Dec. 10, 1940. C. T. HANSEN 2,224,127

LOCOMOTIVE STOKER

Filed May 19, 1938

Fig. 1.

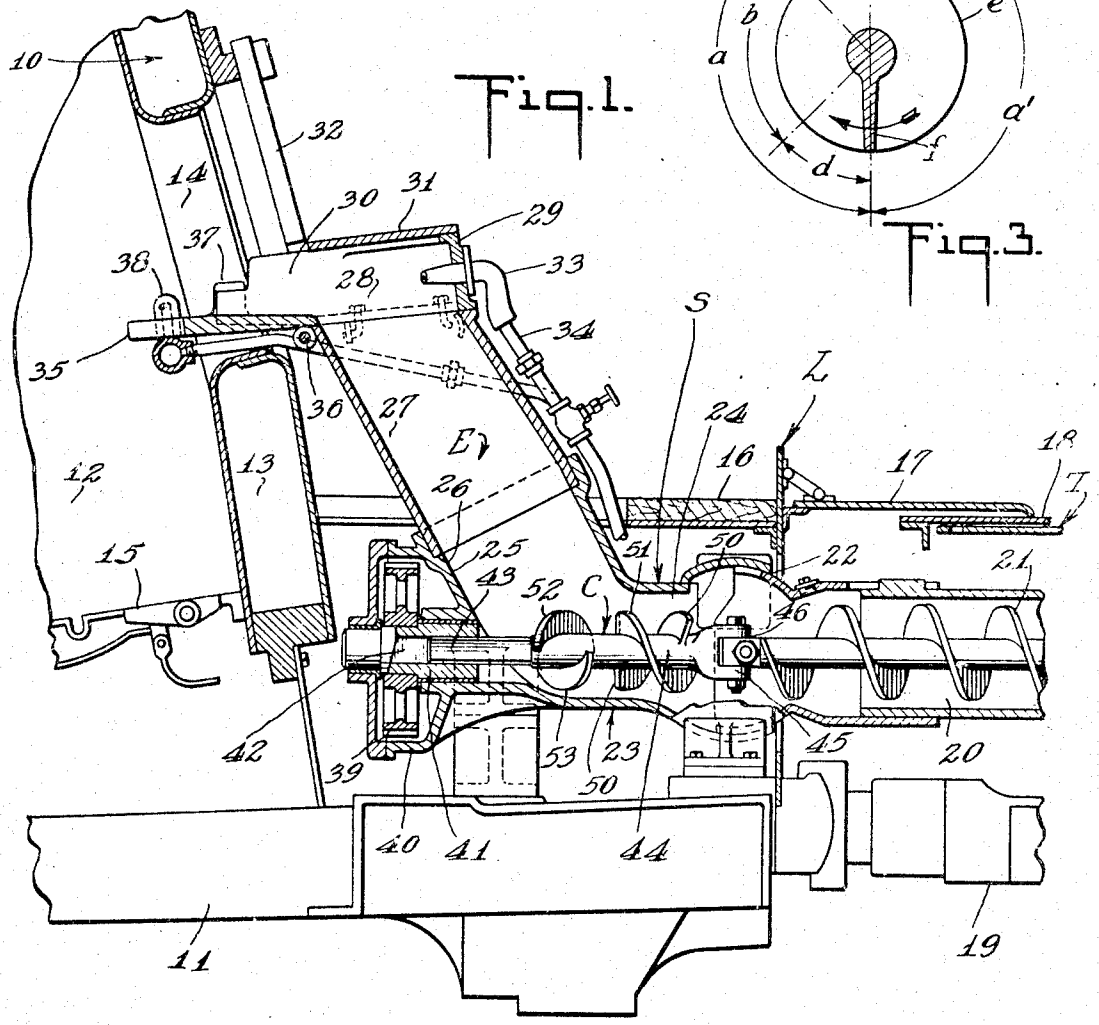
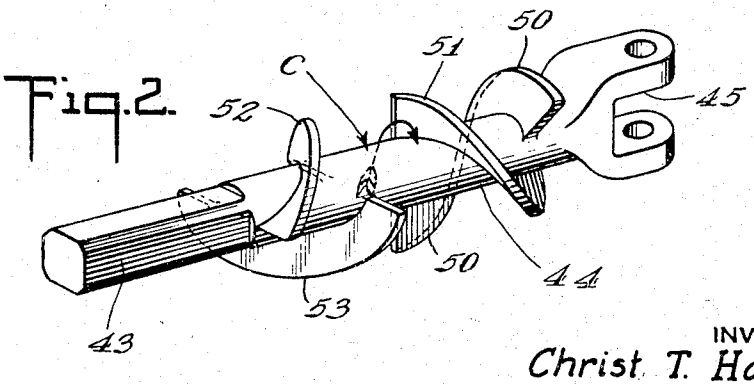


Fig. 3.

Fig. 2.



