Dec. 1, 1925. 1,563,708

R. B. HOLTHAUS ET AL

MECHANICAL STOKER

Filed June 9, 1923 5 Sheets-Sheet 1

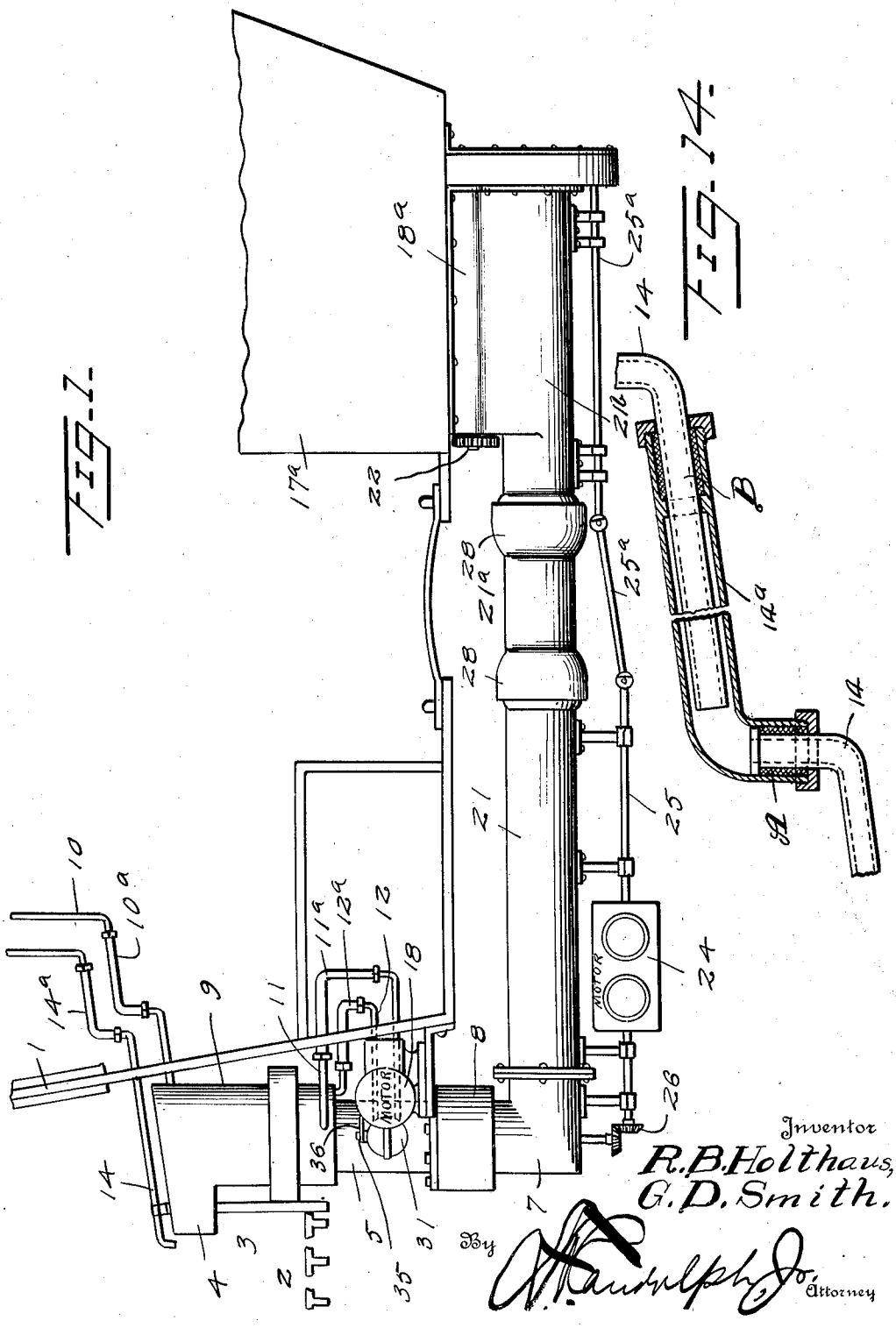

FIG. 1.

