March 30, 1937. N. M. LOWER 2,075,736

FUEL DISTRIBUTING APPARATUS

Original Filed Aug. 27, 1931 5 Sheets-Sheet 1

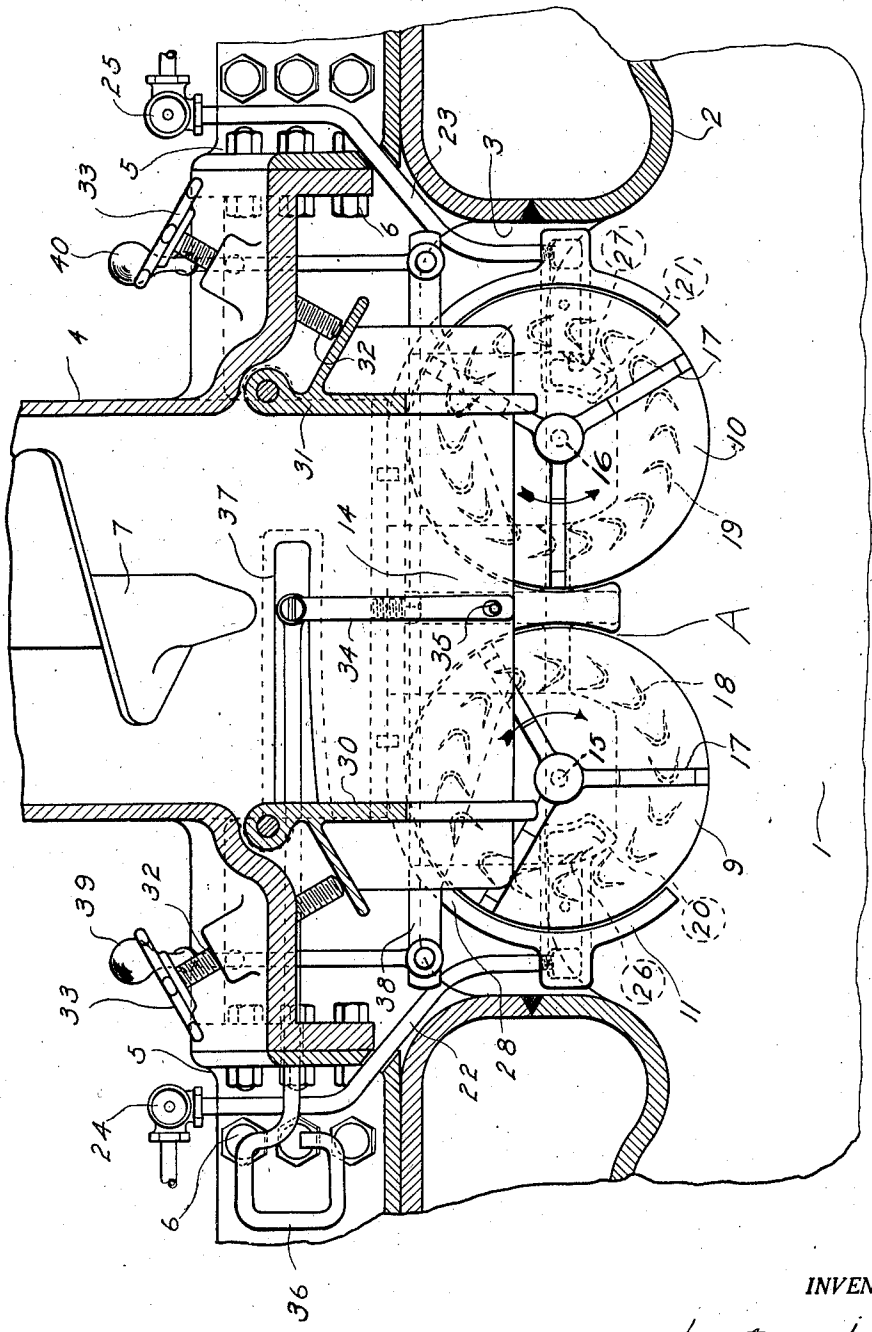


Fig. 1

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FUEL DISTRIBUTING APPARATUS

Original Filed Aug. 27, 1931 5 Sheets-Sheet 2

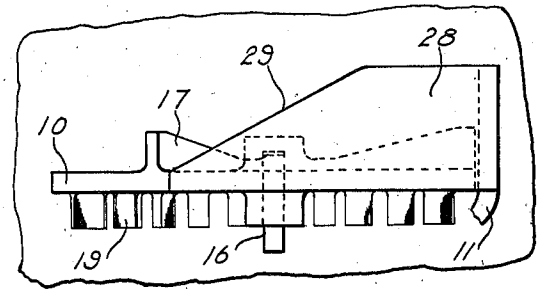


Fig. 3

Fig. 2

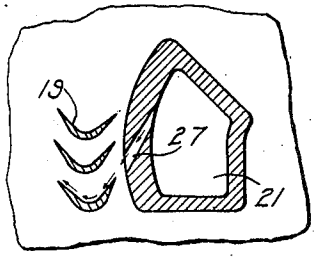


Fig. 4

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FUEL DISTRIBUTING APPARATUS

Original Filed Aug. 27, 1931 5 Sheets-Sheet 3

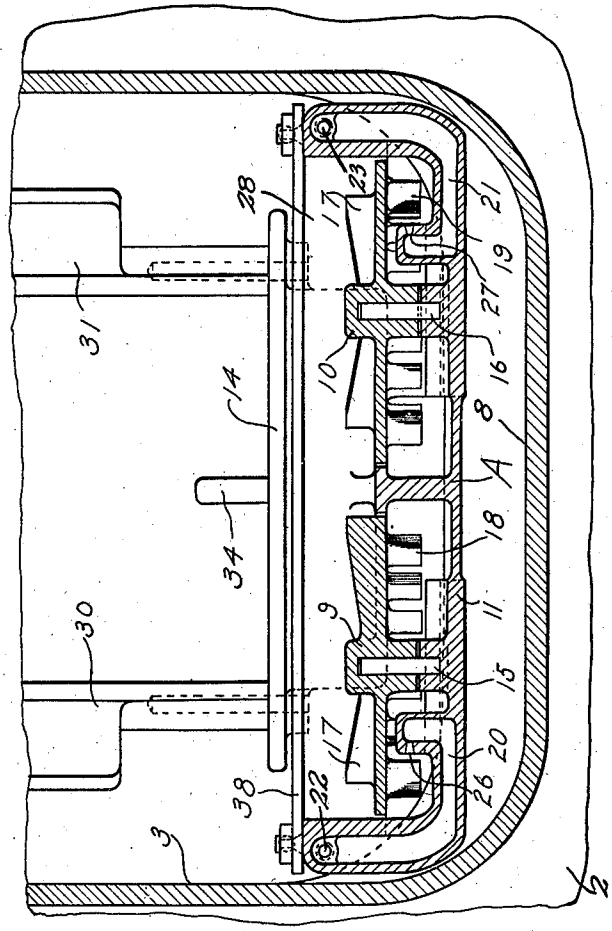


Fig. 5

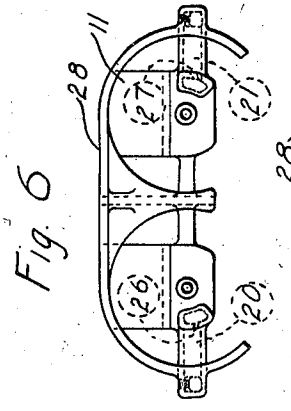


Fig. 6

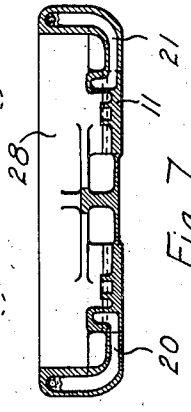


Fig. 7

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FUEL DISTRIBUTING APPARATUS

