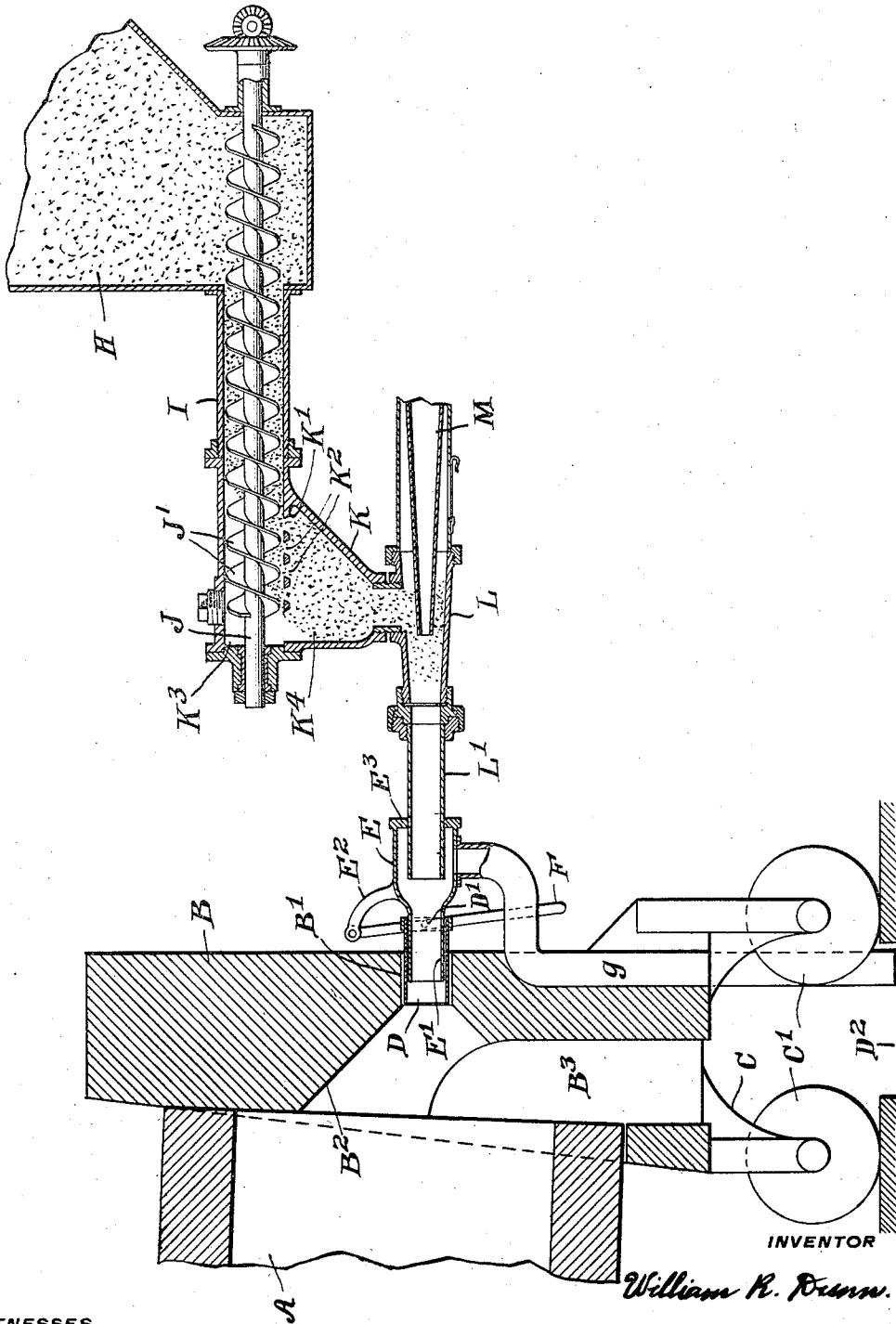


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 APPARATUS FOR HEATING FURNACES OR KILNS.
 APPLICATION FILED AUG. 25, 1909.

