Dec. 6, 1927. 1,652,028

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LOCOMOTIVE STOKER

Filed Dec. 17, 1923 3 Sheets-Sheet 1

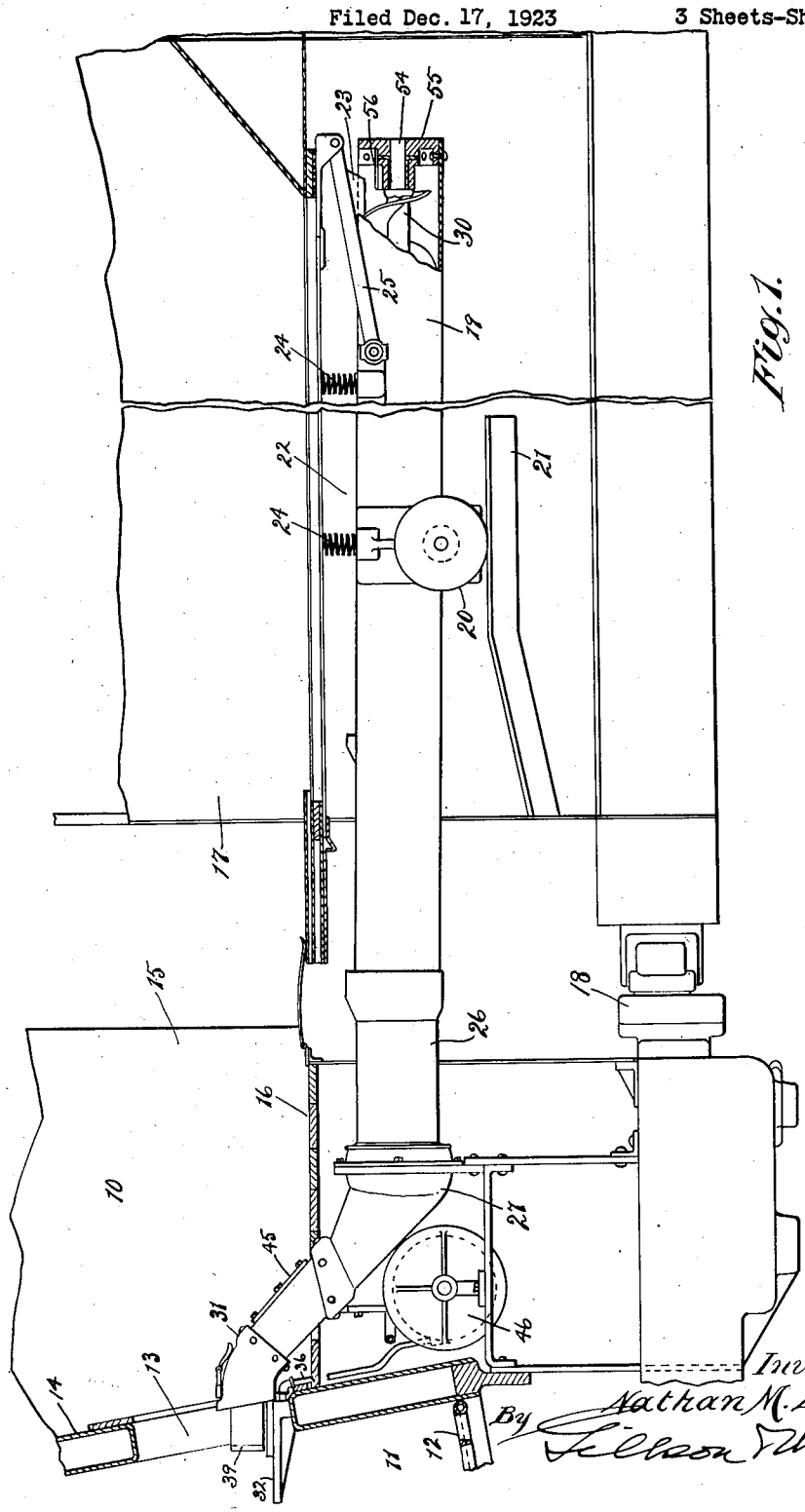

Fig. 1.

