No. 842,848. PATENTED JAN. 29, 1907.

C. A. MATCHAM.

PROCESS OF BURNING CEMENT.

APPLICATION FILED DEC. 28, 1906.

2 SHEETS—SHEET 1.

Fig. 5.

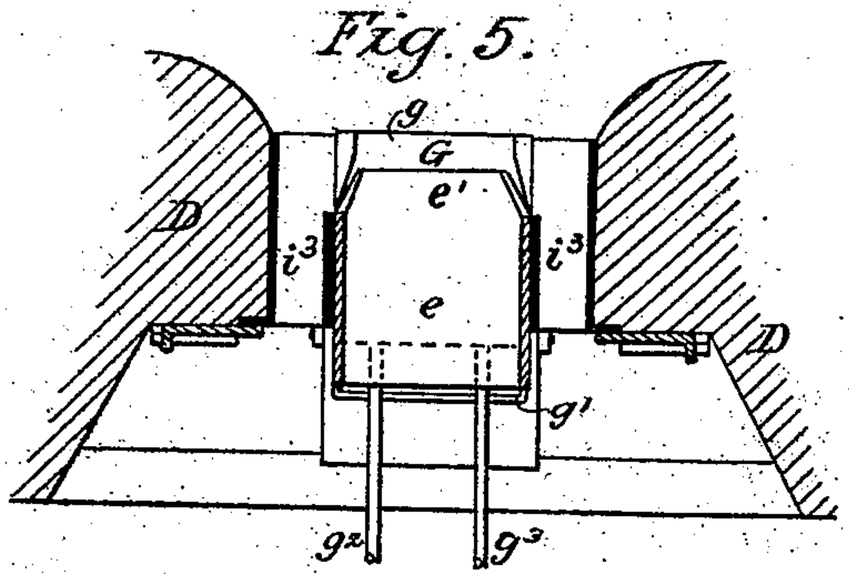

Fig. 2.

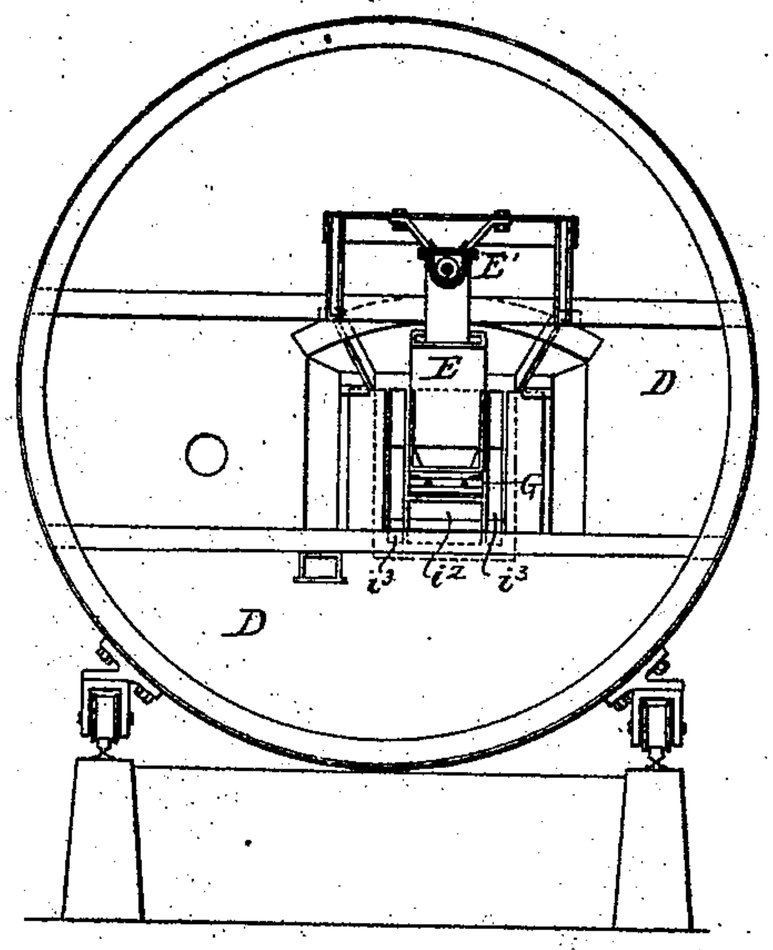

Fig. 4.

