April 12, 1932. N. M. LOWER 1,853,692

LOCOMOTIVE STOKER

Original Filed Feb. 20, 1926 2 Sheets-Sheet 1

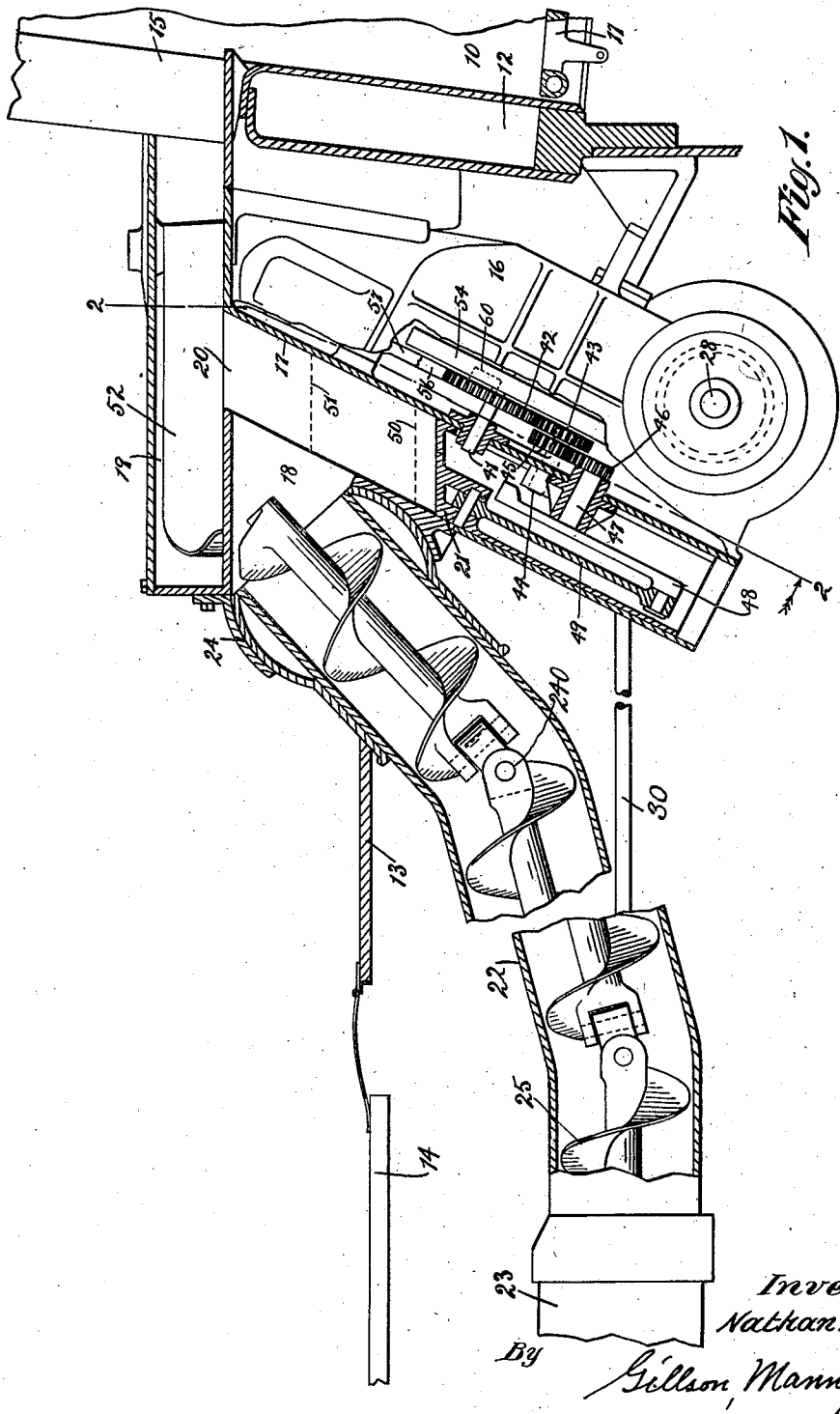

Fig. 1.

