March 29, 1932. N. M. LOWER 1,851,636

LOCOMOTIVE STOKER

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Fig. 1

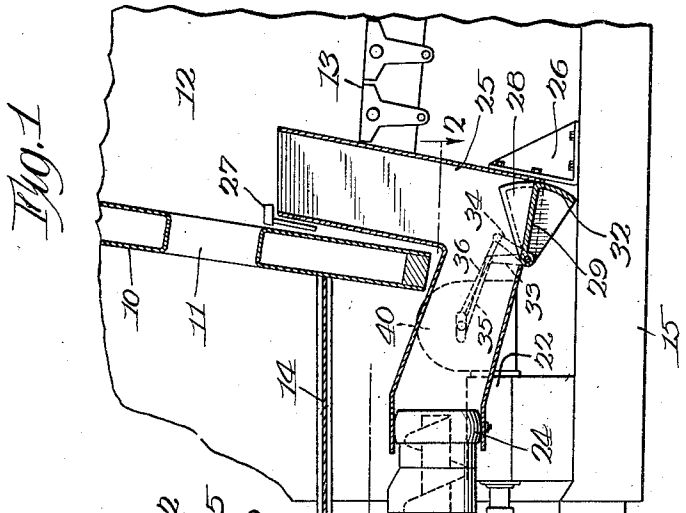
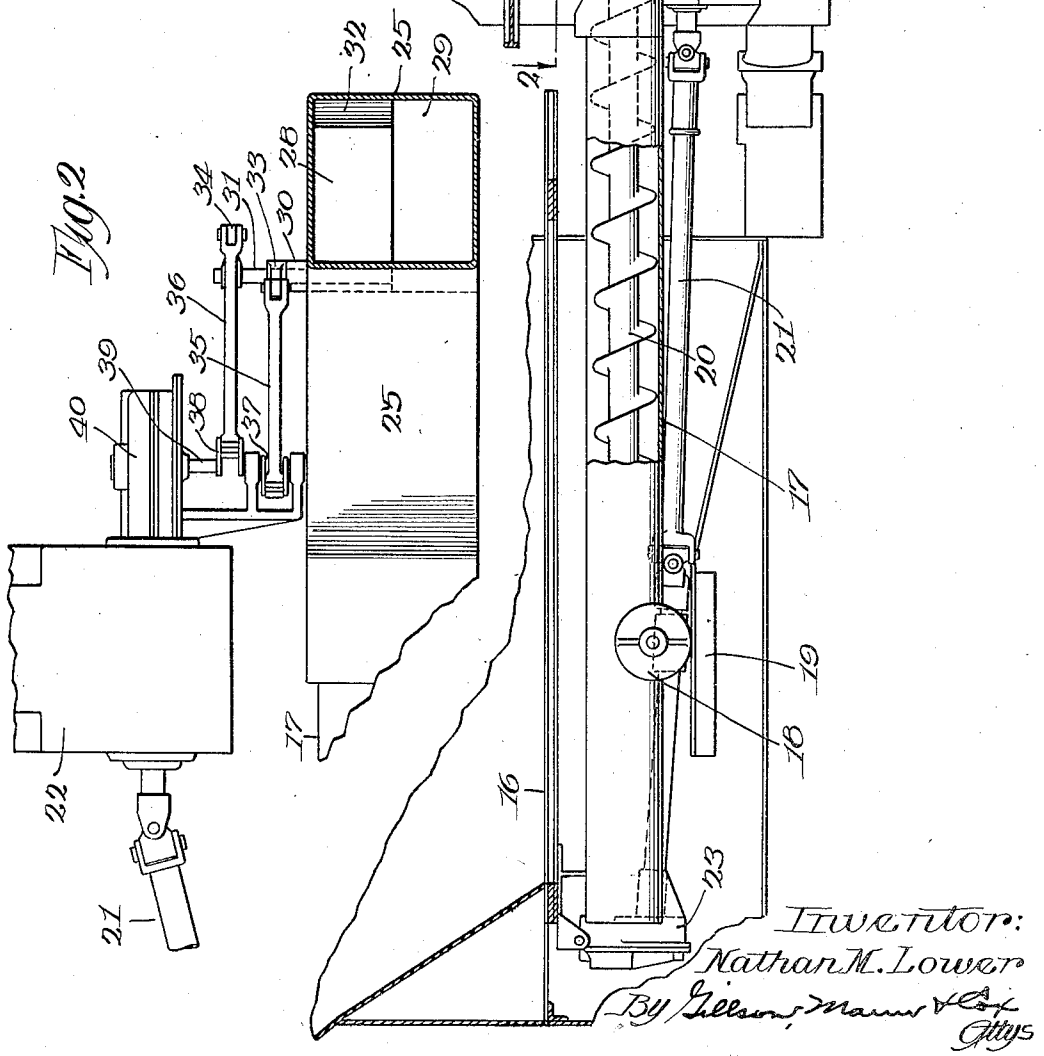