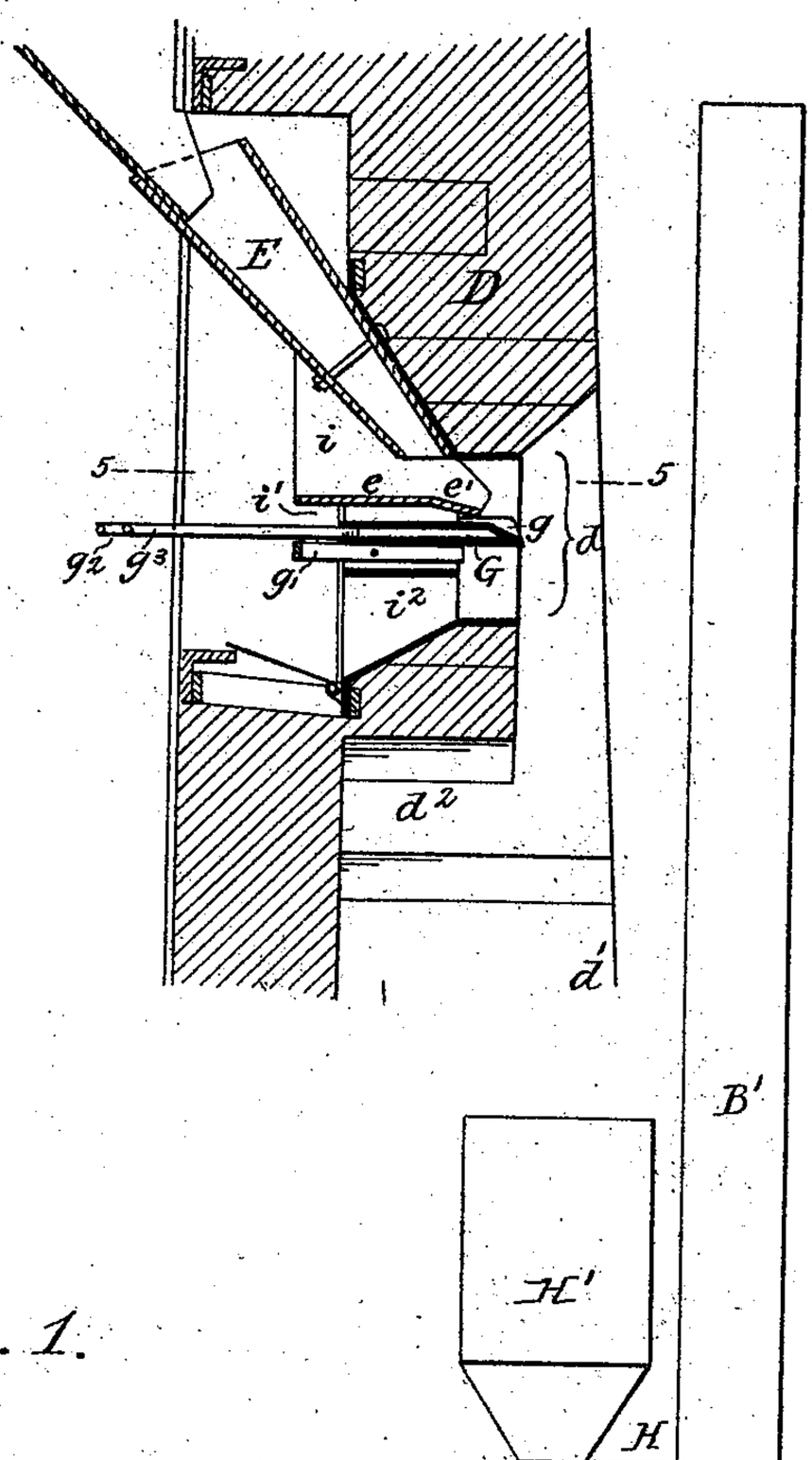

Fig. 1.

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Walter Collier

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2 SHEETS—SHEET 2.

