Sept. 30, 1930. F. P. ROESCH ET AL 1,777,017

STOKER

Original Filed June 2, 1923 4 Sheets-Sheet 1

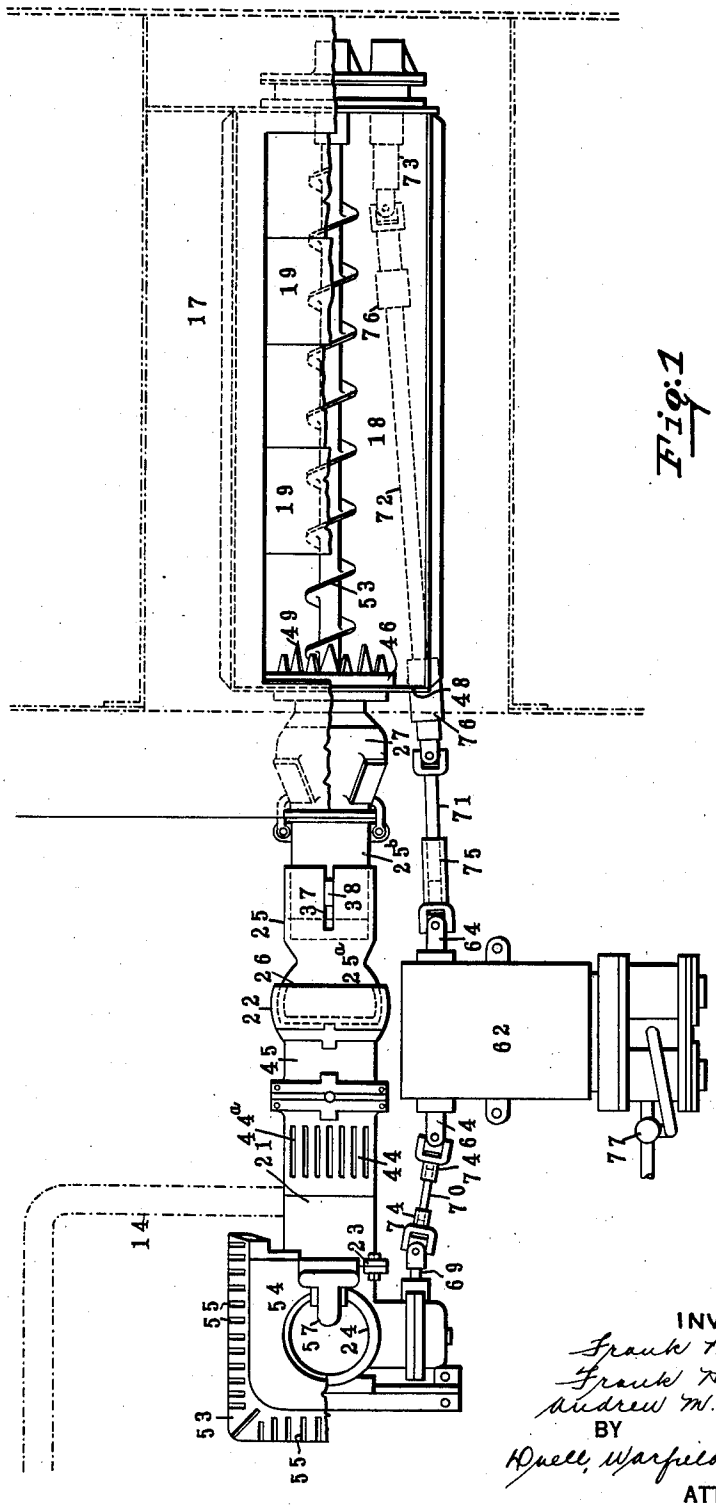


Fig. 1

INVENTORS
Frank P. Roesch
Frank Hopper
Andrew W. Hunt
BY
Duell, Warfield & Duell
ATTORNEY