Fig. 2



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LOCOMOTIVE STOKER

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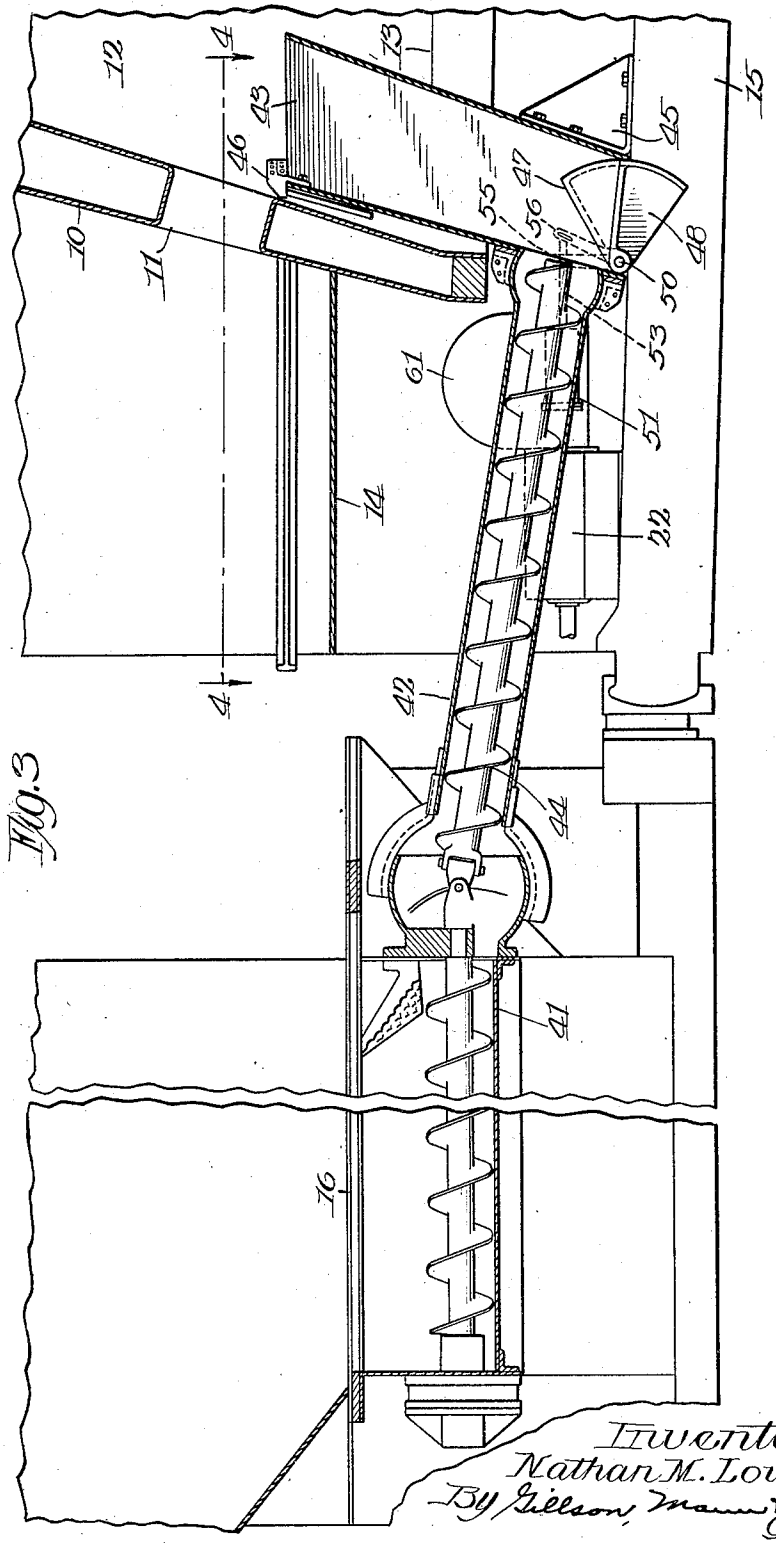

