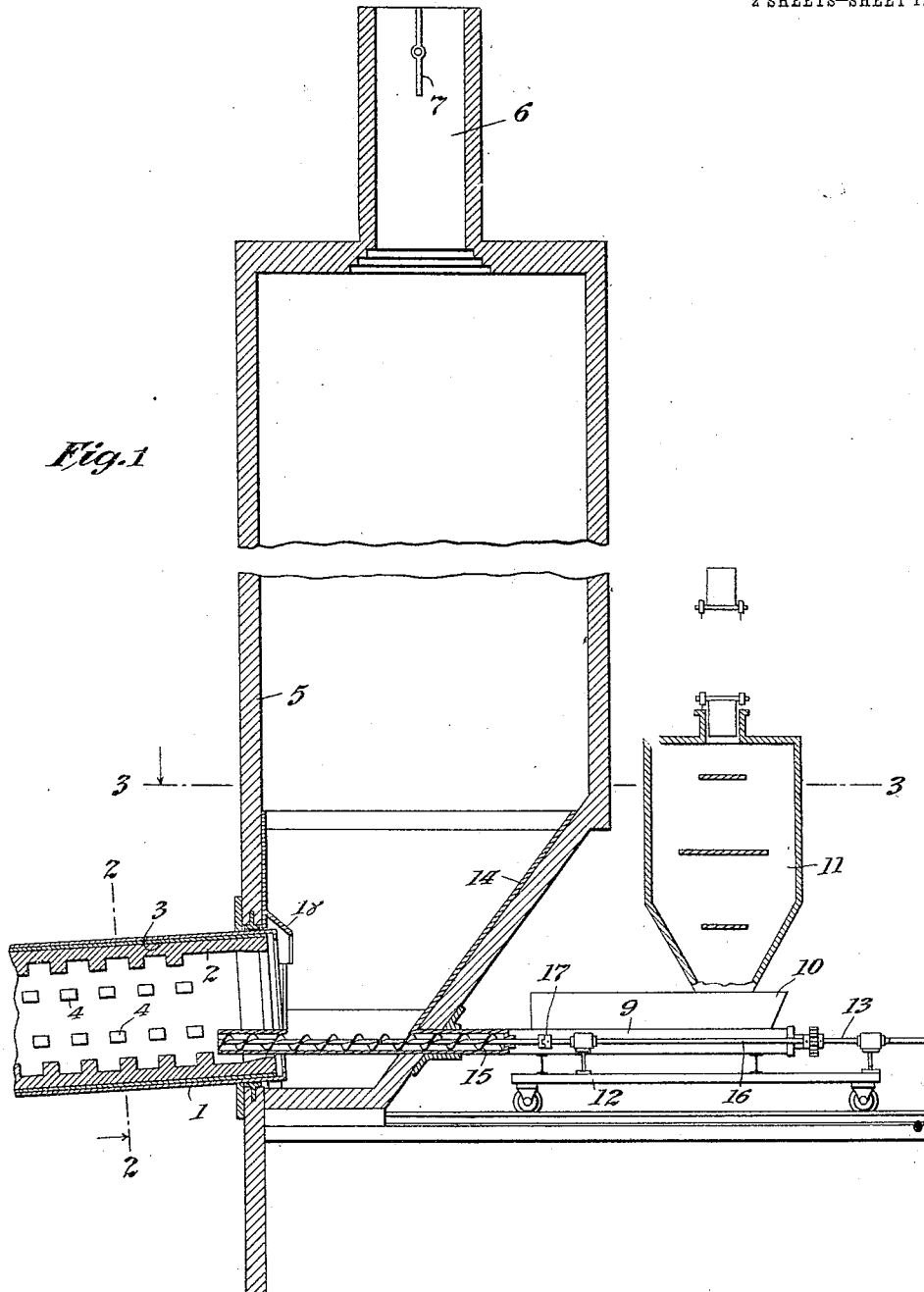


T. A. EDISON.
 CEMENT BURNING KILN.
 APPLICATION FILED JAN. 27, 1906.

1,065,597.

Patented June 24, 1913.