FIG. 1A.

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Fig. 2.

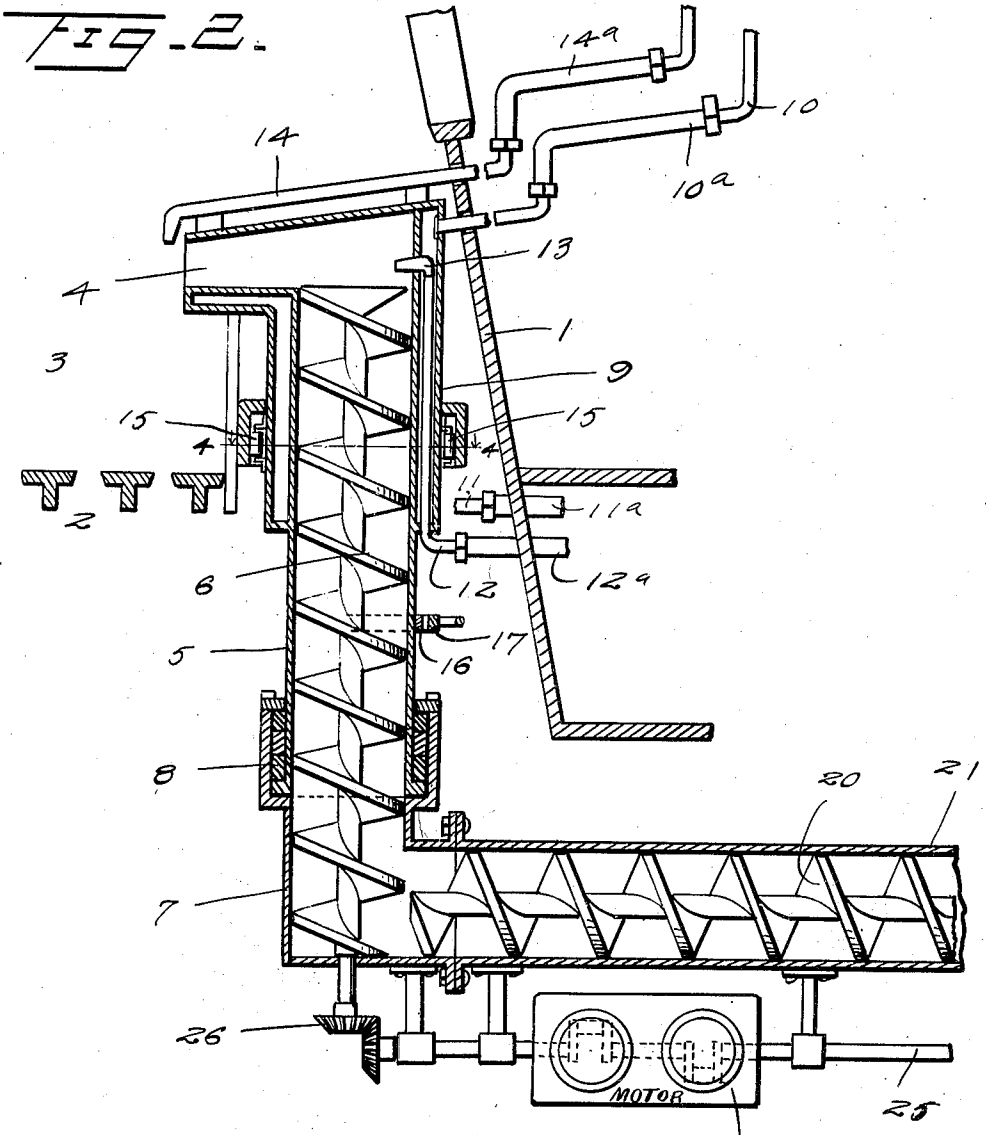
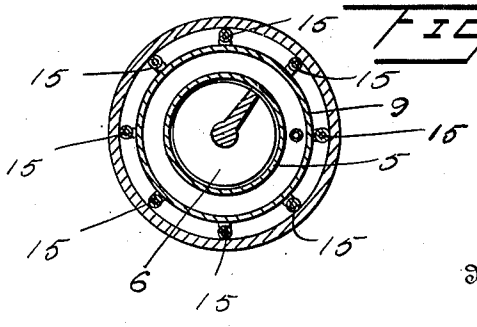


Fig. 4.



