

No. 708,240.

Patented Sept. 2, 1902.

G. A. MACE.
APPARATUS FOR BURNING LIME.

(Application filed Feb. 28, 1902.)

(No Model.)

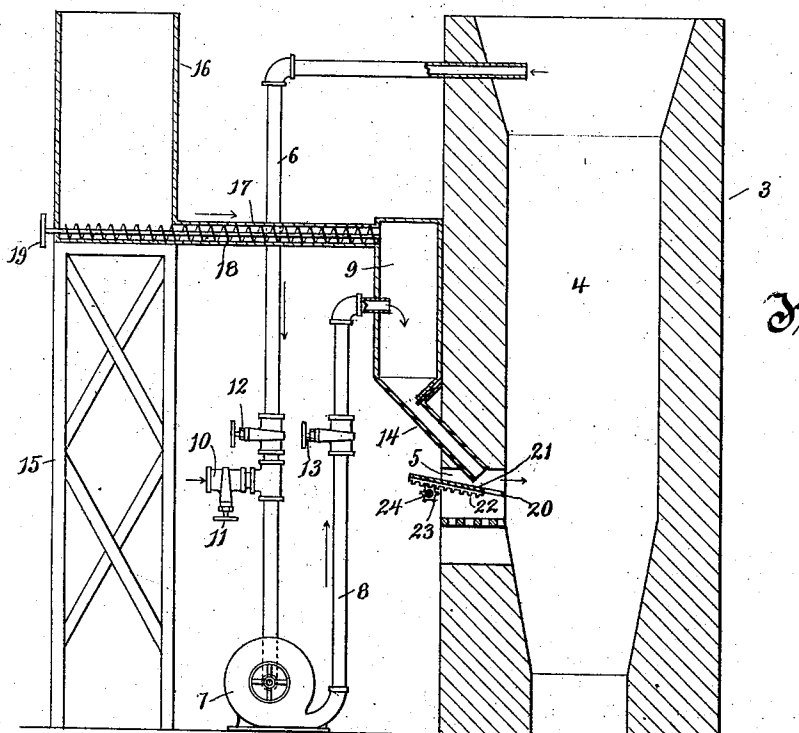
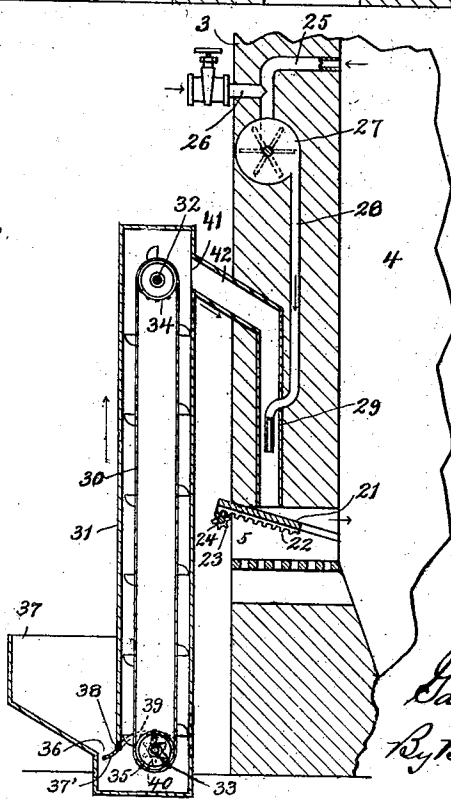


Fig. 1.

Fig. 2.



Witnesses:
C. H. Kelley.
Anna C. Faunt.

Inventor:
Garwin A. Mace.
By Benedict & Morsell.
Attorneys.

UNITED STATES PATENT OFFICE.

GARWIN A. MACE, OF MENOMINEE FALLS, WISCONSIN.

APPARATUS FOR BURNING LIME.

SPECIFICATION forming part of Letters Patent No. 708,240, dated September 2, 1902.

Application filed February 28, 1902. Serial No. 96,074. (No model.)

To all whom it may concern:

Be it known that I, GARWIN A. MACE, of Menominee Falls, in the county of Waukesha and State of Wisconsin, have invented a new and useful Improvement in Apparatus for Burning Lime, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention has relation to an improved apparatus for burning lime.

One of the primary objects of the invention is to provide an improved construction whereby the hot air and gases which are conducted from the main chamber of the kiln back to the fire are before entering the fire-chamber passed into a mixing-chamber and thoroughly mixed and commingled with the coal-dust or other material which is used as the fuel and which is also fed in even quantities to said mixing-chamber, and hence not only is the coal-dust thereby given an initial heating and warmth before entering the fire-chamber, and quick combustion thereby promoted, but also an absolute provision is made for a perfect mixture, inasmuch as an even feed of coal or fuel to the mixing-chamber can always be provided for, which, of course, is not the case where the coal-dust or fuel is fed manually directly into the fire.

