

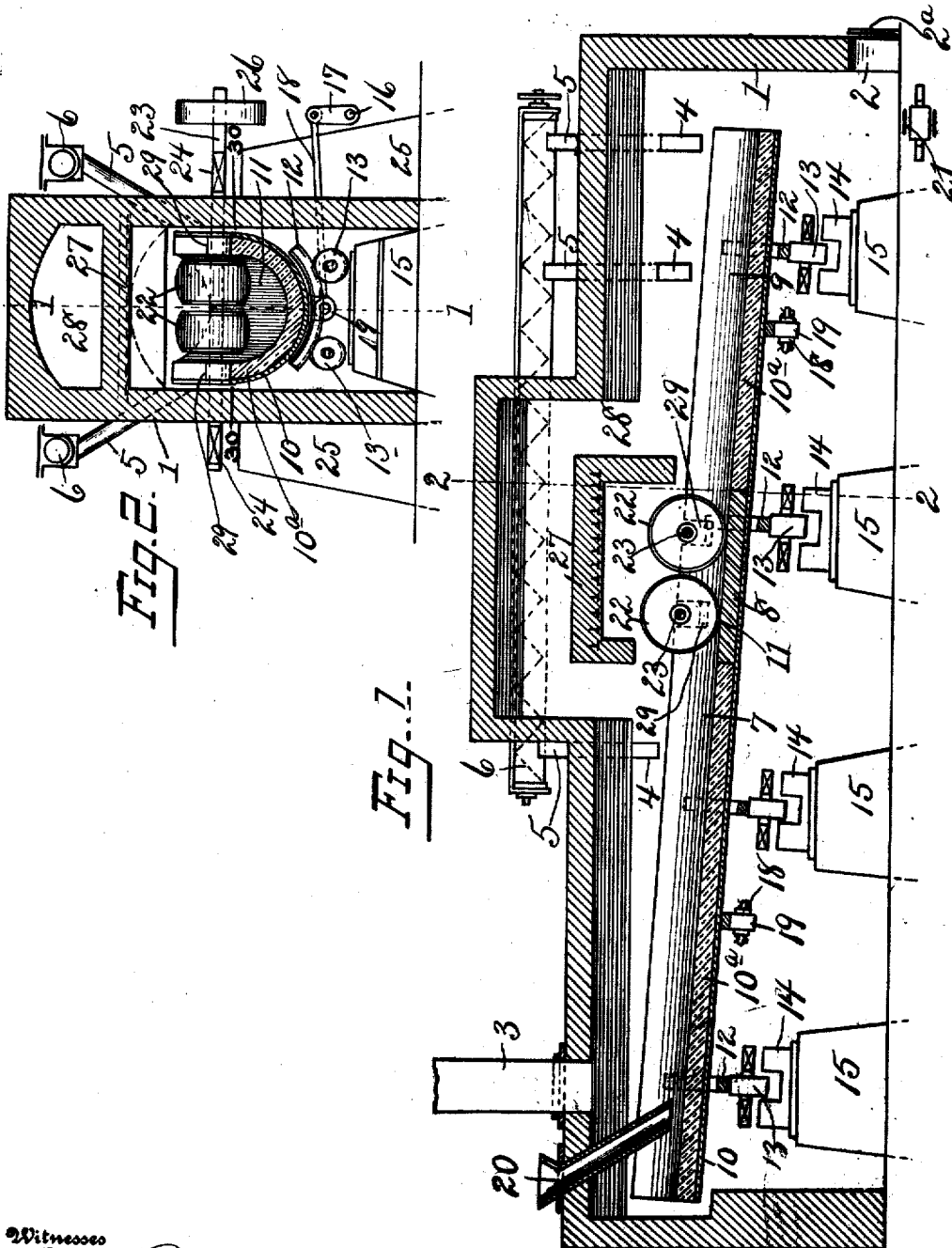
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KILN.

APPLICATION FILED NOV. 13, 1908.

929,765.

Patented Aug. 3, 1909.



Witnesses

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KILN.

No. 929,765.

Specification of Letters Patent.

Patented Aug. 3, 1909.

Application filed November 13, 1908. Serial No. 462,389.

