DE WITT H. PALMER.

STOKER.

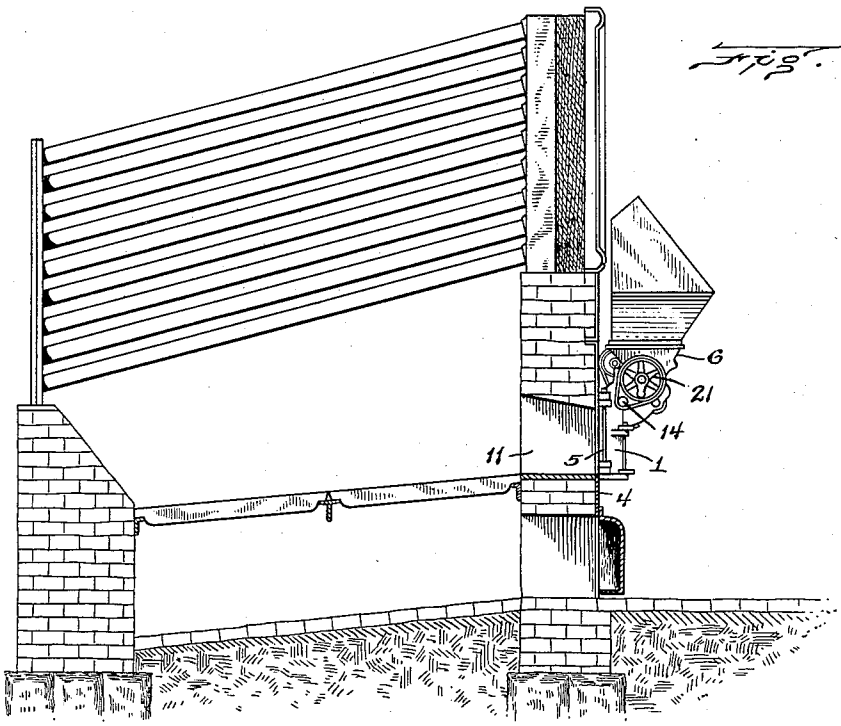
APPLICATION FILED MAY 26, 1908.

1,005,458.

Patented Oct. 10, 1911.

3 SHEETS—SHEET 1.

Fig. 1



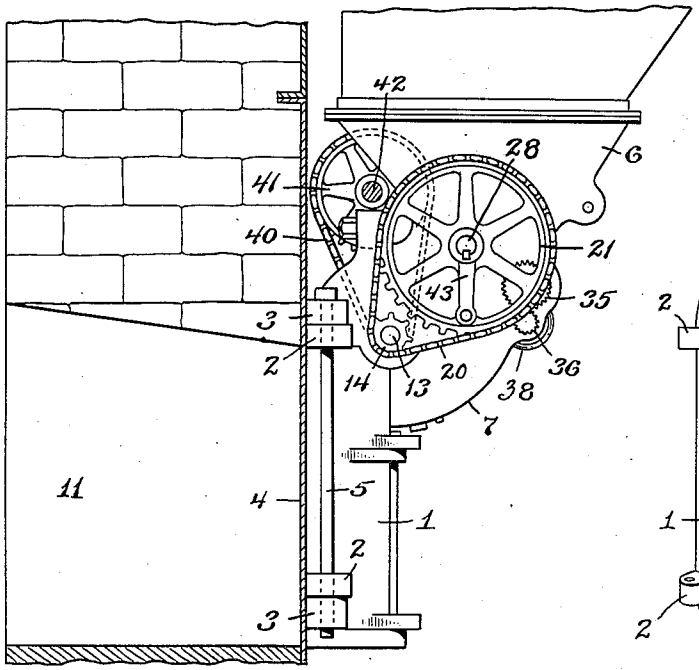
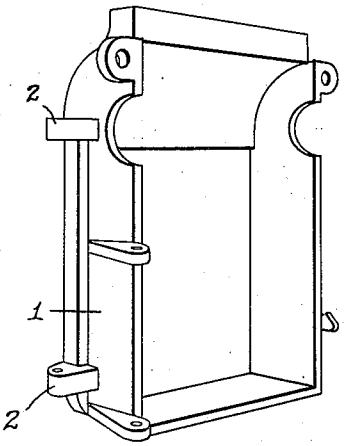


Fig. 2

Fig. 3



Witnesses:
F. R. Roulstone.
A. C. Ratigan

Inventor
De Witt H. Palmer
by Dough Brown Dunlap & Ulen
Attorneys

DE WITT H. PALMER.