With the above primary object and other incidental objects in view the invention consists of the devices and parts or their equivalents, as hereinafter set forth.

In the accompanying drawings, Figure 1 is an elevation of my improvements, showing the kiln and other parts in vertical section and the inner end of the hot-air and gas pipe broken away; and Fig. 2 is a vertical sectional view of a modified form of construction.

Referring to the drawings, the numeral 3 indicates the walls of an ordinary form of limekiln, 4 the main chamber inclosed by said walls, and 5 the fire-chamber communicating at its inner end with the main chamber and at its outer end with the exterior.

While I prefer to use my improvements in connection with a limekiln of the construction just described, and illustrated in the accompanying drawings, yet I do not wish to be

understood as limiting myself to such special adaptation, inasmuch as it is obvious that said improvements may be used in connection with different and varying forms of kilns.

Communicating with the main chamber at a point above the fire-chamber is a pipe 6, said pipe leading outwardly and communicating with any suitable means for creating a suction or for drawing the hot air and gases from the main chamber. An ordinary suction-fan 7, operated in any desirable manner, may be employed for this purpose to advantage, and leading from this suction-fan or other device is another pipe 8. At the front of the limekiln is a mixing-chamber 9, and to this chamber the pipe 8 leads and communicates with the interior thereof.

Projecting from pipe 6 is an extension 10, which at its outer end is open to the external air. This extension is controlled by means of a valve 11. In the pipe 6, above the extension 10, is a valve 12, which regulates the amount of hot air and gases passing from the main chamber of the kiln, and in the pipe 8, between the suction-fan and the mixing-chamber, is another valve 13, which regulates the flow to the mixing-chamber. The lower end of the mixing-chamber is provided with a projecting tube 14, which extends into the fire-chamber.

The numeral 15 indicates a frame which supports a bin or receptacle 16, into which the coal-dust to be fed to the kiln is dumped, said bin being advisably located in convenient position to receive the coal-dust therein directly from cars from which said coal-dust is unloaded. Extending from the lower end of this bin to and communicating with the interior of the mixing-chamber is a tube 17, and within this tube is a screw conveyer 18, said conveyer extending into and across the lower portion of the bin. The conveyer is operated in any of the usual and well-known ways, preferably by extending the shaft thereof outwardly through the side of the bin and mounting on said outer end a pulley 19, around which an endless belt, (not shown,) extending from any suitable source of power, passes.

Within the fire-chamber 5, preferably fitting in inclined guideways 20, is a plate 21. This plate is arranged below the lower end of

the tube 14 and is by preference so constructed as to be capable of adjustment either inwardly or outwardly. Any desirable means for effecting this adjustment may be provided; but I prefer to employ the construction shown in the accompanying drawings, consisting of a rack-bar 22 on the under side of the plate, said rack-bar adapted to be engaged by a pinion 23, mounted on a shaft 24. One end of said shaft may be provided with a suitable crank or handle for convenience in turning the same. It is obvious that when the shaft is turned the pinion is caused to act on the teeth of the rack-bar, and hence the plate is caused to be moved inwardly or outwardly, in accordance with the direction of turning. From the fact that this plate is located directly in the fire-chamber it of course necessarily becomes very hot, and consequently the mixture which passes out of the tube 14 and falls onto said plate is given an initial heating, which necessarily aids greatly in securing a quick or rapid combustion. The plate is lined with fire-brick, in order to preserve it against the intense heat to which it is subjected.

While I prefer to employ a plate adjustable inwardly and outwardly, yet I do not wish to limit myself thereto, inasmuch as a fixed plate may be employed, so located that the fuel from the mixing-chamber will fall thereon and be subjected to an initial heating. The plate is made adjustable, primarily, for the purpose of providing a means for securing an unobstructed draft during the time the kiln is being initially heated. At such time the plate is adjusted outwardly to its full extent, so as not to project into the fire-chamber, and thereby form any obstruction therein, which might clog up the draft-passage through the fire-chamber.

In the operation of my invention the stone to be treated is fed into the main chamber 4 and the flame and heat of the fire passed through it to the top of the kiln. The hot air and gases are then drawn into the pipe 6 through the action of the fan or other medium, thence upwardly in the pipe 8 to the mixing-chamber. The coal-dust or other material used as a fuel is dumped into the bin 16 and is then caught by the endless screw conveyer and carried in regular and even quantities to the mixing-chamber, where it is perfectly mixed with the hot air and gas in said chamber, and which are fed thereto through the pipes 6 and 8. The mixture then passes through the tube 14 onto the plate 21, where, as before stated, it is subjected to an initial heat and is then in such condition as to be quickly consumed by the fire in the fire-chamber. Of course before the operation described is commenced the several valves 11, 12, and 13 are properly adjusted. It is necessary that a provision should be made for the entrance of a desirable quantity of cold air, so as to secure combustion, and hence I

employ the short valve-controlled pipe or tube 10, leading to and communicating with the pipe 6.

