage-ways 6, formed in the side walls of the tunnel at the ingoing end thereof, and thence to the stack 2, thus heating said walls so as to indirectly heat the entering green brick for the purpose of driving out the moisture. To carry away this moisture, and thus satisfactorily complete the drying operation, a separate stack or exhaust-fan is provided at 7, which creates a forward draft through the inlet-door of the tunnel and through the drying brick to said stack, thus securing the prompt removal of the moisture expelled by the heat and insuring the continuous delivery of properly-dried brick to the heating action of the products of combustion in the tunnel ahead.

My improved method of burning may be advantageously carried into effect simultaneously in any desired number of contiguous parallel tunnels formed by parallel partition-walls and connected to a common stack or stacks, (indicated in Fig. 5,) thus effecting a considerable economy in construction and in space required. The main advantages of my invention, however, as will be understood from the foregoing description, are that it provides for the continuous carrying on of the drying, heating, burning, and cooling operations without interruption for cleaning of fires, &c., without subjecting any portion of the material under treatment to excessive and unequal heat action with remarkable uniformity in the character of the product, and with great economy of fuel and labor.

The apparatus employed in carrying out my improved method of burning brick or like operations is separately described and claimed in my pending application, Serial No. 228,128, filed October 12, 1904.

What I claim is—

1. The improvement in the method of burning brick and the like *en route* through a tunnel-kiln, which consists in partially charging the kiln with abutted cars of unburned brick, creating a reverse air-current therethrough, heating the incoming air and combining the same with products of combustion before it comes in contact with the advance brick to thereby heat said advance brick to incandescence, supplying fuel to the brick thus heated and maintaining combustion thereof by said air-current, progressing the brick-train and

thereafter utilizing the heat of the burned brick to heat the incoming air-current.

2. The improvement in the method of burning brick and the like *en route* through a tunnel-kiln, which consists in partially charging the kiln with abutted cars of unburned brick, creating a reverse air-current therethrough, maintaining a movable fire in advance of the brick-train to heat the inflowing air before it reaches the brick, supplying fuel to the brick thus heated and maintaining combustion thereof by said air-current, and simultaneously progressing the brick-train and withdrawing the advance fire.

3. The improved continuous method of drying and burning brick and the like *en route* through a tunnel-kiln which consists in creating a reverse current therethrough, heating said current within the tunnel, utilizing said heated current for heating the incoming wet brick without contact thereof with said brick, and separately withdrawing the moisture-laden air in contact with said brick.

4. The improved continuous method of drying and burning brick and the like in a tunnel-kiln which consists in burning the brick in the inner tunnel by direct contact with the products of combustion and initially drying the incoming brick by indirect contact with said products of combustion.

5. The improved continuous method of burning brick and the like, which consists in passing the brick to be treated through a tunnel, providing fuel in the interior of the tunnel, passing a reverse current of air through the tunnel and varyingly deflecting said current toward the tunnel-floor at different points in the length of the tunnel.

6. The improved continuous method of burning brick and the like, which consists in passing the brick to be treated through a tunnel,

providing fuel in the interior of the tunnel, passing a reverse current of air through the tunnel and varyingly deflecting said current toward the tunnel-floor as it progresses inward to the fuel-provided portion of the tunnel.

7. The improved continuous method of burning brick and the like, which consists in passing the brick to be treated through a tunnel, providing fuel in the interior of the tunnel, passing a reverse current of air through the tunnel and varyingly deflecting said current toward the tunnel-floor as it progresses rearward from the fuel-provided portion of the tunnel.

8. The improved continuous method of drying and burning brick and the like, which consists in passing the brick to be treated through a tunnel, providing fuel in the interior of the tunnel at an intermediate point thereof, and passing air from the exit end of said tunnel continuously rearward through said fuel and through a contiguous passage extending to the entrance end of the tunnel to indirectly heat the incoming brick.

9. The improved continuous method of drying and burning brick and the like, which consists in passing the brick to be treated through a tunnel, providing fuel in the interior of the tunnel at an intermediate point thereof, and passing air from the exit end of said tunnel continuously rearward through said fuel and through a contiguous passage extending to the entrance end of the tunnel, and carrying off separately the moist air in the entrance end of the tunnel.

In testimony whereof I affix my signature in the presence of two witnesses.

ALBERT A. GERY.

Witnesses:

D. M. STEWART,
W. G. STEWART.