Jan. 23, 1951 E. C. MILLER 2,538,944

MECHANICAL STOKER

Filed Oct. 4, 1945 2 Sheets-Sheet 1

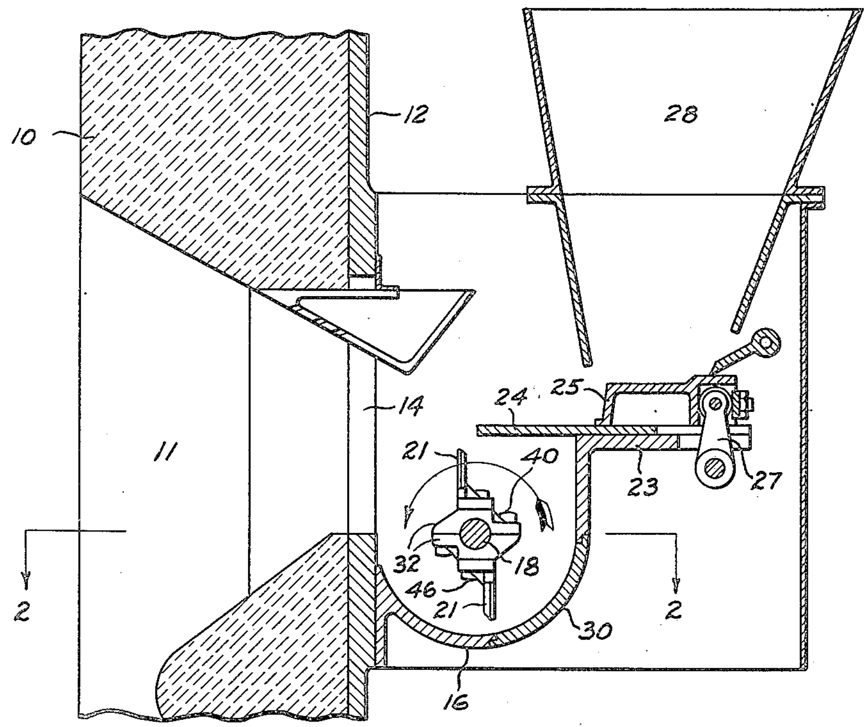

Fig. 1

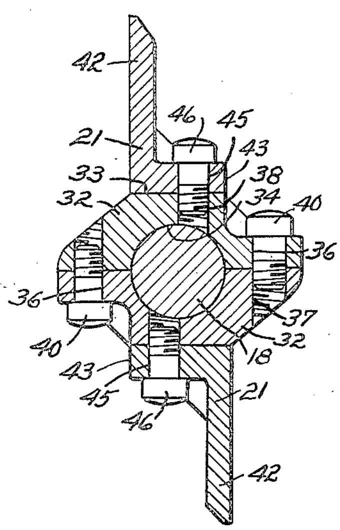

Fig. 4

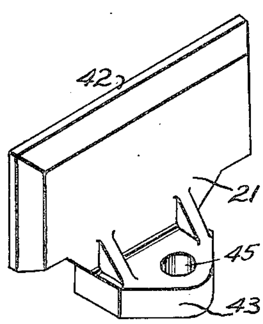

Fig. 7

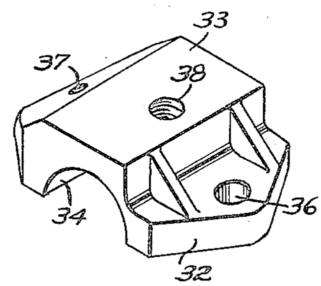

Fig. 6

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Jan. 23, 1951 E. C. MILLER 2,538,944
MECHANICAL STOKER
Filed Oct. 4, 1945 2 Sheets-Sheet 2