STOKER.

APPLICATION FILED MAY 26, 1908.

1,005,458.

Patented Oct. 10, 1911.

3 SHEETS—SHEET 2.

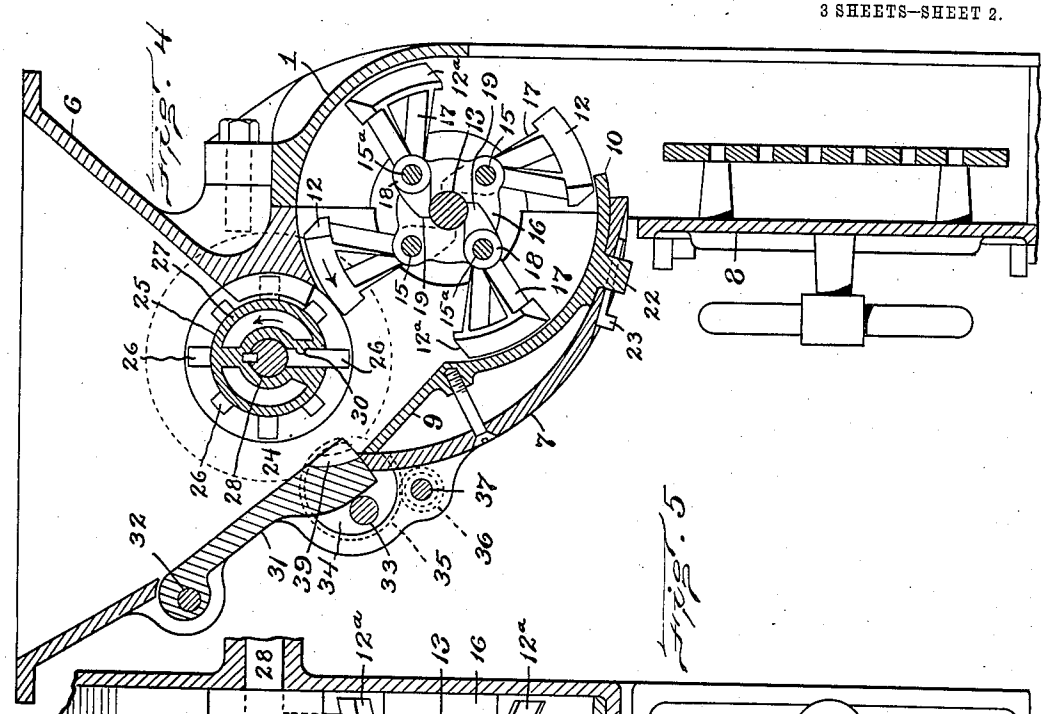


Fig. 4

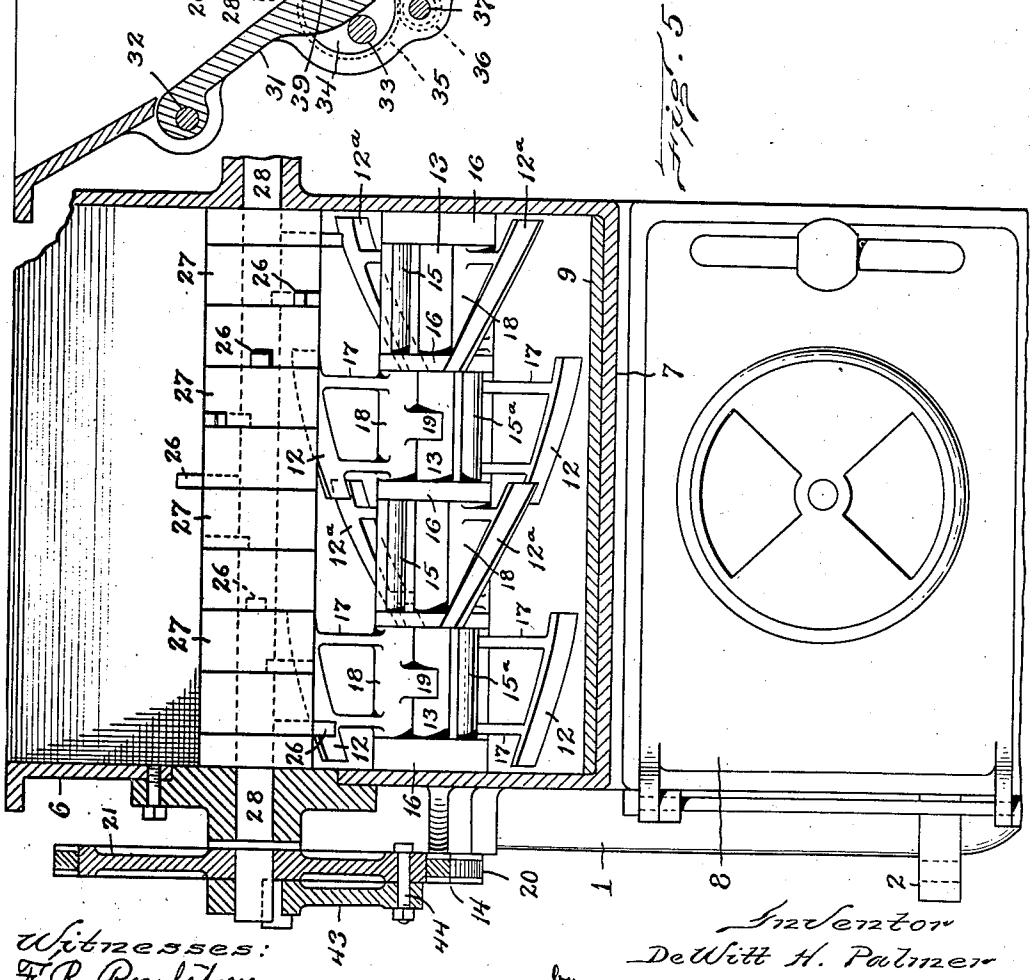


Fig. 5

Witnesses:
F. R. Rentstone
A. C. Ratigan

Inventor
De Witt H. Palmer
by Wright Brown Quinby & May
Attorneys

DE WITT H. PALMER.

STOKER.

APPLICATION FILED MAY 26, 1908.

1,005,458. Patented Oct. 10, 1911.