Original Filed Aug. 27, 1931 5 Sheets-Sheet 4

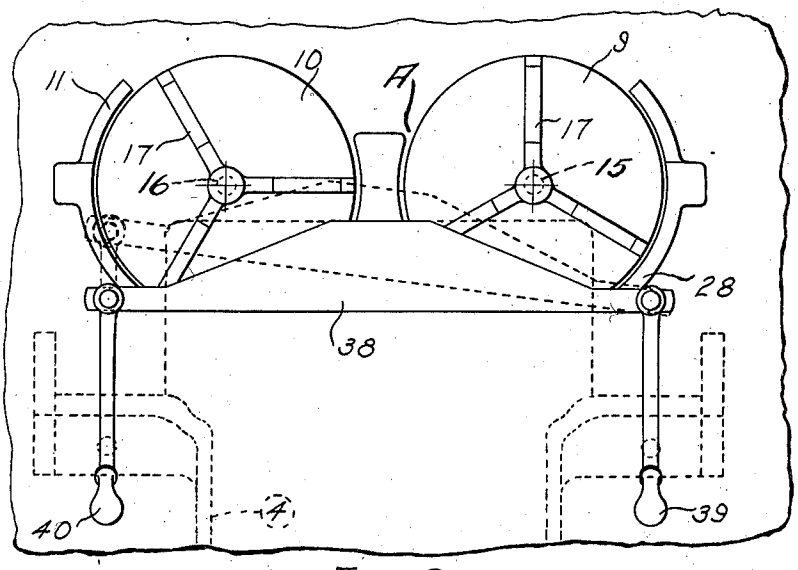


Fig. 8

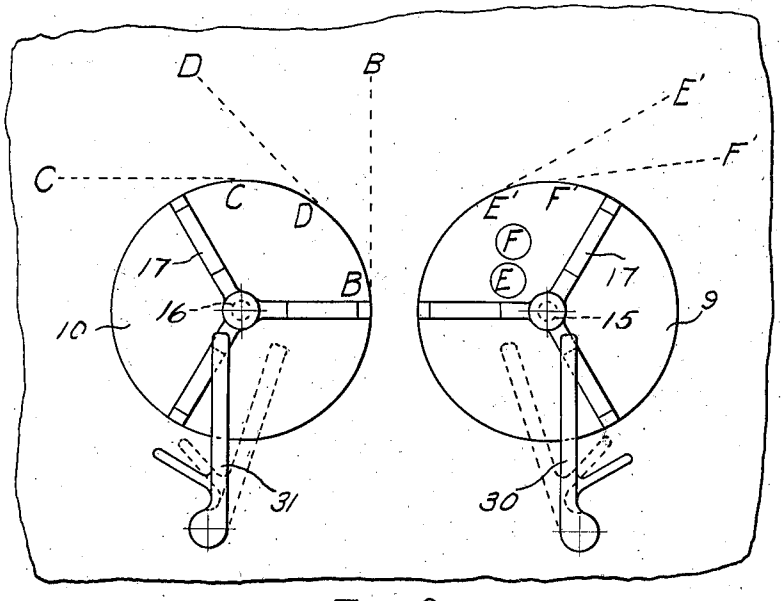


Fig. 9

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FUEL DISTRIBUTING APPARATUS

Original Filed Aug. 27, 1931 5 Sheets-Sheet 5

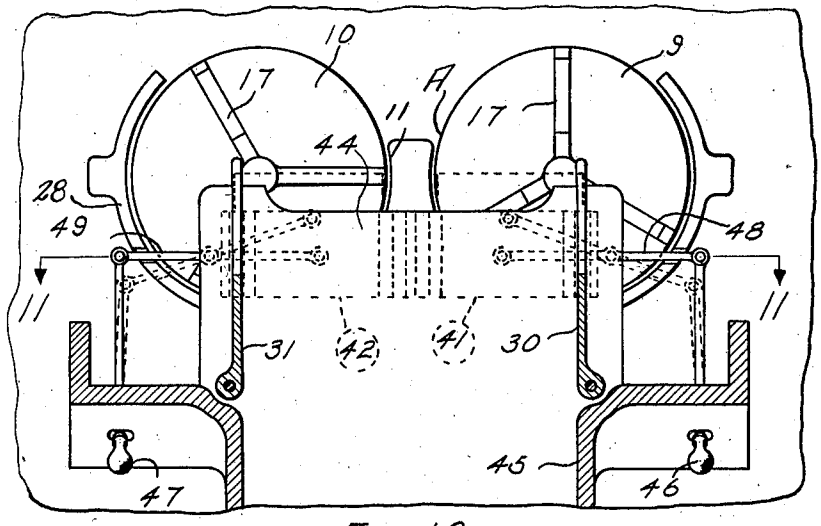


Fig. 10

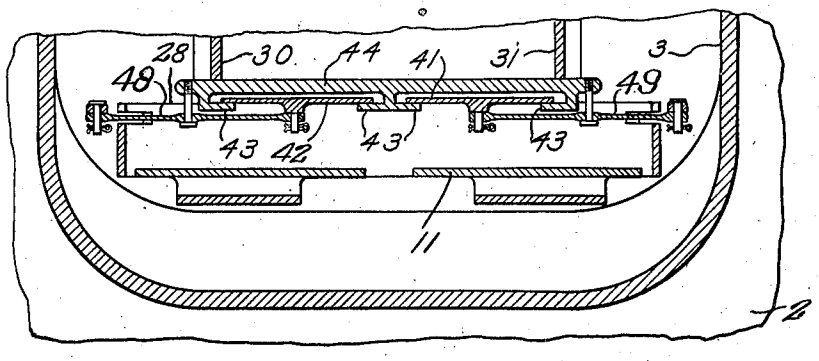


Fig. 11

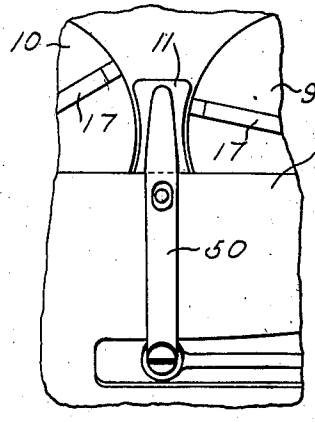


Fig. 12

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Patented Mar. 30, 1937 2,075,736

UNITED STATES PATENT OFFICE

2,075,736

FUEL DISTRIBUTING APPARATUS

Nathan M. Lower, Erie, Pa., assignor to The Standard Stoker Company, Inc., a corporation of Delaware

Application August 27, 1931, Serial No. 559,661
Renewed July 16, 1935

10 Claims. (Cl. 110—115)

This invention relates to improvements in fuel distributing apparatus and has for one of its objects the provision of new and improved mechanical means for scattering fuel over the firebed of a firebox or furnace.

It is another object of the invention to provide such mechanical means which is actuated by pressure fluid blasts.

Another object of the invention is to provide such pressure fluid actuated mechanical means which is highly efficient in operation, to decrease the cost of firing a furnace.

In present practice, fuel is distributed in fireboxes of the locomotive type by a relatively large number of either air or steam pressure fluid blasts that issue from nozzles adjacent the firing opening in the back wall of the firebox, the pressure fluid blasts impinging directly upon the fuel particles to discharge them over the firebed. Fuel is not delivered continuously into the path of each of the fluid blasts, and it is apparent that when the fluid blasts are not discharging fuel, energy is being wasted.

In the present invention, a pressure fluid blast is constantly impinging upon each of two disks for imparting continuous rotary motion thereto and fuel is continuously distributed by the disks. After the disks attain sufficient momentum the pressure of the fluid blasts may be decreased. The amount of pressure fluid used in combination with the disks is considerably less than that used when fluid blasts impinge directly upon the fuel particles.