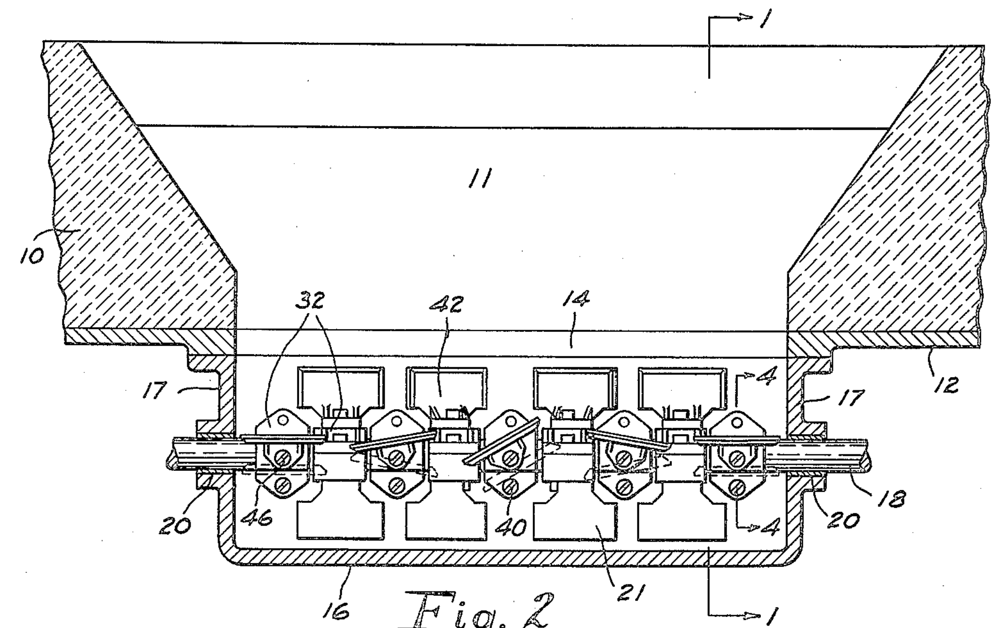

Fig. 2

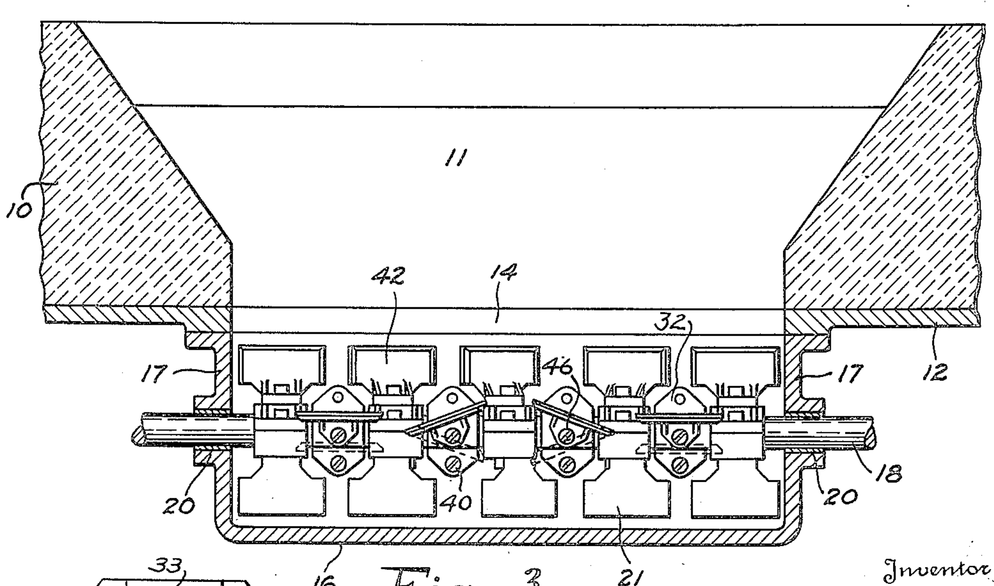

Fig. 3

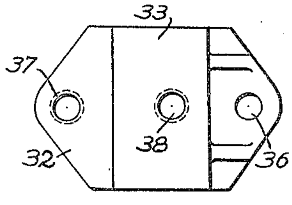

Fig. 5

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MECHANICAL STOKER

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7 Claims. (Cl. 198—128)

1

This invention relates to mechanical stokers, and more particularly to stokers of the so-called "spreader" type having revolving blades to throw fuel particles into a furnace for combustion therein.