Sept. 30, 1930. F. P. ROESCH ET AL 1,777,017

STOKER

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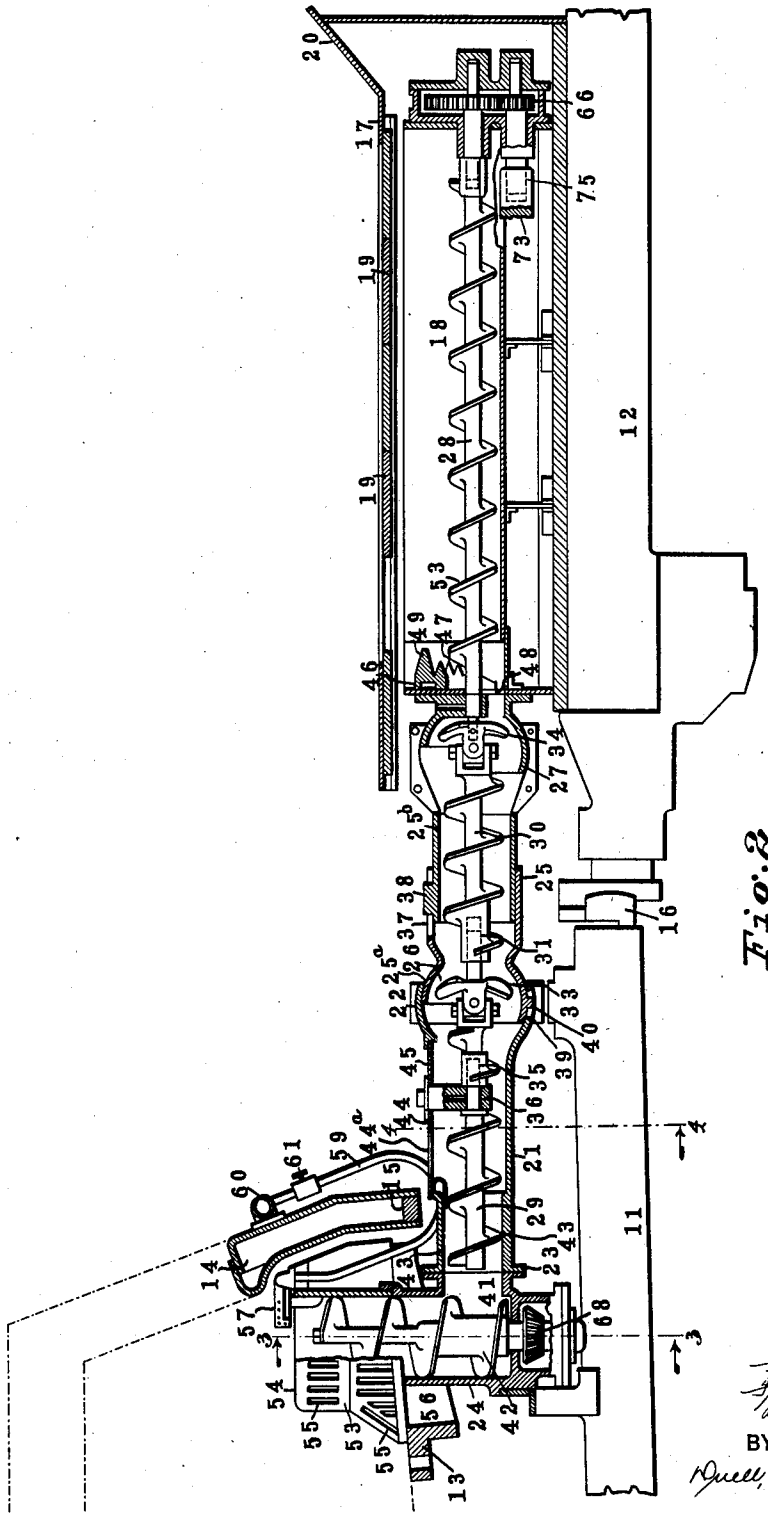


Fig. 2

INVENTORS
Frank P. Roesch
Frank Hopper
Andrew M. Hepner
BY
Duell, Warfield & Duell
ATTORNEY

Sept. 30, 1930. F. P. ROESCH ET AL 1,777,017

STOKER

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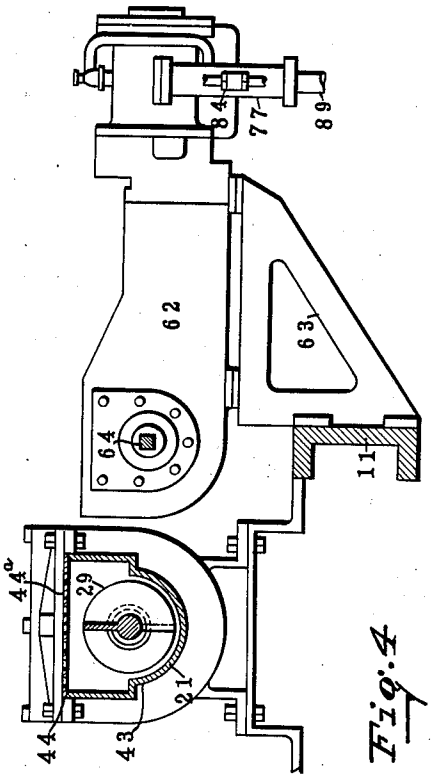