Fig. 3.

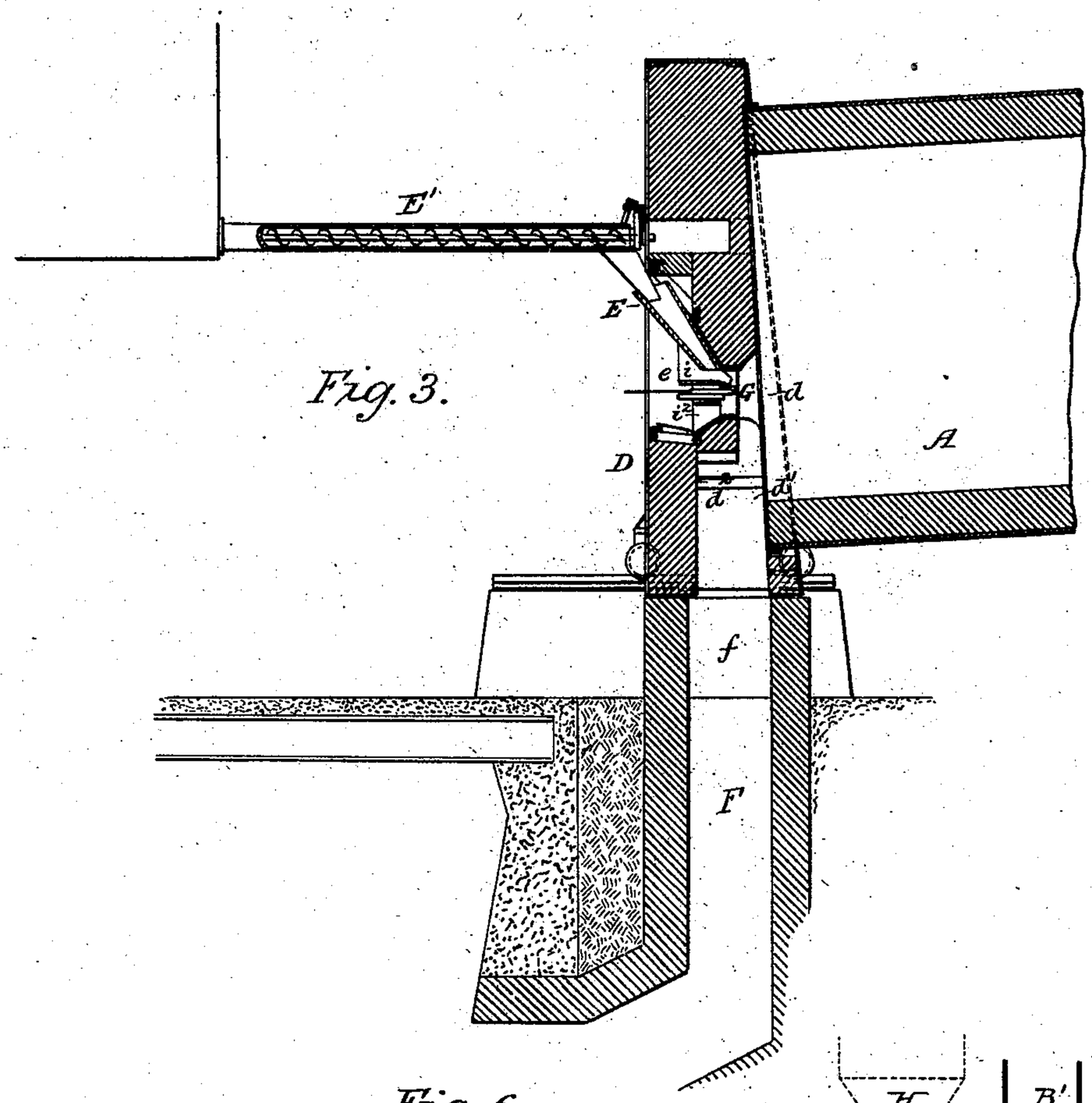