2 SHEETS—SHEET 1.



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Fig. 2

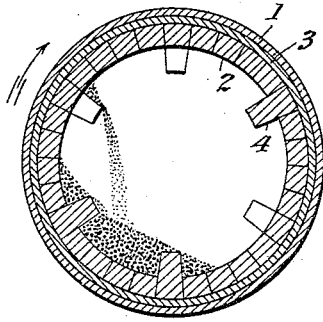


Fig. 4

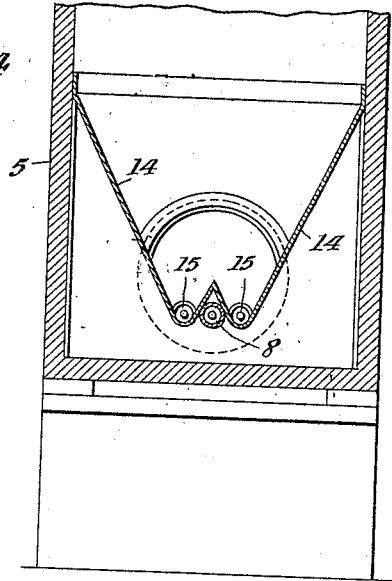
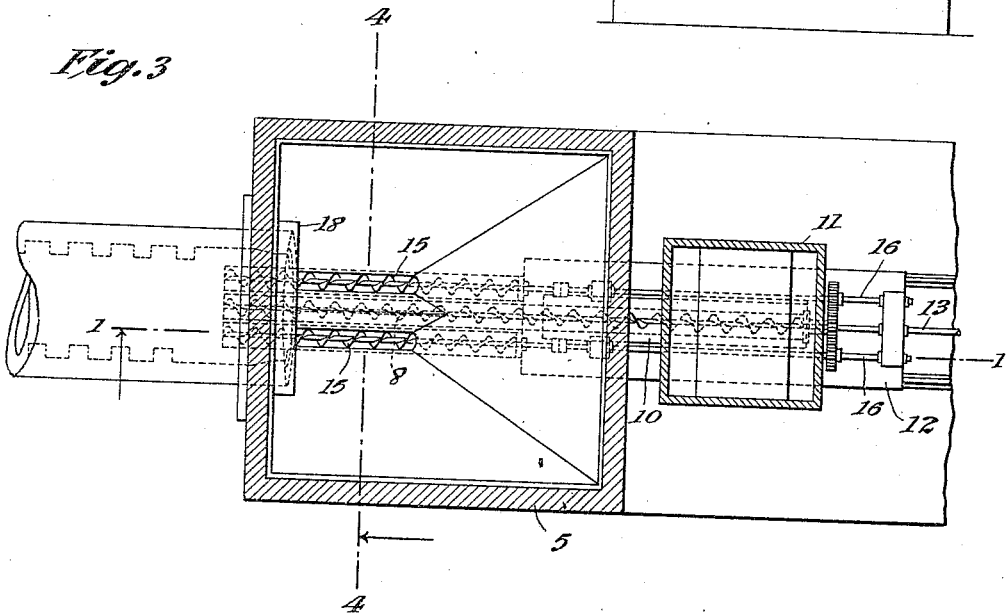


Fig. 3



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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, ORANGE, NEW JERSEY.

CEMENT-BURNING KILN.

1,065,597.

Specification of Letters Patent. Patented June 24, 1913.

Application filed January 27, 1906. Serial No. 298,270.

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, residing at Llewellyn Park, Orange, county of Essex, and State of New Jersey, have invented certain Improvements in Cement-Burning Kilns, of which the following is a description.