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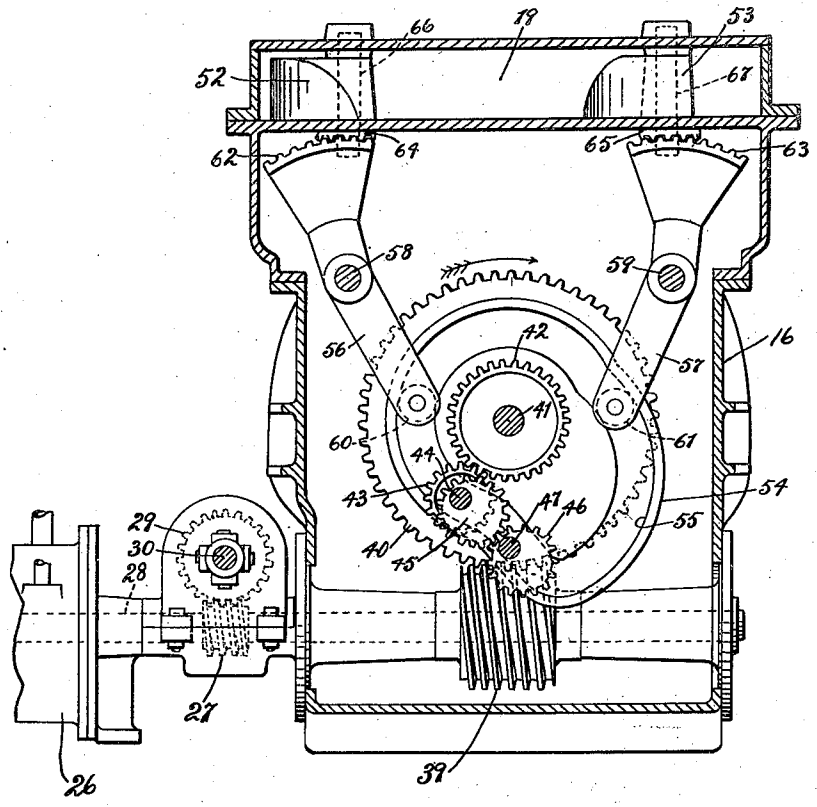

Fig. 2.

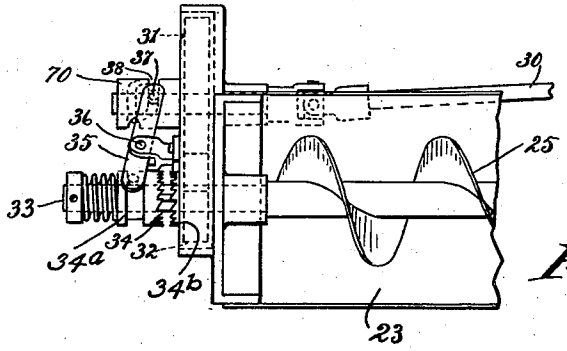

Fig. 3.

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UNITED STATES PATENT OFFICE

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LOCOMOTIVE STOKER

Application filed February 20, 1926, Serial No. 89,652. Renewed November 24, 1931.

This invention relates to stokers for locomotives, and has for one of its objects the provision of new and improved means for delivering increments of fuel to the fuel distributing mechanism.

Another object of the invention is the provision of a new and improved stoker construction in which the conveyor, the elevator and the distributing mechanism operate in timed relation to each other.

A further object of the invention is the provision of new and improved mechanism for delivering fuel intermittently to the zone of action of the distributing mechanism.

Other and further objects and advantages 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 showing the invention in position thereon, with parts in section and parts broken away;

Fig. 2 is a section on broken line 2—2 of Fig. 1; and

Fig. 3 is a detail plan view of the rear portion of the fuel trough, showing the clutch mechanism.

On the drawings the reference character 10 designates the firebox, 11 the grates thereof and 12 the back head of a locomotive of any approved construction. The floor of the cab is shown at 13 and the deck of the tender at 14. The back head 12 is provided with an opening 15 through which coal is projected into the firebox by the stoker mechanism.

Since the details of the locomotive and tender form no part of the present invention, the same is not illustrated and will not be further described.

