METHOD AND APPARATUS FOR UTILIZING THE HEAT FROM CEMENT CLINKERS
APPLICATION FILED MAR. 13, 1905.

Fig. 2. Y

Fig. 3.
T. O. KING.

METHOD AND APPARATUS FOR UTILIZING THE HEAT FROM
CEMENT CLINKERS.

APPLICATION FILED MAR. 15, 1905.

3 SHEETS--SHEET 3.

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WITNESSES:
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METHOD AND APPARATUS FOR UTILIZING THE HEAT FROM CEMENT CLINKERS.


Application filed March 13, 1905. Serial No. 249,735.

To all whom it may concern:

Be it known that I, Tom Cobb King, a citizen of the United States, and resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Methods and Apparatus for Utilizing the Heat from Cement Clinkers and Nodules Made from Metalliferous Masses, of which the following is a specification.

My invention relates to an improvement in method of and apparatus for utilizing heat contained in the products of rotary kilns, and particularly that class of kilns used in connection with the manufacture of cement, clinkers and nodules from metalliferous masses; and the invention relates particularly to a method whereby the heat contained in such products is withdrawn from the same and then utilized in the process conducted in the kiln, as well as in any other convenient manner. In general practice, the cement, clinkers or nodules, which are discharged from such rotary kilns, is heated to 2000° Fahrenheit and upwards. The product is cooled and disposed of without any utilization of its latent heat, whereas this method involves the utilization of the heat contained in the product prior to the final disposition of the same.

The invention will be best understood by reference to the accompanying sheet of drawings, forming a part of this specification, in which—

Figure 1 is a vertical elevation of the apparatus shown in connection with a rotary kiln. Fig. 2 is a vertical section of the heat extractor and the conveyer. Fig. 3 is a plan view of the heat extractor shown in Fig. 2. Fig. 4 is a modified form of heat extractor. Similar letters of reference indicate similar parts throughout the several views.

In Fig. 1 of the drawings, 1 indicates a cylindrical retort or kiln, the interior of which is lined with fire brick or other refractory material. The retort is provided with a number of tires 2-2, which are riveted or otherwise suitably secured upon the exterior thereof and adapted to operate upon the rollers 5-5, which are journaled in bearings formed in the brackets or supports 4-4, the said supports being secured upon the piers 5-5. The said retort is also provided with a large cog wheel 6, which is suitably secured upon the exterior thereof and meshes with and receives power from the pinion 7, which is driven by any suitable power. One of the bearings for said gearing is secured to one of said piers. The lower end of said kiln or retort terminates at the inner end of the hood 8, which is mounted upon the truck 9, which is adapted to travel on the tracks or ways 10, whereby the position of the hood may be changed with relation to the end of said kiln for any necessary purpose. The head or closed end of said hood is provided with two orifices, through one of which the fuel is introduced to the furnace by means of the blow pipe 11 from the fuel tank 12, and through the second of said orifices the pre-heated air, saved from the products is introduced into said furnace through the pipe 15. The upper end of said kiln, which is somewhat higher than the lower end thereof, projects into the base of the stack 13, the said stack being open and in communication with a material feed pipe 14, which projects through the base of said stack into the kiln for the purpose of charging the same. The discharge of the product at the lower end of the kiln is effected through an opening 17 shown in dotted lines in Fig. 1. The material thus discharged through said opening falls into a heat extractor through the funnel shape opening 23 at the top of the same as shown 85 in Figs. 1 and 2.

The interior construction of the heat extractor is shown in Fig. 2. The said extractor consists of a metallic cylinder composed of interior and exterior shells 24 and 25 respectively between which an air or water space 26 is formed. The interior cylinder incloses a space for the reception of the heated material charged therein from the rotary kiln. In the center of said space and coinciding in height to the cylinder 24 is an air chamber 27 which is connected with the air space 26 by the pipe 29. Air or water is introduced into the space 26 by means of the pipe 29 in which a controlling valve 30 is located, the said air or water being discharged in a highly heated condition from the heat radiated from the material in the central space of the heat extractor through the pipe 15 in which a controlling valve 32 is located. When it is desirable to utilize
pre-heated air in any operation, being conducted in the rotary kiln, the non-heated air enters the extractor through the pipe 29, as shown by the arrows in Fig. 2, traverses the exterior chamber 26, passes through the pipe 28 into the interior chamber 27, and thence merges in a highly heated condition through the pipe 15, whence it is conducted back into the hood of the kiln thereby assisting in the combustion taking place thereon. If desired to utilize the same for any other purpose, the pre-heated air or water discharged through pipe 15 may be conducted to another convenient point than that heretofore specified. The inlet and outlet pipes 29 and 15 respectively are much smaller in area than the chambers 26 and 27 shown in the drawings, so that the air or water entering and being discharged therefrom has a greater velocity and pressure than through the chambers where the rapidity of the flow of the same is greatly reduced.

