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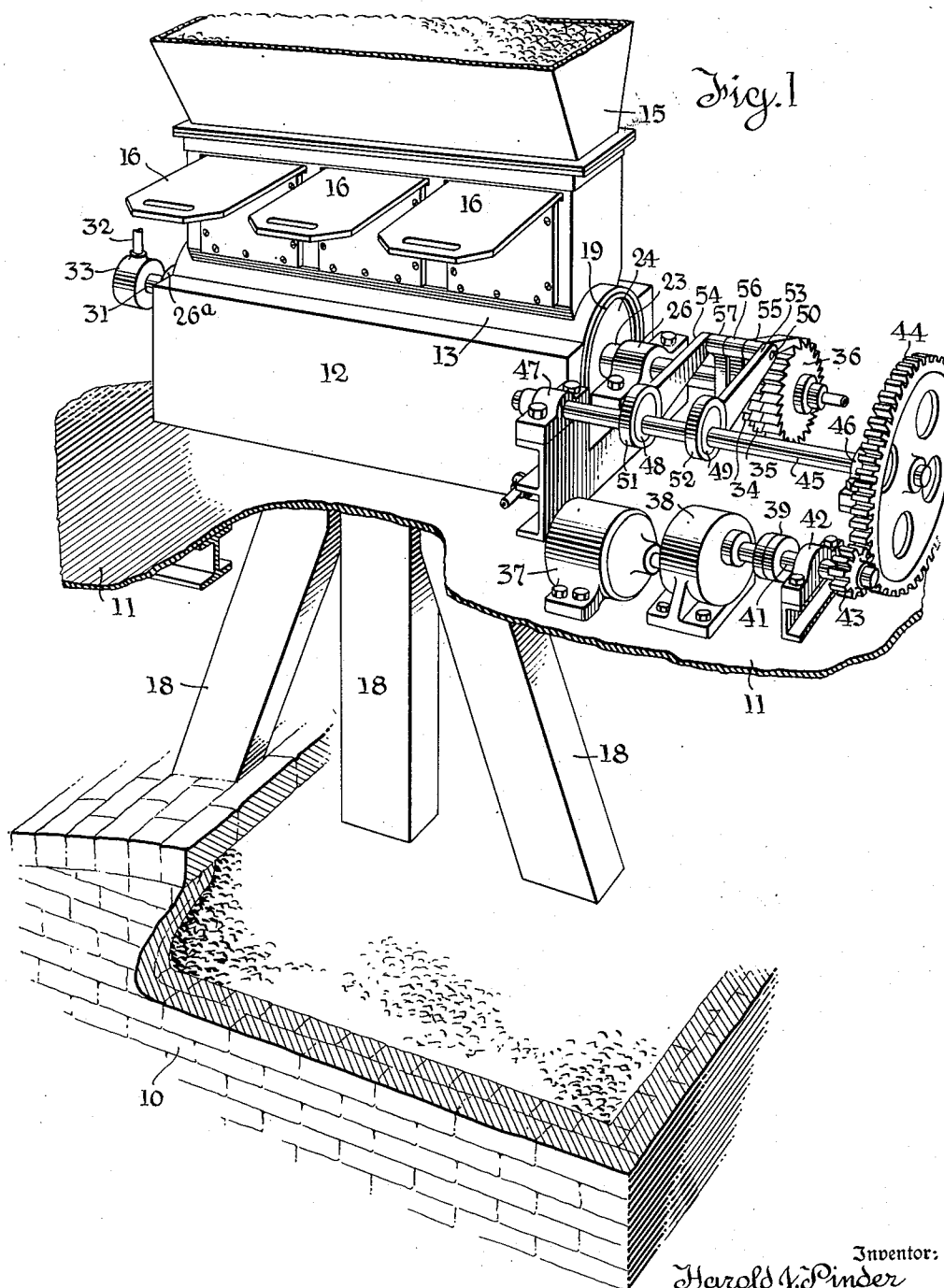
H. J. PINDER