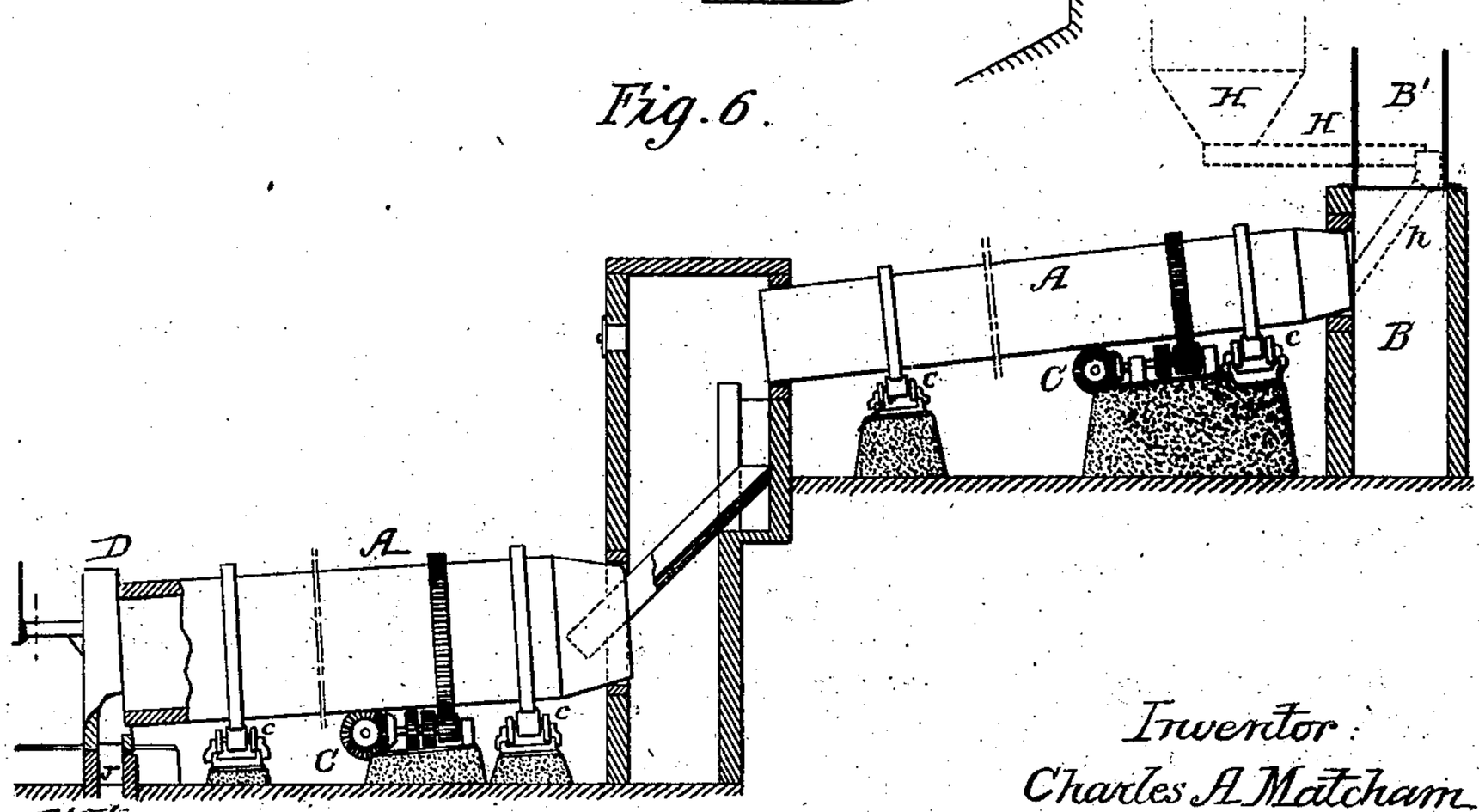