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Patented Dec. 10, 1940 2,224,127

UNITED STATES PATENT OFFICE

2,224,127

LOCOMOTIVE STOKER

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Application May 19, 1938, Serial No. 208,741

4 Claims. (Cl. 198—15)

This invention relates to stokers and particularly to locomotive stokers employing a screw conveyor for urging fuel upwardly to a point of distribution.

In stokers of this type, the conveyor screw which is disposed in the lower portion of a fuel feeding conduit is provided on its terminal end with a double screw flight so that the fuel may receive two upward impulses during each revolution of the screw. This produces a more continuous delivery of fuel to the distributor with the result that a more steady and uniform supply of fuel is distributed over the firebed.

While it is recognized that a still more continuous delivery of fuel would be attained by providing additional flights, it is not usually possible to provide the terminal end of the screw with more than a double flight because the addition of more than one extra screw flight between the normal screw flights would reduce the space necessary for the efficient conveyance of fuel.

It is the principal object of this invention to provide, in a stoker of the type described, a conveyor screw having its flights arranged to impart to the fuel more than two upward impulses during a single revolution of said screw and without materially reducing the fuel carrying capacity of said screw.

A further object of this invention is to provide a conveyor screw having a portion provided with a double flight of normal winding and a portion having a flight of reverse winding.

It is also an object of this invention to so arrange the flights of the normal and reverse windings that impulses are imparted to the fuel at regularly spaced intervals during one complete revolution of the screw.

Specifically, it is the object of this invention to improve, in the manner herein specified, a stoker in which the conveyor screw is driven from its forward end.

Other objects reside in the novel form of the screw per se and in its specific relation with other parts, substantially as described in the following specification which is accompanied by the drawing, in which

Fig. 1 is a vertical section taken longitudinally along the medial plane of the locomotive with the invention in similar section;

Fig. 2 is a perspective of the conveyor screw forming an essential part of this section; and

Fig. 3 is a transverse cross section through a conveyor screw showing its functions diagrammatically.

On this drawing, L is a locomotive having a boiler 10 supported upon a frame 11. The boiler 10 is provided with a firebox 12, the backwall 13 of which has a firing opening 14 above the grates 15. Rearward of the backwall 13 is a cab deck 16 upon which is supported an apron 17 for bridging the space between the cab deck 16 and the deck 18 of the tender T, the latter including an underframe 19.

A stoker S conveys fuel from the tender T to the firebox 12 of the locomotive L. It includes a conveyor conduit 20 leading forwardly from the tender and housing a screw 21 therein. The forward end of the conduit 20 is connected by a ball joint 22 to the rearward end of an elbow conduit 23, the latter forming a portion of a fuel elevator E disposed on the locomotive L. The elbow 23 includes a horizontally directed lower portion 24 and an angularly inclined upward portion 25 provided at its upper end with a rabbeted cr counter-bored seat 26 for receiving a tubular conduit 27. Immediately above the conduit 27 is a shallow casing 28 provided with a rear wall 29, and side walls such as 30 which extend forwardly into the lower portion of the firing opening 14. A lid 31 covers the upper side of the casing 28. That portion of the firing opening 14 above the casing 28 is closed by a firedoor 32.

Fuel is urged upwardly through the elbow 23 and the conduit 27 by a screw C of novel formation which is disposed within the horizontal portion 24 of the elbow 23. The rearwall 29 of the casing 28 carries a pressure fluid distributor head 33 receiving fluid under pressure from a pipe 34. As the fuel enters the casing 28, the distributor head projects the fuel forwardly across a plate 35 which extends into the firebox 12 through the lower portion of the opening 14. A pin 36 secures the plate 35 to the conduit 27 against fore and aft movement while a lug 37, which is formed at each side of the plate 35, rests on a sidewall 30 of the casing 28 for preventing downward movement of said plate 35. If desired, auxiliary jets such as 38 may be provided at the forward end of the plate 35 for directing fuel laterally into the firebox 12.

The screw C is driven from its forward end by a gear 39 which is housed within a casing 40 formed with the elbow conduit 23. A shaft 41 is suitably journaled in the casing 40 and carries the gear 39 whereby said shaft 41 is rotated at a suitable rate of speed. Internally, the shaft 41 is provided with a polygonal socket 42 for telescopically receiving the polygonal portion 43 of the hub 44 upon which are wound the flights of conveyor screw C. The hub 44 at its rearward end is forked to provide a jaw 45, forming one element of a universal joint 46 between the screw C and the screw 21. Since the conduit 20 is telescopic and a similar arrangement is provided in the driving connection between the screw C and shaft 41, it is apparent that the stoker is provided with ample flexibility necessary during operation of the locomotive and tender.

When a conveyor screw, positioned substantially horizontally, is utilized to urge material up-

wardly, its function is considerably different from that of a screw which merely conveys fuel axially. The function of a horizontally disposed conveyor in elevating material is shown diagrammatically in Fig. 3, wherein *f* represents the spirally wound flight of a conveyor screw C, the flight *f* being in transverse section.