Spreader stokers usually comprise a horizontal rotor mounted in front of an opening in a furnace wall and carrying a series of blades to which the fuel is supplied by a suitable feeding mechanism. The furnace is provided with a grate which supports a bed of burning fuel, and the blades throw fuel through the wall opening so that the very fine particles may burn in suspension while the coarser particles are deposited on the fuel bed. Since the width of the grate usually considerably exceeds the length of the rotor, the rotor must spread the fuel laterally in order to obtain uniform fuel distribution over the grate. This problem is complicated by the fact that grates of many different widths are encountered in various installations. Prior stokers have been lacking in the ability to spread the fuel in a uniform manner, and particularly lacking in adaptability for use with varying grate widths. The rotors are necessarily exposed to considerable heat radiating outwardly through the wall opening, and this has caused warping of shafts and other difficulties with these mechanisms as heretofore constructed.

It is accordingly one object of the invention to provide an improved construction for the rotor of a spreader stoker whereby a more uniform distribution of the fuel may be obtained.

It is a further object of the invention to provide a spreader stoker rotor having simple and dependable means whereby the distribution of the fuel may be altered to adapt the stoker to grates of varying widths.

It is a further object of the invention to provide a spreader stoker in which the rotor is more effectively protected from radiant heat than with prior constructions.

It is a further object of the invention to provide a spreader stoker rotor of a simple, rugged, efficient, and relatively inexpensive construction.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawing illustrating one embodiment of the invention, and in which like reference numerals indicate like parts,

Fig. 1 is a vertical section through a spreader stoker, taken on the line 1—1 of Fig. 2;

2

Fig. 2 is a section taken on the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 2, but showing the rotor turned 90 degrees in a forward direction;

Fig. 4 is an enlarged section taken on the line 4—4 of Fig. 2;

Fig. 5 is a detail view of a hub member;

Fig. 6 is a perspective view of a hub member; and

Fig. 7 is a perspective view of a fuel impeller or paddle.

The embodiment illustrated comprises an upright furnace wall 10 having a laterally elongated rectangular opening 11 therein. This opening flares both vertically and horizontally toward the rear or furnace side of the wall. The usual metal front plate 12 is provided on the front or outer side of the wall, this plate having an opening 14 which registers with the wall opening 11. The furnace will be provided with a suitable grate (not shown) below the opening 11, and in accordance with the customary practice this grate will be appreciably wider than the opening. In the case of wide furnaces, a plurality of wall openings will be provided.

Referring now to Figs. 1 and 2, it will be seen that a semi-cylindrical trough or rotor casing 16 is mounted on the front plate 12 immediately below the opening 14, this trough being closed at its ends by upright walls 17. Within the trough there is provided a rotor comprising a horizontal shaft 18 which extends along the axis of the trough and parallel with the front plate 12, this shaft being rotatably supported in bearings 20 of any suitable type carried by the end walls 17 of the trough. The shaft 18 is rotated by any suitable means in an "over-running" direction such that its upper surface travels toward the furnace, and on this shaft there are mounted impellers or paddles 21 arranged to throw fuel rearwardly through the wall opening 11. The front wall of the trough 16 extends upwardly and is provided at its upper edge with a forwardly projecting flange 23 which supports a horizontal plate 24. This plate extends rearwardly over the trough, the rear edge of the plate being located above the rotor. A ram 25 is slidably supported on the plate 24 and arranged to be reciprocated forwardly and rearwardly by suitable rocker arms 27. A fuel hopper 28 is mounted above the ram 25. This hopper supplies fuel to the ram, and the latter pushes fuel at a desired rate rearwardly over the plate 24, the fuel dropping from the rear edge of this plate into the path of the impellers 21. The trough 16 is preferably constructed with a removable section 30 in its lower front portion to permit ready access to the rotor.

The rotor is constructed in a novel manner to provide great practical advantages. Thus the rotor shaft 18 is formed with a plain cylindrical outer surface, this shape being the simplest and least expensive to manufacture and the least likely to be distorted by heat. Along the shaft there are mounted a series of hubs each of which comprises a pair of oppositely disposed hub members 32. Each of these members 32 has a flat or plane outer surface 33 and an inner surface formed with a semi-cylindrical groove 34 for engagement with the shaft, the surface 33 being parallel with the groove axis. At one side of this groove there is provided a plain hole 36, and at the other side there is provided a threaded hole 37. An additional threaded hole 38 is provided through the flat surface 33 and intersecting the groove 34, this hole being offset laterally from the axis of the groove in a direction toward the plain hole 36. The two members 32 of each hub are clamped against the shaft 18 by means of two screws 40 which extend through the plain holes 36 and into the threaded holes 37, the arrangement being such that when a member 32 is on the top of the shaft the corresponding plain hole 36 will be in front of the shaft. As shown in Figs. 2 and 3, the hubs are spaced rather closely together along the shaft, and adjacent hubs are turned 90 degrees with respect to one another. In the embodiment illustrated nine hubs are provided, but this number may be varied depending upon the width of the wall opening 11.