The form of construction illustrated in Fig. 2 differs in specific details from that shown in Fig. 1. For instance, instead of employing an endless screw conveyer an endless conveyer-belt is provided, and, furthermore, the mixing-chamber and the hot-air and gas passage are arranged within the front wall of the kiln. Referring to this figure, the numeral 25 indicates the passage leading from the main chamber and adapted for conducting the hot air and gases from said chamber. Leading from this passage and communicating with the external air is a valve-controlled cold-air tube or passage 26. The passage 25 leads to a suction-fan chamber 27, which may also be located in the front wall of the kiln, and from this suction-fan chamber leads a passage 28, which communicates with the mixing-chamber 29, which chamber is also formed in the front wall of the kiln and communicates at its lower end with the fire-chamber, as clearly shown in the drawings. The endless conveyer is indicated by the numeral 30, and this conveyer is arranged within a casing 31, said casing having the upper and lower shafts 32 and 33, respectively, journaled therein, said shafts having the sprocket-wheels 34 and 35, respectively, around which the endless sprocket-chain of the conveyer passes. The lower end of the casing 31 is provided with an opening 36, which opening is at the bottom of a hopper or bin 37, into which hopper or bin the coal-dust or other fuel is dumped. To prevent the coal-dust from clogging at the opening 36, I prefer to provide a gate 37', said gate being mounted on a shaft 38 and having a finger 39 projecting inwardly therefrom and adapted to be contacted with by the teeth of a small wheel 40, mounted on the shaft 33. It is obvious that as said shaft 33 is revolved the contact of the teeth of the wheel 40 with the finger 39 of the gate 37' will cause said gate to be constantly agitated, and hence prevent possibility of any clogging at the opening 36. As the coal-dust passes into the bottom of the casing 31 it is caught by the buckets of the endless conveyer and carried upwardly to an opening 41 at the upper end of the inner side of the casing; said opening communicating with a passage 42, which passage in turn communicates with the upper end of the mixing-chamber 29. The coal-dust therefore so conveyed upwardly by the endless conveyer passes into the passage 42 and thence into the mixing-chamber, where it is mixed with the hot air and gas which are fed from the main chamber of the kiln to said mixing-chamber in the same manner as in the principal form of construction.

While my improved apparatus is more particularly intended for burning lime, yet I do not wish to be understood as limiting myself solely thereto, inasmuch as I desire to claim

the apparatus in connection with any other form of kiln or heating device to which it may be found adaptable.

What I claim as my invention is—

5 1. The combination of a kiln, a passage leading from the kiln back to the fire, means within the passage for drawing the hot air and gases from the kiln into said passage and back to the fire, a mixing-chamber to which 10 the passage leads, said mixing-chamber being in communication with the fire-chamber of the kiln, a valve in the passage between the mixing-chamber and the drawing or suction means, a valve in said passage in advance of said drawing or suction means, an 15 air-duct also in advance of the drawing or suction means and communicating with the passage, and means for feeding a fuel to the mixing-chamber, said fuel and the hot air and 20 gases being thereby mixed and commingled in the mixing-chamber, before being finally conducted into the fire.

2. The combination of a kiln, a plate in the fire-chamber thereof, means for adjusting 25 said plate inwardly and outwardly, and means for discharging a fuel onto the plate to thereby give said fuel an initial heating.

3. The combination of a kiln, a plate in the fire-chamber thereof, a passage leading from

the kiln at a point above the fire-chamber 30 and extending back to said fire-chamber, means for drawing hot air and gases through said passage and back to the fire-chamber, and means for feeding fuel into said passage, 35 and for discharging said fuel, and the hot air and gases mixed therewith onto the plate.

4. The combination of a kiln, a passage leading from the kiln back to the fire, means for drawing the hot air and gases from the kiln through said passage and back to the 40 fire, a receptacle, a bin provided with an opening leading to the receptacle, a gate for said opening, means for agitating said gate, a conveyer adapted to convey the fuel discharged 45 into the receptacle, and a conduit leading from the receptacle to the passage, the said conveyer adapted to conduct the fuel to the conduit, and the conduit to discharge said 50 fuel into the passage, whereby the fuel is mixed with the hot air and gases prior to being discharged into the fire.

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

GARWIN A. MACE.

Witnesses:

A. L. MORSELL,
ANNA V. FAUST.