The stoker comprises a housing 16 which is rigidly secured to and carried by the locomotive. The rear part of the housing is arranged to form the elevator casing 17 which is provided with rearward extension 18 above which is mounted a fuel distributor plate 190, the rear portion of which may take the form of a fuel receptacle 19. The fuel receptacle 19 is provided with an opening 20 in its bottom wall through which the fuel is delivered by the elevator or plunger 21.

A suitable conveyor is provided for transferring the fuel from the tender to the elevator casing. This conveyor structure set forth herein is somewhat similar to that disclosed in my copending application Ser. No. 699,096, filed March 13, 1924, which matured into Patent No. 1,809,903. As shown, this conveyor comprises a conduit 22 the rear portion of which is in the form of a trough 23 located beneath the deck 14 of the tender for receiving coal from the same by gravity in the usual manner. The conduit 22 extends forwardly and upwardly, and its upper end is connected to the extension 18 of the casing 17 and the fuel receptacle 19 by the universal joint as shown at 24. A suitable conveyor screw 25 is rotatably mounted in the conduit 22 and conforms thereto. When, as shown, the conduit is curved or bent the conveyor screw is made sectional, the sections being connected together by universal joints, as shown at 240.

Since the space between the upper end of the conduit 22 and the bottom of the receptacle 19 is limited, it is desirable that means be provided for rendering the conveyor inoperative except when the plunger 21 is in position to receive its load. Any suitable mechanism may be provided for this purpose. Preferably means are provided for operating the screw 25 intermittently. The screw 25 is operated from the motor 26 through the worm 27 on the engine or power shaft 28, the worm wheel 29, shaft 30, gears 31 and 32, the latter of which is loosely mounted on the projecting end portion 33 of the screw shaft. Upon this shaft is mounted a clutch 34, comprising the movable clutch member 34*a* keyed on the shaft 33 and the clutch member 34*b* carried by the loosely mounted gear 32. The movable clutch member 34*a* is controlled by a lever 35, pivoted at 36 on a fixed support and having a pin 37 engaging a cam groove 38 formed in a collar 70 mounted on the end of the shaft 30. This groove is so shaped that it swings the lever to engage and disengage the clutch members 34*a* and 34*b* at each rotation of the shaft 30. The configuration given the groove 38 will determine the period of action and rest of the screw, both as to dura-

tion and with relation to the movement of the other parts of the mechanism driven by the motor 26.

It is desirable that means be provided for operating the plunger or elevator 21 rapidly during the time that the conveyor screw 25 is idle and for moving the same slowly while said screw is operating to supply fuel to the elevator casing. As shown, elliptic gears are employed for this purpose. The gears are operated from the engine shaft 28 by means of a worm 39, see Fig. 2, which engages a worm wheel 40 mounted on the shaft 41. A gear 42 rigidly connected to the shaft 41 is adapted to mesh with the gear 43 keyed to a shaft 44 on which is mounted an elliptic gear 45. The elliptic gear 45 meshes with the corresponding elliptic gear 46 keyed to the crankshaft 47 on which is rigidly secured the crank 48, see Fig. 1, which in turn is connected to the plunger 21 by means of the link 49.

The parts are so constructed and arranged that when the plunger or elevator 21 has descended to the dotted line position shown at 50 the conveyor screw 25 will begin to operate and will continue to operate until the plunger 21 is elevated to the dotted line position 51 as shown in Fig. 1.

The elliptic gears 45, 46 may be so shaped as to give any desired variation in the rate of movement of the plunger, and may be so positioned radially upon their shafts as to produce such variations in any desired portion of the plunger stroke.

They are desirably shaped and positioned as shown, securing marked variation in the speed of the plunger, and causing it to move slowly during approximately the lower half of its cycle and rapidly during the upper half thereof.

Suitable means are provided for projecting the coal into the firebox in timed relation with the operation of the plunger 21. As shown, oscillating vanes 52 and 53 are employed for this purpose, and are arranged to be operated alternately, one of the vanes commencing its forward movement as the plunger approaches the upper limit of its stroke.