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Filed Dec. 17, 1923 3 Sheets-Sheet 2

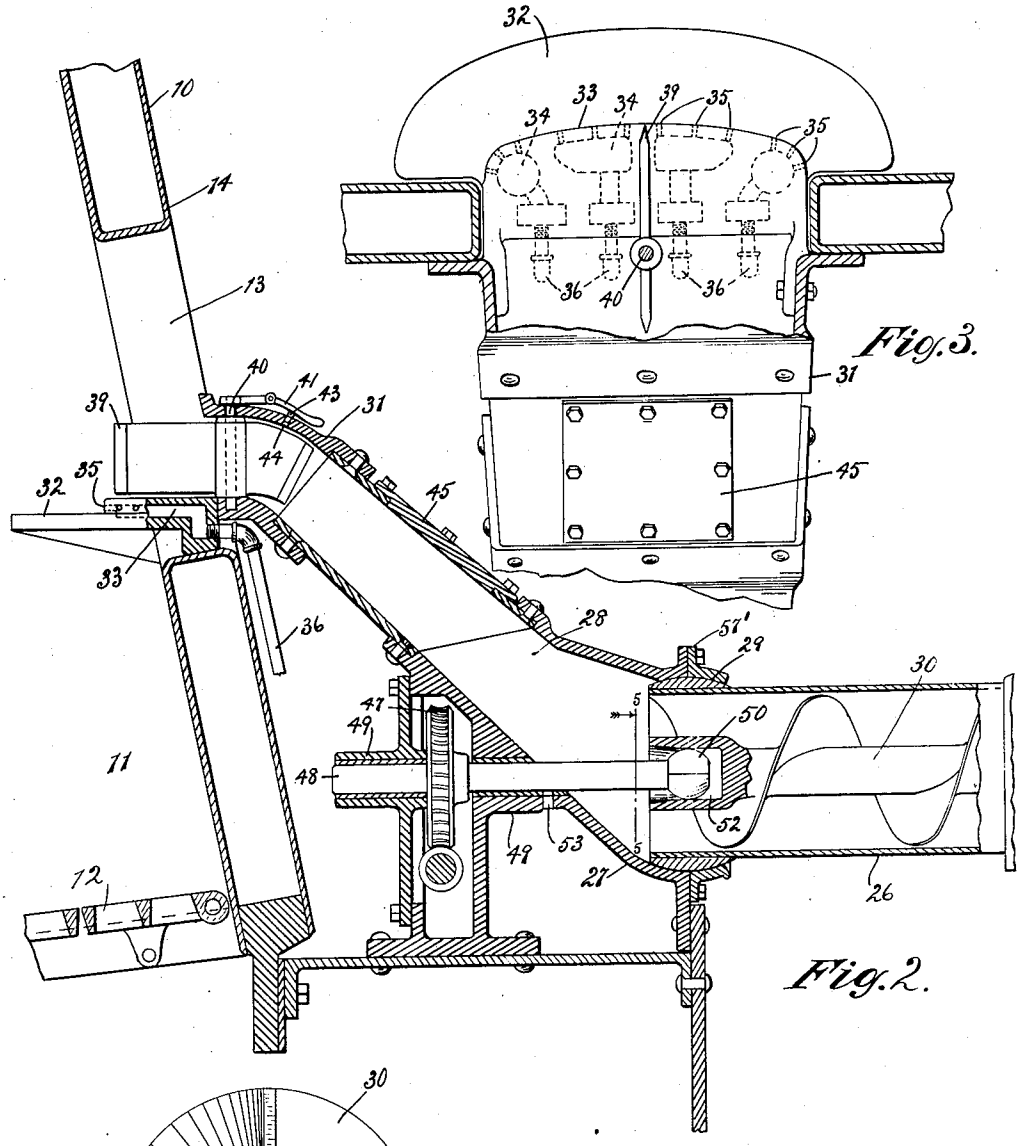

Fig. 3.

Fig. 2.

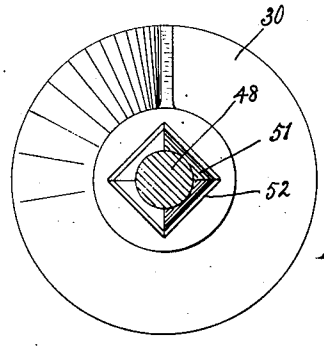

Fig. 5.