Fig. 6.



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UNITED STATES PATENT OFFICE.

CHARLES A. MATCHAM, OF ALLENTOWN, PENNSYLVANIA.

PROCESS OF BURNING CEMENT.

No. 842,848. Specification of Letters Patent. Patented Jan. 29, 1907.

Application filed December 28, 1906. Serial No. 349,809.

To all whom it may concern:

Be it known that I, CHARLES A. MATCHAM, a citizen of the United States, residing in Allentown, Pennsylvania, have invented certain Improvements in the Processes of Burning Cement, of which the following is a specification.

My invention relates to certain improvements in the process of burning cement.

The object of the invention is to burn the material to be treated more evenly than has heretofore been done and to reduce the deleterious effect of the flame upon the fire-brick lining by causing the products of combustion to be drawn into the rotary or other kiln by the natural draft of a chimney, in contradistinction to the usual practice of using a forced draft for this purpose.

My invention is particularly adapted for use in connection with a rotary kiln employing fuel in the form of finely-pulverized coal.

By forcing the fuel into the kiln under pressure I find that either the fuel-feed must be so regulated as to produce a flame which will not impinge upon the interior surface of the kiln or else the material or the burner must be so arranged that the flame will impinge upon the surface of the kiln. In the former case the process is slow, owing to the fact that the material is burned by radiation. In the latter case there is such an intense heat at the point of impingement upon the kiln and the flame strikes the material or the lining of the kiln with such force that the lining is rapidly destroyed and the product is unevenly burned. Furthermore, the intense heat at this point will overburn the product unless the most careful watch is maintained during the process of burning.

By the process hereinafter described I am enabled to more evenly burn the material than heretofore, and as there is no forced draft the lining of the kiln is not subjected to an impinging flame, the fuel being drawn into the furnace by the natural draft of the stack. The flame being carried through the kiln by the draft of the stack is caused to pass gently in contact with the material being clinkered, as well as with that from which the carbonic-acid gas is being driven off. There is therefore no tendency for the flame to impinge upon the material or lining at any given point, as an impinging flame is entirely obviated. The flame is what, in fact, may be termed a "sliding" flame.

In the accompanying drawings, Figure 1 is a vertical section of a rotary kiln and stack, illustrating my invention. Fig. 2 is an end elevation of the hood at the discharge end of the kiln. Fig. 3 is an enlarged view of a form of fuel-feeder which I prefer to use in carrying out my invention. Fig. 4 is an enlarged sectional view of part of Fig. 3. Fig. 5 is a sectional view on the line 5 5, Fig. 4; and Fig. 6 is a view illustrating another form of kiln in which my process may be carried out.

In the above drawings, A is a rotary kiln of the ordinary type mounted on suitable rollers *c c* and driven by the ordinary mechanism C.

B is the back hood, and D is the front hood, respectively closing the ends of the rotary kiln A. Mounted on the back hood B is a stack B′ of such a height and diameter that it will cause a sufficient draft in the kiln as to not only draw the finely-powdered coal into it, but will also produce the desired sliding flame throughout the entire length of the kiln to the stack.

The height and diameter of the stack will vary with the varying lengths and diameters of the kiln; but the kilns and stacks must be so proportioned that the natural draft will be sufficient to draw the powdered coal into the kiln and to produce the desired flame.

I have obtained very good results with a kiln eighty feet long, five feet eight inches internal diameter, having a stack ninety feet high and four feet internal diameter, using a burner as proportioned in the drawings, although the proportions of both kiln and burner may vary with the material under treatment and with the quality of the coal used.

In the hood D is an outlet *d′* for the material, which connects with the passage *f*, communicating with the pit F.

E is an inclined chute which enters an opening *d* in the front hood D, and this chute communicates with a conveyer E′, in the present instance consisting of a trough, in which is mounted a screw driven in any suitable manner for conveying the coal from a bin to the chute in a practically uninterrupted stream. Directly under the chute is a plate *e*, with an inclined lip *e′*, and directly under this plate in the present instance is a plate G, having a beveled edge *g*. This latter plate is adjustably mounted on a pivoted frame *g′*, so that it can be moved to regulate the point

of discharge of the fuel, and is preferably made hollow. Attached to said plate are inlet and outlet water-pipes g^2 and g^3, so that water will freely circulate through it, as it will be understood that this plate may project into the furnace to such an extent as to become highly heated.

The fuel-feeder is provided with air-passages i, i', and i^2, while at each side of said feeder are other air-passages i^3. The flow of air through the passages i^2 and i^3 may be regulated by suitable dampers as desired.