Another object is to provide mechanical fuel distributing means which is compact, so that it can be positioned in the lower portion of the firing openings of locomotive boilers.

Another object of the invention is to provide improved means for controlling the delivery of fuel to a distributing device whereby fuel may be discharged over the firebed either uniformly, or in a manner to suit the condition in which the fire may be burning.

Another object is to provide mechanical means for distributing fuel which will be free from clogging by foreign matter or abnormal lumps of fuel.

Further objects of the invention are to position the mechanical fuel distributing means in the firebox and facilitate cooling the said means to prevent destruction of the same by the heat in the firebox, and provide a structure that can readily be replaced or parts thereof renewed.

Other objects, advantages, and novel detail features of construction will be apparent during the course of the following description and appended claims, taken in connection with the accompanying drawings, in which:

Fig. 1 is a horizontal sectional view through the firing opening of a locomotive firebox and delivery end of a stoker, illustrating the invention applied thereto.

Fig. 2 is a vertical sectional view through the locomotive firing opening, the delivery end of the stoker and the invention.

Fig. 3 is a detail view of one of the fuel distributing disks and a portion of a support member therefor.

Fig. 4 is a detail sectional view through a pressure fluid blast nozzle, illustrating the method of imparting rotation to the disks.

Fig. 5 is a vertical sectional view taken through the axes of the fuel distributing disks.

Fig. 6 and Fig. 7 are detail views showing the support member for the disks.

Fig. 8 is a plan view of the fuel distributing disks, and illustrates a means for controlling the flow of fuel to the disks.

Fig. 9 is a plan view of the fuel distributing disks, diagrammatically illustrating the scattering action of the disks upon the fuel particles.

Fig. 10 is a plan view of the fuel distributing disks and a horizontal sectional view of the delivery end of the stoker, disclosing a modification of the means for controlling the flow of fuel to the disks.

Fig. 11 is a vertical sectional view taken on line 11—11 of Fig. 10 with the discs omitted.

Fig. 12 illustrates a modification of the central dividing rib shown in Fig. 1.

It is preferable that the distributing device herein disclosed be used in connection with mechanical means, such as a stoker, for conveying and delivering fuel thereto, and it is more particularly desirable that the delivery of fuel to the distributing device be continuous, so that the device is in constant use to scatter fuel when firing the furnace.

Material dropped on the surface of a substantially horizontal and relatively rapidly rotating disk will slide off the same and travel in a direction tangent to the circle described by the point at which the material leaves the disk. By controlling the delivery of material to the disk and varying the portions of the disk which receive the material, the direction in which the material is discharged can be controlled and varied, and mechanism for utilizing these features is provided in the present device.

Similar reference characters in the different

figures of the drawings indicate corresponding elements or features of construction herein referred to.

In the drawings, the numeral 1 designates the firebox of a locomotive boiler, having a backhead or back wall 2 provided with a common hand and stoker firing opening 3 therein. A conduit 4 of a mechanical stoker opens forwardly into the firebox and is in communication with the lower portion of the opening 3. The conduit 4 is rigidly secured to the back wall 2 with the use of angle irons 5 by bolts or studs 6. A conveyor screw 7 transfers fuel from a source of supply (not shown) and delivers it to the firing opening 3 and the fuel distributing or scattering device, designated as a whole by the letter A. The conduit 4 is spaced from the lower margin 8 of the firing opening, allowing relatively cold air to be drawn through the firing opening, by the draft in the firebox, for cooling the distributing device A and parts of the stoker exposed to heat. The portion of the firing opening 3 above the conduit 4 may be used for hand firing, and a firedoor (not shown) forms a closure for the said portion.

The distributing device comprises mainly; two disks 9 and 10, which are carried by a support member 11, and various fuel directing controls. The support member 11 is detachably secured to a flange 12 on the conduit 4 as by studs 13, or other suitable means, in such a manner that the distributing device A can be readily disconnected for replacement of parts thereof or an entire new device. The disks 9 and 10 are positioned immediately beneath and receive fuel downwardly from the outlet or delivery end of the conduit 4. A substantially horizontal extension 14 on the lower wall of the conduit 4 projects over approximately the rear halves of the disks and prevents fuel from being dropped upon the portions of the disks that are directly beneath the extension.

