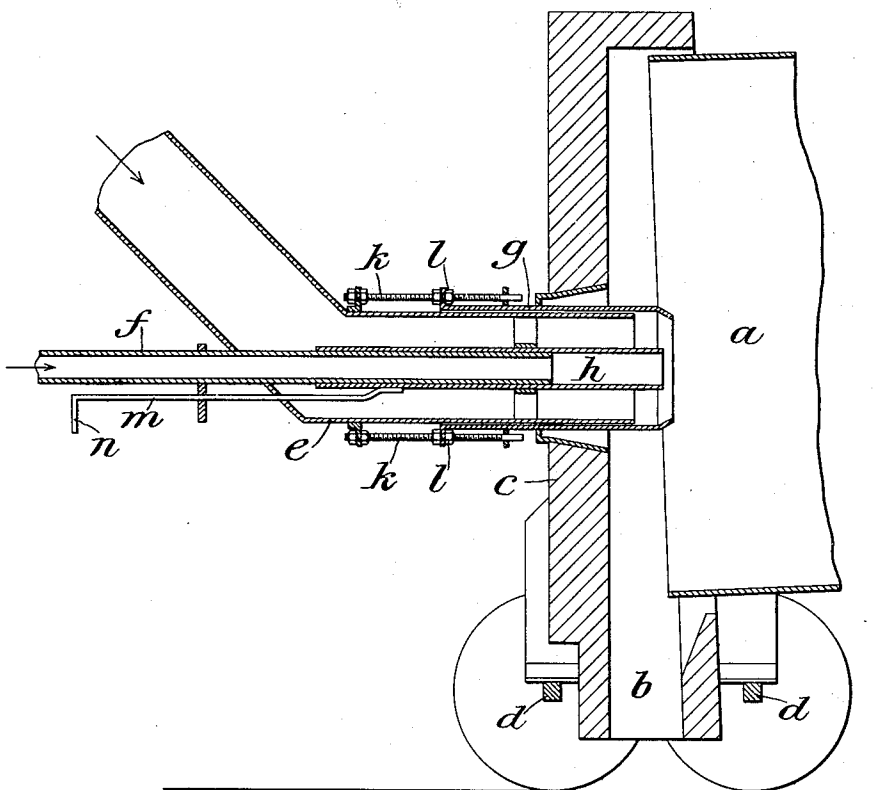


No. 824,728.

PATENTED JULY 3, 1906.

P. LARSEN.
PROCESS OF REGULATING COMBUSTION.
APPLICATION FILED MAR. 30, 1905.



Witnesses:

Chas. R. King.
Maur. E. Vane.

Inventor:

Poul Larsen
by Redding Kiddle Greeley
Attys.

UNITED STATES PATENT OFFICE.

POUL LARSEN, OF COPENHAGEN, DENMARK.

PROCESS OF REGULATING COMBUSTION.

No. 824,728.

Specification of Letters Patent.

Patented July 3, 1906.

Application filed March 30, 1905. Serial No. 252,850.

To all whom it may concern:

Be it known that I, POUL LARSEN, a subject of the King of Denmark, residing in the city of Copenhagen, in the Kingdom of Denmark, have made certain new and useful Improvements in Processes of Regulating Combustion, of which the following is a specification, reference being had to the accompanying drawing, forming a part hereof.

10 In order to regulate the combustion in a furnace it is customary to provide means for varying the amount of fuel or air or fuel mixture introduced therein, whereby the work done by the furnace at any given moment
15 depends upon the amount of fuel in combustion at that moment. I have discovered that in many furnaces the combustion may be regulated between certain limits by varying the point or points of introduction into the furnace of the fuel, air, or both, or the fuel mixture, as the case may be. Particularly is this the case in a rotary furnace, such
20 as is commonly employed in the manufacture of cement. Such a furnace generally has a long cylindrical rotating member slightly inclined, in which the raw material is introduced at its higher end and flows down through the cylinder to the lower end, from which it is discharged, and through which
25 end the fuel is introduced. In such furnaces if the clinkering of the cement is not being properly effected I have discovered that by moving the point of introduction of the fuel or fuel mixture farther into the cylinder the
30 same effect is produced as if the quantity of fuel or fuel mixture were increased, and vice versa. I have also discovered that the introduction of the fuel and air separately into the cylindrical combustion-chamber and the
35 varying of the points of introduction of the air and fuel independently of each other produces a corresponding regulating effect. Moreover, there are other advantages in introducing the air and fuel separately into the
40 combustion-chamber in that it permits the quantity of fuel mixture to be regulated with great accuracy and in that the air may be heated to any degree of temperature without danger of explosions, as occur when the air
45 and fuel are heated together or when the fuel is introduced through the same conduit with the highly-heated air.

