Feb. 27, 1934. 1,948,686

C. J. SURDYKOWSKI, NOW BY JUDICIAL CHANGE OF NAME C. J. SURDY

STOKER MECHANISM

Filed May 27, 1930 3 Sheets-Sheet 1

Fig. 1

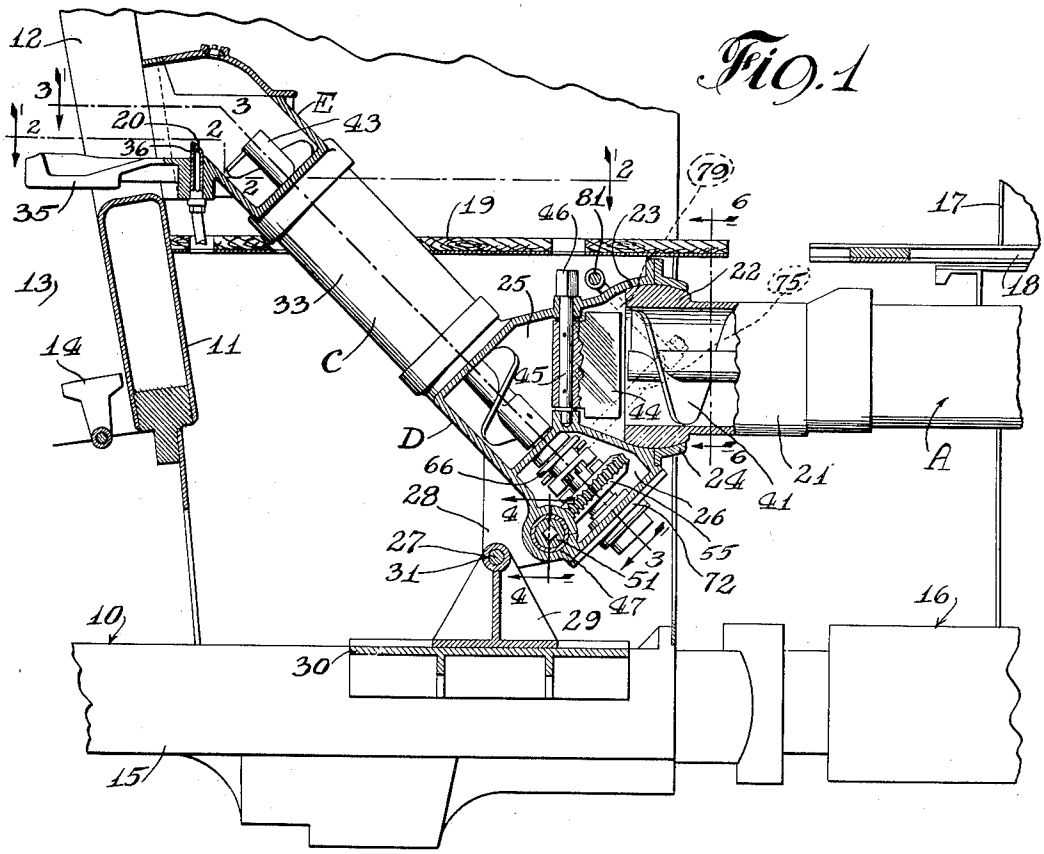
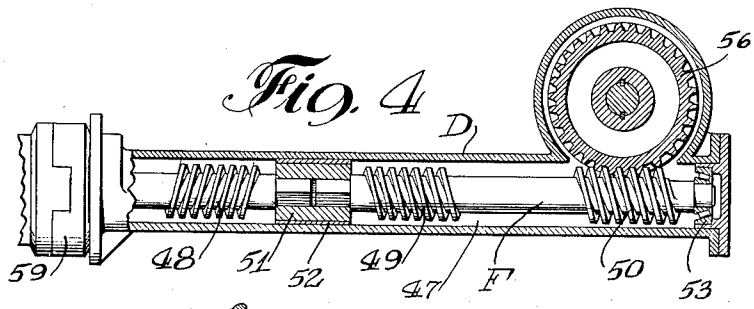