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FUEL FEEDING APPARATUS

Filed March 1, 1939

2 Sheets-Sheet 1



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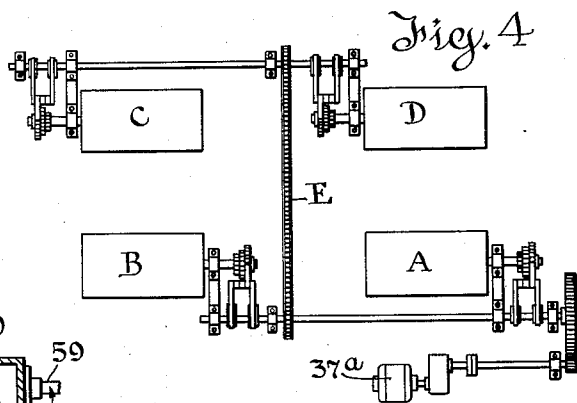
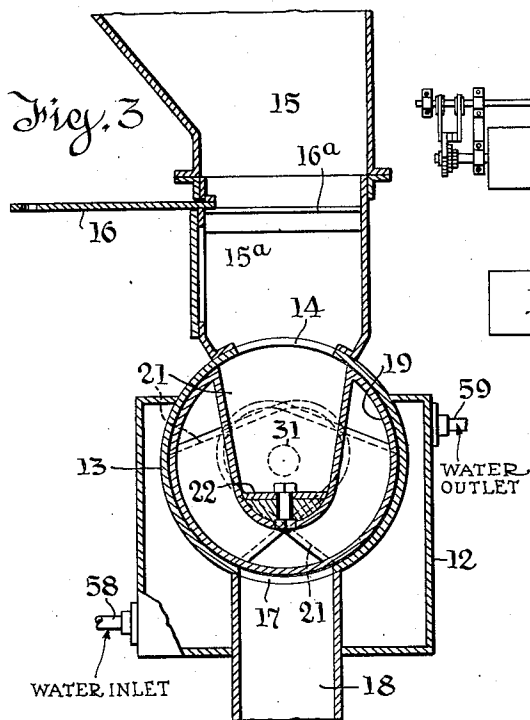
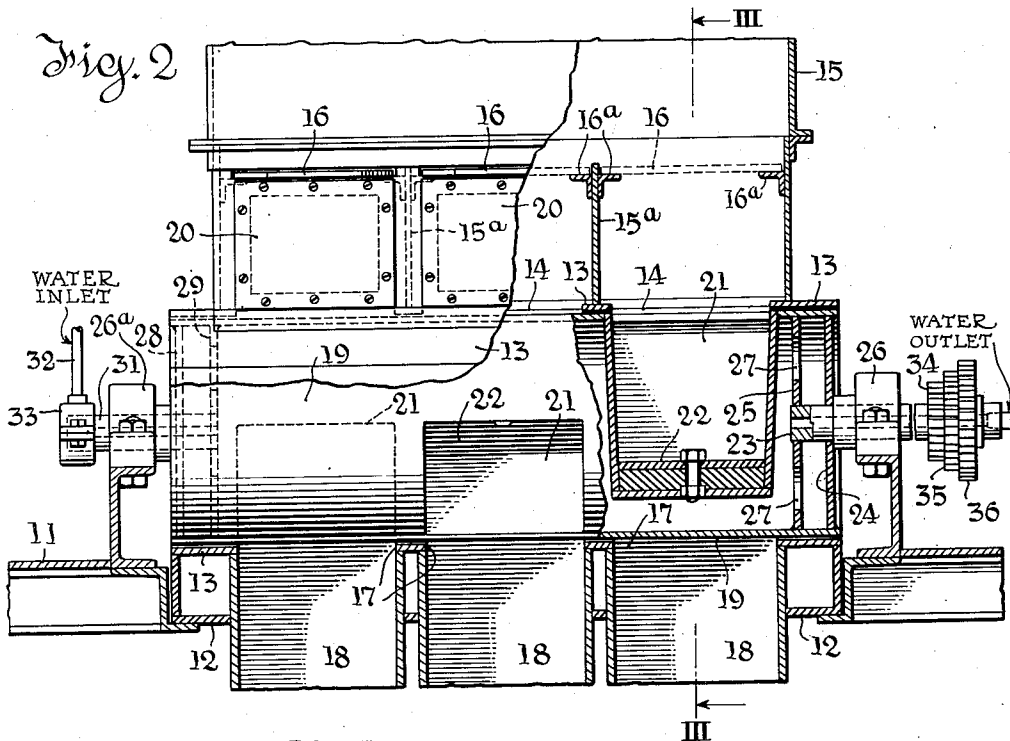
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UNITED STATES PATENT OFFICE