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MECHANICAL STOKER

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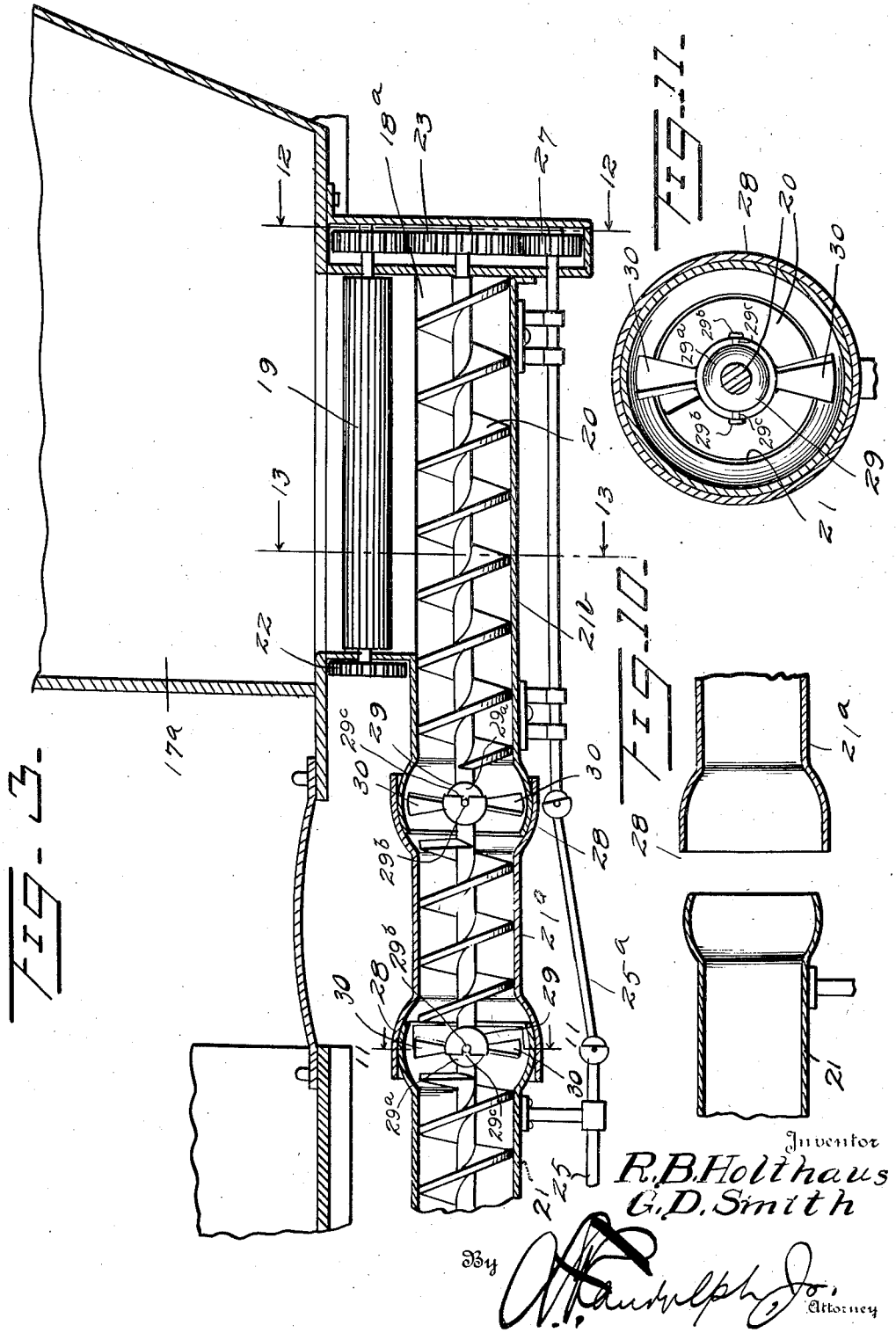

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Fig. 5.