To all whom it may concern:

Be it known that I, ROBERT W. P. HORN, a citizen of the United States, residing at New Castle, in the county of Lawrence and State of Pennsylvania, have invented new and useful Improvements in Kilns, of which the following is a specification.

This invention relates to improvements in kilns, and consists in certain improvements in the construction thereof as will be hereinafter fully described and pointed out in the claims.

The invention is particularly adapted for manufacturing Portland cement.

The common method of making Portland cement is to prepare the raw materials by pulverizing. This pulverized material is fed into kiln which is rotated, the kiln being set slightly on an incline. This inclination feeds the material through the kiln. The combustion material is all fed in through one end of the kiln. The clinker formed in the kiln is afterward ground or pulverized, so as to give it the powdered form of common Portland cement.

The materials entering into Portland cement can be much more readily pulverized when in heated condition. In the preferred form of my invention therefore, I propose to heat the material initially to render it soft and brittle, so that it may be readily crushed. I prefer after this crushing action to treat the material so crushed, while still retaining its initial heat, to the final burning or clinkering process. In my preferred form of kilns also, the air and combustible fuel are delivered at different points in the kiln, so that complete combustion is accomplished, and the temperature of different parts of the kiln more readily controlled as desired.

The further objects of my invention will appear from the specification and claims.

The invention is illustrated in the accompanying drawings as follows:

Figure 1 shows a central longitudinal section of a kiln on the line 1--1 in Fig. 2. Fig. 2 a cross section on the line 2--2 in Fig. 1. 1 marks the kiln walls. These ordinarily form a long narrow kiln. Air is admitted at 2, the draft opening being provided with a gate 2^a for controlling the admission of air. A stack 3 is provided at the opposite end of the kiln. Fuel, preferably in the form of pulverized coal is delivered at various open-

ings 4 to the kiln. These may be arranged at different points along the length of the kiln to give the desired results as the distribution of heat and the best results as to the mixing of the coal and air. The fuel is delivered to the openings 4 through chutes 5 which are connected with a conveyer 6 for distributing the fuel to the several chutes.

Arranged within the kiln is a long support for material. It is preferably curved in cross section and arranged in the kiln at an inclination, so that when reciprocated or oscillated material will be fed from it by reason of the movement of the support. The support comprises the part 7 on which the raw material is mixed and heated; a grinding portion 8 in continuation of the part 7; and a burning or clinkering portion 9 in continuation of the part 8. These are all inclosed in a metal shell 10, and the supports 7 and 9 have surfaces of some refractory material such as fire brick 10^a over the metal 10. The support has the ribs 12 arranged on its under side. These ribs rest on the rollers 13. The rollers are mounted in bearings 14, and the bearings are mounted on the pillars 15, arranged on the floor of the kiln.

A shaft 16 is arranged on the walls of the kiln and parallel to the support within it. This shaft is given an oscillating movement by any common mechanism for this purpose. It is provided with the rock arms 17 which are connected by the links 18 with arms 19 extending from the lower part of the support. These are preferably arranged along the supports, so as to move the support with as little strain as possible.

The material is fed to the support by a chute 20, and is discharged from the support to a conveyer 21. The part 8 is surfaced with material 11 adapted to withstand the action of the crusher. Crushing rolls 22 are arranged above the metal 11, so that the heated material is, as the support is oscillated, brought under the rolls 22 and pulverized. These rolls are carried by the shaft 23 which extends through the wall of the kiln, and are arranged in the bearings 24. The bearings are mounted on pillars 25 outside the kiln walls. The shaft 23, and with the shaft the rolls 22 are driven by means of a pulley 26. The sides of the support are slotted at 29, to allow for the necessary play as the support is oscillated.

I prefer to provide the deflector 27 over the rolls 22, so that the heated gases are carried by way of a flue 28 around the rolls. In this way the temperature directly at the rolls is somewhat below than at other points on the support.

In the operation of the device, material is fed through the chute 20 onto the part of the support 7. The material is ordinarily in its raw state. As the support is oscillated, it is by reason of oscillation and inclination of the support fed forward on the support, and at the same time so heated to render it soft and brittle. It reaches the part 8 of the support in this condition, and is readily pulverized by means of the rolls 22 acting upon the outside surface 11. The material in this condition is discharged from the support onto the conveyor 21 from which it is carried out of the kiln, and afterward pulverized and brought to the form of ordinary Portland cement.

