April 2, 1940. W. T. HANNA 2,195,815

CRUSHING CONVEYER FOR LOCOMOTIVE STOKERS

Original Filed Aug. 10, 1928 2 Sheets-Sheet 1

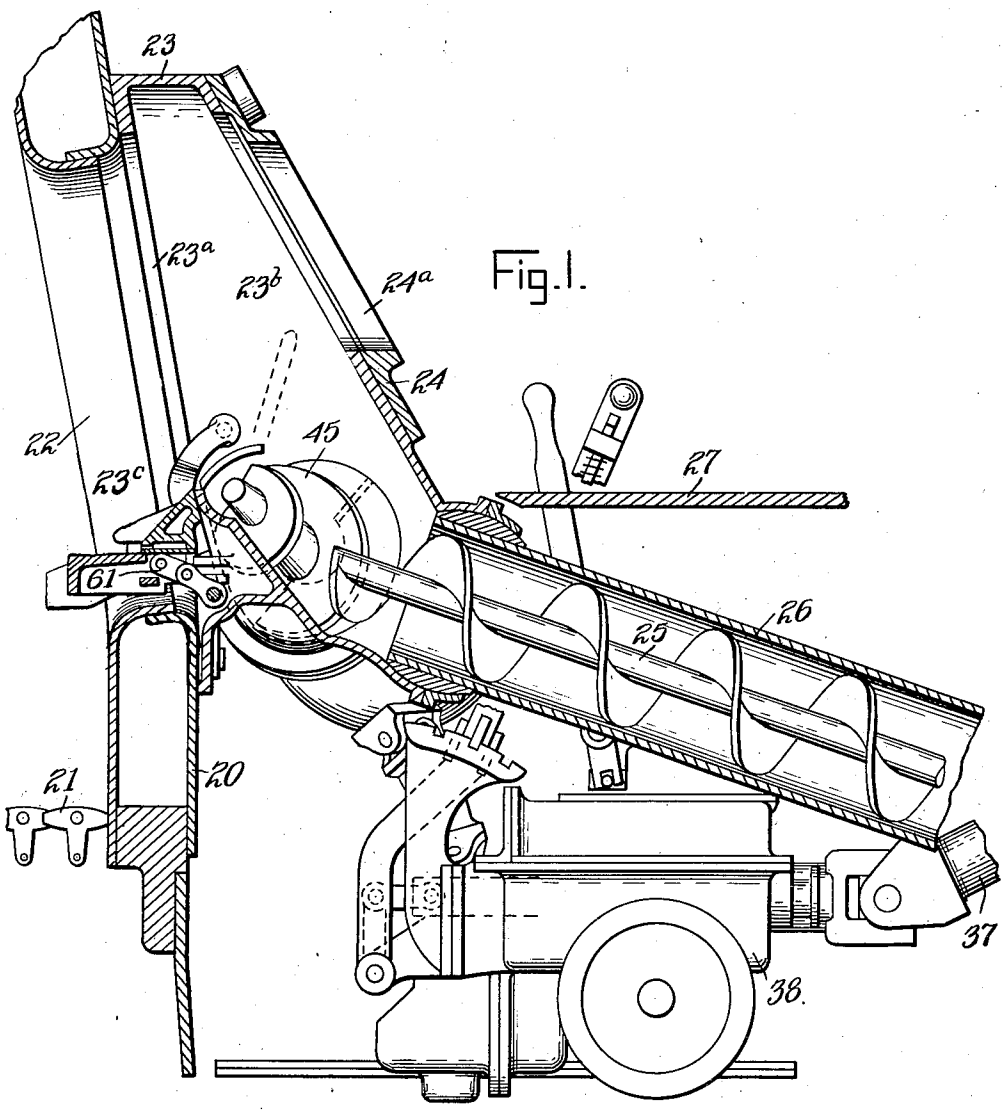


Fig. 1.

Fig. 6.