These hubs support pairs of opposed impellers 21. As best shown in Figs. 4 and 7, each impeller comprises a flat blade 42 and a base 43 integral with the blade, these portions being at approximately right angles to provide a structure L-shaped in cross section. The base is provided with a plain hole 45 for the reception of a single screw 46 which extends into the threaded hole 38 and thus fastens the base against the flat surface 33 of the hub member 32, the blade 42 being in advance of the base 43 in the direction of rotation. The width of the blades 42, measured parallel with the axis of rotation, considerably exceeds the width of the hubs 32, so that the blades on adjacent hubs may overlap appreciably.

It will now be apparent that the impellers 21 can be pivotally adjusted about the screws 46 to vary the angular positions of the blades 42 relative to the axis of rotation. This has very great practical advantages, as it makes it possible to adapt the stoker to furnaces of various dimensions and obtain proper distribution of the fuel. By increasing the angularity of a blade with respect to the axis, the blade can be made to throw the fuel more to one side, and the lateral spread of the fuel can be controlled in a desired manner. In general I have discovered that the blades at the right hand side of the rotor center should be set to deflect fuel to the right, and the blades at the left hand side of the rotor center should be adjusted to deflect fuel to the left. Furthermore, the blades near the center of the rotor should have the greatest angle, the angularity of succesive blades preferably decreasing gradually toward the ends, the end blades having little or no angularity. Thus, with nine pairs of blades as shown in Figs. 2 and 3, the pair at the center may be set at say 30 degrees, with one turned to the right and the other to the left. The blades next adjacent may be set at say 20 degrees, the next adjacent blades at say 10 degrees, and the remaining blades (two pairs at each end of the rotor) at zero degrees, i. e. parallel with the axis of rotation. These angles may be increased if the furnace is wide enough to require a greater lateral spread of the fuel. The construction makes it possible to obtain a very uniform fuel distribution while avoiding appreciable impact of fuel particles against the sides of the wall opening 11.

Referring now particularly to Figs. 1 and 4, it will be noted that the fuel-engaging faces of the impeller blades 42 are not radial but are offset in the direction of rotation. Thus when a blade is in its uppermost or fuel-striking position, its advancing face will be located somewhat rearwardly of the shaft axis. By reason of this construction the rotor shaft can be mounted somewhat farther from the furnace, where it will be better protected from the heat, while the impeller blades nevertheless distribute the fuel particles in a desired manner. Since the hub members 32 cover nearly the entire outer surface of the rotor shaft within the casing 16, they are of considerable value in shielding the shaft from the furnace heat.

In the operation of the invention, the reciprocating ram 25 will push fuel from the hopper 23 rearwardly over the plate 24. The fuel will fall from the rear edge of this plate into the path of the revolving blades 42, which will throw the fuel particles rearwardly through the opening 11 into the furnace. The fine particles will burn in suspension, while the coarse particles will fall upon the furnace grate to form a bed of burning fuel. Because of the novel angular positioning of the blades, varying from a maximum angularity at the center of the rotor to zero angularity at the ends of the rotor, the fuel will be distributed with great uniformity throughout the furnace. The same rotor can be used with furnaces of different widths by varying the adjustment of the blades. The blades can be adjusted without disturbing the rotor shaft and in fact while the furnace is still in operation, since the removal of the trough section 30 will permit ready access to the rotor. To adjust each blade the operator needs to loosen only a single screw 46, and a very few minutes will be sufficient, with only a brief interruption in the fuel feed. The blades are mounted in diametrically opposed pairs, with adjacent pairs displaced 90 degrees about the rotor axis and overlapping in the axial direction. Thus there are four rows of blades, with the blades in adjacent rows staggered. This construction provides for dynamic balance, it avoids any gaps along the rotor, and it permits angular adjustment of each blade independently of adjacent blades, all in a simple, rugged and inexpensive structure.

