May 26, 1931. L. B. McDANIEL 1,807,069

PAN ROTARY KILN

Filed March 7, 1930 3 Sheets-Sheet 1

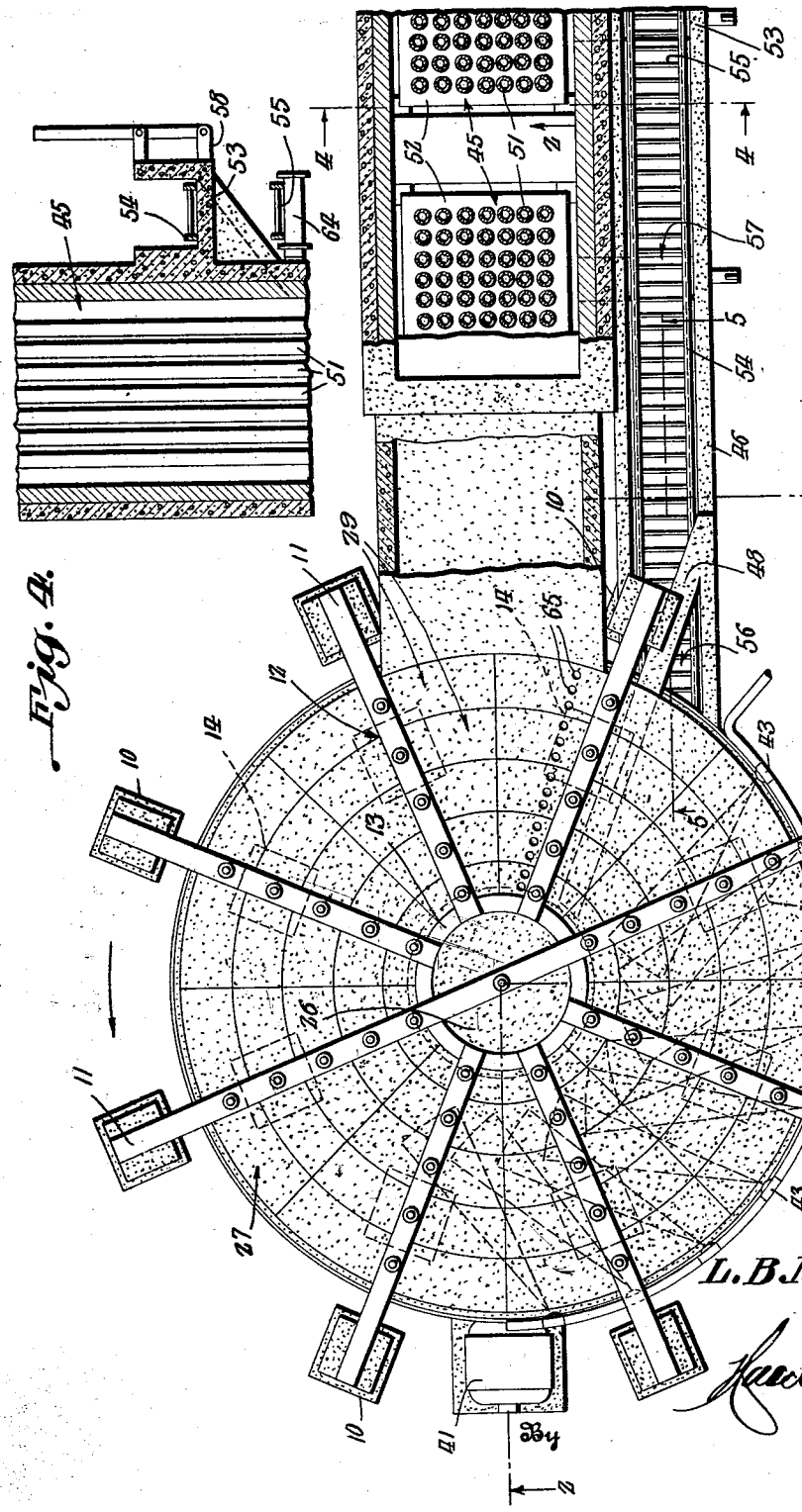


Fig. 1.

Fig. 2.