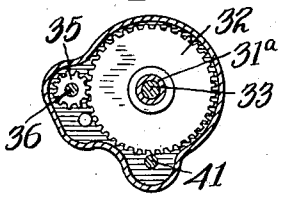
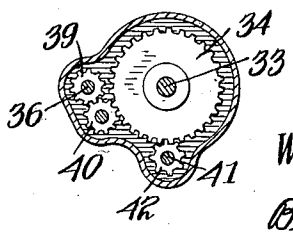


Fig. 7.



INVENTOR
William Thompson Hanna
BY
Blair, Curtis & Dunne
ATTORNEYS

April 2, 1940. W. T. HANNA 2,195,815

CRUSHING CONVEYER FOR LOCOMOTIVE STOKERS

Original Filed Aug. 10, 1928 2 Sheets-Sheet 2

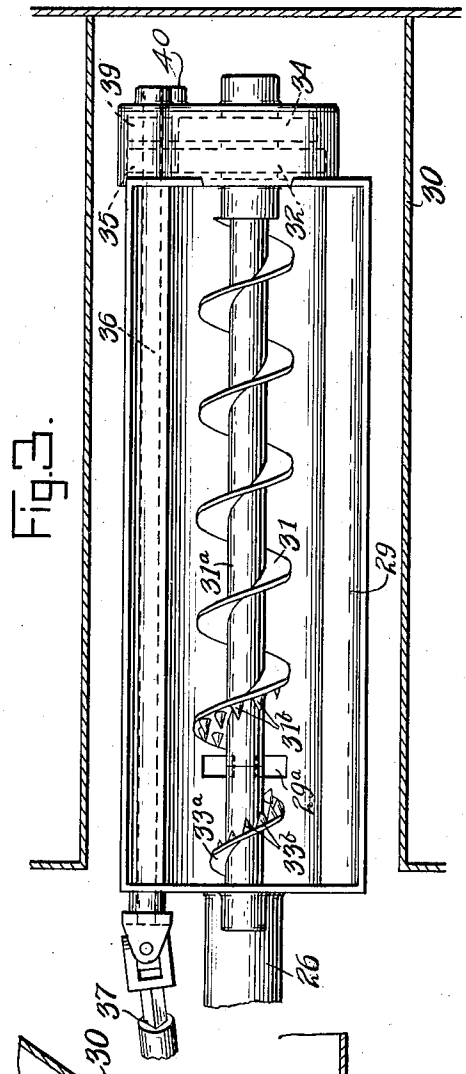


Fig. 3.

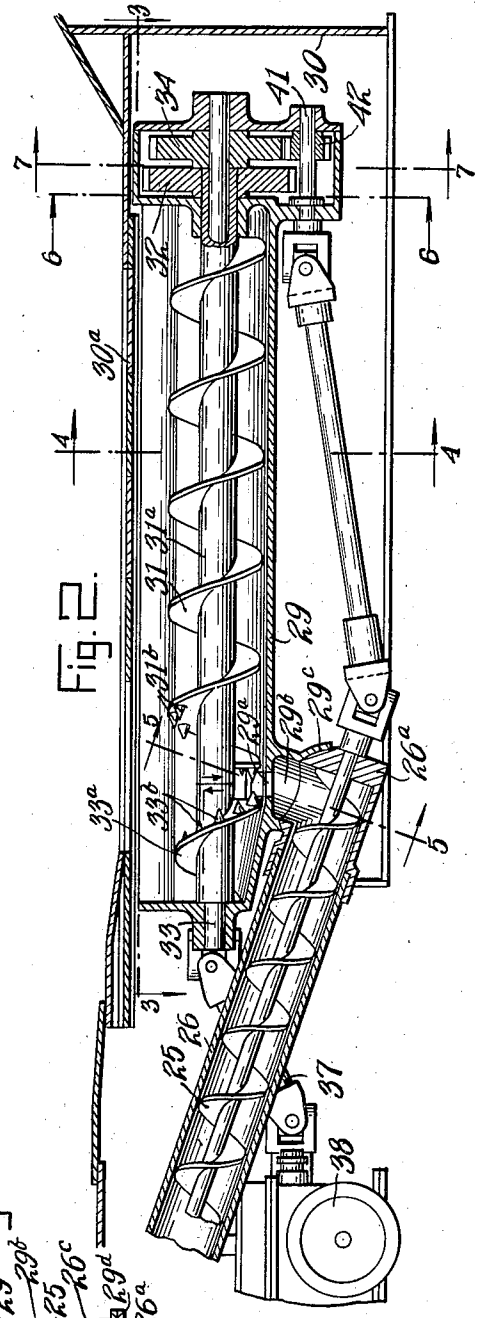


Fig. 2.