2,224,797

FUEL FEEDING APPARATUS

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Application March 1, 1939, Serial No. 259,289

4 Claims. (Cl. 221-106)

This invention pertains to a fuel feeding or stoking mechanism, and has for its object the production of a structure which will feed the fuel, say coal, to a stationary fire bed in such a manner that the coal will have an opportunity to burn beyond the coking stage prior to the introduction of an additional charge onto the previously placed charge.

The structure also provides means for successively feeding fuel, hereinafter referred to as coal, to different points or zones upon the bed and placing successive charges at such points, whereby the coal is burned to the greatest advantage and the temperature is maintained as nearly constant as possible.

The structure has been used primarily for heating retorts for the treatment of materials for the production of lime, especially where the fuel feeding mechanism is subjected to high temperatures having a tendency to warp or distort the operating parts, although it is applicable to use in any branch of industry where a relatively fixed and given temperature is desirable in the operation of the plant.

Various advantages of the structure herein described, which has proven highly satisfactory in numerous installations, will appear in the following specification and reference is had to the annexed drawings, wherein—

Figure 1 is a perspective view of the structure as a whole, the roof or arch of the furnace being broken away in part to show the underlying coal bed;

Fig. 2, a longitudinal vertical sectional view of the feeding apparatus, with parts in elevation;

Fig. 3, a transverse sectional view taken on the line III—III of Fig. 2; and

Fig. 4, a plan view showing different units for feeding various furnaces from a common source of power.

The structure is such that the rate and volume of the feed to any particular point upon the bed of fuel within the furnace may be regulated to bring about the best combustion results. Furthermore, the feeding elements are water-cooled throughout, whereby warping and sticking of the movable parts is precluded. The structure is shown as feeding to three points or zones upon the furnace bed, although it will be understood that it may be a greater or less number of points.

The feeding mechanism is located above the furnace 10 and is supported upon a floor or platform denoted by 11. The mechanism will, of course, be formed of metal and the main body may be said to comprise a housing for the ro-

tatable charge feeding element. The housing is denoted by 12 and there is formed in the upper portion thereof a cylindrical chamber 13, the upper portion of which extends above the housing 12 and is provided with three separate openings 14. These openings stand in alignment with the lower end of a feed hopper for coal, denoted generally by 15 and subdivided by cross-partitions 15^a (Fig. 2). Slide valves 16, one for each opening, movable on angle pieces 16^a attached to the partitions 15^a and to the ends of the hopper wall, underlie the lower end of the hopper so that they may cut off fuel from feeding downwardly into the apparatus if for any reason it becomes necessary so to do.

Extending from the lower portion of the cylindrical chamber 13 and in line with openings 17 formed in the lower section thereof are chutes 18, one for each opening, which, as best seen in Fig. 1, extend through the furnace arch and terminate above the fire bed. The outermost chutes diverge from the central one so that the feed of the coal takes place at separate points or areas upon the burning coal bed.

The charge feeding structure is mounted within the cylindrical chamber 13. It may be said to comprise a hollow cylindrical member or drum 19 provided with a series of separate longitudinally spaced radial pockets 21 preferably spaced peripherally about the member as indicated in dotted lines in Fig. 3. In other words, the open outer ends of these pockets are offset with reference to each other, so that the coal is not fed simultaneously from all of them or, in fact, from any two of them. The cubical capacity of the pockets 21 may be varied by securing filler pieces 22 in the bottom thereof, as best shown in Fig. 3. Any other means for varying the capacity may, however, be employed. Each of the chambers formed in the bottom of the hopper 15 is laterally accessible through openings formed in their sides and closed by cover plates 20. This permits access to the interior of the chambers for repairing, inspection, or cleaning of the parts as well as to permit ready substitution of different filler pieces in the radial pockets. The pockets 21 are not in communication at any point with the interior of the hollow drum, as this drum is designed to be cooled by water passing through the same.