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

1. A fuel distributing rotor for a mechanical stoker comprising a supporting structure rotatable about a horizontal axis and having outwardly facing plane surfaces parallel with the axis, a series of fuel-throwing impellers carried by said structure and each including a base and a blade joined at approximately right angles to provide a device L-shaped in cross-section with the blade in advance of the base in the direction of rotation, and means fastening the bases of the impellers to the said plane surfaces for

pivotal adjustment about axes extending perpendicular to the said surfaces.

2. A fuel distributing rotor for a mechanical stoker comprising a supporting structure rotatable about a horizontal axis and having outwardly facing plane surfaces parallel with the axis, a series of fuel-throwing impellers carried by said structure and each including a base and a blade joined at approximately right angles to provide a device L-shaped in cross-section with the blade in advance of the base in the direction of rotation, and a single screw fastening the base of each impeller to the corresponding plane surface for pivotal adjustment about the axis of the screw.

3. A fuel distributing rotor for a mechanical stoker comprising a horizontal rotatable shaft, a series of hubs on the shaft and each shaped to provide two diametrically opposite outwardly facing plane surfaces parallel with the axis of the shaft, a pair of diametrically opposed fuel-throwing impellers carried by each hub, each impeller including a base and a blade joined at approximately right angles to provide a structure L-shaped in cross-section with the blade in advance of the base in the direction of rotation, and means fastening the bases of the impellers to the said plane surfaces for pivotal adjustment about axes extending perpendicular to the said surfaces.

4. A fuel distributing rotor for a mechanical stoker comprising a horizontal rotatable shaft, a series of hubs on the shaft and each shaped to provide two diametrically opposite outwardly facing plane surfaces parallel with the axis of the shaft, a pair of diametrically opposed fuel-throwing impellers carried by each hub, each impeller including a base and a blade joined at approximately right angles to provide a structure L-shaped in cross-section with the blade in advance of the base in the direction of rotation, adjacent hubs being turned 90 degrees with respect to one another so that the blades are arranged in four rows with the blades in adjacent rows staggered, the blades in each row being of sufficient width to overlap the blades in the adjacent rows, and means fastening the bases of the impellers to the said plane surfaces for pivotal adjustment about axes extending perpendicular to the said surfaces.

5. A fuel distributing rotor for a mechanical stoker comprising a horizontal rotatable shaft having a cylindrical outer surface, a series of hubs on the shaft and each including a pair of oppositely disposed members clamped against the shaft by fastening means and providing two diametrically opposite outwardly facing plane surfaces parallel with the axis of the shaft, a pair of diametrically opposed fuel-throwing impellers carried by each hub, each impeller including a base and a blade joined at approximately right angles to provide a structure L-shaped in cross-section with the blade in advance of the base in the direction of rotation, adjacent hubs being turned 90 degrees with respect to one another so that the blades are arranged in four rows with the blades in adjacent rows staggered, the blades in each row being of sufficient width to overlap the blades in the adjacent rows, and means fastening the bases of the impellers to the said plane surfaces for pivotal adjustment about axes extending perpendicular to the said surfaces.

6. A fuel distributing rotor for a mechanical stoker comprising a supporting structure rotatable about a horizontal axis, and a longitudinal row of fuel-throwing impellers projecting from the supporting structure and providing fuel-striking surfaces positioned at varying angles with respect to the axis, the impellers at the right side of the rotor center being set to deflect fuel toward the right, and the impellers at the left side of the rotor center being set to deflect fuel toward the left, the angularity of the impellers decreasing progressively from a maximum adjacent the center of the rotor to a minimum adjacent the ends of the rotor.

7. A fuel distributing rotor for a mechanical stoker comprising a supporting structure rotatable about a horizontal axis, and longitudinal rows of fuel-throwing impellers projecting from the supporting structure and providing fuel-striking surfaces positioned at varying angles with respect to the axis, the impellers being arranged in pairs of diametrically opposed impellers with laterally adjacent pairs turned 90 degrees with respect to one another to form four rows of impellers with the impellers in adjacent rows staggered, the impellers at the right side of the rotor center being set to deflect fuel toward the right, and the impellers at the left side of the rotor center being set to deflect fuel toward the left, the angularity of the impellers decreasing progressively from a maximum adjacent the center of the rotor to a minimum adjacent the ends of the rotor.

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