Fig. 3

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LOCOMOTIVE STOKER

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Fig. 6

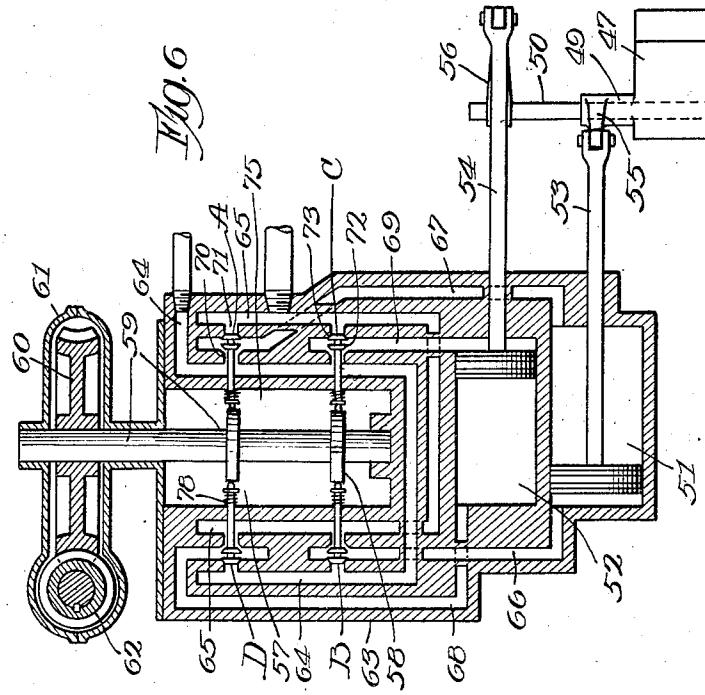


Fig. 5.

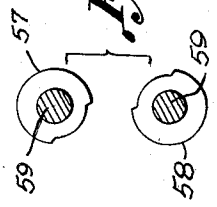
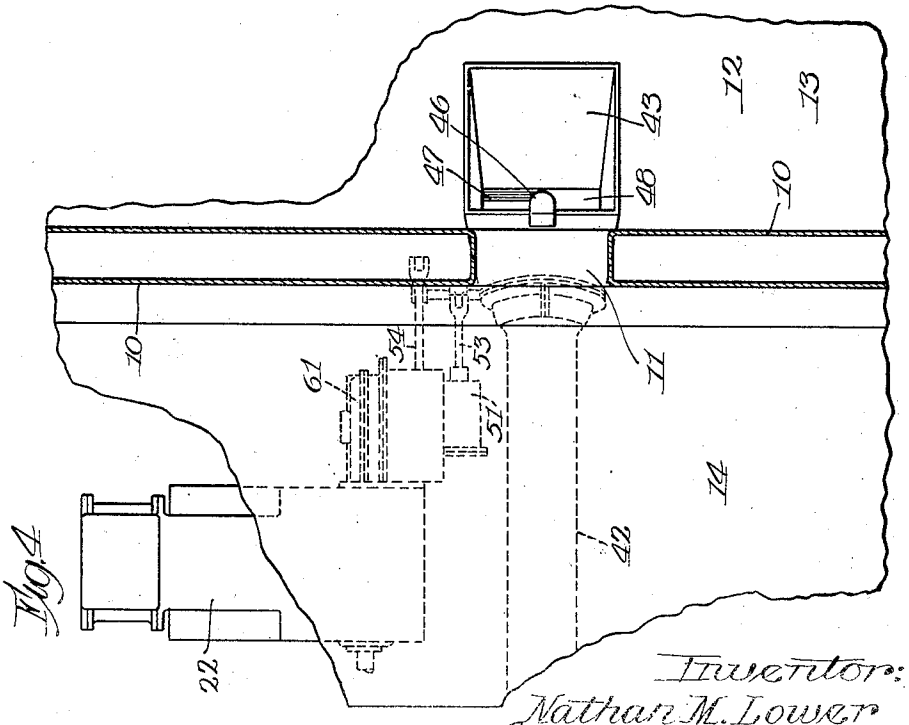


Fig. 4



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Patented Mar. 29, 1932 1,851,636

UNITED STATES PATENT OFFICE

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LOCOMOTIVE STOKER

Application filed June 11, 1926. Serial No. 115,178.