Fig. 4



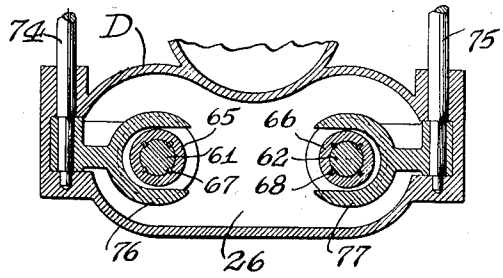


Fig. 5

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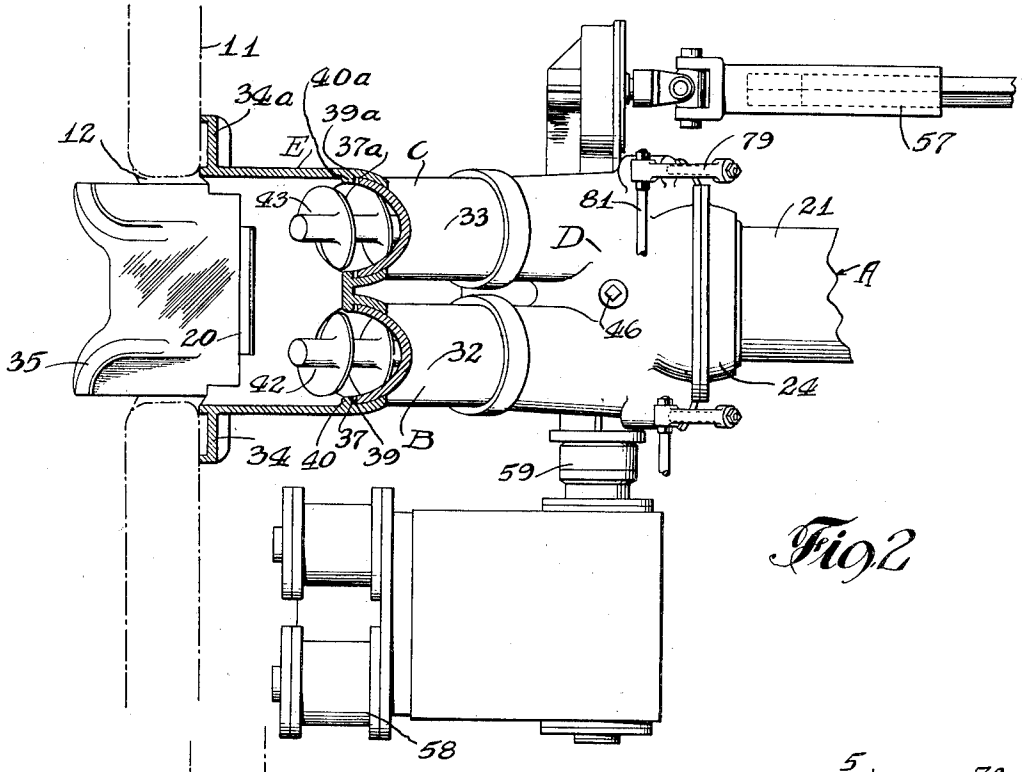