Fig. 4

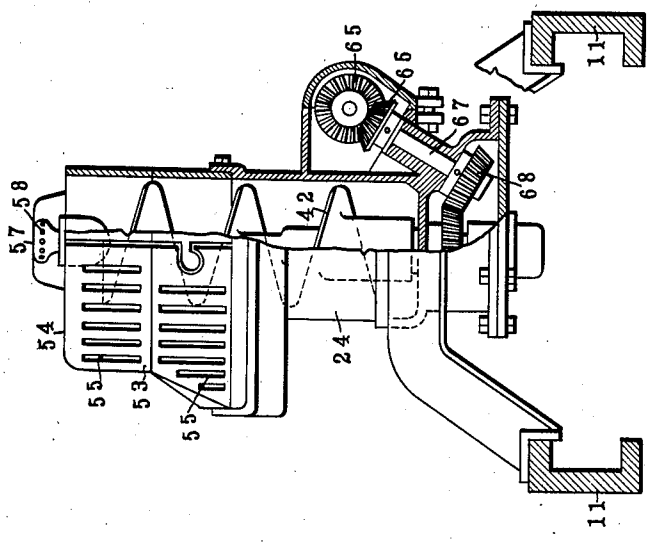


Fig. 3

INVENTORS
Frank P. Roesch
Frank Hopper
Andrew W. Hunt
BY
Duell, Warfield & Duell
ATTORNEY

Sept. 30, 1930. F. P. ROESCH ET AL 1,777,017

STOKER

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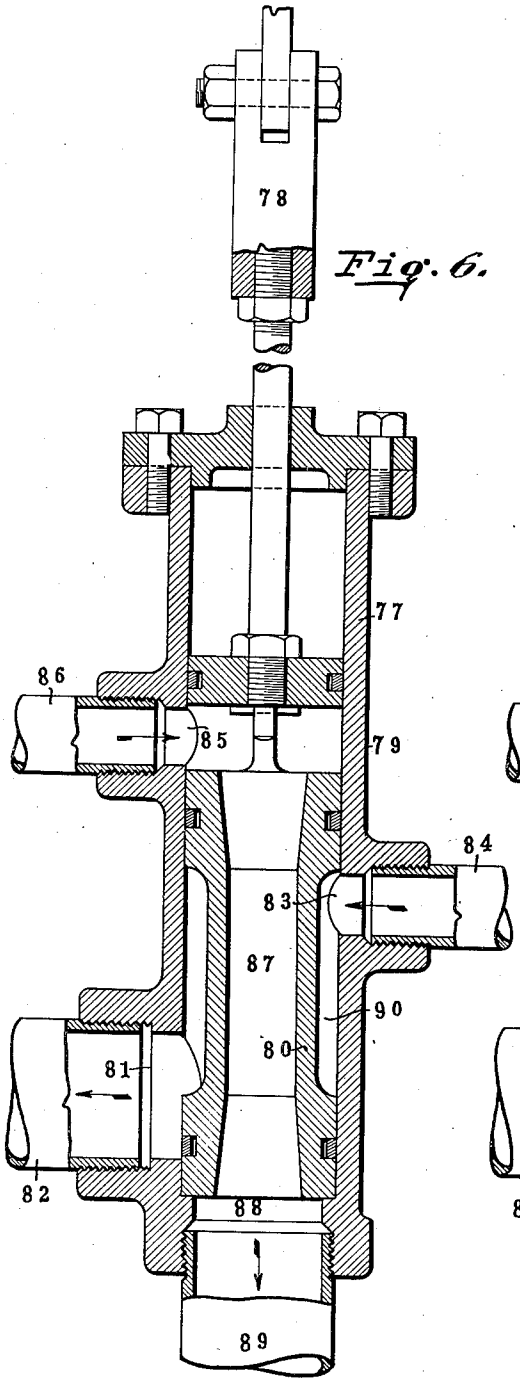


Fig. 6.