It will be noted, that the support is so proportioned to the width of the kiln, as to leave a space 30 between it and the side walls of the kiln. The air passes through this space to the part above the support where combustion actually takes place. In this way the air may be delivered to different parts of the kiln as will be most efficient in producing combustion and regulating temperature.

What I claim as new is:

1. In a kiln, the combination of the walls; a support for the material being treated arranged within the kiln; means for moving the material over the support; means for feeding fuel to the kiln above the support; and devices for delivering air to the kiln below the support, the support and walls being proportioned to leave a space between the walls and support for the passage of air.

2. In a kiln, the combination of the kiln walls; a semi-circular support arranged within the walls on which the material is treated, said support being proportioned to the walls to leave a space between the walls and the support; means for delivering fuel to the kiln above the support; devices for delivering air to the kiln below the support; and means for oscillating the support.

3. In a kiln, the combination of the kiln walls; a support within the walls for the material being treated, said support being so proportioned to the walls as to leave a space between the support and the walls; means for moving the material over the support; means for delivering fuel to the kiln above the support; and means for delivering air to the kiln below the support, the air passing through the space between the support and the walls to support combustion.

4. In a kiln, the combination of the walls; a semi-circular support arranged within the walls and proportioned to the walls to leave a space between the support and the walls; means for delivering fuel to the kiln above

the support; devices for delivering air below the support, the air passing through the space between the support and the walls to support combustion; and means for oscillating the support.

5. In a kiln, the combination of the walls; a support arranged within the walls on which the material is treated; means for moving the material over the support; means for delivering fuel at intervals along the sides of the support; and means for delivering air to support combustion.

6. The combination of a kiln; a support upon which the material may be treated; and a crusher in the kiln for operating upon the heated material; and means for conveying material in a heated condition to the crusher.

7. The combination of a kiln; a crusher in the kiln; and means for carrying the material in a heated condition to the crusher.

8. The combination of a kiln; a crusher in the kiln; means for carrying the material in a heated condition to the crusher; and means for further heating the crushed material while under the influence of the initial heat.

9. The combination of a kiln; a moving support within the kiln over which the material is fed; and a crusher in position to receive the material in a heated condition from the moving support.

10. The combination of a kiln; an oscillating support in the kiln over which the material is fed; and a crusher in position to receive the material in a heated condition from the oscillating support.

11. The combination of a kiln; a moving support within the kiln over which the material is fed; a crusher in position to receive the material in a heated condition from the moving support; and a second movable support over which the material is fed and treated by heating, in position to receive the material from the crusher in a heated condition.

12. The combination of a kiln; a moving support within the kiln over which the material is fed; a crusher in position to receive the material in a heated condition from the moving support; and a second movable support, over which the material is fed and treated by heating, in position to receive the material from the crusher in a heated condition.

13. The combination of a kiln; a moving support within the kiln over which the material is fed; a crusher in position to receive the material in a heated condition from the moving support; and a second movable support, over which the material is fed and treated by heating, in position to receive the material from the crusher in a heated condition, said second support being rigidly connected with the first support and moving with it.

14. The combination with a kiln; a movable support arranged in the kiln over which the material is fed; and a crusher arranged

to operate within the kiln upon the support and to operate upon the material in a heated condition on said support.

15 The combination of a kiln; a movable
5 support arranged on inclination in the kiln; and grinding wheels arranged intermediately on the ends of said support, arranged to operate thereon to crush the material as it moves on the support.

10 16. The combination of a kiln; a support on the kiln over which the material is fed; a crusher arranged intermediately of the ends of the support and operating upon the material as it is fed on the support; and devices
15 for deflecting the heat away from the crusher.

17. The combination of a kiln; a movable semi-circular support in the kiln; crushing

wheels arranged to operate upon the support intermediately of its ends; and a deflector arranged over the crushing wheels for deflecting the heated gases of the kiln. 20

18. The combination of a kiln; a support arranged in the kiln; means for feeding the material continuously over the support; and a crusher arranged intermediately of the 25 ends of the support for crushing material as it is fed over the support.

In testimony whereof, I have hereunto set my hand in the presence of two subscribing witnesses.

ROBERT W. P. HORN.

Witnesses:

HERBERT M. MOORE,
L. A. JOHNSTON.