In the accompanying drawing, there is illustrated a portion of a furnace in which

the invention may be practiced, although, as 55 will be clear, it may be carried out in other ways than the drawing suggests.

Said drawing represents in central section the lower end of a rotary furnace, showing the tubes or pipes for the introduction of 60 fuel and air.

The combustion-chamber *a* of said furnace is cylindrical in construction and may be of any suitable length. Only the lower end of this chamber is shown; but it will be 65 understood that the upper end is adapted to receive the raw material, which, as the cylinder rotates, gravitates toward the lower end of the chamber, where it is discharged through an opening *b* in a hood *c*, which caps 70 said lower end. Suitable means, which it is unnecessary to illustrate, are provided to effect the rotation of the cylindrical chamber *a*, and the hood *c* is rigidly secured to the foundation or supports for the furnace, in 75 the present case to trucks *d*. Through the hood *c*, preferably at its central portion, the means for supplying the fuel or fuel mixture is introduced and extends into the combustion-chamber *a*. In the present instance the 80 fuel and air are introduced separately, the air entering through a pipe or conduit *e* and the fuel through a pipe or conduit *f*, which is within the pipe or conduit *e* and is preferably concentric therewith. 85

In order to vary the points of introduction of the air and fuel, each of the pipes *e* and *f* is provided with extensions or sliding nozzles *g* and *h*, respectively, each of which is slightly 90 larger than its corresponding pipe, so as to fit over the end of the same and be movable back and forth thereon. The backward and forward movement of the nozzle *g* may be effected by rods and nuts *k* and *l*, respectively, or in any other suitable manner, and 95 for the corresponding movement of the nozzle *h* a rod *m* and a handle *n* may be provided.

In accordance with the invention the air is heated to the desired temperature and introduced through the pipe *e* into the furnace, 100 while the fuel, if solid, is pulverized and introduced into the furnace separately through the pipe *f*. When the air and fuel are discharged, they form a jet, the shape of 105 which depends upon the relative positions of the two nozzles *g* and *h*. The hot blast produced by the burning jet impinges upon the

material in the furnace which is traveling toward the jet and, in the case of cement, effects the clinkering of the same.

It will be clear that by moving the nozzles 5 farther into the furnace, so that the combustion will occur farther up in the cylindrical chamber *a*, the clinkering process, in the case of cement, will begin nearer the entrance of the raw material. If, therefore, it is discovered 10 that the cement is not being delivered from the lower end of the combustion-chamber properly clinkered, the nozzles may be so adjusted that the clinkering shall begin at the proper point in the chamber, whereby 15 when the cement is eventually delivered therefrom it will be properly clinkered.

It will be understood that various changes may be made in the apparatus illustrated herein for carrying out the invention without

departing from the spirit of the invention. It 20 will be further understood that this invention is not limited to rotary furnaces, to which reference has been made specifically hereinbefore, but may be used in furnaces generally.

I claim as my invention— 25

The process of regulating combustion in a furnace which consists in moving the point of introduction of fuel or fuel mixture farther into the furnace or vice versa, and changing the relative position of the openings 30 through which air and fuel are separately introduced, substantially as described..

This specification signed and witnessed this 11th day of March, A. D. 1905.

POUL LARSEN.

In presence of—

EMIL RÜSAGER,
CHR. ENGELHART.