Fig 2

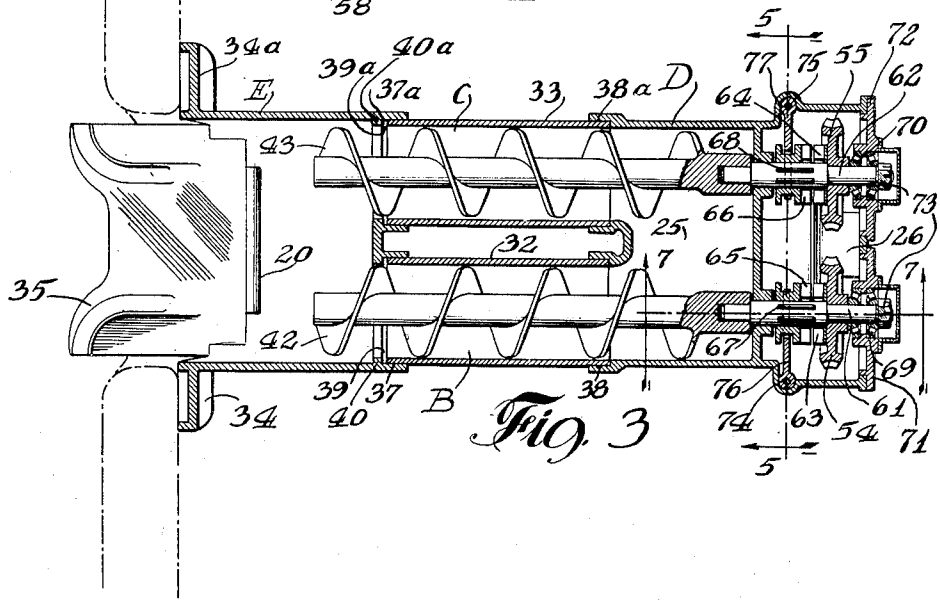

Fig. 3

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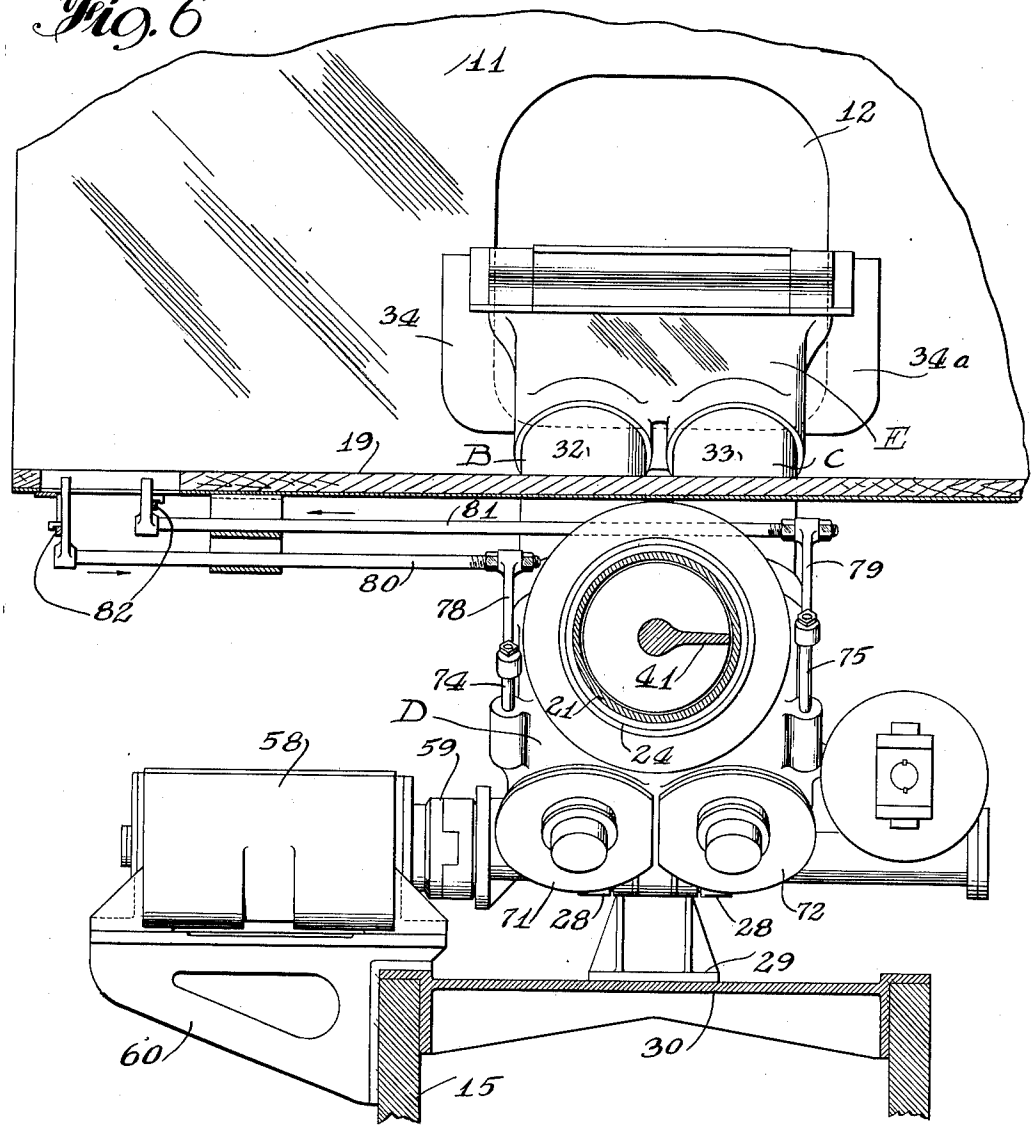
Fig. 6