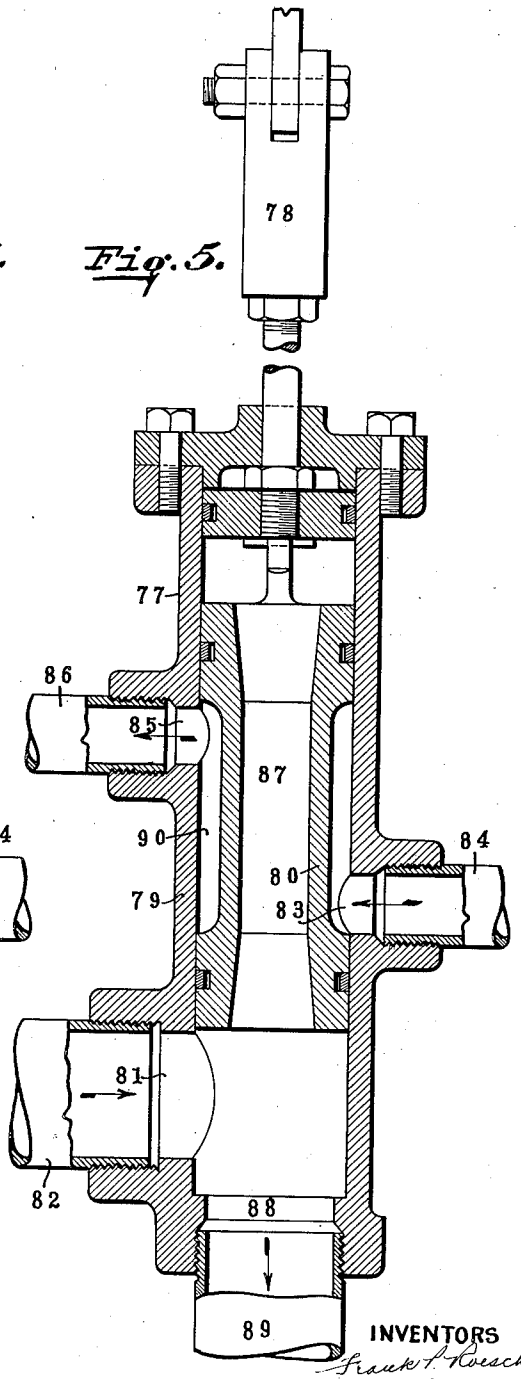


Fig. 5.

INVENTORS
Frank P. Roesch
Frank G. Capper
Andrew W. Hunt
BY
Duell, Warfield & Duell
ATTORNEY

Patented Sept. 30, 1930 1,777,017

UNITED STATES PATENT OFFICE

FRANK P. ROESCH, OF CHICAGO, ILLINOIS, FRANK HOPPER, OF ERIE, PENNSYLVANIA, AND ANDREW M. HUNT, OF NEW YORK, N. Y., ASSIGNORS TO STANDARD STOKER COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

STOKER

Application filed June 2, 1923, Serial No. 643,016. Renewed September 6, 1928.

This invention relates to stokers, and more particularly in some of its details to stokers especially adapted for use in connection with locomotives.

It is the general object of the invention to improve and perfect the construction of the elements of a stoker and to effect an advantageous combination thereof, resulting in an improved assembly possessing advantages from the standpoints of minimum number of wearing parts, economy and efficiency in operation, and facility of repair or replacement of parts.

Another object is to minimize the tendency to clogging or jamming in the conveyor of a stoker of the class mentioned, and to provide improved means for loosening such jams should they occur.

Another object is to effect an improved arrangement of the driving motor for the conveyor, and to provide an improved flexible driving connection between the driving motor and the conveyor.

Another object is to provide an improved arrangement of the conveyor conduits with flexible connections for taking care of the changes in relative positions of the locomotive and tender which occur in operating on a track that is not uniform in grade and alignment, and being specially arranged for effecting a uniform and uninterrupted flow of fuel to the combustion chamber.

Other objects will be in part obvious in connection with the accompanying detailed description, and in part specifically pointed out in connection therewith.

The invention accordingly comprises the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the constructions hereinafter set forth and the scope of the application of which will be indicated in the claims.