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PAN ROTARY KILN

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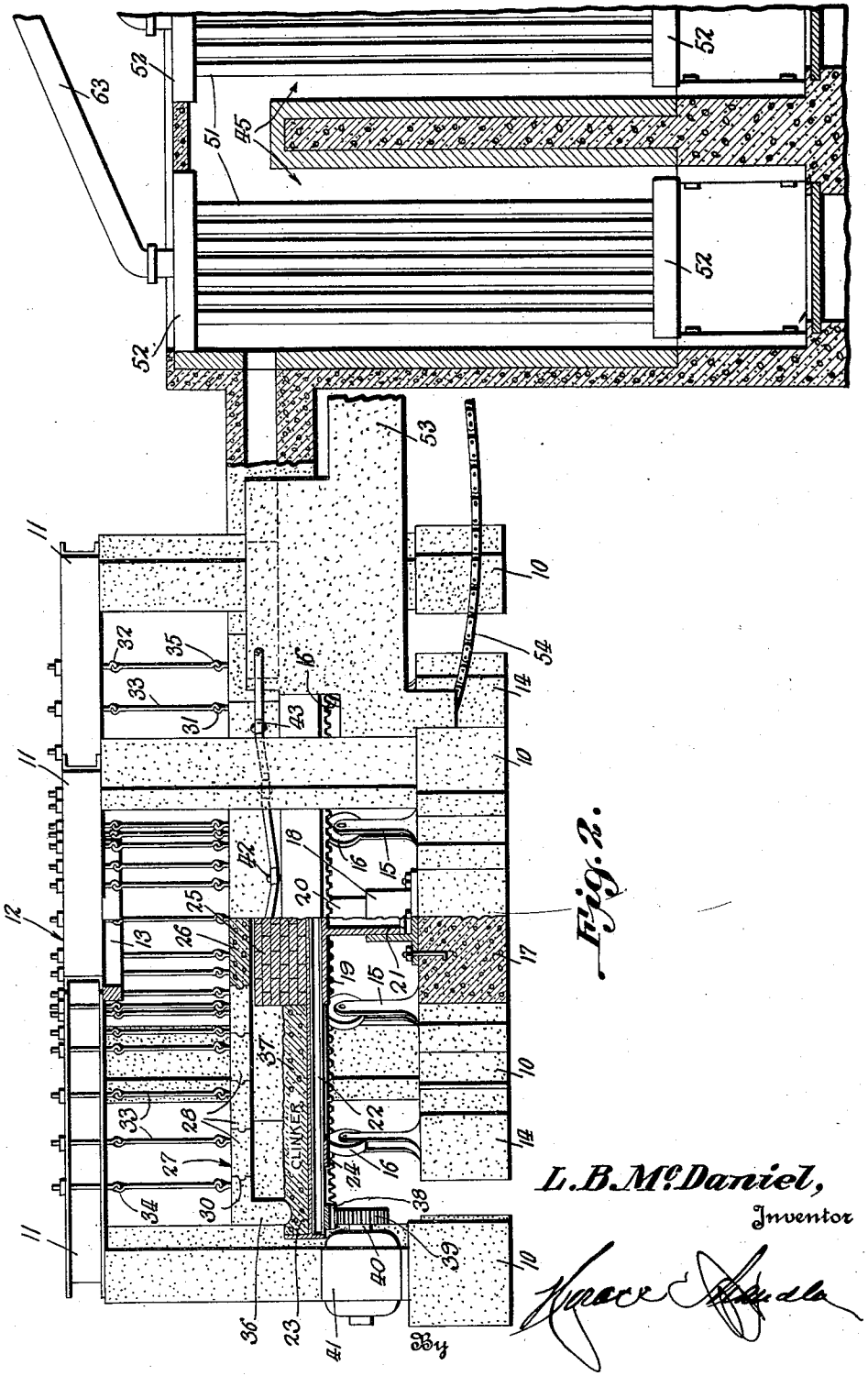


Fig. 2.