Any appropriate means may be employed for operating the vanes. As shown, a cam member 54 provided with a cam groove 55 is rigidly mounted on the shaft 41. Lever members 56 and 57 pivotally mounted as at 58 and 59 are provided at their lower ends with cam engaging members or projections 60 and 61 which are adapted to engage the cam groove 55 for oscillating the lever members 56 and 57. The upper ends of the levers 56 and 57 are provided with segmental gears 62 and 63 which engage gears 64 and 65 mounted on the shafts 66 and 67 to which the vanes 52 and 53 are rigidly secured.

The cam 38 is configured to cause the screw to be driven while the plunger 21 is passing through the lower portion of its cycle, and to rest during the upper portion of such cycle, thus causing an advance of the fuel only when the plunger is in position to receive a load, insuring an adequate load and preventing congestion while the elevator is making its delivery.

I claim as my invention:—

1. In a locomotive stoker, a fuel conveyor, a reciprocating elevator, means for reciprocating said elevator, means for operating said conveyor for delivering fuel to said elevator, and means for rendering said last named means inoperative during the initial return or lowering movement of said elevator.

2. In a locomotive stoker, a pair of distributor vanes, means for operating the same, means including a conveyor and continuously operated mechanism for delivering fuel into the zone of action of said vanes, and means for rendering said conveyor inoperative during the forward movements of said vanes.

3. In combination, a locomotive firebox, an opening in one wall thereof, a distributor plate extending into said opening, an elevator casing beneath said plate, a fuel conveyor, means for operating said conveyor for delivering fuel to said elevator casing, an elevator for delivering the fuel from said casing onto said plate, oscillating vanes for moving the fuel on said plate into said firebox and means for rendering said conveyor operating means inoperative during the time the fuel is being projected into said firebox.

4. In a locomotive stoker, a fuel conveyor, a distributor plate, an elevator for receiving fuel from said conveyor and delivering the same to said plate, a continuously operating power shaft, means for automatically intermittently operating said conveyor from said shaft, and means for operating said elevator at a variable speed in timed relation to the operation of said conveyor, said means causing said elevator to move at its minimum speed during operation of said conveyor and to move at its maximum speed when said conveyor is at rest.

5. In a locomotive stoker, a distributor member, an elevator for delivering fuel to said distributor member, a fuel conveyor, means for driving said conveyor intermittently for delivering fuel intermittently to said elevator, and means for operating said elevator at a variable speed, said last named means causing said elevator to move at its maximum speed at a time when said conveyor is not delivering thereto.

6. In a locomotive stoker, a fuel conveyor, a reciprocating elevator, means for operating said conveyor for delivering fuel intermittently to said elevator, and means for reciprocating said elevator at a greater average rate of speed when moving in one direc-

tion than when moving in the opposite direction.

7. In a locomotive stoker, a fuel conveyor, an elevator, means for operating said conveyor for delivering fuel intermittently to said elevator, means for operating said elevator at a variable speed, and means for rendering said conveyor operating means inoperative while said elevator is at one extreme limit of its movement.

8. In a locomotive stoker, means for intermittently ejecting fuel, means for operating the same, means including a fuel conveyor and a continuously operated elevator receiving fuel from said conveyor for delivering it into the zone of action of said ejecting means, means for driving said conveyor and means for rendering said conveyor driving means inoperative during the ejecting action of said ejecting means.

9. In a locomotive stoker, an elevator casing, a screw conveyor, means for driving said conveyor for furnishing fuel to said casing, a distributor plate, a plunger in said casing for delivering fuel upward to said plate, and means for automatically intermittently rendering said conveyor driving means inoperative for stopping the flow of fuel from said conveyor into said casing during the final upward movement and the initial downward movement of said plunger.