By the above-described arrangement the proper volume of air at normal temperature can be drawn into the kiln with the powdered coal. This air alone in many instances is not sufficient to produce a proper combustion of the fuel; and I therefore extend the outlet-opening d' to form a deep flue d^2 in the lower part of the hood D, said flue extending from the pit-passage f to a point directly under the fuel-feed opening. This flue allows for a large volume of heated air from the clinker-pit to be drawn into the kiln by the natural draft at a point directly under the incoming powdered fuel, so that it mingles with the incoming cool air and bodily supports the fuel, producing a perfect flame for the burning of the cement as it passes into and through the kiln.

The construction of the front hood and the fuel-feeding device are fully set forth and claimed in an application for patent filed by me December 31, 1906, Serial No. 350,215, and I therefore lay no claim to the said construction of the hood and burner in the present application.

The material is fed into the rear end of the kiln through a chute h, connected to a conveyer H, preferably of the screw type, which removes material from a bin H', situated at any convenient point, it being understood, however, that the material may be fed into the kiln by any other suitable mechanism.

It is not necessary that a single-cylinder kiln should be used in carrying out my invention, as a two-cylinder kiln may be employed, as shown in Fig. 6 and as set forth in my application for patent filed August 22, 1906, Serial No. 331,595, without departing from the essential feature of said invention.

In carrying out my improved process the material is fed into the kiln in definite quantities through the chute h while the kiln is slowly rotated, and the fuel is fed in given amounts through the chute E, so as to fall in front of the air-inlet openings. The natural draft at the stack end of the kiln will cause air to be drawn in through the opening d, carrying with it the finely-divided fuel and at the same time causing a relatively large volume of heated air to pass from the pit through the flue d^2 to a point directly under the fuel-inlet opening d. A flame will thus be immediately produced, being drawn through the kiln in a spiral path and having a sliding contact with the material being treated and with the walls of the kiln. This results in a more even burning of the material being calcined than by any forced-draft system, and instead of burning out the fire-brick lining, as is the tendency of a forced-draft flame, which impinges directly upon the material being treated, it rather avoids such action.

While I prefer to use a high stack to produce a natural draft, other means may be used at the stack end of the kiln to produce an induced draft, and while I have used the term "air" throughout the specification and claims this must be understood to cover mixed gases or other gas.

I claim—

1. The process herein described of burning cement in a substantially horizontal kiln, said process consisting in feeding the cement material into one end of the kiln and allowing it to flow from the inlet end to the discharge end thereof, feeding powdered fuel to the kiln, creating at the inlet end of the kiln a draft through said kiln from the discharge end to the inlet end thereof sufficient to draw into the kiln the powdered fuel and a volume of air, the flame being drawn in a substantially straight path through the kiln in contact with the cement material without materially disintegrating the lining thereof, substantially as described.

2. The process herein described of burning cement in a substantially horizontal kiln, said process consisting in feeding the cement material into one end of the kiln, creating at the inlet end of the kiln a draft through the kiln from the discharge end to the inlet end thereof, and thereby simultaneously drawing into the discharge end of the kiln a stream of powdered fuel, a volume of air at normal temperature, and a relatively large volume of heated air, the flame being drawn through the kiln in contact with the cement material without materially disintegrating the lining of the kiln, substantially as described.

3. The process herein described of burning cement in a substantially horizontal kiln, said process consisting in feeding the cement material into one end of the kiln, creating at the stack end of the kiln a draft through the kiln from the discharge end to the stack end thereof, drawing into the discharge end of the kiln by said draft a stream of powdered fuel with a volume of air at normal temperature and simultaneously introducing a relatively larger volume of heated air directly under the incoming powdered fuel and air, thereby immediately forming a combustible mixture with the fuel as this enters the kiln, substantially as described.

4. The process herein described of burning cement in a substantially horizontal kiln, said process consisting in creating a draft at

the stack end of the kiln, feeding powdered fuel in a relatively dense mass directly into the kiln and drawing in a relatively large volume of heated air directly under the powdered fuel so as to spread and support said fuel and carry it into the combustion zone of the furnace, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES A. MATCHAM.

Witnesses:

WILLIAM E. BRADLEY,

JOS. H. KLEIN.