1,013,379.

Patented Jan. 2, 1912.



WITNESSES

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APPARATUS FOR HEATING FURNACES OR KILNS.

1,013,379.

Specification of Letters Patent.

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Application filed August 25, 1909. Serial No. 514,493.

To all whom it may concern:

Be it known that I, WILLIAM R. DUNN, a citizen of the United States of America, residing in Easton, in the county of Northampton, in the State of Pennsylvania, have invented a certain new and useful Improvement in Apparatus for Heating Furnaces or Kilns, of which the following is a true and exact description, reference being had to the accompanying drawing, which forms a part thereof.

My present invention relates to the means employed for heating furnaces or kilns of the type in which the fuel employed is pulverized coal and is blown into the combustion chamber of the furnace or kiln by an air blast, and the invention is particularly adapted for use in connection with the elongated rotary kilns of the kind used in the manufacture of hydraulic cement.

The object of the invention is to improve the means employed for heating furnaces or kilns of the type specified; in part, by providing simple and effective means by which the character of the flame and its location can be controlled and regulated to respond to the varying conditions with which the furnace may operate; and in part, by the provision of novel means by which the air passing into the combustion chamber with the powdered coal is preheated.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, and the advantages possessed by it, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described one of the forms in which the invention may be embodied.

The one figure of the drawing shown is a sectional elevation of a portion of a rotary kiln and the mechanism for blowing powdered fuel into the kiln.

In the drawing, A represents the body of the kiln of the usual elongated rotary type, slightly inclined to the horizontal, in common use in the manufacture of hydraulic cement.

B represents the end wall of the kiln at

the end where the fuel is admitted. The end wall B has a perforation formed through it comprising a cylindrical outer portion B' which is located substantially in line with the axis of the body of the kiln, and a conical inner portion B² connecting with the inner end of the cylindrical portion B'. The end wall B may be supported on the usual frame C and wheels C' and is formed with a vertical passageway B³ intersecting, in the form shown, at its upper end with the conical cavity B², and terminating at its lower end above the mouth D² of the usual clinker pit.

At the outer side of the end wall B, and in alinement with the cylindrical portion B' of the perforation through the end wall, is located a hollow member E terminating in a cylindrical portion E' over which is fitted telescopic fashion a pipe section or conduit member D which extends into the aperture B' with its inner end in proximity to the inner end of the cylindrical perforation portion B'. The pipe D may be axially adjusted to vary the position of its inner end relative to the inner surface of the wall B by means of a hand lever F pivotally connected to the pipe D at D', and pivotally connected to an arm E² projecting from the body of the member E. In the form shown the fuel is blown into the member E through a pipe section L' projecting through the outer end wall E³ of the member E. The pipe section L' is appreciably smaller than the internal diameter of the body of the member E and the latter has connected to it a conduit g, the lower end of which projects into the mouth D² of the clinker pit.

The mechanism employed for blowing the powdered coal through the tube L' may be of any suitable form, though I prefer the mechanism shown, which, however, forms no part of the present invention, but on the contrary is described and claimed in my Patent No. 954,944, granted April 12, 1910. This apparatus comprises a hopper H from which the powdered coal is carried at a regulated rate through a pipe section I by means of a rotary conveyor J having spiral conveyor ribs J'. The pipe I communicates with the cylindrical chamber K² of a hous-