10. In a locomotive provided with a firebox having a backhead with a firing opening therethrough and a tender having a floor, a fuel conveying system comprising a fuel discharge casing rigidly mounted on said backhead communicating with said firing opening, a unitary angular transfer conduit extending in a general forward and upward direction from a point below said tender floor to said fuel discharge casing and flexibly connected to said discharge casing, said angular transfer conduit having a posterior and an anterior bend, the portion of said conduit rearward of said posterior bend being disposed in a horizontal plane, the portion of said conduit between said posterior and said anterior bend inclined forwardly from said horizontal portion, at a slight angle from the horizontal, the portion of said conduit forward of said anterior bend inclined forwardly from said second named portion, at a greater angle from the horizontal, a fuel conveyor screw within said transfer conduit composed of sections flexibly connected together adjacent said porterior and anterior bends, means for rotating said screw and means associated with said discharge casing for projecting fuel over the firebed in the firebox, the fuel entering the firebox through the firing opening.

11. In a locomotive provided with a firebox having a backhead with a firing opening therethrough and a tender having a floor, a cab deck for said locomotive rearward of the firebox, a fuel conveyor transferring fuel from the tender to the locomotive comprising a transfer conduit extending in a general forward and upward direction from a point below said tender floor upwardly through the cab deck, to a point on the locomotive above such deck, said conduit comprising a substantially horizontal rearward portion disposed beneath the tender floor and at its forward end terminating at the front end of the tender, a slightly inclined intermediate portion extending upwardly and forwardly from the forward end of said rearward portion and at its forward end terminating on the locomotive beneath said deck, and an inclined forward portion sloping upwardly and forwardly through said deck towards the rear wall of the firebox from the forward end of the intermediate portion at a greater angle from the horizontal, said conduit portions being in end to end relation, a sectional screw in said transfer conduit comprising a screw section in each of said conduit portions, said screw sections being jointed at the juncture of the intermediate conduit portion with the rear and forward conduit portions, means for rotating said screw and means disposed at the forward end of the fuel conveyor arranged to receive the fuel therefrom and project it over the firebed in the firebox, the fuel entering the firebox through the firing opening.

12. In a locomotive provided with a firebox having a backhead with a firing opening therethrough and a tender having a floor, a cab deck for said locomotive rearward of the firebox, a fuel conveyor transferring fuel from the tender to the locomotive comprising a transfer conduit extending in a general forward and upward direction from a point below said tender floor upwardly through the cab deck, to a point on the locomotive above such deck, said conduit comprising a substantially horizontal rearward portion disposed beneath the tender floor and at its forward end terminating at the front end of the tender, a slightly inclined intermediate portion extending upwardly and forwardly from the forward end of said rearward portion and at its forward end terminating on the locomotive beneath said deck, and an inclined forward portion throughout its length sloping upwardly and forwardly through said deck towards the rear wall of the firebox from the forward end of the intermediate portion at a greater angle from the horizontal, said conduit portions communicating at their adjacent ends and the intermediate and rearward conduit portions being rigidly related with respect to one another, a sectional screw in said transfer conduit comprising a screw section in each of two or more conduit portions, said screw sections being universally connected at their adjacent ends, means for rotating said screw and means disposed at

the forward end of the fuel conveyor arranged to receive the fuel therefrom and project it over the firebed in the firebox, the fuel entering the firebox through the firing opening.

13. In a locomotive provided with a firebox having a backhead with a firing opening therethrough and a tender having a floor, a cab deck for said locomotive rearward of the firebox, a fuel conveyor transferring fuel from the tender to the locomotive comprising a transfer conduit extending in a general forward and upward direction from a point below said tender floor upwardly through the cab deck, to a point on the locomotive above such deck, said conduit comprising a substantially horizontal rearward portion disposed beneath the tender floor and at its forward end terminating at the front end of the tender, a slightly inclined intermediate portion extending upwardly and forwardly from the forward end of said rearward portion and at its forward end terminating on the locomotive beneath said deck, and an inclined forward portion sloping upwardly and forwardly through said deck towards the rear wall of the firebox from the forward end of the intermediate portion at a greater angle from the horizontal, said conduit portions being in end to end relation and the intermediate and rearward conduit portions being rigidly related with respect to one another, a sectional screw in said transfer conduit comprising a screw section in each of said conduit portions, said screw sections being jointed at the juncture of the intermediate conduit portion with the rear and forward conduit portions, means for rotating said screw and means disposed at the forward end of the fuel conveyor arranged to receive the fuel therefrom and project it over the firebed in the firebox, the fuel entering the firebox through the firing opening.

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