T. A. EDISON.

FUEL FEEDING APPARATUS.

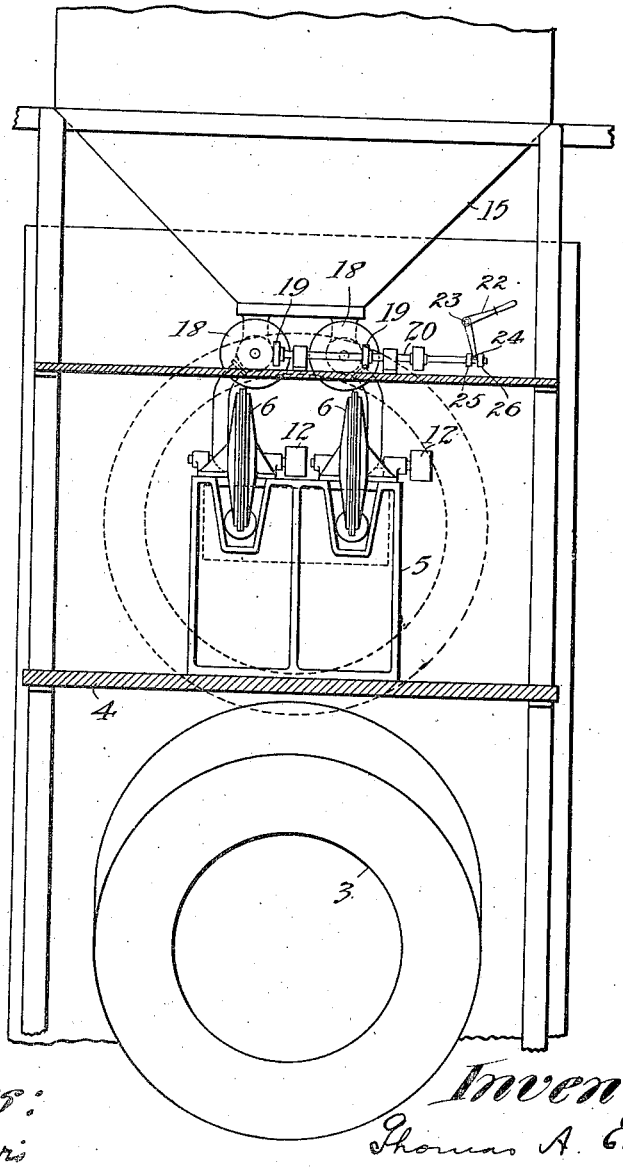
APPLICATION FILED NOV. 29, 1907.

1,106,444.

Patented Aug. 11, 1914.

2 SHEETS—SHEET 1.

Fig. 1



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2 SHEETS—SHEET 2.

Fig. 2.

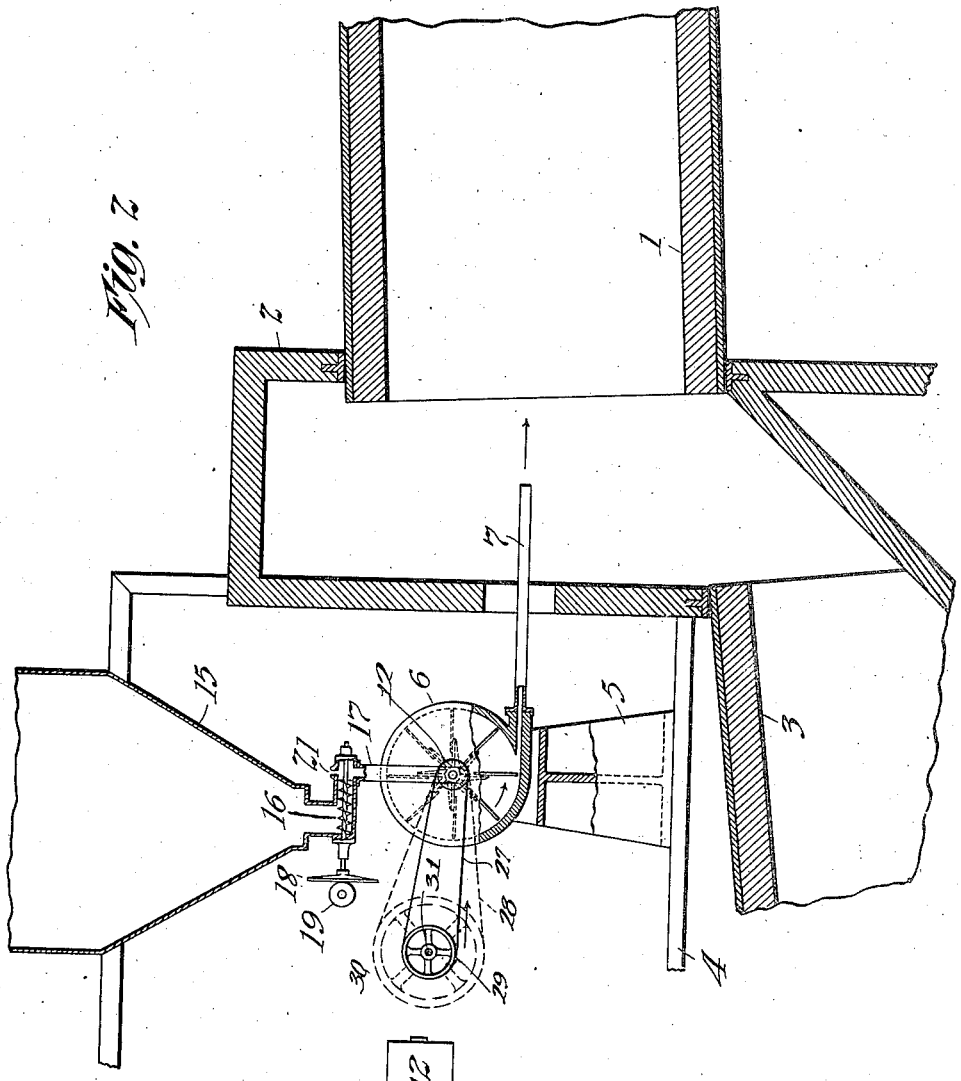
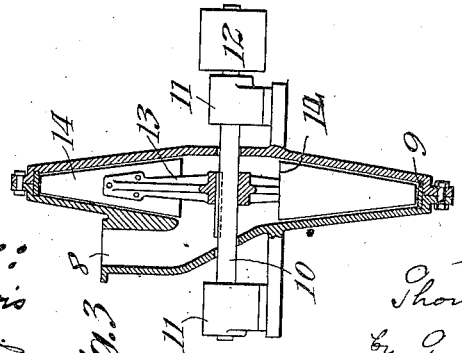