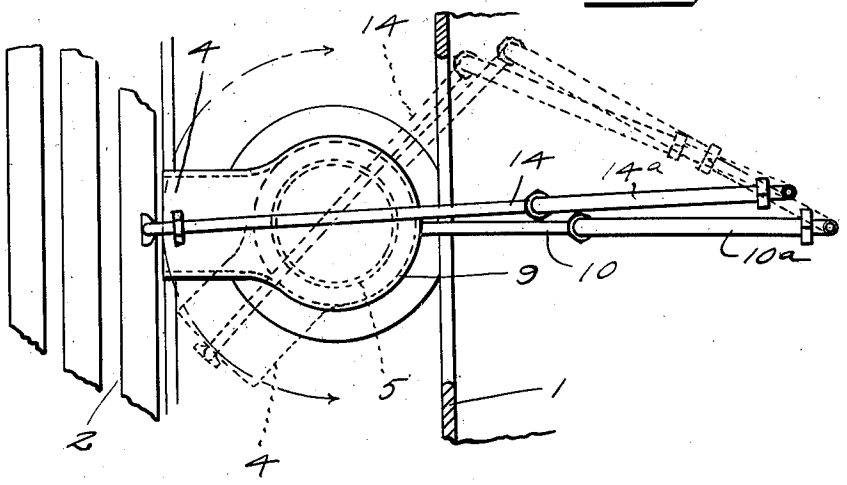
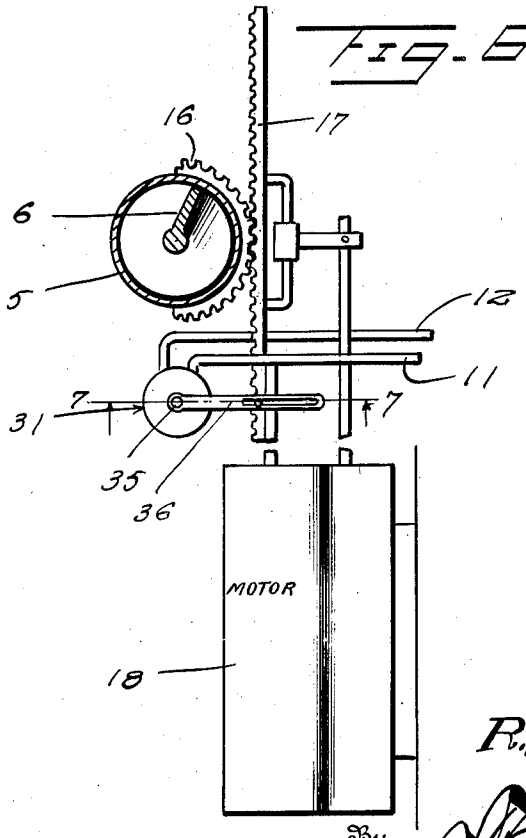


Fig. 6.



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MECHANICAL STOKER

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Fig. 13.

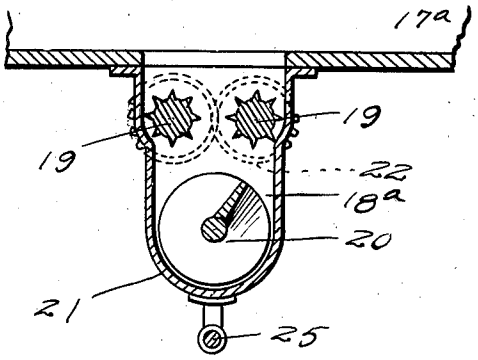


Fig. 12.

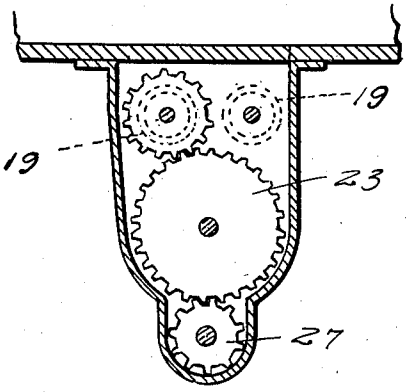


Fig. 8.