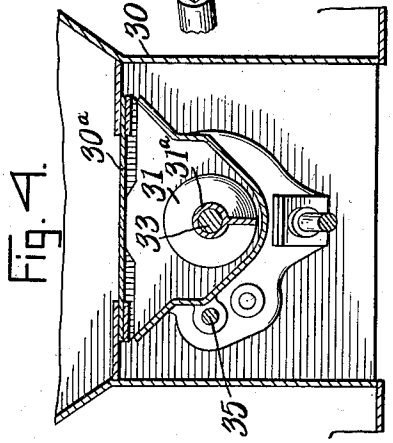


Fig. 4.

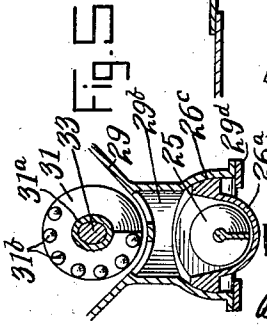


Fig. 5.

INVENTOR
William Thompson Hanna
BY
Blair, Curtis & Dunne
ATTORNEYS

Patented Apr. 2, 1940 2,195,815

UNITED STATES PATENT OFFICE

2,195,815

CRUSHING CONVEYER FOR LOCOMOTIVE STOKERS

William Thompson Hanna, Cincinnati, Ohio

Original application August 10, 1928, Serial No. 298,817. Divided and this application August 13, 1936, Serial No. 95,728

3 Claims. (Cl. 83—52)

The present invention relates to locomotive stokers.

This application is a division of my application Serial No. 298,817, filed August 10, 1928, which issued as U. S. Patent No. 2,051,040.

An object of the invention is to provide a crushing device on the tender which comprises a construction that acts to relieve congestion of the fuel preliminary to and within the crushing device, as well as after the crushing operation.

Another object of the invention is to provide fuel conveying means in which the means preliminary to the crushing operation will be of slow speed and high power, and the conveying means subsequent to the crushing operation will be of high speed, thus acting to prevent the fuel from pyramiding around the crushing device and on the tender deck.

These and other apparent objects and advantages are attained by the means described in the following specification and disclosed in the accompanying drawings, wherein

Fig. 1 shows a sectional view of stoker mechanism such as may be used in connection with the present invention;

Fig. 2 is a vertical longitudinal section of locomotive stoker conveying apparatus embodying the invention;

Fig. 3 is a horizontal section of the mechanism shown in Fig. 2 and taken substantially on line 3—3 of Fig. 2;

Fig. 4 is a vertical section taken on line 4—4 of Fig. 2;

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

Fig. 6 is a sectional view taken substantially on line 6—6 of Fig. 2;

Fig. 7 is a sectional view taken on line 7—7 of Fig. 2.

Referring to Fig. 1, there is shown a locomotive stoker. The stoker is mounted on a backhead 20 of a locomotive fire-box having the usual fire bed grate bars 21 and a firing opening 22. Embracing said opening and rigidly mounted on the outer face of the back-head is a housing 23 having a delivery opening 23—*a*, coinciding with the fire door opening 22. Substantially in alignment with the opening 23—*a*, in the opposite wall of said housing, is an opening 23—*b* which is embraced by a conventional form of fire door plate 24 having an opening 24—*a*, which serves as a fire door opening and upon which plate may be mounted the usual automatic fire door (not shown), such as for example the Franklin butterfly type. The lower side of the delivery opening 23—*a* is represented by a portion of the housing 23—*c*, which constitutes in effect a ledge extending across the firing opening 22 and serves as a sort of spillway for the fuel as it enters the fire-box.