Fig. 3.



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UNITED STATES PATENT OFFICE.

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

FUEL-FEEDING APPARATUS.

1,106,444. Specification of Letters Patent. Patented Aug. 11, 1914.

Application filed November 29, 1907. Serial No. 404,215.

To all whom it may concern:

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, and a resident of Llewellyn Park, Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Fuel-Feeding Apparatus, of which the following is a description.

My invention relates to an improved apparatus for feeding fine or pulverized fuel, and the invention has been especially designed, and has been successfully used, for feeding pulverized coal into rotary cement kilns.

My object is to produce an apparatus by means of which fine or pulverized fuel may be fed in a compact stream within a rotary kiln or other heating chamber in an effective manner and at low cost. At the present time in the operation of rotary cement kilns, it is the general practice to force the pulverized coal into the kiln with a blast of air amounting only to a small proportion of that necessary for complete combustion, the balance of the air being drawn into the kiln by the inductive effect of the blast and by the draft created by the stack; and with the best practice the large bulk of combustion air which is thus drawn into the kiln surrounds the central core of pulverized fuel as an inclosing envelop. This practice of feeding pulverized fuel to a cement kiln is objectionably expensive. For example, in the operation of several standard 150 foot Edison kilns, each equipped with two blast nozzles, I found that air compressors of substantially 40 horsepower for each kiln were necessary to effect the proper feed, whereas, with my present improvements the same amount of coal can be fed to the kilns just as effectively with an expenditure of only 5 horse-power for each kiln, or 2½ horse-power for each nozzle.

Broadly stated, my invention consists in projecting the fine fuel within the kiln through one or more nozzles by mechanical devices which impart to the fine particles an enormous velocity, serving not only to introduce the fuel within the kiln substantially free of air, but also tending in a measure to reduce the size of the fuel particles. The projecting device in its preferred form comprises a suitable casing in which is rotatably mounted a series of radial arms, carrying wings which engage the fuel particles and project them centrifugally into a kiln, such arms being rotated within the casing at an enormous surface velocity.

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 represents a front elevation, partly in section, showing a rotary kiln and the cooler, and illustrating the use of two projecting devices for feeding fuel to the kiln; Fig. 2, a longitudinal sectional view of the same showing means for driving the feeding devices at different speeds; and Fig. 3 an enlarged cross-sectional view of one of the feeding devices.

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

The rotary kiln 1, the stationary chamber 2 into which it leads, and the cooler 3 for receiving the clinkered material from the kiln, are all of well-known construction. Suitable means (not shown) are employed for feeding unburned cement material to the upper end of the kiln. At the front of the kiln is the usual platform 4 on which the operator may stand for observing the operation of the kiln. Mounted upon this platform is a suitable standard 5, carrying the two projecting devices 6, from each of which leads a nozzle 7. These nozzles, as will be obvious, are arranged on either side of the longitudinal axis of the kiln. Each projecting device comprises a suitable two part casing (see Fig. 3) bolted together, one section being formed with an entrance passage 8 through which the fuel enters the casing. Extending around the interior of the casing is a removable ring 9, having an opening passage to the nozzle 7, as will be understood, and made of chilled iron or other very hard material. Practically all of the wear within the casing will be confined to this removable ring, which can be taken out and replaced when worn. Mounted in each casing is a shaft 10, carried in suitable bearings 11—11, outside of the casing and driven by a pulley 12 from any suitable source of power. The shaft 10 carries a spider 13 whose arms are provided with removable wings or plates 14, snugly fitting the casing, as shown. In form, the plates or wings 14 preferably taper outwardly, their width being greatest nearest the shaft 10. The