ing member K formed also with a chamber K⁴ below the chamber K³. Chambers K³ and K⁴ are in communication with each other through distributed ports K² formed in the lower wall K' of the chamber K³, so that the coal is fed into the upper end of the chamber K in a number of fine streams and because of its flocculent nature the particles of coal separate from one another in the chamber K⁴ through which they pass more or less slowly into the pipe section L. An air blast nozzle M projects into the pipe L and may be connected to any suitable air moving device (not shown), for supplying air at the necessary pressure to carry the coal out of the pipe section L and through the section L' which forms an extension of the pipe section L into the chamber E. The stream of air and coal passing into the chamber E from the pipe section L' has sufficient velocity to cause a considerable additional amount of air to be drawn into the chamber E through the conduit g. The air drawn through the conduit is drawn from the mouth of the cylinder pit and of course is highly heated. In consequence, the air and coal passing into the kiln proper is preheated to an advantageous extent which facilitates the proper and efficient combustion of the coal within the kiln. The combustion of the coal, those skilled in the art will understand, begins when it is heated to a certain temperature known as the temperature of ignition. The pipe section D is formed usually, if not always, of metal, and in any case is necessarily maintained at a substantially lower temperature than the inner surface including the conical wall B² of the furnace end wall B to prevent the section D from being destroyed by the heat to which it is subjected. Preferably, as shown, the member D does not entirely fill the perforation portion B', but has its outer surface separated from the inner curved surface of the perforation portion so that a cooling film of air may be drawn into the furnace along the outer surface of the pipe section D. When the pipe D extends into the furnace beyond the inner end of aperture portion D', the air and coal issuing from the pipe D is less quickly heated than when the air and coal issue from the pipe D in close proximity to the wall of the conical aperture portion B². In consequence, the adjustment of the pipe section D determines the point in the kiln at which combustion begins, and I have found in actual operation that the shape of the flame is also effected by the adjustment of the member D. When this member is projected into the furnace some distance beyond the aperture portion B² the flame is actually longer, that is, combustion proceeds less rapidly and is continued in a portion of the furnace more remote from the end wall B, than when the pipe D projects a

shorter distance into the kiln. I have also found that the adjustment of the pipe D which will give the best results under one condition of operation will not give the best results under different conditions of operation. Among the varying conditions which I find need to be compensated for by adjusting the pipe D, are the temperature at the mouth of the clinker pit when the connection g is employed, the stack pressure, the pressure of the air passing through the nozzle or pipe D, the pressure of, and moisture contained in, the atmosphere, and the character of the coal; that is its dryness and fineness.

The arrangement shown for preheating the blast and fuel possesses important advantages because of the relative shortness of the pipe g and consequent small frictional opposition to the passage of hot air through it, and also because the hot air from the clinker pit is admixed with the blast and fuel in close proximity to the point of discharge into the kiln. In consequence there is little waste of heat of the air drawn from the clinker pit through conduction or radiation and no mechanism is subjected to the action of hot air and gases drawn from the clinker pit which are of a character to be injured thereby.

In accordance with the provisions of the statutes I have herein described the best form of my invention now known to me. It will be readily apparent to those skilled in the art, however, that changes may be made in the form of the apparatus disclosed without departing from the spirit of the invention, and that certain features of the invention claimed may be advantageously employed under some circumstances without a corresponding use of other features, and I do not wish the claims herein made to be limited to the particular form of apparatus herein-after disclosed more than is made necessary by the state of the art.

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

1. The combination with the wall of a kiln having a perforation through it, comprising a cylindrical outer portion and a conical inner portion, of means for blowing powdered fuel and air into the kiln through said perforation, including a pipe section or burner nozzle extending into said perforation and adjustable in the direction of its length to vary the relation between the inner end of the section and the inner surface of the kiln wall, said burner nozzle having its outer surface separated from the inner wall of said perforation by a space through which air may pass into said kiln.

2. In a cement kiln, the combination with the kiln proper and the clinker pit, of means for blowing powdered coal into the kiln,

comprising in combination a blast nozzle
through which air under pressure admixed
with the powdered coal issues, a chamber
surrounding said nozzle, a burner nozzle ex-
5 tending into the kiln through which the fuel
may be blown from said chamber into said
kiln, means for adjusting said nozzle in the

direction of its length, and a conduit ex-
ternal to the kiln leading directly from the
clinker pit to said chamber.

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Witnesses:

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