The cylinder 24 terminates at the base in a cone shaped projection 33, which is provided with an opening 34 through which the product is discharged upon the buckets of the conveyor 18, which is adapted to carry the cooled product to a receiving bin 19. The contents of said conveyor are discharged into said receiving bin, and if necessary further cooled by a spray of water from the sprayer 20, which terminates the end of the water supply pipe 21. A car 22 is located below the receiving tank in position to receive the cooled product.

In Fig. 4 of the drawings I show a modified form of heat extractor in which two cylinders 24' are employed, differing in construction from that shown in Fig. 2 in that the modified form of extractor comprises a single cylinder instead of two, as shown in said Fig. 2. These cylinders are closed at the top by the ordinary bell and hopper mechanism 35 as shown, and the product of the kiln is introduced into said cylinders alternately by means of a chute, the direction of which may be changed depending upon which of the cylinders 24' is being charged from the rotary kiln, the bell and hopper mechanism being operated in the usual manner to effect the filling or charging. The discharge from said cylinders is accomplished by removing plates 36 which close the discharge opening in the bottom of the cylinders respectively, the said plates being held in place by bolts 37 and the swiveled bolt 38, or in any other suitable manner.

Air or water is introduced through the pipe 29' in the same manner as in the construction shown in Figs. 1 and 2, the admission thereof being controlled by the valve 30'. In this construction the air and water is brought into direct contact with the heated product charged into the different cylinders. The cylinders are connected at the top by the pipe 15', which unite in a main pipe 15' whereby the pre-heated air is conducted back, in case air is employed, into the rotary kiln or the heated water or air may be used for any other purpose, and may be carried off for further disposition to any convenient point. Valve 32' performs the same function as valve 32 in the construction illustrated in Fig. 2. When it is desired to discharge the contents of the rotary kiln, or a portion thereof into either of said cylinders 24' depending upon which of the cylinders are being charged, the bell and hopper mechanism is properly operated to permit the contents or a portion of the contents of the rotary kiln to be charged into said cylinder, and when the same is charged completely the bell is drawn up. The air or water admitted as heretofore specified comes into direct contact with the heated product just discharged into said cylinder, and is raised by contact therewith to a high degree of temperature, and passes out through the discharge pipe 15' as heretofore specified. The interior of the chambers 24' respectively is provided with baffle plates 40 for the purpose of preventing the products charged therein from passing into the pipes 29' and 15' respectively. After the products have been specially cooled with contact with air or water it is discharged into cars 22', placed upon tracks the same way, as shown in Fig. 1. In this form of my apparatus one of the chambers may be in condition for being charged while the other is cooling the product charged therein.

Having described my invention what I claim and desire to secure by Letters Patent is:

1. The herein described method of utilizing the heat contained in cement clinkers, and nodules formed from metalliferous masses, etc. which consists in discharging the said products from the receptacle in which they are heated and formed into a suitable chamber and passing a suitable heat absorbing medium through the same, charging similar products into a similar chamber for the purpose of heating the same, while the heat absorbing medium is being passed through the first chamber, and then passing a suitable heat absorbing substance through the said second chamber for the purpose of absorbing the heat, and then utilizing the heat absorbing medium as it goes from said chamber in any of the manners set forth.

2. The combination of a rotary kiln, a plurality of chambers into which the products formed in the kiln are charged, means for alternately introducing the charge into the chambers, means for alternately introducing the heat absorbing medium into the cham-
bers after said chambers have been heated by the charge, and devices substantially as described for discharging the contents of said chambers and withdrawing from each the heat absorbing medium and conducting the same to a point where it may be utilized.

In testimony, that I claim the foregoing as

my invention, I have signed my name in presence of two witnesses, this eleventh day of March, 1905.

TOM COBB KING.

Witnesses:

WILLARD PARKER BUTLER.

JOHN FRENCH.