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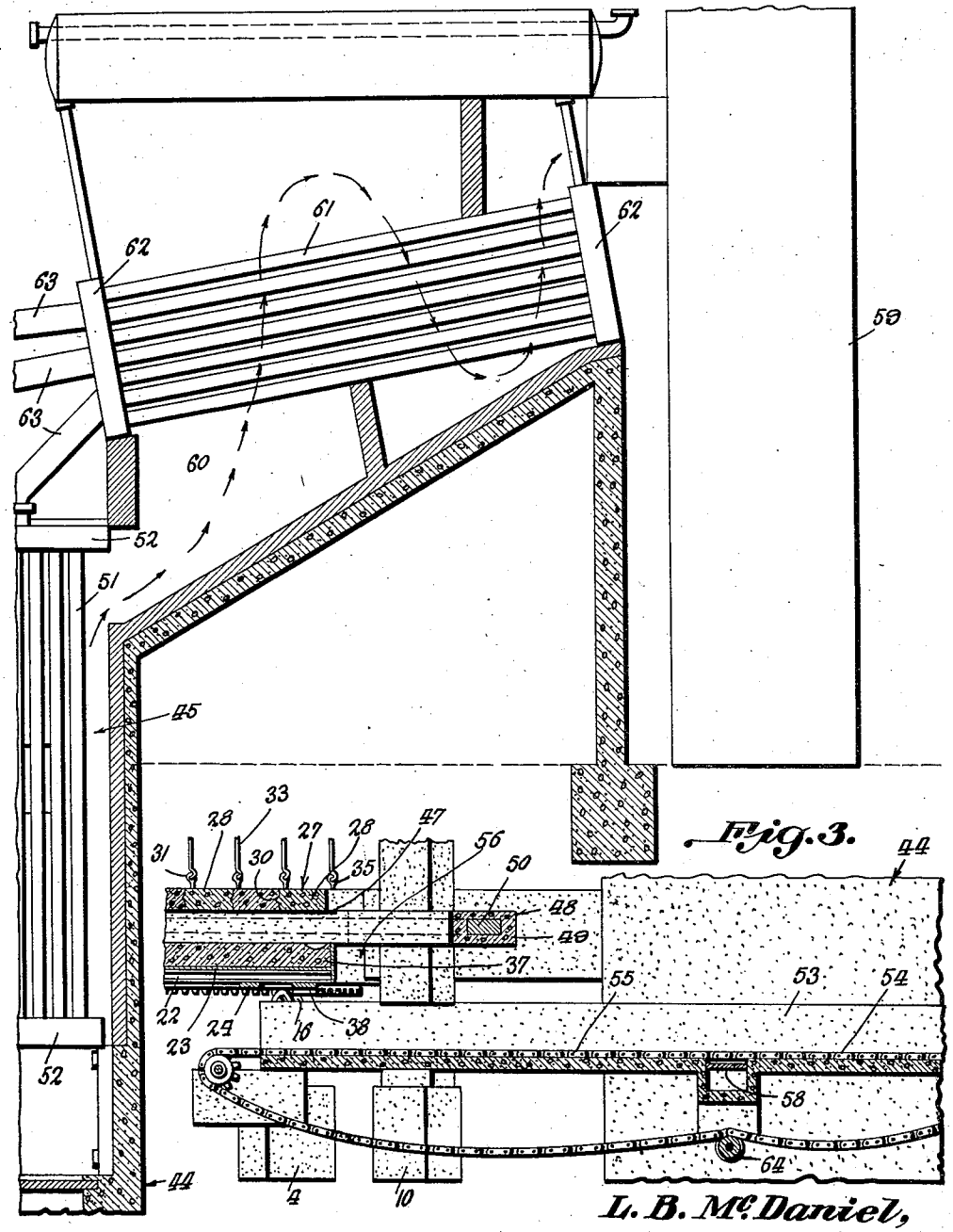


Fig. 3.

Fig. 5.

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Patented May 26, 1931 1,807,069

UNITED STATES PATENT OFFICE

LEVI B. McDANIEL, OF CONCRETE, WASHINGTON

PAN ROTARY KILN

Application filed March 7, 1930. Serial No. 434,105.

This invention relates to new and useful improvements in kilns, and particularly to cement kilns.

One object of the invention is to provide a device of this character by means of which the slurry is more quickly and effectively transformed into clinker, than in similar devices heretofore.

Another object is to provide a device of this character wherein the heat issuing from the clinker is utilized to advantage, instead of being wasted, as with the kilns now in general use.

Other objects and advantages will be apparent from the following description when taken in connection with the accompanying drawings.

In the drawings:

Figure 1 is a plan view of the rotary pan and a portion of the pit.

Figure 2 is a vertical longitudinal sectional view on the line 2—2 of Figure 1.

Figure 3 is a continuation of the sectional view on the line 2—2 of Figure 1, and is to be read in connection therewith.

Figure 4 is a vertical transverse sectional view on the line 4—4 of Figure 1.

Figure 5 is a vertical longitudinal sectional view on the line 5—5 of Figure 1.