The housing 23 is arranged to receive the delivery end of a transfer conveyer screw 25 which is rotatively supported in a cylindrical transfer conduit 26 the forward end of which is universally and slidably connected with the housing below the deck 27 of the locomotive. The other end of the conduit 26 is encompassed by a connecting member 26—*a* universally connected with a downwardly opening pasage 29—*b* of a tender hopper 29 (Fig. 5). The universal connection is made by a spherical female portion 29—*c* on the passage 29—*b* and a spherically shaped male portion on the connecting member 26—*a*. The latter is held in place by curved supporting surfaces 26—*c* extending downwardly from the connecting member and resting on plates 29—*d* secured to flanges of the passage 29—*b*.

The tender hopper is preferably in the form of a trough, as shown, and is rigidly mounted in the usual manner upon a tender 30. Above the tender hopper is the usual deck 30—*a* provided with shiftable plates so as to permit various areas of the deck to discharge fuel into said hopper. Rotatively supported within the trough of the hopper is a conveyer or vane 31 having a hub portion 31—*a* in the form of a tubular shaft terminating above an opening 29—*a* in the hopper floor and communicating with the passage 29—*b*. The rearward end of the hub shaft is journaled in the rearward wall of the hopper and carries a gear 32 by means of which the conveyer may be driven as will be hereinafter described. The vane or conveyer 31 is so constructed that at its delivery end it may serve as one member of a crushing device. This construction comprises a plurality of projections or crushing teeth 31—*b* provided on the leading face of the end portion of the vane.

Passing through the hub portion of the hub shaft 31—*a* and supporting it at its forward free end is a shaft 33 suitably journaled at either end of the hopper. Mounted on and secured to the forward end of the shaft is a hub portion carrying a vane 33—*a* adapted to coact with the delivery end of the conveyer 31 to drop fuel through the delivery opening 29—*a* provided in the bottom wall of the hopper.

The vane 33—*a* may be provided with a plurality of projections or crushing teeth 33—*b* arranged on the face of the vane to coact with the crushing teeth 31—*b* of the conveyer 31.

The shaft 33 is provided at its rearward end

with a gear 34 by means of which the shaft and vane 33—*a* are driven.

Referring to Figs. 6 and 7, gearing mechanism for driving conveyer 31 and vane 33—*a* is shown. Gear 32 is driven by a gear 35 secured to a shaft 36 suitably journaled in the tender hopper and driven through a telescopic shaft 37 by a suitable engine 38 mounted on the locomotive. There is considerable reduction between the gear 35 and the gear 32 so that the latter is driven relatively slowly and with considerable mechanical advantage.

Gear 34 which drives the shaft 33 and the vane 33—*a* is driven by means of a gear 39 mounted on the shaft 36 with the gear 35. The gear 39 meshes with an idler 40 suitably journaled in the gear box and the idler 40 meshes with the gear 34. In this manner the gear 34, the shaft 33 and the vane 33—*a* are rotated in a direction opposite to that of the rotation of the conveyer 31 and the two coact to center the fuel over the opening 29—*a* and to crush fuel when too large to pass through.

This same gear casing also supports a short shaft 41 which carries a small gear 42 meshing with the gear 34. The shaft 41 is connected through suitable drive shaft and universal connections with the rearward end of the conveyor 25 to drive the same. Thus the conveyer 25 is driven appreciably faster than the conveyer 31 (by reason of the difference in the size of the gears 34 and 42). Fuel moving along the hopper and through the opening 29—*a* by reason of the vanes 31 and 33—*a* is not allowed to pile or back up at the lower end of the conduit 26 because the effective fuel handling capacity of the conveyer 25 is greater than that of the conveyer 31.

By reason of the universal connections between the various driving and driven parts and between the tender and the transfer conduit, and the transfer conduit and the housing, sufficient freedom is provided for relative movement between the parts rigidly mounted on the locomotive and the parts rigidly mounted on the tender. Further than this, by reason of the construction and the combination of parts, the passage of the fuel from the hopper to the housing is not interfered with or obstructed and so undesirable pulverization of the fuel does not result.