For a complete understanding of the nature and objects of the invention, reference is had to the accompanying detailed description of a practical exemplification thereof, taken in connection with the drawings, in which:

Figure 1 is a fragmentary plan view of the improved stoker as applied to a locomotive and its tender, certain parts being diagrammatically shown;

Fig. 2 is a central vertical longitudinal section of the apparatus shown in Fig. 1;

Fig. 3 is a fragmentary elevational view, partly in section, on the line 3—3 of Fig. 2 looking in the direction of the arrows;

Fig. 4 is a sectional elevation on the line 4—4 of Fig. 2;

Fig. 5 is an enlarged central section through a reversing valve; and

Fig. 6 is a view similar to Fig. 5, but showing the reversing valve in reverse position.

In the embodiment of the invention shown in the drawings, a fragment of the locomotive under-frame construction is shown at 11, and a fragment of the tender under-frame construction at 12. The grate of the firebox or combustion chamber of the locomotive is indicated at 13, overlying the ash-pit, and the back-head of the fire-box or rear water-wall of the locomotive boiler is indicated at 14, with the mud-ring 15 extending along the lower part thereof. The coupler between the locomotive and its tender is indicated diagrammatically at 16.

The coal space of the tender is disposed above the floor 17 thereof underlying which is a trough or channel 18 normally covered by removable cover sections 19. Ordinarily the floor of the coal space is inclined downwardly toward the trough 18 at sides and back thereof, the inclined rear floor being shown at 20 in Fig. 2. By means of this arrangement, the coal will move downwardly along the inclined floor sections into position to enter the conveyor trough 18. The removable cover sections 19 may be slid forwardly or moved from covering position to permit entry of coal into the trough as the supply becomes depleted.

The transfer conveyor

The tender conveyor trough forms part of a conveyor conduit continuing from the forward end of the tender to the locomotive, preferably underlying the cab floor thereof (not shown) and leading to a point below the combustion chamber. This conduit is divided into sections, flexibly connected to

permit relative movements between the locomotive and its tender without damaging the conveyor. The forward conduit section 21 is rigidly connected to the locomotive as by the support 22 and by connection through flange 23 to the upright or lifting conduit 24, which in turn is supported from the locomotive frame 11. The intermediate conduit section 25 is connected by ball-and-socket joints 26 and 27 with the locomotive and tender sections respectively, providing flexible joints for the purpose mentioned. Each of these joints includes an exterior bowl or socket member formed on the adjacent forward conduit section, and an interior bowl or ball member formed on the adjacent rearward conduit. In each instance, the interior bowl member is lapped or shingled on the interior of the co-operating bowl in the direction of movement of material in the conduit, so as to avoid obstruction to advancement thereof. The inner bowl of the joint 27 is rigidly secured to the tender in alignment with the trough or conduit 18.

For carrying the coal or other fuel from the tender to the locomotive, a sectional conveyor screw is rotatively mounted in the conduit, including a rear or tender section 28, a forward or locomotive section 29, and an intermediate section 30 flexibly connected to the other two sections by means of universal joints. These joints, being flexible, permit relative angular movements of the screw sections, while relative bodily displacement longitudinally of the screw sections is provided for by means of a slip joint 31. Provision is thus made for relative movements between the locomotive and its tender, as in passing over irregular tracks, around curves, etc. Auxiliary conveyor paddles 33 and 34, preferably arranged in separable conveying sections, may be provided at the joints of the conveyor screw, which joints will ordinarily be located adjacent the flexible joints in the conduit. These paddles provide additional conveying capacity at the joints and the tendency to choking or clogging at these points is overcome.

The forward screw section 29 is preferably made in two parts, detachably connected by a joint as indicated at 35, the parts lying on opposite sides of a supporting and thrust bearing 36. By means of this arrangement disassembly and removal of the screw section from the conveyor conduit is facilitated.

Relative bodily movement longitudinally of the conveyor is provided for in the conveyor conduit by means of a slip joint, preferably positioned in the intermediate conduit section. For this purpose, the intermediate section is constructed in two telescopic parts, with a slot 37 and interengaging rib or lug 38 permitting relative longitudinal movement, but restraining axial rotation of the two sectional parts. There will normally be a tendency of the intermediate conduit section to rotate axially under the influence of the screw, but this tendency will be resisted by connection of the section part 25^a with the rigid forward section 21, by means of a slot and lug connection 39, 40, shown at Fig. 2, while the rear part 25^b is prevented from rotation by means of the slot and lug connection 37, 38 as above mentioned. The slot and lug connection 39, 40 is preferably disposed at the forward conduit joint 26 permitting angular displacement of the two adjacent conduit sections.