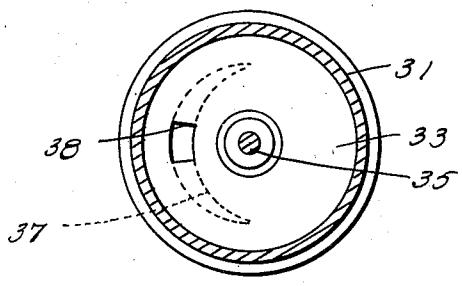


Fig. 7.

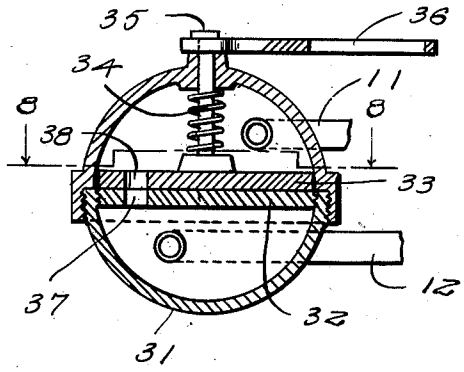
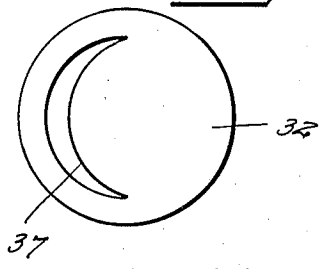


Fig. 9.



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UNITED STATES PATENT OFFICE.

RAINSFORD B. HOLTHAUS AND GEORGE D. SMITH, OF FREMONT, NEBRASKA.

MECHANICAL STOKER.

Application filed June 9, 1923. Serial No. 644,415.

To all whom it may concern:

Be it known that we, RAINSFORD B. HOLTHAUS and GEORGE D. SMITH, citizens of the United States, residing at Fremont, in the county of Dodge and State of Nebraska, have invented certain new and useful Improvements in Mechanical Stokers; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The main object of the present invention is the provision of means for automatically supplying fuel to the firebox of a locomotive engine, said means embodying a crusher for breaking up the lumps of coal and reducing the same to a convenient size for automatic feding, a conveyor for moving the fuel from the bunker to the firebox, and means for distributing the fuel in the firebox to insure a uniform level of the firebed.

Other objects and advantages will be apparent and suggest themselves as the nature of the invention is understood.

While the drawings illustrate an embodiment of the invention it is to be understood that in adapting the same to meet different conditions and requirements, various changes in the form, proportion and minor details of construction may be resorted to without departing from the nature of the invention.

Referring to the accompanying drawings forming a part of the application:

Figure 1 is a diagrammatic view illustrative of the invention,

Figure 2 is a view of the forward portion of the conveyor substantially in central vertical section,

Figure 3 is a sectional view of the lower portion of the coal bunker, showing the crushing rolls and conveyor,

Figure 4 is a sectional view on the line 4—4 of Figure 2,

Figure 5 is a detail plan view of a portion of the firebox showing the fuel feeding mechanism in position therein,

Figure 6 is a fragmentary plan view partly in section of the means for imparting an oscillating movement to the delivery end of the conveyor and controlling the supply of steam to the nozzle,

Figure 7 is an enlarged detail sectional view of the valve mechanism for controlling the supply of steam to the nozzle taken on the line 7—7 of Figure 6,

Figure 8 is a section on the line 8—8 of Figure 7,

Figure 9 is a plan view of the valve seat having the crescent shaped port,

Figure 10 is a detail view of the joint between adjacent sections of the conveyor conduit or casing, the parts being separated,

Figure 11 is a detail sectional view of the joint formed between adjacent sections of the conveyor on the line 11—11 of Figure 3,

Figure 12 is a sectional detail view on the line 12—12 of Figure 3,

Figure 13 is a sectional detail view on the line 13—13 of Figure 3, and

Figure 14 is a detail view of the adjustable joint in the length of the steam pipe.