The fuel distributing device is located in the firing opening 3. The disks 9 and 10 are mounted on parallel and substantially vertical stub shafts 15 and 16, which are secured in and spaced transversely of the support member 11. Upright projections or ribs 17 are mounted radially and spaced equidistant on the top surfaces of the disks. The ribs are shown as being formed with the disks, but they may be separate therefrom and secured thereto in any desirable manner. Mounted on the underside of each disk near the outer edge thereof is a series of equally spaced turbine-like blades 18 and 19.

The support member 11 is provided at each side with a cavity or passage 20 and 21. Pipe lines 22 and 23 make communication between the passages 20 and 21, respectively, and a source of pressure fluid (not shown). It is preferable, in the present instance that steam be used as the pressure fluid, but air may be used if desired. Valves 24 and 25 are provided in the pipe lines 22 and 23, respectively, for controlling the pressure of the fluid in the passages 20 and 21, respectively. Jet openings or nozzles 26 and 27 are in communication with the passages 20 and 21, respectively. The nozzles are directed so that pressure fluid blasts therefrom will discharge toward the outer edges of the disks to impinge upon the blades 18 and 19 for imparting continuous rotary motion to the disks. The blades 18 and 19 are associated so as to efficiently utilize the energy of the fluid blasts issuing from the nozzles. The fluid blasts also act to cool the disks and other parts of the device adjacent the disks with which the fluid blasts come in contact.

The blade 18 and nozzle 26 are arranged so that the disk 9, which is on the right side of the firing opening and discharges fuel to the right side of the firebox, will be rotated in a clock-wise direction completely around its axial line by the fluid blast from the nozzle 26. The blades 19 and nozzle 27 are arranged so that the disk 10, which is on the left side of the firing opening and discharges fuel to the left side of the firebox, will be rotated in a counterclockwise direction completely around its axial line by the fluid blast from the nozzle 27. The number of rotations per minute of the disks can be varied independently of each other by the valves 24 and 25, thus facilitating individual control over each half of the firebox. If it is desirable to discharge fuel at a greater or nearer distance from the distributing device the rotations per minute of the disks can be increased or decreased upon increasing or decreasing the pressure of the fluid blasts from the nozzles 26 and 27 by opening or closing the valves 24 and 25, respectively.

Formed with the support member 11 is a rim 28, which extends around the sides and rear of the disks. The rim 28 is disposed above the elevation of the top surfaces of the disks and prevents fuel from being discharged in any direction except toward the firebox. The sides of the rim 28 are beveled at 29 so that large lumps of fuel or foreign matter will not get clogged between the ribs 17 and the rim.

Hinged at the sides of the outlet end of the conduit 4 are the vanes 30 and 31. The positions of the vanes are manually regulated by means of adjusting screws 32 and hand wheels 33. The fuel moving through the conduit tends to keep the vanes 30 and 31 in an outward position, and the screws 32 limit their outward movement. By turning the hand wheels 33 in one direction the vanes are moved inwardly and by turning the hand wheels in the opposite direction the fuel passing through the conduit moves the vanes outwardly. With the use of the vanes 30 and 31, the portions of the disks that receive fuel can be varied transversely.

In order that the disks will receive equal amounts of fuel when the fire is burning properly, an adjustable central rib 34 is provided at the delivery end of the conduit 4. The central rib 34 is pivoted at 35 to the horizontal extension 14 of the conduit. If the condition in which the fire is burning requires that more fuel be discharged to one side of the firebox than the other, the central rib can be set by the hand operated rod 36 so more fuel will be delivered to one disk than the other. The rod 36 is pivoted to the rear end of the central rib and arranged to move in a slot 37 in the lower wall of the conduit.