3 SHEETS—SHEET 3.

Fig. 6

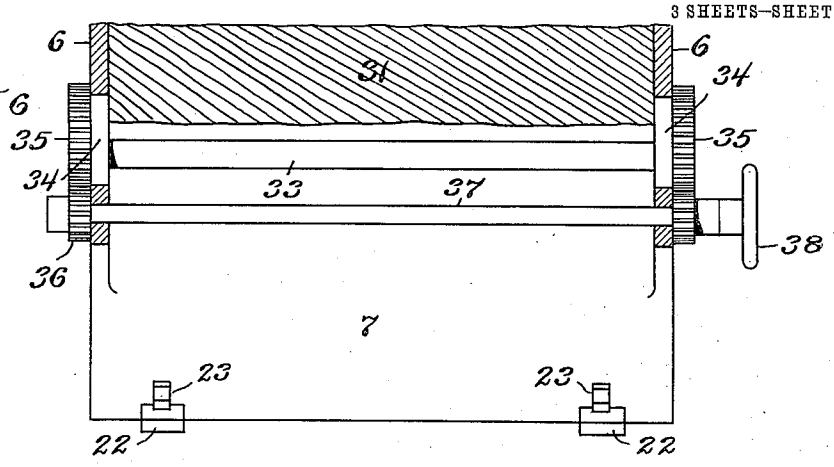


Fig. 8

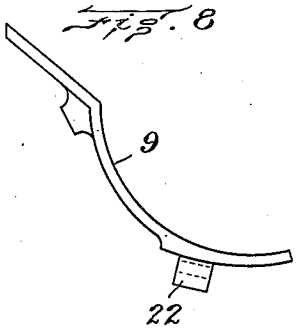


Fig. 7

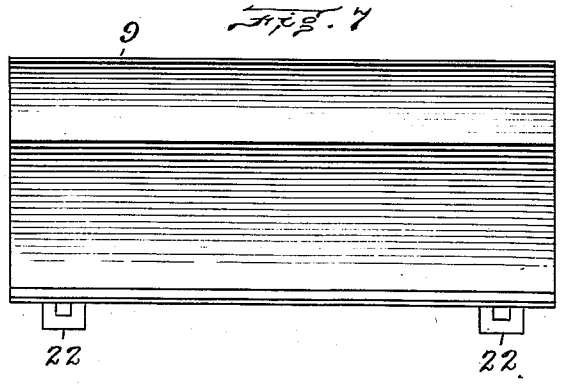


Fig. 10

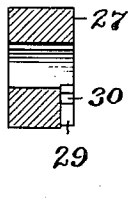


Fig. 9

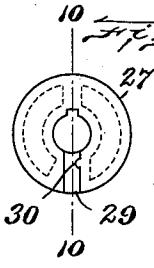


Fig. 13

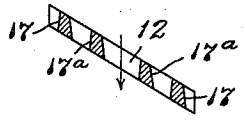


Fig. 11

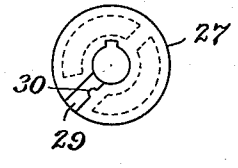
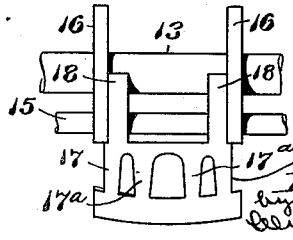


Fig. 12



Witnesses:
F. R. Roulstone.
A. C. Ratigan

Inventor
De Witt H. Palmer
by
Albright Brown Mirick & Albright
Attorneys

UNITED STATES PATENT OFFICE.

DE WITT H. PALMER, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO VULCAN FURNACE COMPANY, OF WARREN, OHIO, A CORPORATION OF NEW YORK.

STOKER.

1,005,458. Specification of Letters Patent. Patented Oct. 10, 1911.

Application filed May 26, 1908. Serial No. 435,038.

To all whom it may concern:

Be it known that I, DE WITT H. PALMER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Stokers, of which the following is a specification.

This invention relates to apparatus for automatically stoking furnaces, and has for its object to provide a simple and compact device capable of ready attachment to any furnace, and capable of feeding coal continuously in small amounts thereto so as to maintain an even fire.

Another object is to provide an apparatus of this character which will distribute the fuel to the sides as well as to the rear of the furnace, and will break up the fuel before discharging it into the furnace, and also to govern the amount of fuel delivered and the rate of feed thereof, making the same proportional to the duty required of the boiler.

I have embodied my ideas in a practical device which is illustrated in the accompanying drawings, in which,—

Figure 1 represents in elevation my apparatus applied to a steam-boiler furnace of any type whatever. Fig. 2 represents a similar view of a part of the apparatus and furnace, on an enlarged scale. Fig. 3 represents a perspective view of part of the casing of the apparatus. Fig. 4 represents a cross-section of the apparatus