My present invention relates to cement burning kilns of the type, wherein a long rotary slightly inclined tubular burner, lined with firebrick, is supplied with pulverized cement material at its upper end, so as to be fed through the burner by reason of its rotation and inclination, the kiln being heated by one or more streams of burning pulverized fuel, forced into the burner at its lower end by compressed air. A kiln of this type is described and claimed in my Patent No. 802,631 dated October 24th, 1905. With kilns of the type referred to, considerable heat is lost in the exit gases which pass up the stack at a high temperature, since the material occupies but a small part of the interior of the kiln and the opportunity of abstracting heat from the burning fuel and products of combustion and decomposition is comparatively limited. Furthermore, with present cement kilns, the bore of the tubular burner is relatively smooth, so that the rotation carries the material for only a short distance up the sides, whereupon the material slides down again and slightly forward, due to the inclination of the kiln, in this way progressing slowly throughout the length thereof. In these operations the load of material while still in its pulverulent condition, undergoes very little bodily change, the upper portions receiving an undue proportion of the heating effect and the inner and bottom portions of the mass being heated largely by conduction and by radiation from the kiln walls. Obviously, the material would be much more perfectly heated and with higher fuel economy, if the load of material were kept in bodily movement, so as to present all portions thereof to the direct heat of the burning fuel. As I have pointed out, in my patent above referred to, as one of the objects of the invention therein claimed, a very marked economy in fuel burned can be effected by materially increasing the length of the kiln, and I have suggested in that patent the use of a kiln upward of 100 feet in length, as distinguished from the

prior kilns, which were generally of a standard length of sixty feet. My present improvements can be, and preferably are, used with very long kilns, as suggested in my said patent, but they are not limited to such use and may be effectively employed with rotary kilns of any desired length. In the operation of rotary kilns a considerable loss of material occurs, irrespective of the length of the burner, due to the fact that the rapid draft of the products of combustion and chemical decomposition through the kiln carries more or less of the very light unburned material up through the stack and the material thus lost slowly settles in all directions around the kiln house. It is important that this loss of material should be overcome. In my said patent, I reduce the loss of material from this source by introducing the material within the kiln by means of a conveyer arranged close to the bottom of the kiln, and which packs the material therein in successive increments, so as to withdraw the material as much as possible from the effects of the draft, but nevertheless, even when this expedient is resorted to, an objectionable loss is incurred.

The objects of my present invention are, first, to provide a rotary kiln, which will effect very considerable economies in the fuel burned by materially reducing the temperature of the stack gases; and second, to provide a rotary cement kiln in which the loss due to the carrying off of unburned material with the stack gases will be considerably reduced.

To this end, the invention consists in providing the kiln on its interior (for that portion of its length in which the material remains in a pulverulent or granular condition) with projecting ledges, shoulders, or ribs, preferably forming part of the lining, and by which material from the bottom of the load will be carried up the sides and allowed to fall off upon the top, thereby presenting all portions of the load successively to the direct heat, and furthermore, the material successively falling upon the top of the load will pass directly through the column of burning fuel or products of combustion, to further economize the heating effect and reduce the temperature of the stack gases; and second, combining with such a kiln, a settling chamber into which the upper end of the kiln leads, and of such a size as to reduce the velocity of the draft to a sufficient

extent as to permit any material carried out of the kiln by the draft to be deposited by gravity in said settling chamber and be returned to the kiln for burning therein by gravity, or by appropriate feeding mechanism.

I am aware that it has been heretofore proposed to form a kiln on more or less of the length of its interior with projecting ribs or shoulders for the purpose of increasing the area of material presented to the products of combustion, but if such an expedient were alone relied upon, the very much greater loss in material carried out of the stack would more than offset any advantage secured in the way of economy of fuel burned. By combining the kiln with a settling chamber, as I now propose, I secure the increased economy in fuel burned, while at the same time I prevent loss, due to the carrying of any of the material out of the kiln with the escaping gases.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification, and in which—

Figure 1, is a longitudinal sectional view on the line 1—1 of Fig. 3, through the upper end of the kiln, showing the settling chamber, Fig. 2, a cross-sectional view on the line 2—2 of Fig. 1, Fig. 3, a horizontal sectional view on the line 3—3 of Fig. 1, and Fig. 4, a vertical section on the line 4—4 of Fig. 3.

In all of the above views, corresponding parts are represented by the same numerals of reference.