Immediately beneath the outlet end of the conduit and above the disks is a plate 38, which is supported on the rim 28 of the support member 11 and arranged to slide thereon toward and away from the firebox. The plate 38 is moved by handles 39 and 40 that are pivoted to the sides thereof. The plate 38 in effect, varies the length of the horizontal extension 14 of the conduit so that the portions of the disks of the distributing device which receive fuel can be varied longitudinally. If it is desired, one handle can be pushed further forward than the other, thereby offsetting the plate 38 (Fig. 8) so more fuel will

be deposited on one disk than the other, at the forward portions of the disks.

Figures 10 and 11 illustrate a modification of the control described in the foregoing paragraph. The portions of the disks which receive fuel can be varied longitudinally independently of each other by the plates **41** and **42**. The plates **41** and **42** are arranged to slide toward and away from the firebox in tracks **43** that are formed on the underside of the horizontal extension **44** of the stoker conduit **45**. The plates **41** and **42** are moved by handles **46** and **47**, respectively, which are operatively connected to the plates by pivoted levers **48** and **49**.

In Figure 12 a central rib **50**, which is a modification of the central rib **34**, is shown projecting forward of the horizontal extension **14** of the stoker conduit. The forward portion of the central rib will maintain the fuel properly divided when the controls set forth in the two foregoing paragraphs are in their forward positions or positions toward the firebox.

As fuel falls from the outlet end of the conduit upon the disks, on the advancing sides of the ribs **17**, it is projected therefrom into the firebox by the forward movement of the ribs, and it is scattered in the firebox by reason of being thrown, by momentum, off the disks. The scattering action of the disks and ribs **17** upon the fuel is diagrammatically illustrated in Fig. 9 of the drawings. A lump of fuel leaving the disk at a point B will travel in a direction indicated by line B—B. The course of a lump of fuel leaving the disk at a point C will be that indicated by line C—C. Particles of fuel leaving the disk at points intermediate points B and C, for instance, at point D, will travel in a direction indicated by line D—D. By moving the vanes **30** and **31** to the positions shown by the dotted lines, the bulk of fuel will be delivered near to and on the edges of the disks and the greater portion will be discharged to the center of the firebox.

The position at which the fuel falls upon the disks of the distributing device, forward or rearward, determines the direction in which it is projected into the firebox. A lump of fuel dropped on the rotating disk at a point E, will slide along one of the ribs **17**, leave the disk at a point E′, and be projected in a path indicated by line E′—E′. A lump of fuel dropped on the disk further forward, as at a point F, will leave the disk at a point F′ and travel in a course indicated by line F′—F′.

To discharge fuel to the center of the firebox, the controls are set so fuel is delivered adjacent the outer portions of the disks immediately beneath the forward edge of the horizontal extension **14**. To discharge fuel to the sides and rear corners of the firebox, the plate **38** is moved to its forward position so fuel is delivered to the forward portions of the disks.

I have shown and described what I believe is a preferred embodiment of my invention, but those skilled in the art may see various improvements and uses of the features of my invention, so I do not regard the invention as limited to the construction illustrated and described. The fuel distributing disks are shown as being actuated by pressure fluid blasts; but they may be actuated mechanically, as by a chain belt connected with suitable means for imparting motion thereto; or the disks may be geared together so both will rotate the same number of rotations per minute. Such changes may be made without departing from the spirit and scope of the invention. Although the distributing device is shown and described in connection with a locomotive boiler it is to be understood that its application is not limited thereto.

What I claim is:

1. In combination with a firebox having a wall provided with a firing opening therein, a stoker conduit extending upwardly to and opening forwardly into the firing opening, a plurality of fuel distributing disks carried by said conduit and arranged to rotate in opposite directions, said disks being positioned below the outlet end of said conduit to receive fuel therefrom, a portion of the bottom wall of said conduit extending above said disks, means for transferring fuel through said conduit and over said portion of the bottom wall of the conduit onto said disks, and means for rotating said disks.