The elevating conveyor

An elevating conveyor is disposed at the forward or delivery end of the transfer conveyor, communicating at its side with the latter through an opening or discharge mouth 41, being adapted to elevate the fuel from a point below the combustion chamber to a point there-within. The elevating conveyor includes an upright conduit 24, above referred to, suitably supported on the locomotive frame as indicated diagrammatically in Fig. 2, and a rotary lifting screw conveyor 42 therein supported upon a lower bearing. The diameters of the conduit and screw are substantially the same, so as to prevent fuel falling over the blade edges during elevation of the fuel. Due to the tendency of the fuel to fall from the blades of the lifting screw, there may be a consequent tendency to clogging or stagnation of the fuel at and adjacent to the opening 41. To minimize this tendency, and to permit free and uninterrupted operation of the conveyor, the transfer conduit is preferably flattened adjacent its delivery mouth, as indicated at 43, so the vertical diameter thereof is substantially the same as that of the conveyor screw. This flattened section of the conduit may be substantially rectangular or oblong in cross section, as shown in Fig. 4, but reference to Fig. 2 will show that the top or upper wall of the conduit is lower and nearer to the periphery of the conveyor screw, at its forward end, than it is at the point at which the section of Fig. 4 is taken. Rearwardly of this point the conduit becomes circular in section and is of greater diameter than the screw. The flattening of the conduit at its forward end minimizes the falling of fuel over the blade edge of the lifting screw, due to the fact that the coal in its upward movement sooner enters the confines of the elevating conduit. The delivery mouth of the transfer conduit will ordinarily be filled with fuel to the extent of its vertical dimension and the form of the delivery opening of the transfer conduit is such that the coal is fed to the elevating conduit over an extended area which assists in starting the fuel in its upward path.

The forward section 21 of the conveyor conduit is provided with removable cover-

plates 44 and 45, the forward cover plate 44 having openings 44[a] therein, so an attendant in the locomotive cab can readily observe the operation of the conveyor.

The crusher

A crushing device is preferably provided for reducing large lumps of coal to a size convenient for consumption and for ready and uninterrupted handling by the conveyor. As shown in Figs. 1 and 2 this crusher 46 is preferably placed adjacent the forward part of the tender conveyor trough being disposed transversely thereof, and preferably including a base plate with forwardly projecting spikes or teeth 47 and 49. The crusher plate is preferably mounted on a transverse plate or diaphragm 48, a somewhat restricted passageway being provided in the trough at this point to prevent entry into the conveyor of large lumps of coal, or of other material or extraneous matter unsuited for use in the combustion chamber. The upper teeth 49 are larger than the lower teeth, extending therebeyond against the advancing fuel so as to meet first with the larger lumps and partially reduce them.

The protector grate, distributor head and connections

The elevating conveyor extends for some distance above the grate 13 into the combustion chamber, the part thereof lying within said chamber being protected from excessive heat by a protecting grate 53 surrounding, or partially surrounding the conveyor, and terminating in an upper surface, forming a firing table 54, adjacent the delivery end of the conveyor. This protecting grate is preferably provided with slots 55 for passage of air into the combustion chamber, the air being led to the interior of the grate from below through an opening 56 in the rear of the grate 13. An insulating air-space is thus provided between the conduit and the auxiliary grate, further protecting the conduit from excessive heat. The distributor head 57, preferably of integral cast hollow construction, is mounted at the rear of the combustion chamber adjacent the firing table, being provided with jet openings 58 distributed around the side walls thereof in position to command the entire grate area of the combustion chamber. These openings are preferably inclined inwardly and downwardly, so the jets of steam issuing therefrom will be disposed in such position that the fuel will be distributed evenly over and downwardly on the fire-bed, and thus opposing the action of the draft which tends to drive the smaller particles of the fuel into and through the boiler tubes. Steam or air under pressure is supplied to the distributor head, issuing forcibly in jets from the openings in such a manner that the fuel lifted through the conduit 24 will be equally distributed over the entire fire-bed of the combustion chamber.