taken on a vertical plane passing longitudinally of the furnace. Fig. 5 represents a sectional elevation on a plane at right angles to that of Fig. 4. Fig. 6 represents a front elevation of part of the apparatus. Figs. 7 and 8 represent respectively, front and side elevations of the plate by which the fuel is guided in passing from the fuel container to the furnace. Fig. 9 represents an elevation of one of the hubs or sleeves forming part of the fuel-crushing device, which is one of the features of my invention. Fig. 10 represents a cross-section on line 10—10 of Fig. 9. Fig. 11 represents an elevation of another hub or sleeve. Figs. 12 and 13 represent respectively, an elevation and a cross-section of a distributer blade used in connection with my invention.

The same reference characters indicate the same parts in all the figures.

The apparatus embodies a supporting frame 1 provided with lugs 2 which are adapted to engage lugs 3 formed or attached to the front plate 4 of a furnace wall, and perforated to receive a pintle 5, whereby it is hinged. To the upper part of the supporting frame 1 is secured the mechanism proper in the form of a hopper 6 from the contracted portion of which extends a curved plate 7 which terminates near the vertical center of the supporting frame. The supporting frame is entirely open at the front, and that part of the front opening below the curved plate 7 is closed by a door 8. In front of the segmental plate 7 is a curved lining 9 of which the lower rear edge or lip 10 may extend beyond the edge of the plate, for a purpose to be described. This lining serves as a guide for the fuel, as hereinafter explained, and is referred to as such in the claims.

The hinge support for the apparatus is so located that the device is held in front of the fire door or charging opening 11 of the furnace, and an opening at the rear of the supporting frame 1 is directly over this door-way. The edge 10 of the lining or shroud 9 is below the upper edge of the door-way so that fuel thrown therefrom will pass through the door-way to the grate.