The operation of this stoker mechanism comprises the reception of the coal by the trough of the tender hopper, beneath the deck of the tender, and its movement therein into the crushing zone of the crushing device wherein the lumps of fuel are reduced to a predetermined maximum size or less, before discharge from the tender hopper, from which the crushed fuel falls by gravity into the path of a conveying device, such as the conveyer 25, by which it is transported to the locomotive and deposited by the said conveyer directly into the distributing zone of a distributing device such as the spiral distributors 45, which serve to subsequently pass the fuel through the firing opening above the level of the fire, thus causing it to fall upon and flow over the blast chamber, which action tends to further distribute it and prepare it for reception by a distributor plate from which it is scattered over the fire by means of the blasts of steam emitting from the jets of the blast chamber.

It should be particularly observed that a distinct advantage of the construction shown is that the delivery end of the conveyer 25 is positioned just below the deck of the locomotive, and that the opposite end of said conveyer is positioned below the forward end of the tender, and that thereby this arrangement permits the conveyer to be tipped so that a direct route is established for the fuel, through the conveyer and distributing devices, from the tender to a point well above the level of the fire. Further, it should be observed that it is a distinct advantage that the conveyer 25 is not in axial alignment with the conveyer in the tender hopper, as thereby the conveyer 25 may be operated at a relatively higher speed than said other conveyer, and that this construction obviates any necessity of placing driving connections within the fuel conveyer conduit. Furthermore, this arrangement provides for the fuel to fall through space as it leaves the tender hopper and before entering the conveyer which transports it to the locomotive, thus preventing back pressure into the crushing device and tender hopper such as is ordinarily experienced when the conveyer in the tender hopper delivers the fuel directly to the conveyer which transports it to the locomotive.

While I have shown and described a particular construction embodying this invention as applied to a locomotive and its tender, it is to be understood that the same is for the purpose of illustration only, and that I am not limited to the detailed features thereof, as it is obvious that the construction may be variously modified and altered without in any manner departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. In a locomotive stoker for transferring fuel from a tender to a fire box of a locomotive, in combination, a hopper beneath said tender having a delivery opening, a transfer conveyer for transferring fuel forwardly from said delivery opening to the fire box, combined fuel moving and crushing means in said hopper comprising a first flight for moving fuel forwardly in said hopper to a point adjacent said delivery opening, fuel crushing projections on the fuel moving face of the forward end portion of the first flight, a second flight coaxial with the first screw conveyer forward thereof and having its flight wound in the same direction, fuel crushing projections on the fuel moving face of said second flight, and means for turning said flights in opposite directions whereby coal caught between said fuel crushing projections is crushed.

2. In a locomotive stoker for transferring fuel from a tender to a fire box of a locomotive, in combination, a hopper beneath said tender having a delivery opening, a transfer conveyer for transferring fuel forwardly from said delivery opening to the fire box, combined fuel moving and crushing means in said hopper comprising a first flight for moving fuel forwardly in said hopper to a point adjacent said delivery opening, fuel crushing projections on the fuel moving face of the forward end portion of the first flight, a second flight coaxial with the first screw conveyer forward thereof and having its flight wound in the same direction, fuel crushing projections on the fuel moving face of said second flight, means for turning said flights in opposite directions whereby coal caught between said fuel crushing projections is crushed, and the opposing ends of said first and second conveyers terminating adjacent said delivery opening whereby they act together to move fuel through said delivery opening.

3. In a locomotive stoker for transferring fuel

from a tender to a fire box of a locomotive, in combination, a hopper beneath said tender having a delivery opening, a transfer conveyer for transferring fuel forwardly from said delivery opening to the fire box, a screw conveyer in said tender hopper for moving the fuel forwardly to said delivery opening, a second screw conveyer ahead of and coaxial with said first screw conveyer and pitched in the same direction as said first screw conveyer, and means for rotating said second screw conveyer in the opposite direction from that in which said first screw conveyer is rotated for reversing the movement of the fuel, the opposing ends of said conveyers lying approximately adjacent said delivery opening.

WILLIAM THOMPSON HANNA.