For supplying steam under pressure to the distributor head, a plurality of steam-pipes 59 extends from a manifold 60 on the outer face of the water-wall 14 to the head, each pipe being preferably manually controllable by means of a valve 61. Each steam-pipe 59 preferably leads to a jet opening or openings separated from the other openings so the distributing capacity of the steam issuing from individual jet openings may be regulated and the distribution of fuel to various parts of the combustion chamber thus controlled. As shown in Fig. 2, the steam supply pipes are bowed downwardly around the mud-ring, forming a downwardly extending loop and forming a flexible pipe connection resulting in reduction of loose joints, breakage and accidental leaks in the pipe connections. The forward legs of the supply pipes lying between the water-wall of the boiler and the rear wall of the combustion chamber, formed partly by the lifting conduit 24, are thus advantageously protected from exposure to the extreme heat of the combustion chamber.

The conveyor drive

The drive for the conveyor includes an engine 62 suitably supported on brackets 63 on the locomotive frame. In the embodiment shown, a two-cylinder engine is used having a crank shaft 64 extending at opposite sides of the engine casing and flexibly connected at either end by universal joints with the adjacent sections of the conveyor drive shaft. This drive shaft extends along the transfer conveyor being connected at opposite ends thereof by transmission gears 65 and 66 respectively with the lifting and transfer conveyors. The gear 65 transmits power through an inclined intermediate shaft 67 mounted in the conveyor casting, and through bevel gears 68 to the conveyor screw. The drive shaft is made up of a plurality of angularly disposed or disaligned sections lying at either side of the engine and flexibly connected together by universal joints, shaft sections 69 and 70 lying forwardly to drive the lifting conveyor, and sections 71, 72 and 73 lying rearwardly for driving the transfer conveyor. The sections 69 and 73 of the drive shaft and the crank shaft section 64 are preferably substantially parallel to the longitudinal axis of the conveyor, but spaced differently therefrom, while the intermediate sections 71 and 72 may be inclined to said axis. This provides a flexible shaft for transmitting power to the conveyors, well adapted to absorb shocks and vibrations incident to the rough usage of actual operation without injury to the parts. Also, by this arrangement the driving engine may be spaced from the conveyor as desired, accurate alignment thereof being unnecessary, and its operation and the

operation of the transmission connections not being easily affected by slight disalignment of the parts which may occur due to accidents or rough usage. The universal joints of the shaft permit relative angular displacement of the shaft sections incident to operation, while longitudinal displacement is provided for by slip joints 74 in the forward drive shaft, and similar slip joints 75 in the rear drive shaft. Bearings for the rear section 72 of the drive shaft mounted on the tender are shown diagrammatically at 76 in Fig. 1.

The reversing mechanism

A reversing mechanism for temporarily driving the conveyor in reverse direction is provided, this mechanism including in the embodiment shown in Figs. 5 and 6 a valve 77 in the steam-pipe connections of the engine under manual control of the attendant in the engine through connections at 78. This reversing valve includes a cylindrical casting 79 and a sliding valve member 80 therein. The valve is provided with an exhaust port 81 with a connected pipe 82 normally leading to the exhaust valve of the engine, a live steam port 83 with a connected pipe 84 leading to the boiler, and a live steam port 85 with a connected pipe 86 leading to the intake port of the engine. The slidable valve member 80 is provided with a conduit 87 extending longitudinally therethrough and lying in position to communicate with the valve exhaust port 88 and a connected pipe 89 to conduct the exhaust steam from the engine to the atmosphere. The valve member 80 is also provided with a circumferential slot 90, extending there-around forming a peripheral conduit lying in position to communicate with the ports 83 and 85 when the valve member is in the direct position shown in Fig. 5. In this position, live steam passes from the boiler through the pipe 84, valve conduit 90 and pipe 86, to the cylinders of the engine to drive it forwardly; in this position the exhaust steam from the engine passes through the pipe 82 to port 81 of the valve, and thence to atmosphere, through the exhaust pipe 89.