Directly above the rear portion of the plate 9 is a fuel distributer which consists of the blades 12 and 12ª carried by a shaft 13 which is arranged horizontally. The shaft passes through bearings in the side walls of the frame and has on one end a pulley or sprocket wheel 14 by which it is rotarily driven. The blades are carried eccentrically of the shaft, being pivoted to pins 15 which are mounted in spiders 16 secured to the shaft. The blades are inclined relatively to their direction of travel, having the form of sections of a helical bar, and are integrally united with arms 17 connected to hubs 18 which surround the pivot rods 15. These rods pass from end to end of the feeder through the several spiders, and the latter are spaced apart by the hubs 18. Projecting from each hub is a stop 19 which bears against the shaft 13 and limits the swinging movement of its blade in one direction. The distributer is rotated by a belt or chain 20 driven by a wheel 21 and ordinarily travels at a constant speed. This speed is great enough so that centrifugal force throws the distributer blades outward

and holds the stop projections 19 in contact with the shaft 13. These projections do not prevent swinging of the distributer blades in a direction opposed to that of their travel, and consequently, in case particles of the fuel become wedged upon the plate 9, or any other obstruction is encountered, the blades will be enabled to yield and to be carried over the obstruction without danger of injury occurring to any part. It will be noted that the blades are arranged in pairs, those designated by the numeral 12 being pivoted to rods 15 on diametrically opposite sides of the shaft 13, while those designated by 12^a are pivoted to the rods 15^a opposed to each other but quartering with respect to the rods 15. The inclination of the blades is also different, that of the blades 12 being opposite to the inclination of the adjacent blades 12^a. That is, the operative edges of the blades 12 follow the direction of a left-handed helix, while that of the blades 12^a is a right-hand helix. Thus the blades not only throw the fuel rearwardly into the furnace, but give it lateral impulses as well toward the opposite sides of the furnace, so that the fuel is spread over the entire surface thereof. The ends of the blades overlap, as will be seen by reference to Fig. 5, with the result that the entire extent of the plate 9 at its rear edge is swept over.

The extent and inclination of the rear portion of plate 9, which may be called the "discharge lip", together with the speed of the distributer, govern the distribution of the fuel. If the lip 10 is carried farther upward and to the rear than shown in Fig. 4, the fuel will follow an upward path before it descends, and will be carried farther to the rear than in the design illustrated, while if the plate is shortened, more of the fuel will drop into the front of the furnace. To permit this governing of the fuel distribution, the plate 9 is made detachable so that a plate having a longer or shorter lip may be substituted. When once in place, however, the plate is immovably held. For securing the plate, lugs 22 are formed upon it which project through openings in the bottom of the wall 7 and are secured by cotter pins or keys 23. These pins may be readily removed to permit substitution of a different lining plate. The shape of the plate, being a section of a cylinder, is such that it embraces a considerable proportion of the path of revolution of the distributer, as here shown, about one-fourth, and its curved part rises to approximately the height of the axis of the distributer. From this point a flat portion extends on an upward slant to the edge of the plate 7. By reason of this structure, fuel discharged from the container outlet is led over the inclined part to the distributer and falls over an abrupt shoulder directly in front of the distributer blades. It is then guided in a path concentric with that of the blades, being held so close to the edges of the latter that it cannot wedge between the plate and the blades, and at the same time, because of the abrupt falling away of the plate in front of the shoulder, an initial velocity is given the fuel by gravity, which enables the distributer to impart its own velocity to the fuel with a minimum of resistance. As the fuel is held in contact with the blades during a considerable proportion of their travel, it is gradually given the same velocity and thereby projected into the furnace with the required force and without shock.

A preferred construction of distributer blade is shown in Figs. 12 and 13, the blade being a bar which is connected with its hub or lugs 18 by arms 17 and 17^a. The intermediate arms are provided to strike and impel lumps of fuel which may be forced above the blade, thereby preventing any of the lumps from jumping over the blade and being left behind it. Spaces are provided between these arms so that the blades may not act as fans and force much air over the fire, and such spaces are enlarged from front to rear and from hub to blade to prevent wedging of the fuel between the bars and filling of the spaces thereby. Centrifugal force and the pressure of the fuel in front of the blade together cause any pieces that may be caught in the narrower parts of the spaces to pass into and through the wider portions thereof.