The drum 19 is supported by a hollow drive shaft 23 extending through the end wall 24. The shaft is welded or otherwise secured to the end of the drum, and also passes through a second wall or partition 25 fixedly secured within the drum a short distance from the wall 24. The end

of the shaft is thus supported by the two walls to maintain its alignment with its bearing 26 supported on the platform 11.

The wall 25 has openings 27 formed therein to permit water to flow into the space between the two walls, and thus maintain the same at a sufficiently low temperature to prevent distortion of the parts or undue heating of the coal being fed. At the opposite end, the same general arrangement is employed, the walls being denoted by 28 and 29 and a hollow shaft 31 extends through the walls and is secured thereto. This shaft rotates in a bearing 26^a similar to bearing 26. The outer end of the shaft 31 is in communication with an inlet water pipe 32 through a suitable fixture 33 of any approved type. Hence, water may circulate through shaft 31 from inlet 32, through the interior of the drum 19 in contact with the walls of the fuel pockets and out of the shaft 23. Means are provided to impart a step-by-step rotative movement to the cylindrical feeding member 19, and to that end a series of different sized ratchet wheels 34, 35 and 36 are secured to the shaft 23, the ratchets and consequently the shaft, being driven through a pawl mechanism best shown in Fig. 1.

Mounted upon the platform 11 is an electric motor 37, the shaft of which is interconnected with reduction gearing housed at 38 which, in turn, is connected through a flexible coupling 39 with a shaft 41 mounted in a bearing 42. Shaft 41 carries a pinion 43 which meshes with a gear 44 secured to a shaft 45 mounted in bearings 46 and 47. The shaft 45 has secured to it a pair of eccentrics 48 and 49 surrounded by straps 51 and 52, from which extend arms 53 and 54, respectively. In the outer free ends of said arms, which extend toward the ratchet wheels heretofore referred to, is a shaft 50 upon which are pivotally mounted a series of pawls, one for each ratchet wheel, the pawls being denoted 55, 56 and 57, respectively. Through the utilization of these pawls and the different sized ratchet wheels, variable speeds of rotation may be imparted to the cylindrical member 19.

As will be readily appreciated, if the pawl 55 is thrown forward into working relation with the large ratchet wheel 36, a relatively slow motion will be imparted to the charge feeding element. At that time the other two pawls may be thrown backward out of contact with their wheels, and will ride idly on the same. The speed may be increased by throwing one or the other of the pawls 56, 57 into working relation with its respective ratchet wheel.

As best shown in Figs. 2 and 3, the clearance provided between the rotating drum 19 and the cylindrical chamber 13 is reduced to a minimum in order to limit to a negligible quantity the amount of highly heated gases passing between the periphery of the drum and the cylindrical chamber. This prevents warping and consequent binding of the parts and, likewise, prevents coal from sticking to the surface of the drum. Otherwise, overheating of the parts would cause hot fine coal to gradually clog the space between the surfaces of the parts.

The passage of gas upwardly from the furnace through the members 18 and around the space between the elements 13 and 19 is negligible, while passage through the hopper is precluded by the body of coal therein. Ordinarily, the apparatus will be mounted in the open air, hence the escape of gas upwardly will be of no con-

sequence except for the possible loss of a small volume of the heat units.

Upon reference to Fig. 3, it will be noted that the member 12 is provided in its lower portion with a pipe 58 connected with a tank or other source of water supply, and in its upper portion with an outlet pipe 59. Thus, a circulation of water may be maintained within the hollow box-like body to keep the parts cool. The rotating drum is also cooled by the introduction of water through the hollow shaft 31 and the outflow thereof through shaft 23 and allied parts. Consequently, the fuel feeding drum and its charges are cooled by water circulating within the drum. Thus, the temperature is held to a satisfactory value regardless of adverse conditions of location. In cool weather if the installation is out of doors, there is no necessity for water cooling, as has been demonstrated by actual operation of the apparatus.