Referring particularly to the accompanying drawings, 10 represents a circular series of cement piers on the upper ends of which are supported the outer ends of the arms 11, of the kiln supporting spider, designated as a whole by the numeral 12. The inner ends of the arms 11 are secured to the ring 13. Disposed concentrically inward of the piers 10 is a circular series of shorter piers 14, the upper ends of which have the brackets 15 mounted thereon, and each of said brackets supports a roller 16, to which more particular reference will be made later herein. Located centrally of the series of piers 14, is a base 17, on which is mounted an upwardly extending tubular member 18. Disposed directly above the tubular member 18 is a horizontal metal plate 19, and formed on the lower face of said plate is a downwardly extending tubular member 20 which properly fits within the tubular member 18, and rests on the antifriction bearings 21, therein. Secured to the plate 19, and extending radially therefrom, are the metal beams 22, and secured to the upper faces of said beams are the metal plates 23, whereby to form a pan. Secured to the lower faces of the beams 22 is a circular track 24 which rests on the rollers 16, for rotary movement. Built on the plate 19 is a fire-brick wall 25, and disposed a short distance above the wall is a horizontal disk of clinker concrete 26, which forms the center of the cover 27, of the pan. The remainder of the cover 27 is divided radially into the segments 28, and each segment is divided circularly into a plurality of parts 29. All of the parts 29 are fitted together by tongue and groove joints 30. Each of the parts 29, and the center disk 26, is provided with an embedded eye-bolt 31, while the radial beams or arms 11 are provided with similar eye-bolts 32. Rods 33, each having hooks 34 and 35, at its ends are provided for engagement with the eye-bolts of the cover parts, and of the beams 11, for the purpose of supporting the cover over the pan. It will be noted that the outermost of the parts 29 are each formed with a depending flange 36, which serves as the outer wall of the pan. On the upper face of the floor of the pan are placed a quantity of cold clinkers 37, at the desired depth, and in this mass of clinkers the lower edge of the flange 36, of the cover, plows, as the pan is rotated. On the bottom of the pan, outwardly of the track 24, is a toothed track 38, which is engaged by the gear 39, of the shaft 40, of a suitable motor 41, whereby the pan is caused to rotate.

In the said flange are formed openings 42, and disposed through said openings are the oil burners 43. The burners are inclined downwardly toward the floor of the pan, and are arranged in batteries of three, one battery being spaced from the pan floor a distance of three inches, the next battery being spaced a distance of five inches, while the next battery is spaced a distance of three inches from said floor.

It will, of course, be understood that the burners 43 may be used for burning powdered coal, as well as oil.

Sunk in the ground, adjacent the set of piers 10, is a pit 44, said pit being divided into three chambers 45, which have their upper ends slightly above the level of the rotary pan, and which are arranged in a line. One end chamber 45 has an inlet 46 which is arranged on the level of the rotary pan, and in registry with the rake-off opening 47, of the flange 36. The rake, indicated by the numeral 48, is formed of a clinker concrete mixture 49, molded around the metal reinforcing core 50, such rake being disposed in a horizontal position through the opening 47, with one end resting on one of the cement piers 10, and its other end in position to rake the clinkers from the pan, through said opening 47, so that such clinkers will fall on the adjacent end of a conveyor to be later described. Disposed within each of the chambers 45, of the pit 44, are the vertical pipes 51, which are connected, at their opposite ends, to the headers 52, arranged respectively at the upper and lower ends of the chambers. Extending along the outsides of the chambers 45, at a level just below that of the inlet 46, is a trough 53, in which runs the upper lap of the drag chain 54, said chain being provided with regularly spaced flights 55, which drag the hot clinkers which fall into the trough, through the opening 56, and cause them to fall through the opening 57, in the trough, into the chamber 45. This trough is provided with one of these openings 57 over each chamber 45, and each opening is provided with a manually operable valve 58, so that when sufficient clinkers have fallen into the first chamber 45, the attendant closes the first valve, and opens the second valve, thus permitting the clinkers to be deposited in the second chamber 45.

Adjacent the other end of the chamber 45 is a stack 59, and establishing communication between the chambers 45 and said stack is a flue 60. Within this flue 60 are arranged the inclined boiler tubes 61, connected to the headers 62, said headers being connected with the upper headers of the pipes 51, by means of the pipes 63. The lower lap of the conveyor chain 54 is supported on the idler rollers 64, beneath the trough.

In the cover 27 there are formed the radially extending series of openings 65, through which the slurry is introduced to the pan.