Fuel contained in the hopper or fuel container 6 is allowed to fall through the outlet 24 thereof into the space between the upper part of the member 9 and the feeder. The fuel is prevented from wedging and jamming in the outlet, and is also broken up so that lumps larger than a predetermined size will not be fed into the fire, by a breaking and feeding member 25 located in the hopper outlet close to one wall thereof. This member has a number of pins or bars 26 which project from its lateral surfaces and strike the lumps of fuel, chipping and crushing them in case they are too large to pass through the opening 24. The member 25 is constructed of a number of drums or sleeves 27 keyed upon a shaft 28 which passes through the end walls of the hopper, each of which drums has a radial slot or slots 29 in one of its side faces. This slot receives the bar 26, and in one side of the slot there is a protuberance 30 which enters a notch in the side of the bar and prevents it from dropping out. Lateral displacement of the toothed bar is prevented by the face of the next adjacent drum. The slots 29 and toothed bars are not all in the same radial planes, but are angularly disposed, so that the teeth follow a helical line from one end to the other of the fuel breaker.

The relative arrangement of the slots in two adjacent drums is illustrated in Figs. 9 and 11. The side of the member 25 which travels upward in its rotation is so near the adjacent wall of the hopper that no fuel can fall past it, and all the fuel fed from the hopper is caused to travel through the opening 24. The width of this opening is varied by adjustment of a plate 31 which is pivoted at 32 and forms part of the front wall of the hopper. The lower end of the plate rests upon a pin 33 eccentrically carried by disks 34. These disks are provided with gears 35 outside of the end walls of the hopper with which mesh pinions 36 on a shaft 37 which is provided with a hand-wheel 38. Rotation of the hand-wheel serves to carry the rod 33 about the axis of the disks, and adjusts the lower edge of the pivoted wall 31 to widen or narrow the opening 24. Fig. 4 shows the wall located so as to provide the maximum opening, but this opening can be reduced until the edge of the wall closely approaches the cylindrical surface of the member 25. The teeth then pass through grooves 39 in the plate, and the fuel, in order to pass through, must be broken up into fine pieces. By thus adjusting the wall and varying the size of the fuel outlet, the rate at which the fuel is fed to the furnace and the quantity fed in a given length of time, can be exactly governed, so that it may be proportioned to the load on the boiler.

By swinging back the door 8, an opening is provided through the supporting frame 1 for observing and slicing the fire, and hand-firing in cases of emergency, while by swinging the whole apparatus about the hinge pin 5, the furnace door may be exposed for more convenient access to the interior of the furnace. Thus in case the apparatus gets out of order, it can be moved out of the way and the hand method of firing the boiler used, without loss of time, while the automatic device is being repaired.

The shaft 13 of the distributer is permissibly rotated by a chain 40 and sprocket 41 on a shaft 42 which is driven from any convenient source of power, while the fuel breaker 25 is driven from the shaft 13 by a chain 20 and sprocket 21 on the shaft 28. Thus the action of both the rotary members is positive and bears a fixed relation to each other. The sprocket 21 is loose on the shaft 28, and drive connection with the shaft is made through an arm 43 keyed to the shaft and pinned by means of a bolt 44 to the sprocket.

I claim:—

1. A stoking apparatus comprising a fuel container having an outlet in its bottom, a horizontal rotary fuel breaker arranged in said outlet and having projections separated laterally from one another for breaking up the fuel and forcing it downwardly through the outlet, a movable wall for the container beside said breaker, adjustable toward and from the same to vary the size of the opening and adapted to be rigidly held in any adjusted position, to govern the amount of the fuel discharged, said wall having grooves to receive said projections so that the body of the wall may be placed close to the fuel breaker to close the outlet, and a distributer arranged to throw the broken fuel into the furnace.

2. A stoking apparatus comprising a fuel container having an outlet in its bottom, a guide leading from the fuel container outlet and terminating in a substantially horizontal portion, and a rotary distributer having rigid blades arranged to travel in close proximity to a part of said guide but out of contact therewith, said blades being pivotally connected so as to be capable of yielding and normally held in a substantially radial position by centrifugal force, to engage the fuel falling from the fuel container and throw the same into the furnace, said guide being rigidly and immovably secured, but being detachable to permit substitution of another guide having a different inclination at its discharging edge, whereby the trajectory of the fuel and the distance through which it is thrown are governed.