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Filed Dec. 17, 1923 3 Sheets-Sheet 3

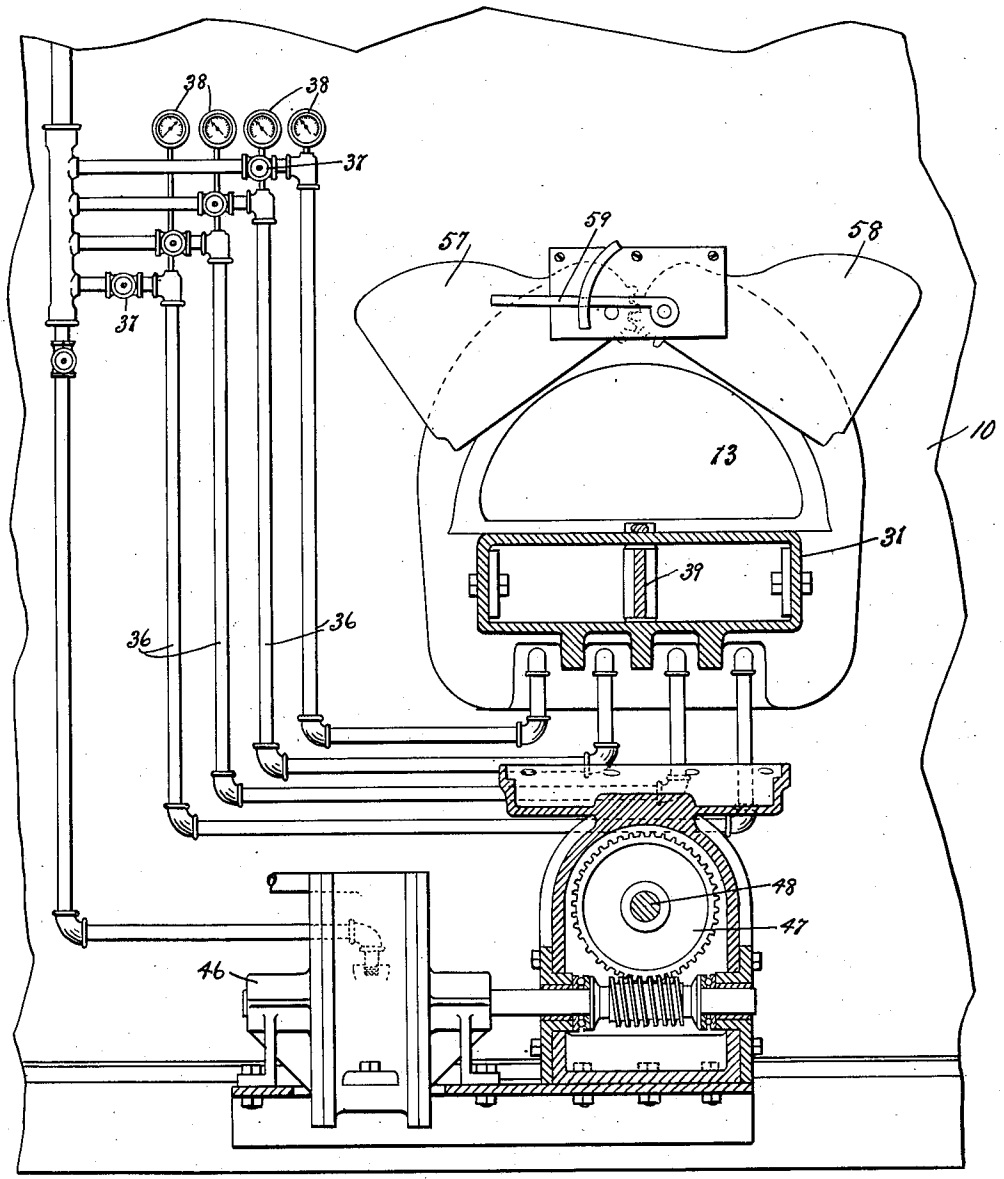

Fig. 4.

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Patented Dec. 6, 1927. 1,652,028

UNITED STATES PATENT OFFICE.

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LOCOMOTIVE STOKER.

Application filed December 17, 1923. Serial No. 681,035.

This invention relates to mechanical stokers, and more particularly to stokers for locomotives and the like.