In Fig. 4, a layout is shown wherein four feeding units, A, B, C and D, of the type above described may be driven from a common motor through suitable extensions of the shaft comparable to the shaft 45 interconnected by a cross driving chain E. The motor in this instance is denoted by 37^a and the reduction gear and other parts remain the same as heretofore described.

In resumé it may be said that each division of the feed hopper discharges fuel directly to a pocket in the cylindrical member or drum. As the drum rotates step-by-step about its axis, it discharges fuel to the associated chute 18, thence to a definite place or zone in the furnace, delivery being fixed in position and timed in accordance with the spacing of the pockets in the rotating drum and its speed, as above set forth. This accomplishes the burning of the coal beyond the coking stage before another supply of coal is delivered at that particular point in the furnace. With this arrangement, smothering of the fire is prevented and a new charge of coal is always introduced to the particular zone when it is required. Continuous delivery of coal to a furnace bed is not successful, due to the building up of coke in the furnace. It has been found in actual use of the present intermittent stoking apparatus in comparing it with methods of continuous stoking, that the output of lime per kiln where the same kilns are employed, is increased, by use of the present invention, from 9 tons per day to 13 tons per day, and this is accompanied by a material reduction in the amount of fuel burned.

What is claimed is:

1. In a fuel feeding apparatus, the combination of a hollow casing having a longitudinally extending cylindrical member located therein, said member having a series of openings in the upper portion thereof above the casing and a series of openings in the lower portion thereof; a chute leading from each of said last named openings; a hopper located above the cylindrical member in line with the openings in the upper portion thereof; a pocketed member rotatably mounted within said cylindrical member, the pockets being spaced circumferentially about the cylindrical member and spaced longitudinally thereof; means for imparting a step-by-step rotative movement to said pocketed member; and means for passing cooling water through the rotatable member.

2. In a fuel feeding apparatus, the combination of a water-cooled chamber; a rotatable cylindrical member extending longitudinally

thereof, said member having a series of pockets formed therein; means for introducing cooling medium into the member and outside of the pockets; openings in the uppermost portion of said chamber for delivering fuel to said pockets as the open ends thereof are in their uppermost positions; chutes communicating with openings formed in the lower portion of the cylindrical chamber and registering successively with the pockets in the cylindrical member as it rotates from its uppermost to its lowermost position; means for feeding fuel through the uppermost openings in the cylindrical chamber into the underlying pockets and thence through the lowermost openings in the cylindrical member as it rotates; means for imparting rotative movement to said cylindrical member; and means for varying said movement in accordance with varying conditions of operation.

3. In an intermittent fuel feeding apparatus, a water-cooled casing having registering openings in its upper and lower portions; a fuel hopper mounted on said casing and having separate fuel discharge portions communicating with the openings in the upper portion of said chamber; a hollow rotatable member located in said casing and having radial pockets adapted for successive

registry with the upper and lower openings in said casing; means for passing water through said hollow rotatable member to cool the same; a fuel discharge chute connected with each of the openings in the lower portion of the casing; means for rotating said member; and means for varying the speed of rotation of said member.

4. In an intermittent fuel feeding apparatus, a water-cooled casing having a cylindrical chamber formed therein and containing aligned openings in its top and bottom portions; a fuel hopper carried on top of said casing and having fuel discharge openings communicating with the openings in the top of said chamber; a drum rotatably mounted in said chamber and having staggered radial fuel pockets adapted for successive registry with the top and bottom openings in said chamber as the drum rotates; fuel discharge chutes leading from the openings in the bottom of said chamber; means for fluid cooling the exterior of said cylindrical chamber; means for fluid cooling the interior of said drum; and means for rotating said drum to feed charges of fuel from said hopper into said fuel discharge chutes in succession.

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