The kiln is formed preferably of a shell 1, composed of cast iron sections with a fire-brick lining 2, a layer 3 of asbestos being preferably interposed between the lining and shell, as I describe in my said patent. This kiln is inclined slightly, and is rotated by any suitable source of power. Any suitable provision is made for heating the kiln in the usual way. Projections or shoulders 4 are formed on the interior of the kiln, preferably by extending certain of the firebricks (as shown in Fig. 2) and when this expedient is adopted, these projections are preferably located in a spiral arrangement, as shown in Fig. 1. It will of course be understood that any other projections, shoulders, ribs or ledges may be employed for the purpose. Preferably, the projections 4 are located only in the upper part of the kiln where the temperatures are not excessively high and where the material occurs in a pulverulent or granular condition, although they might be arranged throughout the entire length of the kiln, if desired. At its upper end, the kiln opens into a settling chamber 5, the diameter of which is very much larger than that of the kiln, so as to reduce the velocity of the draft and permit the fine particles of cement ma-

terial to settle by gravity. From the upper part of the settling chamber leads the stack 6, preferably having a damper 7 therein for regulating the draft.

The cement material is fed to the upper end of the kiln by a conveyer 8, the barrel 9 of which is connected to a trough 10, and above the latter is mounted a bin 11, containing the material, as I describe in my said patent. The conveyer 8 is mounted on a carriage 12, so that it may be withdrawn from the upper end of the kiln for any purpose. Said conveyer is operated by a shaft 13. The bottom of the settling chamber 5 is preferably formed with a double hopper 14, in which are mounted on opposite sides of the conveyer 8, two conveyers 15—15, leading also into the upper end of the kiln and operated by shafts 16, connected by gearing as shown (Fig. 3) with the shaft 13. If desired, the conveyers 15—15 may be also mounted on the carriage 12, or they may be permanently located in the bottom of the settling chamber, in which case a clutch 17 may be employed to connect or disconnect each of the shafts 16 from the conveyers 15 when the carriage is moved toward or away from its operative position. If desired, a shield or apron 18 may be mounted over the upper edge of the kiln to prevent material from escaping through the joint between the kiln and the settling chamber. I prefer to make use of one or more auxiliary conveyers 15, for returning to the kiln the fine particles deposited in the settling chamber, particularly when the amount of material burned is great, necessitating a very rapid draft and incurring the carrying into the settling chamber of considerable quantities of fine material. It will be understood, however, that this return of the material deposited in the settling chamber may be effected by the same conveyer 8 that feeds the main body of cement material, or that such return may be secured by gravity. In operation, the presence of the projections, shelves, or ledges 4 within the kiln, will carry up material from the bottom of the load (as shown graphically in Fig. 2) and let it fall upon the top of the load, so as to pass through the column of escaping combustion gases and absorb heat from the latter. The turning over of the load of material in this way also results in all portions of it being subjected to the direct effects of the heat, so that an additional economy for this reason will result. Of course, this operation would result in a larger amount of the fine particles being carried out by the draft than with the ordinary kilns, but by employing the settling chamber 5, practically all of the material withdrawn from the kiln by the draft will settle by gravity, owing to the retardation in the speed of the escaping gases, and the

material thus separated will deposit in the bottom of the settling chamber and be returned to the kiln.

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

10 1. In cement burning apparatus, the combination with a rotary kiln, of a settling chamber with which the upper end of the kiln connects, a hopper in said settling
15 chamber, a conveyer running from the bottom of the hopper to the bore of the kiln for returning to the kiln the material deposited by the settling chamber, a main conveyer outside of the hopper and leading into
20 the kiln for feeding material thereto, and means for adjusting the position of the main conveyer, substantially as set forth.

2. In a rotary kiln, a stack provided with
25 a base having a chamber adapted to receive and to retain matter dropped from the stack, a kiln-tube connected with the base and ter-

minating with its interior portion slightly below the chamber thereof, and movable means for positively conducting the descending matter from the stack-flue directly into said kiln. 25

3. In a rotary kiln, a kiln-tube, a stack having a base provided with a chamber, the walls of the bottom portion whereof are downwardly inclined, a conveyer located in the bottom of said chamber and terminating in said kiln-tube, the inclined walls of said chamber adapted to conduct matter dropping from said stack directly to said conveyer and said conveyer adapted to conduct the matter directly into said kiln-tube, substantially as set forth. 30 35

This specification signed and witnessed this 24th day of January 1906.

THOMAS A. EDISON.

Witnesses:

FRANK L. DYER,
ANNA R. KLEHM.