One of the objects of the invention is the provision of a stoker for delivering fuel to the firebox above the level of the fire without the necessity of employing elevating mechanism other than the transferring screw beneath the tender.

Another object of the invention is the provision of a mechanical stoker that is simple in construction, cheap to manufacture, composed of a minimum number of moving parts, that may be easily assembled and readily installed on the locomotive, and that is not likely to become broken or get out of order.

Other and further objects and advantages of the invention will appear from the following description taken in connection with the accompanying drawings, in which

Fig. 1 is a side elevation of a portion of a locomotive and its tender with the invention in position thereon, with parts in section and parts omitted;

Fig. 2 is a partial vertical section of the stoker and a portion of the locomotive;

Fig. 3 is a plan view of the forward portion of the stoker in position on the locomotive;

Fig. 4 is a vertical section of the forward portion of the stoker with the parts shown more or less diagrammatically; and

Fig. 5 is a section on line 5—5 of Fig. 2.

On the drawings the reference character 10 designates a portion of a locomotive provided with a firebox 11 having in its lower portion the grate bars 12, and a door opening 13 in the back wall 14 thereof, all of which are of the usual or well known construction. The locomotive is also provided with the usual cab 15 having the floor 16 and a tender 17 flexibly connected thereto in the usual manner, as conventionally shown at 18.

Suitable fuel transferring mechanism is mounted in the usual manner beneath the deck of the tender. This mechanism comprises a fuel transfer conduit 19 extending beneath and parallel with the deck of the tender. For convenience in description the term "forward" is employed to denote the direction in which the fuel moves along the transfer conduit. The rear end of this conduit, that is, the end beneath the tender may be considered a trough and is open at its upper side for receiving fuel from the tender through a suitable opening in the deck. The conduit is provided with rollers 20 which engage tracks 21 in the manner disclosed in patent to Lower No. 1,423,533, July 25, 1922.

An angle ring 22, made of angle bars, having its depending flanges 23 extending into the open side of the trough and held against the under side of the deck opposite the opening therein by the springs 24 and the links 25, is employed to prevent loss of fuel over the sides of the trough during the operation of the stoker.

The front end of the conduit 19 is tubular as shown at 26, is circular in cross-section, and is adapted to be articulated with the lower end 27 of a fuel or elevator conduit 28 by the universal joint 29. In forcing solid fuel through conduits having sharp turns there is more or less of the fuel reduced to powdered form by the pressure, and in fuels that contain powdered or crushed portions there is more or less loss due to the draft carrying the unconsumed finer particles along with it through the smokestack. In order to reduce the crushing action to a minimum, and thereby effect a saving of fuel, the conduit 28 is preferably arranged at a moderate incline. It is rigidly mounted on the locomotive by any suitable means and extends upwardly and forwardly from the front end of the conduit 19 at a moderate inclination, its upper end being in communication with the conventional fire-door opening in the back wall of the firebox above the grates.

The conduit 19 is provided with a conveyor screw 30 of the usual or well known construction. This screw is coextensive with the conduit 19, and is adapted to force fuel upwardly through the elevator conduit 28 into the firebox.

In forcing fuel, especially coal or coke, through a tubular conduit, the fuel is likely to become clogged or wedged in the conduit unless suitable provision is made for agitating or breaking up the mass as it moves along the conduit. Any suitable means may be provided for this purpose. Preferably this is accomplished without the aid of moving mechanism. As shown, the lower end 27

of the conduit 28 is circular in cross-section to conform to the forward end of the conduit 19. The upper portion of the conduit is non-circular, that is, it is flattened somewhat. The upper portion 31 is preferably rectangular, the sides thereof diverging upwardly to a width substantially that of the door opening as shown in Fig. 3, the construction being such that the conduit gradually increases in cross-sectional area toward its upper and delivery end. Either of these expedients tends to prevent choking or jamming of the fuel in the conduit. The gradually increasing size of the conduit permits loosening of the mass as it moves upward and the change in contour forces the particles of fuel to change their positions relatively to each other, and consequently breaks up any mass that may tend to become compact in its movement along the conduit.

The fuel forced through the conduit 28 is delivered on to the distributing plate 32 which is located at such a height above the grates that the fuel is distributed over the entire grate area by the fuel projecting means.