Corresponding and like parts are referred to in the following description and designated in the several views of the drawings by like reference characters.

The numeral 1 designates the rear wall of the firebox of a locomotive engine and 2 the grate. The delivery end of a conveyor extends into the firebox 3 adjacent the rear wall 1 and terminates in a laterally disposed nozzle 4 which is so arranged as to deliver the fuel over the bed in the firebox. The delivery portion of the conveyor is vertically disposed and is mounted to receive an oscillatory movement whereby the fuel is distributed throughout the firebox. The delivery portion of the conveyor comprises a vertically disposed conduit or casing 5 terminating at its upper end in the laterally disposed nozzle 4. A screw conveyor 6 is mounted within the casing 5 and positively moves the fuel therethrough. The lower end of the casing 5 is connected to the vertical extension 7 of the horizontal portion of the conveyor by means of a swivel joint 8 which may be of any preferred construction. A jacket 9 surrounds the upper portion of the casing 5 and is supplied with steam from the boiler by means of a pipe 10, a pipe 11 conducting the steam from the jacket 9 to a valve mechanism which controls the supply of steam to a pipe 12 terminating in a nozzle 13 opposite the nozzle 4, whereby to forcibly discharge the fuel through the nozzle 4 and over the bed of fuel in the firebox. The delivery portion of the pipe 12 extends through the jacket 9 and the nozzle 13 opens into the casing 5 at a point opposite the nozzle 4, whereby

the blast is discharged across the upper end of the casing 5 to deliver the fuel through the nozzle 4. The force of the blast is regulated according to the position of the nozzle 4 and the distance to which the fuel is to be projected in order to uniformly distribute the same throughout the firebox. A steam pipe 14 is associated with the nozzle 4 to supply steam for promoting combustion and spreading the fuel. Rollers 15 are disposed about the jacket 9 to engage the track ring of the boiler and reduce the friction to the smallest amount possible. The several steam pipes 10, 11, 12 and 14 are in sections connected by a yieldable connection or joint as designated at 10^a, 11^a, 12^a, and 14^a, respectively, and as shown in detail in relation to pipe 14, in Figure 14; the same structure being carried out in regard to joints 10^a, 11^a, and 12^a. Each of such connections or joints is rotatably mounted on one of the pipe sections, designated A in Figure 14, for the purpose of illustration, and slidably connected at B to the other section of the same pipe.

Cog teeth 16 are provided on the casing 5 and cooperate with a rack bar 17 whereby to oscillate the casing 5 and swing the nozzle 4 from one side to the other of the firebox whereby to distribute the fuel throughout the same to maintain a uniform depth of fire. A small engine 18 imparts a reciprocatory movement to the rack bar 17 with the result that the casing 5 is oscillated. The engine 18 may be of any approved construction suitable for the purpose.

The numeral 17^a designates a coal bunker and a trough 18^a is in communication with the bottom thereof and contains a pair of crushing rolls 19 and a portion of a screw conveyor 20. The crushing rolls 19 break up lumps of coal and reduce the same to suitable size to be fed to the firebox by means of the conveyor. A conduit or casing 21 leads from the delivery end of the trough 18^a to the lower end of the casing 5 and the screw conveyor 20 operates therein. The crushing rolls 19 are geared at one end as indicated at 22 and one of the crushing rolls is geared at the opposite end to the screw conveyor 20, as indicated at 23. A suitable motor 24 is connected by means of a tumbling rod or shaft 25 with the screw conveyor 20. Said rod or shaft 25 is in flexibly connected sections 25^a. The screw conveyor 20, its casing 21 and the shaft 25 comprise universally jointed sections. Bevel gearing 26 connects the shaft 25 with the screw conveyor 6 and gearing 27 connects the opposite end of the shaft with the screw conveyor 20. The casing comprises sections 21, 21^a and 21^b which are coupled by means of separable universal joints 28 and the screw conveyor 20 is likewise formed of sections which are coupled by means of separable universal joints 29 whereby, in the event of the tender separating from the locomotive, the parts of the conveyor, such as the casing and screw 20, will separate without injury to either. To this end, balls 29^a of said universal joints have trunnions 29^b detachably disposed in open slots 29^c of caps 29^d of said joints. Spiral blades 30 are applied to the universal joint 29 coupling the sections of the screw conveyor 20, whereby to positively feed the fuel across the joint and prevent clogging of the latter.