The invention relates to that type of locomotive stokers in which the fuel is conveyed by a conduit from the tender and delivered thereby to a riser tube, through which it is carried to a point above the grates of the fire-box by means of pressure exerted by the transferring mechanism within the conduit; its objects being to incorporate into stokers of this type a certain known form of transfer conduit and mechanism, and to provide improved means for preventing the impacting of the fuel.

In the accompanying drawings,

Fig. 1 is a detail central longitudinal vertical section of a locomotive and its tender, including one form of embodiment of the invention;

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

Fig. 3 is a view similar to Fig. 1, showing a modified form of construction;

Fig. 4 is a sectional view on the line 4—4 of Fig. 3;

Fig. 5 shows in elevation two cams appearing in Fig. 6, and in section, a shaft upon which they are mounted;

Fig. 6 is a plan view, partly in section and partly diagrammatic, of the fuel lifting mechanism of Fig. 3.

For the purpose of showing the application of the stoker to a locomotive, certain parts of the latter are shown,—the boiler backhead being designated 10, and having a hand firing door opening 11; the grates of the fire-box 12 are indicated at 13; the floor or deck of the locomotive cab is designated 14; the locomotive frame is marked 15; and the floor of the fuel bin of the tender is designated 16.

As shown in Fig. 1, a transfer conduit 17 is located below the floor 16 of the tender, and is carried by wheels, as 18, running on tracks, as 19, which are secured to the tender frame. This conduit is of known form, its rearward portion being open at the top to receive fuel through an aperture in the floor 16. A helical screw conveyer 20 is mounted within the conduit for advancing the fuel therethrough and is driven by means of a jointed and telescopic shaft 21, actuated by a motor 22, suitably mounted on the frame 15 of the locomotive,—the rearward end of the shaft being operatively connected with the screw by means of suitable gearing housed within the casing 23 at the rear end of the conduit.

The conduit 17 extends forwardly as a single unit under the cab deck 14 and is connected by a ball joint 24 with an approximately horizontal leg of an elbow-shaped conduit 25 which extends under the backhead 10 and thence upwardly adjacent to the inner surface thereof, terminating above the normal level of the bed of fuel to be carried by the grate. The upwardly extending leg of the elbow constitutes a riser through which the fuel is urged by the pressure exerted by the screw 20, and is angular in cross section, being shown in Fig. 2 as approximately square.

The elbow constitutes a delivery nozzle from the open and upper end of which the fuel issues and from which it is scattered over the grate by means of steam jets from a nipple conventionally indicated at 27 and positioned between the nozzle and the backhead, and slightly above the former.

The lower wall of the elbow of the riser tube 25 is apertured, the aperture being closed by a pair of reciprocating plates 28, 29, which are pivotally carried by rock shafts 30, 31, sleeved one upon the other. The plates 28, 29, are arranged to swing upwardly from the line of the bottom wall of the elbow through a small angle, and at their free ends are provided with skirts, as shown at 32, for preventing fuel from entering below them when elevated. The shafts 30, 31, are provided with crank arms 33, 34, which are connected, by means of links 35, 36, with cranks 37, 38, of a shaft 39 journaled within a casing 40 carried by the casing of the motor 22, and within which are mounted suitable gears for rotating the shaft 39.

Fuel is forced by the pressure of the screw 20 through the delivery nozzle 25, with the cooperation of the plates 28, 29, which prevent its impacting at the elbow. The cranks 37, 38, are disposed at such angles that the plates 28, 29, while moving continuously, make their respective strokes in alternation.

The advantage of this arrangement is that any tendency of the fuel to settle in the upstanding or delivery leg of the riser tube, as one of the plates recedes, is prevented by the movement of the companion plate.

In the construction illustrated in Fig. 3, the transferring conveyer comprises a rearward section 41, which may be rigidly attached to the tender frame and receives the coal from the fuel bin, and a forward section 42, connected to the rearward section by a universal joint and leading forwardly under the deck 14 of the cab and being united, by a ball joint below the mud ring of the boiler, to a riser tube 43. Within the transfer conduit there is housed a fuel-advancing element, here shown as a screw 44, formed of two sections universally jointed together and extending to the forward end of the forward section of the conduit.