3. In a mechanical stoker having a fuel container, a rotary fuel breaker and feeder extending across the container in the discharge opening thereof and consisting of a shaft, hubs keyed thereon, each having a radial slot, pins or bars contained in said slots, and means for locking said bars in said slots, said bars extending beyond the peripheries of the hubs to constitute teeth.

4. In a mechanical stoker having a fuel container, a rotary fuel breaker and feeder extending across the hopper in the discharge opening thereof and consisting of a shaft, hubs keyed thereon, each having a radial slot in one of its side faces and a locking projection, and pins or bars contained in said slots and locked therein by said projections, said bars extending beyond the peripheries of the hubs to constitute teeth and being prevented from lateral displacement from the slots by the next adjacent hub.

5. In a mechanical stoker having a fuel container provided with a gravity discharge opening, a rotary fuel breaker and feeder extending across said container in such opening and comprising a laminated cylindrical body having a plurality of sections provided with slots and a radial blade contained in each of said slots and projecting beyond the periphery of the section containing such slot, said blades being detachably secured in said slots to permit removal and renewal.

6. In a mechanical stoker, the combination of a fuel container having an outlet, a plate forming one wall of such outlet and

pivoted so as to be adjustable for varying the size of the outlet and the rate of discharge of fuel therefrom, and a rotary fuel crusher having lateral separated teeth mounted in the outlet, said adjustable plate serving, in coöperation with said rotary crusher, as a crushing jaw, and having grooves to receive said teeth, with intermediate portions capable of entering the spaces between the teeth to close the outlet.

7. A stoker comprising a supporting frame having an opening at its rear and a curved fuel guide at the front near the upper end of the opening independent of the wall of the frame, a fuel container secured to said supporting frame and having an outlet arranged so as to drop fuel on said wall, and a rotary distributer having traveling, rigid, pushing blades pivotally connected to the body of said distributer, said blades being slanted relatively to the direction in which they move, and held out from the axis of the distributer by their momentum, above the lower rear part of the wall arranged to travel over the same and push fuel therefrom, the axis of the distributer being in rear of the fuel container outlet, so that the falling fuel strikes the guide before being engaged by the distributer blades, and said guide being curved concentrically with the path in which the distributer moves and lying closely around a portion of said distributer out of contact therewith.

8. A stoker comprising a supporting frame having an opening at its rear and a segmental wall at the front near the upper end of the opening, a stationary lining within said wall, a fuel container secured to said casing and having an outlet arranged so as to drop fuel on said lining, a distributer having traveling inclined pushing blades above the lower rear part of the lining arranged to travel over the same and push fuel therefrom, said lining embracing said distributer and extending slightly beyond the rear thereof, serving to guide the fuel into engagement with the distributer, the extent and inclination of the rear of said lining serving to govern the distance and direction through which the fuel is thrown, and detachable clamping means including lugs on the lining passing through said wall, and keys passed through said lugs externally of the wall, holding said lining immovably in place.

9. In a stoking apparatus, the combination of a casing, and within the same a revoluble fuel distributer having pivotally mounted yielding blades, and a fuel guiding plate within and independent of the casing having an inclined portion extending toward the distributer to a point close beside the path in which said blades travel and as high as the axis of rotation of the distributer, being thence concentric with such path to its termination beneath the distributer, said guiding plate being wholly out of contact with the distributer to guide the fuel in the path of the blades and permit the latter to be swung freely outward by centrifugal force so as to strike the fuel and impel it by impact into the furnace.

10. In a stoking apparatus, the combination of a casing, and within the same a revoluble fuel distributer, a guide plate independent of the casing inclosing said distributer from a point beside and as high as the distributer axis to its termination beneath and in rear of such axis, being concentric therewith, said plate having a preliminary inclined fuel-spreading portion, and blades pivoted to said distributer arranged to travel close to, but out of contact with, said plate, the blades having their greatest mass most remote from the distributer axis, whereby they are thrown outward by centrifugal force and caused to strike fuel guided by the plate with a sudden impact.

11. In a mechanical stoker having a rotary fuel distributer, comprising in part a revolving pivot, a blade consisting of a bar-like member, a hub by which the same is connected to the pivot, and a plurality of arms connecting said member and hub together, said arms being separated by spaces which increase in width from the inner to the outer ends of the arms and from front to rear, whereby to prevent wedging of fuel in them.

In testimony whereof I have affixed my signature, in presence of two witnesses.

DE WITT H. PALMER.

Witnesses:
P. W. Pezzetti,
Arthur H. Brown.