Assuming the screw C to be revolving in the direction shown by the arrow, it will be observed that the flight *f* elevates fuel during traverse of the straight angle *a* (180°); in traversing straight angle *a'* (180°) the flight *f* will not lift material. In traversing angle *a*, the flight *f* elevates material most efficiently while passing through angle *b*, which is approximately 90° in extent. This is apparent from an inspection of Fig. 3 from which it will be observed that in traversing the primary angle *d* (45°) and the final angle *c* (45°), the flight *f* urges the material a greater distance horizontally than vertically. In traversing angle *b* (180°), the flight *f* moves the material more nearly vertically than horizontally.

Thus it will be apparent that a horizontally positioned conveyor screw having but a single flight wound around its hub or stem will elevate material most efficiently through substantially one-fourth (¼) of its turn. In order to provide a screw which will elevate material efficiently throughout a complete turn thereof, it would be necessary to provide three additional screw flights between the normal flight. To do so would materially reduce the carrying capacity of the screw because the three extra screw flights would occupy space necessary for the material being conveyed and elevated.

According to this invention, the screw conveyor C is so arranged that it will elevate fuel most efficiently without materially reducing the carrying capacity of the screw and without obstructing the free flow of fuel. Between the jaw **45** and the polygonal portion **43**, the hub **44** of the screw C has wound thereon a flight **50** which is arranged to convey fuel forwardly thence upwardly when the screw C is rotated in the direction indicated by the arrow in Fig. 2. Another flight **51** is also wound about the hub **44** and it is substantially co-extensive in length with the flight **50** but arranged so that its forward end is spaced 180° from the flight **50**.

Since the screw C is driven from its forward end, the polygonal portion **43** of the screw hub **44** may sometimes form an obstruction to the free passage of fuel upwardly. To obviate this, that portion of the screw hub **44** immediately rearward of the polygonal portion **43** is provided with a pair of flights **52, 53** wound in a direction such that fuel will be urged rearwardly and upwardly when the screw C is rotated in the direction indicated. Preferably, these "reverse" flights **52, 53** are spaced 180° from each other and so related with the "forward" flights **50, 51** so as to be approximately 90° away therefrom. In this manner, there is provided a conveyor screw having a double flight portion for conveying fuel forwardly and upwardly and a double flight portion for conveying fuel rearwardly and upwardly, the two double flight portions being so related with each other that the most efficient lifting action is imparted to the fuel during the entire revolution of the screw. The flights **52, 53** not only serve to prevent fuel from lodging underneath the polygonal shaft portion **43**, but also aid in the continuous upward elevation of the fuel.

In operation, the conveyor screw **21** conveys fuel forwardly into the elbow conduit **23** wherein the screw C picks up the fuel and advances it forwardly and upwardly. As shown in Figs. 1 and 2, the "reverse" flight **52** is midway through the angle *b* (Fig. 3), and the "forward" flight **51** is approaching this angle *b* for imparting continuous upward movement to the fuel. Thereafter, the "reverse" flight **53** will enter the angle *b*, to be followed in turn by the "forward" flight **50**. The fuel is thus elevated through the elbow conduit **23** and the upstanding conduit **27** by a screw which imparts a vertical movement to the fuel throughout a complete revolution of the screw. This will result in more even and continuous delivery of fuel to the distributing means without obstructing the free passage of the fuel in the elbow conduit **23**. Due to the fact that the elbow conduit **23** is completely filled with fuel to a point adjacent the jaw **45**, the "reverse" flights **52, 53** will not push the fuel an appreciable distance rearwardly but will merely lift the fuel. The "forward" and "reverse" double flight portions act somewhat opposite to each other with reference to forward and rearward conveyance of fuel, but the resultant force is in an upward direction.

From the foregoing, it will be apparent that the stated objects of this invention have been achieved by the structure which is now to be claimed.

I claim:

1. A conveying system comprising an upwardly extending conduit and a conveyor screw at the base of said conduit for urging material upwardly in said conduit, said conveyor screw having a double helical flight portion wound to urge material normally in one direction and a double helical flight portion spaced axially from said first named double helical flight portion and wound to urge material in the opposite direction, the adjacent terminal edges of said flight portions being spaced 90 degrees apart.

2. As a new article of manufacture, a conveyor screw having a double helical flight portion wound to urge material in one direction and a double helical flight portion spaced axially from said first named double helical flight portion and wound to urge material in the opposite direction, the adjacent terminal edges of said flight portions being spaced 90 degrees apart.

3. A conveying system comprising an upwardly extending conduit and a conveyor screw at the base of said conduit for urging material upwardly in said conduit, said conveyor screw having a double helical flight portion wound to urge material normally in one direction and a double helical flight wound to urge material normally in the opposite direction, said flights being formed with their adjacent final quarter turns in different quarter phases of revolution.

4. As a new article of manufacture, a conveyor screw having a double helical flight portion wound to urge material in one direction and a double helical flight portion wound to urge material in the opposite direction, said flights being formed with their adjacent final quarter turns in different quarter phases of revolution.

CHRIST T. HANSEN.