In the form of the device selected to illustrate one embodiment of the invention, steam jets are employed for this purpose. A suitable nozzle 33 which may be integral with the distributing plate 32 is provided. The nozzle is provided with a plurality of steam chambers 34, from each of which nozzle openings 35 are adapted to direct jets of steam across the upper surface of the plate 32 for forcing the fuel to all parts of the firebox as fast as it is delivered on to the plate 32. Each chamber 34 is provided with a separate pipe 36 for supplying steam thereto. Each pipe is provided with a separate valve 37 for controlling the supply of steam to the corresponding nozzle. Each pipe 36 may be provided with a gauge 38 to assist the fireman in determining the proper regulation of the valves.

It is desirable that means be provided for varying the delivery of the fuel on the different portions of the plate 32. For this purpose a deflecting plate 39 provided with a vertical pivot 40 intermediate its ends is provided whereby said plate extends forwardly and rearwardly from said pivot. The pivot 40 is journaled in the upper end of the conduit on the median line thereof and is provided with an operating handle 41 rigidly secured thereto whereby the plate 39 may be oscillated to direct the bulk of the fuel to either side of the plate if it is so desired. The handle is held in adjusted position by the lug 43 carried by the pivoted section of the handle. The lug is adapted to engage suitable openings in the upper portion of the conduit, one of which is shown at 44 in Fig. 2.

In order that access may be had to the interior of the elevator conduit 28 the upper wall of the same is provided with a detachable door 45.

Suitable mechanism is provided for operating the transferring screw. As shown in Figs. 2 and 4 a rotary engine 46 provided with a worm gear drive 47 is provided for this purpose. The gear shaft 48 may be mounted in suitable bearings 49 in the lower end of the conduit casing and its rear end terminates in a ball-like projection 50 having a squared central portion 51, which is adapted to slidably engage a rectangular opening 52 in the forward end of the shaft of the screw conveyor 30 and form therewith a universal joint concentric with the universal joint 29 whereby relative movement between the conveyor and conduit is permitted. The slidable connection between the shaft 48 and screw 30 permits the parts to be disconnected by an endwise movement.

The bearing 49 may if desired be provided with an opening 53 for permitting the discharge of powdered fuel and other foreign matter that may work into the bearing along the shaft 48.

The rear end of the conveyor screw 30 is journaled on a pin 54 extending forwardly from the rear end of the conduit 19. The rear end of the screw engages a thrust plate 55 extending about the pin 54. When the screw is reversed the thrust is taken by the ball 50, the screw 30 moving forward slightly away from the plate 55. In order to prevent fuel from falling between the end of the screw and the plate 55 a shield 56 is provided which extends forwardly over the pin 54.

The space above the conduit in the opening in the back wall of the firebox may be provided with suitable doors 57 and 58 for closing said opening. Any suitable door operating mechanism 59 of well known construction may be employed for operating the doors when hand firing becomes necessary.

Where it is desired to disconnect the conduit 19 from the conduit 28, as when the locomotive is disconnected from the tender or it becomes necessary to disconnect the parts for replacements or repairs, the retaining flange member 57′ of the universal joint 29 is first removed after which the parts may be disconnected by an endwise movement.

Various changes of detail may be made within the scope of the invention. For example, while it is usually desirable to deliver the coal to the fire box through the hand firing door opening or an enlargement thereof, this is not of the essence of the invention.

I claim as my invention:

1. In combination, a fuel transfer conduit having its forward end provided with a curved enlargement, an elevator conduit

having its lower end provided with a curved recess for receiving said enlargement, and a retaining member for holding said enlargement in said recess, a fuel conveyor screw in said transfer conduit, the forward end of said screw being provided with an angular opening, a driving shaft provided with a driving head slidably and pivotally engaging in said recess for driving said screw whereby said transfer conduit and screw may be removed by an endwise movement after first removing said retaining member.

2. In combination, a fuel transfer tube, a fuel conduit, a fuel transfer screw in said tube, driving mechanism carried by said conduit, said mechanism comprising a driving head pivotally and slidably engaging in a recess in the forward end of said screw for rotating the same, and means for flexibly connecting said tube to said conduit, said means including a removable member whereby said tube may be removed from said conduit and said mechanism by an endwise movement thereof.