The riser tube 43 is a substantially square tube, rigidly secured to the engine frame as by means of a bracket 45, and extending upwardly through the grates to a suitable height for the distribution of the fuel thereover as it issues from the open upper end of the riser. A steam nipple 46, secured at the rearward side of the top of the riser tube, discharges steam jets thereacross which are suitably directed for scattering the fuel over the entire grate area. The lower end of the riser tube 43 is open, and within it is mounted a pair of pusher plates 47, 48, which are fixed upon a pair of shafts 49, 50, which are in sleeved relation and extend across the rearward side of the riser tube. These plates swing upwardly partially across the delivery end of the transfer conduit, and are arranged to act intermittently and in alternation. Each plate remains at rest in its upper position while the other makes a complete down and upstroke.

The mechanism for thus actuating the blades may take various forms. As illustrated it comprises a pair of reciprocating steam motors 51, 52, the piston rods 53, 54, of which are suitably connected to crank arms 55, 56, attached, respectively, to the shafts 49, 50. The valves of the motors 51, 52, are controlled by a pair of cams 57, 58, mounted on a shaft 59, driven by means of a worm wheel 60 within a gear casing 61 attached to the casing of the motor 22, and a worm 62 driven from the main motor.

The valve casing 63 of the motors 51, 52, is provided with a steam passage 64 and an exhaust passage 65, both of which may be opened to ducts leading to both ends of the cylinders of each of the motors 51, 52. The ducts associated with the motor 51 are designated, respectively, 66 and 67; the ducts associated with the motor 52 being designated, respectively, 68, 69. In each case the portion of these ducts within the casing 63 is formed in walls separating the ducts 64, 65, and which are ported, as shown at 70, 71, to communicate with each. These ports are in each instance aligned and are controlled by a pair of valves, as 72, 73, fixed upon a stem 74 projecting into a central chamber 75 of the casing 63, within which is disposed the shaft 59 and the cams 57, 58. The valves of each pair are so related that in each of the positions of the stem one of the valves is seated and the other opened.

These cams are circular in form, their peripheries being recessed, as shown at 76, 77, through one-fourth of the circumference, and turn in the direction of the arrows. The inner ends of the valve stems, as 74, ride upon the peripheries of the cams, and are held in contact therewith by springs, as 78.

The several sets of valves are, for convenience of description of operation, designated, respectively, A, B, C, D,—the valves A, B, cooperating with the motor 51, and the valves C, D, with the motor 52. With the valves in the positions as illustrated the steam passage 64 is open to the duct 67 leading to the cylinder of the motor 51, and the duct 66, connected with the opposite end of this cylinder, is open to the exhaust passage 65,—this dispositioning of the valves A, B, having subsisted during one-half of a revolution of the cams 57, 58, and continuing while these cams make a further quarter turn, the piston of the motor 51 meantime remaining at rest.

The valves C, D, have just been shifted by the cams to open the steam passage 64 to the duct 69 leading to one end of the cylinder of the motor 52, and to open the exhaust passage 65 to the duct 68 leading to the opposite end of this cylinder. During the quarter turn of the cam which has just been completed, the stems of the valves C, D, have been in contact with the reduced sections 76, 77, of the cams, during which interval the steam passage 64 has been in communication with the duct 69 and the piston has made an outstroke, carrying the plate 48 downward. The shifting of the valves C, D, which is shown to have just occurred, will cause the reverse stroke of the piston of the motor 52, returning the plate 48 to its upper position which it will continue to occupy until the cams shall have completed a three-fourths turn. Meantime the piston of the motor 51 remains at rest, holding the plate 47 in its upper position until the cams have made a quarter turn, by which time the plate 48 will have been returned to its upper position.

In both forms of the plate-actuating mechanism one plate is always acting to prevent recession of fuel within the riser tube. In the construction shown in Figs. 1 and 2, there is one plate always acting to give the fuel an upward impulse.

In each of the forms shown the fuel is prevented from packing at the lower end of

the riser tube by the action of the swinging plates, and any tendency to rotation as it passes upwardly is prevented by the cross-sectional angular form of the riser tube.

That portion of the riser tube which is within the fire-box is protected against the intense heat by air currents passing upwardly along its outer faces, and the swinging plates make a sufficiently loose fit within the lower end of the riser tube to permit the admission of air which passes up through or with the fuel. If desired a protecting wall of any suitable kind may inclose the riser.

The details of construction may be varied within the scope of the invention.

I claim as my invention—

1. In a stoker, in combination, a transfer conduit, a riser conduit receiving therefrom, a screw within the transfer conduit for advancing fuel therethrough and for exerting a pressure on the same within said riser conduit, a pair of upwardly swinging plates at the lower end of the riser conduit, a pair of reciprocating motors, crank connection between the piston of each motor and one of the plates, steam and exhaust passages, ports connecting each of said passages with both ends of the motor cylinders, valves controlling such ports, cams for controlling the valves and arranged to cause complete strokes of the two motors in alternation, and means for actuating the cams.