The valve mechanism for controlling the supply of steam to the nozzle 13 comprises a casing 31 in which is located a valve seat 32 and a valve 33. The supply pipe 11 connects with the valve casing 31 upon one side of the valve seat 32 and the distributing pipe 12 connects with the valve casing 31 upon the opposite side of the valve seat 32. It will thus be understood that the valve mechanism is located between the supply and distributing pipes. The valve 33 receives an oscillatory movement and is held upon the seat 32 by means of a spring 34.

The stem 35 of the valve 33 is connected by means of an arm 36 with the rack bar 17 and in this manner, the valve mechanism controlling the supply of steam to the nozzle 13 is operated simultaneously with the delivery portion 5 of the fuel feeder. The port 37 in the valve seat 32 is of crescent form, thereby diminishing from a central point towards opposite ends. The port 38 in the valve 33 consists of an opening corresponding with a middle portion of the port or opening 37. When the nozzle 4 is intermediate its extreme movements, the valve 33 occupies a position with the opening 38 opposite the center of the port 37 and as the nozzle 4 moves to one side or the other, the valve 33 correspondingly moves, thereby causing the opening 38 to move over an end portion of the port 37, thereby reducing the supply of steam and the force of the delivery at the nozzle 13. When the nozzle 4 points straight ahead, the distance to the front wall of the firebox is greatest and when the nozzle 4 extends laterally in either direction, the distance between it and a side wall of the firebox is materially reduced, hence the force of the blast is proportionately reduced. As a result of the arrangement, the strength of the blast delivering the fuel is proportionate to the distance of distribution and this is taken care of by means of the valve mechanism comprising the elements 32 and 33.

What is claimed is:

1. In a mechanical stoker, a fuel feeder having a movable section functioning dually as a discharge nozzle and as a feed conduit, means operating automatically to impart an oscillatory movement to said movable section in order to distribute the

fuel throughout the firebox, means to deliver a blast of steam across said movable section and through said nozzle to effectively deliver the fuel, and means operated by the first mentioned means to vary the force of the blast.

2. In a mechanical stoker, a fuel feeder comprising a vertical and a horizontal portion, said vertical portion including a discharge nozzle and a conduit for the fuel, means for imparting an oscillatory movement to said vertical section and discharge nozzle, means to deliver a blast of steam across said vertical section and through said nozzle to effectively deliver the fuel, and means operated by the first mentioned means to vary the force of the blast.

3. In a mechanical stoker, a fuel feeder having a conduit section constituting a discharge nozzle, means to automatically actuate said nozzle to distribute the fuel throughout the fire box, means for delivering a blast to effect a distribution of the fuel, and a valve mechanism operable automatically to vary the force of the blast so as to project the fuel different distances.

4. In a mechanical stoker, a conveyor for feeding the fuel and embodying an oscillatory delivery portion, a blast nozzle associated with the delivery portion of the conveyor, means for automatically imparting an oscillatory movement to the delivery portion of the conveyor, and a valve mechanism controlled by the operating means for the delivery portion of the conveyor, whereby to regulate the force of the blast so as to project the fuel different distances.

5. In a mechanical stoker, a fuel feeder having a movable section functioning dually as a discharge nozzle and as a feed conduit, means operating automatically to impart an oscillatory movement to said movable section in order to distribute the fuel throughout the firebox, means to deliver a blast of steam across said movable section and through said nozzle to effectively deliver the fuel, and a control valve for said last mentioned means operating under control of the first mentioned means to vary the blast from the nozzle, said valve including plates one movable relatively to the other and having coacting ports, one of the ports being substantially crescent shape to control the supply of steam so as to project the fuel different distances.

In testimony whereof we affix our signatures.

RAINSFORD B. HOLTHAUS.
GEORGE D. SMITH.