3. The combination with a boiler firebox of a conduit curving from its lower portion to an upwardly inclined portion without sudden changes in its cross sectional dimensions, said conduit having successive cross sectional areas toward its delivery end not less than the cross sectional area of said lower portion, the upper end of said conduit extending on the outer side of the firebox and projecting above the level of the fire of the firebox, a conveying apparatus for delivering coal to the lower portion of the conduit and forcing the coal forward through said conduit, the forward end of the impelling portion of said conveying apparatus being spaced from the forward wall of said conduit a distance sufficient to prevent packing of the coal in said conduit, and means for scattering the fuel over all parts of the firebox.

4. The combination with a boiler firebox of a conduit curving from its lower portion to an upwardly inclined portion and without sudden changes in its cross sectional dimensions, said conduit having successively increasing cross sectional areas toward its delivery end, the end of said conduit projecting above the level of the fire and the upwardly inclined portion being outside the firebox, a conveying apparatus for delivering fuel to the lower portion of the conduit and forcing the fuel forward through said conduit, the forward end of the impelling portion of said conveying apparatus being spaced from the forward wall of said conduit a distance sufficient to prevent the packing of the coal in said conduit and distributing means at the upper end of the conduit adapted to act on the fuel as it emerges from the conduit to distribute the same over the fire bed.

5. The combination with a boiler firebox having an opening in its back wall above the level of the fire through which coal is adapted to be supplied, of a conduit curving from a lower to an upwardly extending portion without sudden changes in its cross sectional dimensions, said conduit having successive cross sectional areas not less than the cross sectional area of said lower portion, the upwardly extending portion of the conduit projecting above the bottom of said opening and the upwardly extending portion of the conduit being outside the firebox, a conveying apparatus which delivers coal to the lower portion of the conduit and forces the coal forward through said conduit, the forward end of the impelling portion of said conveying apparatus being spaced from the forward wall of said conduit a distance sufficient to prevent packing of the coal in said conduit and means for projecting the coal over all parts of the firebox as it is delivered from said conduit.

6. The combination with a firebox, of a stoker comprising an upwardly extending conduit, its upper portion being outside the firebox and terminating above the level of the fire, screw means for supplying coal to said conduit and forcing the same therethrough, the impelling portion of said screw means terminating short of the front wall of the conduit to prevent packing of the coal, said conduit having successive cross sectional areas to its outer end, not less than the cross sectional area of its lower portion adjacent said screw means, and a distributor comprising means for scattering the coal over the fire bed as it is delivered from said conduit.

7. The combination with a firebox, of a stoker comprising an upwardly extending conduit the upwardly inclined portion thereof being outside the firebox, means for supplying coal to said conduit and forcing the same therethrough, the impelling portion of said means terminating short of the front wall of the conduit to prevent packing of the coal, said conduit having successive cross sectional areas to its outer end not less than the cross sectional area of its lower portion adjacent said means, successive cross sectional areas of the conduit varying in shape and a distributor comprising means for scattering the coal over the fire bed as it is delivered from said conduit.

8. The combination with a firebox, of a stoker comprising an upwardly curved conduit having successive cross sectional areas extending to its outer end, not less than the cross sectional area of its lower portion, the upwardly inclined portion of the conduit being outside the firebox and terminating in a delivery mouth above the fire level, means at the lower end of said conduit for supplying coal to said conduit and forcing the same therethrough, the impelling portion of

said means being spaced from the front wall of the conduit to prevent the packing of coal thereagainst, a distributor comprising means for directing a plurality of fluid jets for scattering the coal as it is delivered upwardly from said conduit over the fire and an adjustable deflector for selectively controlling the direction of movement of said coal to the fire bed.

9. In combination, a locomotive provided with a firebox having an opening in the back wall thereof, a tender and a cab for said locomotive, a conveyor conduit member beneath said tender, an elevator conduit extending upwardly and forwardly from the front end of said member through the floor of the cab and on the outside of the firebox to a point above the lower margin of said opening and in communication therewith, a screw conveyor in said conduit member for conveying fuel to, and forcing it through said elevator conduit, the impelling portion of said screw conveyor having its forward portion terminating short of the front wall of said elevator conduit a distance sufficient to prevent packing of the fuel, and means for scattering the fuel delivered by the conduit to all parts of the fire bed.

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