2. In a stoker, in combination, a transfer conduit, a riser conduit receiving therefrom a screw within the transfer conduit for advancing fuel therethrough and for exerting a pressure on the same within said riser conduit, a pair of upwardly swinging plates at the lower end of the riser conduit, a pair of reciprocating motors, crank connection between the piston of each motor and one of the plates, steam and exhaust passages, ports connecting each of said passages with both ends of the motor cylinders, valves controlling such ports, cams for controlling the valves and arranged to cause complete strokes of the two motors in alternation, a prime motor for actuating the screw, and operative connection between the prime motor and the cams.

3. In combination, a boiler having a fire-box, a fuel bin rearward of said boiler, a stoker comprising a transfer conduit for conveying fuel forwardly from said bin, a riser tube extending upwardly and communicating with the firebox, the conduit delivering into the riser tube, means within the conduit for advancing fuel therethrough and for exerting pressure on the fuel within the riser tube, means separate and apart from said first named means including a plurality of fuel lifting members operating at the bottom portion only of the riser tube to prevent impacting of the fuel and for cooperating with said first named means in advancing the fuel, and means for actuating said lifting members alternately.

4. In combination, a boiler having a fire-box, a fuel bin rearward of said boiler, a stoker comprising a transfer conduit for conveying fuel forwardly from said bin, a riser tube extending upwardly and communicating with the firebox, the conduit delivering into the riser tube, means within the conduit for advancing fuel therethrough and for exerting pressure on the fuel within the riser tube, means separate and apart from said first named means including a pair of alternately acting, upwardly swinging members operating at the bottom portion of the riser tube only to prevent impacting of the fuel and for cooperating with said first named means in advancing the fuel, and means for actuating said members alternately.

5. In combination, a boiler having a fire-box, a fuel bin rearward of said boiler, a stoker comprising a transfer conduit for conveying fuel forwardly from said bin, a riser tube extending upwardly and communicating with the firebox, the conduit delivering into the riser tube, means within the conduit for advancing fuel therethrough and for exerting pressure on the fuel within the riser tube, means separate and apart from said first named means including a pair of intermittently and alternately acting, upwardly swinging plates operating at the bottom portion only of the riser tube to prevent impacting of the fuel and for cooperating with said first named means in advancing the fuel, and means for actuating said plates alternately.

6. In combination, a boiler having a fire-box, a fuel bin rearward of said boiler, a stoker comprising a transfer conduit for conveying fuel forwardly from said bin, a riser tube extending upwardly and communicating with the firebox, the conduit delivering into the riser tube, means within the conduit for advancing fuel therethrough and for exerting pressure on the fuel within the riser tube, means separate and apart from said first named means including a pair of intermittently and alternately acting, upwardly swinging plates operating at the bottom portion only of the riser tube to prevent impacting of the fuel and for cooperating with said first named means in advancing the fuel, and means for actuating said plates.

7. In combination, a boiler having a fire-box, a fuel bin rearward of said boiler, a stoker comprising a transfer conduit for conveying fuel forwardly from said bin, a riser tube extending upwardly and communicating with the firebox, the conduit delivering into the riser tube, means within the conduit for advancing fuel therethrough and for exerting pressure on the fuel within the riser tube, means separate and apart from said first named means including a pair of intermit-

tently and alternately acting, upwardly swinging plates operating at the bottom portion only of the riser tube to prevent impacting of the fuel and for cooperating with said first named means in advancing the fuel, and an individual fluid motor for actuating each plate.

8. In combination, a boiler having a firebox, a fuel bin rearward of said boiler, a stoker comprising a transfer conduit for conveying fuel forwardly from said bin, a riser tube extending upwardly and communicating with the firebox, the conduit delivering into the riser tube, means within the conduit for advancing fuel therethrough and for exerting pressure on the fuel within the riser tube, means separate and apart from said first named means including a pair of intermittently and alternately acting, upwardly swinging plates operating at the bottom portion only of the riser tube to prevent impacting of the fuel and for cooperating with said first named means in advancing the fuel, and an independent steam motor for actuating each plate and power driving cams controlling the motor valves and acting to operate the motors intermittently and alternately.

In testimony whereof I affix my signature.

NATHAN M. LOWER.