nozzle 7 leads out of the casing tangentially, so that the pulverized fuel introduced into the casing through the passage 8, will be projected centrifugally through the nozzle into the kiln in a manner somewhat analogous to the operation of a centrifugal pump. In practice, I make use of feeding devices of this type in which the extreme diameter of the plates is twenty-four inches and rotate the shaft at from 2500 to 3000 revolutions per minute, giving a surface velocity to the particles of upward of 15,000 feet per minute. With a feeding device of this size and operated at this speed, I find it possible to feed as much coal in as effective a manner as can be done under present conditions with an expenditure of 20 horsepower for operating an air compressor. The pulverized fuel is supplied to each feeding device by any suitable mechanism. I illustrate a bin 15, containing the finely pulverized fuel, and connected at its lower end with one or more screw conveyers 16, for delivering the fuel to a pipe 17 connected with the passage 8. Any suitable mechanism can be employed for regulating the amount of fuel supplied to each feeding device, for instance, the shaft of each of the conveyers 16 may be provided with a friction wheel 18, with which a friction wheel 19 engages, mounted on a shaft 20. By varying the position of each friction wheel 19 with reference to the center of the cooperating friction wheel 18, the speed of the conveyer will be regulated and the supply of fuel in this way may be controlled, as will be obvious. The positions of the wheels 19 with respect to the wheels 18 may be regulated by any convenient means, as for example, by means of the shifting lever 22 pivoted at 23 and carrying a pin 24 at its lower end, engaging between shoulders 25 and 26 on the shaft 20. The speed of rotation of each of the feeding devices may be the same, so that two streams of pulverized fuel will be fed at the same velocity into a kiln (as shown in Fig. 1), but preferably, the speed of one feeding device is higher than that of the other, so that the combustion zones as formed by the burning fuel, will overlap so as to thereby form an extended area in which the clinkering operation takes place. A construction for accomplishing this last result is shown in Fig. 2 in full and dotted lines, pulleys 12 of the same size being directly connected to the shafts of the feeding devices and being driven by belts 27 and 28 respectively, passing over pulleys 29 and 30 of different sizes fixed to driving shaft 31. Ordinarily, I provide a small air vent 21 above the pipe 17, to prevent the suction of the fans or wings 14 from drawing the pulverized fuel past the conveyer 16, but the amount of air which thus enters the feeding device is negligible, and if desired the said air vent may be dispensed with. Consequently, with my present invention, practically all the air necessary to effect the combustion of the fuel is drawn into the kiln by the draft. While I prefer to make use of a pair of nozzles leading into each kiln, such an arrangement being especially advantageous with very long kilns, and particularly when the combustion zones overlap, as explained, it will be understood that a single nozzle may be employed and may be advantageously used when the kilns are relatively short.

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

1. In a device of the character described, the combination with a closed casing, a series of rotating vanes mounted in the casing, said casing having a peripheral discharge opening arranged tangentially to said vanes, a supply bin, a closed passageway connecting said bin and casing, said passageway being formed with one branch extending from the bin and one branch extending from the casing and being provided with a minute vent at the junction of the two branches, and means located in said first branch for conveying a supply of fuel from the bin to the casing, substantially as described.

2. In a device for feeding pulverized fuel, a closed casing having a peripheral discharge opening, a rotary member mounted within said casing and closely fitting the interior thereof in the vicinity of said opening, means for rotating said rotary member at a high speed, a supply bin, a closed passageway between said bin and said casing, and a conveyer in said passageway, said passageway being provided with a minute vent between the conveyer and said casing, substantially as described.

3. In a device of the character described, the combination of a kiln, a supply bin, a closed casing having a nozzle arranged to project fuel into the kiln, a closed passageway connecting said bin and casing, a conveyer in said passageway for supplying fuel to said casing from said bin, said passageway being provided with a minute vent between the conveyer and said casing, and means in said casing adapted to discharge the fuel wholly by impact through said nozzle and into said kiln, substantially as described.

4. In a device of the character described, the combination of a kiln, mechanical means for projecting within and through one end of the kiln and solely by impact, a continuous compact stream of pulverized fuel substantially free from admixed air, and a cooling chamber communicating with the end of the kiln through which the fuel is projected and supplying air to the kiln whereby the stream of fuel will be supplied with

a surrounding envelop of air necessary to support combustion, substantially as described.

5. In a device of the character described, the combination of a kiln, means for projecting within the kiln a continuous compact stream of pulverized fuel substantially free from admixed air, and means for supplying the stream of fuel as it enters the kiln with a surrounding envelop of air necessary to support combustion thereof, substantially as described.

6. In a device for feeding pulverized fuel, a closed casing having a discharge opening, a closed passageway communicating with said casing, means for supplying fuel to said casing through said passageway, and means within said casing for discharging fuel therefrom through said discharge opening, said passageway being provided with a minute vent, substantially as described.

This specification signed and witnessed this 25th day of November 1907.

THOS. A. EDISON.

Witnesses:
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ANNA R. KLEHM.