In the operation of the device, the burners 43 are ignited, and the slurry fed through the openings 65, until the floor of the pan is properly filled. At this time the pan is set into rotary movement, whereupon the intense heat from said burners act upon the slurry to first dry out the moisture, and then reduce the slurry to clinker form. The rake 48 is in a stationary position, and rakes the clinkers continuously while the kiln pan is rotating, to cause the hot clinkers to be forced out through the opening 47, and on the conveyor chain 54, which carries the clinkers forward for deposit in the first chamber 45, through the opening 57, of the trough. These clinkers are permitted to rise to a predetermined level, in this pit chamber, when the operator closes the valve thereof, and opens the valve of the next chamber, whereupon the clinkers will then fall into the second chamber 45. After the third chamber has been permitted to fill, the operator permits the first chamber 45 to discharge the clinkers. The first chamber is being discharged while the last chamber is being filled, so that when the first chamber has emptied the clinkers therefrom, the last chamber has filled, so that the operator permits the first one to refill, while at the same time he permits the second chamber to empty. When the second chamber has emptied, the operator permits the third chamber to empty.

The heat from the clinkers, when deposited in the pit, and in contact with the pipes, heats the contents of such pipes, which is water, whereby to generate steam for various purposes at the plant, as will be readily understood.

Attention is particularly called to the form of the kiln, on which the clinkers are formed, as well as the location of the burners. The burners are formed in batteries of three, as before mentioned, each battery projecting its flames parallel to the slurry, at different distances therefrom, ranging from three to five inches, and at different distances with respect to the adjacent batteries. The fact that the slurry is placed on a rotary pan, and the burners direct their flames parallel to the said slurry, such slurry will be more quickly and effectively heated so as to form clinkers, than in the inclined tubular kilns now in general use, wherein the flames travel from one to three feet from the slurry. When the kiln floor passes under the rake 48, said floor will be extremely hot (about 2000° F.) when it receives the new layer of slurry. This preheating of the slurry, by the hot kiln floor, will compensate, to a great degree, for the long travel of the hot gases in the tubular kilns, now in general use.

What is claimed is:

1. A cement kiln comprising a rotatable pan member, a cover for the pan member, means for depositing slurry on the pan, and means for directing flames on the slurry.

2. A cement kiln comprising a rotatable pan member, a cover for the pan member, means associated with the cover for depositing slurry on the pan, and means for directing flames on the slurry.

3. A cement kiln comprising a rotatable pan member, a cover for the pan member, means for depositing slurry on the pan, and means associated with the cover for directing flames on the slurry.

4. A cement kiln comprising a rotatable

pan member, a stationary cover for the pan member having slurry receiving openings, and burners for directing flames on the slurry, through said cover.

5. A cement kiln comprising a rotatable pan member, a cover for the pan member, and means associated with the cover for depositing slurry on the pan, and means associated with the cover for directing flames on the slurry.

6. A cement kiln comprising a rotatable pan member, a stationary cover for the pan member having slurry receiving openings, and burners projecting inwardly through the sides of said cover in position to direct their flames on the slurry.

7. A cement kiln comprising a rotatable pan member, a stationary cover for the pan member having slurry receiving openings and a depending peripheral flange, said flange contacting with the slurry and clinkers in said pan, and means for discharging the clinkers from the pan.

8. A cement kiln comprising a rotatable pan member for supporting the slurry to be burned to clinkers, a stationary suspended cover arranged over the pan and having a depending peripheral flange resting within the slurry and clinkers, said cover being formed of separable sections, means for discharging the clinkers from the pan, and means for conveying such clinkers to points where the radiating heat, due to cooling of the clinkers, can be utilized.

9. A cement kiln comprising a rotary pan, a stationary cover suspended above the pan, a pit adjacent the pan, a conveyor extending from the pan across the pit, and means on the pan for raking the hot clinkers therefrom onto the conveyor, said conveyor being arranged to deposit the clinkers in said pit.

10. A cement kiln comprising a rotary clinker forming means in the form of a rotatable horizontal pan, a pit adjacent the pan having chambers, a conveyor extending across the upper ends of said chambers for conveying the hot clinkers from the pan to said chambers, and means in the chambers for utilizing the radiant heat from the clinkers.

11. A cement kiln comprising a rotary clinker forming device in the form of a rotatable horizontal pan, a chambered pit adjacent the pan, a trough extending across the upper ends of the chambers and having valved outlets over the chambers, an endless conveyor movable in the trough, steam boiler tubes in the chambers to be heated by hot clinkers deposited from the conveyor, and means associated with the pan for raking the hot clinkers from the pan to the conveyor.

In testimony whereof, I affix my signature.

LEVI B. McDANIEL.