2. In combination with a firebox having a firing opening, means for delivering fuel to said firing opening, a plurality of disks arranged to receive fuel from said means and discharge it into the firebox, means for transversely varying the fuel receiving area of said disks and means for longitudinally varying the point of reception of fuel on said disks.

3. In combination with a firebox having a firing opening, means for delivering fuel to said firing opening, a plurality of disks arranged to receive fuel from said means and discharge it into the firebox, means for transversely varying the fuel receiving area of said disks, means for longitudinally varying the point of reception of fuel on said disks and means for varying the relative amounts of fuel delivered to said disks.

4. In combination with a firebox having a firing opening, a stoker conduit for delivering fuel to said opening, a plurality of disks arranged to receive fuel from said conduit and discharge it into the firebox, a vane pivotally mounted on a vertical axis at each side of the discharge end of said conduit, means for moving said vanes about said pivots to vary the width of the discharge end of said conduit, a horizontal plate above said disks and subjacent the discharge end of said conduit and means for longitudinally varying the position of said plate.

5. In combination with a firebox having a firing opening, a stoker conduit for delivering fuel to said opening, a plurality of disks arranged to receive fuel from said conduit and discharge it into the firebox, a vane pivotally mounted on a vertical axis at each side of the discharge end of said conduit, means for moving said vanes about said pivots to vary the width of the discharge end of said conduit, a horizontal plate above said disks and subjacent the discharge end of said conduit, means for longitudinally varying the position of said plate, and a hinged dividing rib positioned centrally between said disks for varying the relative amounts of fuel delivered to said disks.

6. In combination with a firebox having a wall provided with a firing opening therein, a stoker conduit communicating with said firing opening, a plurality of fuel distributing disks carried by said conduit and arranged to rotate in opposite directions, said disks being positioned below the discharge end of said conduit to receive fuel therefrom and discharge it into the firebox, the lower wall of said conduit projecting forwardly over the rear portion of said disks, a pair of movable vanes forming respectively continuations of the side walls of said conduit and extending

forwardly therefrom across the lower wall portion of said conduit that projects over the rear portion of said disks, means for transferring fuel through said conduit and over said projecting conduit wall portion onto said disks and means for rotating said disks.

7. In combination with a firebox having a wall provided with a firing opening therein, a stoker conduit extending upwardly to and opening forwardly into the firing opening, a flange depending from the bottom wall of said conduit near its discharge end, a support member secured to said flange, a plurality of fuel distributing disks carried by said support member and arranged to rotate in opposite directions, said disks being positioned below the discharge end of said conduit to receive fuel therefrom, a portion of the bottom wall of said conduit extending above said disks, means for transferring fuel through said conduit and over said portion of the bottom wall of the conduit onto said disks, and means for rotating said disks.

8. In combination with a firebox having a firing opening, means for delivering fuel to said firing opening, a plurality of disks arranged to receive fuel from said means and discharge it into the firebox, means for transversely varying the fuel receiving area of said disks and means for longitudinally varying the point of reception of fuel on said disks independently of each other.

9. The combination in a furnace having a wall with a firing opening therein, of a stoker conduit having a delivery end in communication with said firing opening, means for urging fuel through said conduit, a fuel distributing device below the delivery end of said conduit for projecting the fuel into the furnace, a plate element between the delivery end of said conduit and said distributing device forming a spill edge over which fuel passes from said conduit to said distributing device, and means for adjustably moving said plate element longitudinally and angularly of said conduit to cause the spill edge thereof to assume any one of a number of angular positions with respect to the delivery end of said conduit.

10. The combination in a furnace having a wall with a firing opening therein, of a stoker conduit having a delivery end in communication with said firing opening, a fuel distributing device below the delivery end of said conduit for projecting the fuel into the furnace, a plurality of plate elements between the delivery end of said conduit and said distributing device forming a plurality of spill edges over which fuel passes from said conduit to said distributing device, and means for adjusting said plate elements independently of each other longitudinally with respect to the delivery end of said conduit.

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