When it is desired temporarily to reverse the operation of the engine and the conveyor, the slidable valve member 80 is moved to the position shown in Fig. 6. In this position, the live steam from the boiler enters port 83 through pipe 84, as before, passing thence through circumferential conduit 90 through the pipe 82 to the exhaust port of the engine. In this position of the valve, the exhaust steam from the engine cylinders passes to the reversing valve through the pipe 86 to port 85, and from thence to the atmosphere through valve conduit 87 and exhaust pipe 89. It will be seen therefore that the operation of the engine will be reversed. Since the purpose of this reverse operation is principally to dislodge jams of fuel or extraneous material which may have found its way into the conveyor, it will be understood that the reverse operation of the engine will be confined to a very few revolutions. As soon as the jam has become loosened or extraneous object dislodged, the operation of the conveyor may be quickly restored to normal by the locomotive attendant, through the connections 78.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a locomotive stoker, in combination, a transferring fuel conveyor including a conduit section mounted on the locomotive, a conduit section mounted on the tender, an intermediate conduit section having ball and socket joints flexibly connecting it with the other two sections, said conduit sections being overlapped or shingled at said joints in the direction of advancement of the fuel, said intermediate section including a plurality of longitudinally movable parts and a conveyor screw section in each of said conduit sections, said conveyor screw sections being flexibly connected to one another at their ends.

2. In a locomotive stoker, in combination, a transferring fuel conveyor including a conduit section connected to the locomotive, a conduit section connected to the tender and an intermediate conduit section, said intermediate section including a plurality of parts, and a slip joint between said parts including a rib and slot arrangement associated with said parts permitting relative longitudinal movement of the parts, but resisting rotary movement thereof.

3. In a locomotive stoker, in combination, a transferring conveyor having a gear drive at its rear end, an elevating conveyor adapted to receive fuel from said transferring conveyor and having a gear drive offset to one side, a driving shaft extending along said transferring conveyor and operatively connected at one end with the gear drive of said elevating conveyor and at the other end with the gear drive of said transferring conveyor at the end of said transferring con-

veyor remote from said elevating conveyor, said driving shaft including disaligned extensible sections flexibly connected together, and a prime mover having a crank shaft with its opposite ends connected intermediate the ends of said driving shaft for driving the same, the parts being so constructed as to permit said prime mover to be located in different positions longitudinally and laterally of said transferring conveyor or in different angular positions relative to said transferring conveyor.

4. In a locomotive stoker, in combination, a transferring conveyor having a gear drive at its rear end on the tender, an elevating conveyor on the locomotive adapted to receive fuel from said transferring conveyor and having a gear drive adjacent its lower end, a driving shaft extending along said transferring conveyor and operatively connected at the locomotive end with the gear drive of said elevating conveyor and at the tender end with the gear drive of said transferring conveyor at the end of said transferring conveyor remote from said elevating conveyor, said driving shaft including extensible sections flexibly connected together and adapted to be out of alignment with each other, and a prime mover having a crank shaft with its opposite ends connected intermediate the ends of said driving shaft for driving the same, the parts being so constructed as to permit said prime mover to be located in different positions longitudinally and laterally of said transferring conveyor or in different angular positions relative to said transferring conveyor.

5. In a locomotive stoker, in combination, a transferring fuel conveyor including a conduit section rigidly connected to the locomotive, a conduit section rigidly connected to the tender and an intermediate conduit section, said intermediate section including a plurality of relatively longitudinally movable parts, flexible joints for connecting said parts respectively with said locomotive section and said tender section, means cooperating with one of said rigidly connected sections for resisting rotation of one of said movable parts of the intermediate section comprising a pin and slot arrangement, and a slip joint between said movable parts including a rib and slot arrangement associated with said parts permitting relatively longitudinal movement of the parts but resisting rotary movement thereof.

6. In a locomotive stoker, in combination, a transferring conveyor having a gear drive at its rear end on the tender, an elevating conveyor on the locomotive adapted to receive fuel from said transferring conveyor and having a gear drive adjacent its lower end, a driving means for said conveyors comprising a drive shaft formed of two main sections adapted to be out of alignment with each other and a prime mover interposed between and having associated therewith a power shaft with its ends universally connected directly to the adjacent ends of said sections for driving the same, the forward section of said drive shaft operatively connected at the locomotive end with the gear drive of said elevating conveyor and the rear section of said drive shaft operatively connected at the tender end with the gear drive of said transferring conveyor at the end of said transferring conveyor remote from said elevating conveyor, and at least one of said sections of the drive shaft including extensible relatively sliding telescopic parts, the parts of said driving means being so constructed as to permit said prime mover to be located in different positions longitudinally and laterally of said transferring conveyor or in different angular positions relative to said transferring conveyor.

In testimony whereof we affix our signatures.

FRANK P. ROESCH.
FRANK HOPPER.
ANDREW M. HUNT.