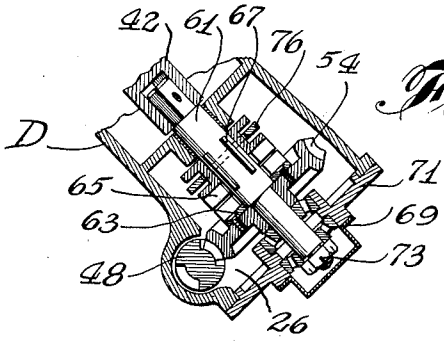


Fig. 7

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Patented Feb. 27, 1934 1,948,686

UNITED STATES PATENT OFFICE

1,948,686

STOKER MECHANISM

Charles J. Surdykowski, New York, N. Y., now by judicial change of name Charles J. Surdy, assignor to The Standard Stoker Company, Incorporated, a corporation of Delaware

Application May 27, 1930. Serial No. 456,007

4 Claims. (Cl. 110—101)

My invention relates to stokers. Its principal object is the provision of a new stoker mechanism having means for conveying the fuel in a single stream from a source of supply to an elevating means, there to be divided, equally or unequally in a plurality of streams and so elevated to a point adjacent the discharge mouth of the conveyor system where the streams converge into a single stream which is advanced to a common distributor acting to project the fuel in aerial paths over the firebed of a boiler firebox.

More specifically my invention contemplates the provision of a fuel feeding mechanism wherein the fuel is conveyed from a source of supply in a single stream to an elevating means, which raises the fuel in a plurality of streams to a common receiving chamber, there the streams converging into a single stream and being advanced to a distributor acting to scatter the fuel over the fire.

Another object of the invention is the provision of a stoker mechanism wherein the quantity of fuel delivered to either side of the firebox is under positive control of the stoker operator.

Still another object of my invention is the provision of a means, in a stoker of this character, whereby the elevators used for delivering the fuel to a common distributing member, may be independently operated.

For purposes of illustration, the present embodiment of the invention will be described as applied to a locomotive, although its use is not to be so restricted for it is equally applicable to other types of boilers.

On the drawings,

Fig. 1 is a central longitudinal section of a locomotive, illustrating the stoker mechanism;

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

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a section on the line 4—4 of Fig. 1;

Fig. 5 is a section on the line 5—5 of Fig. 3 illustrating the shifting mechanism;

Fig. 6 is a section on the line 6—6 of Fig. 1, looking in the direction of the arrows, and

Fig. 7 is a section on the line 7—7 of Fig. 3.

Referring now to the drawings, the reference character 10 designates a locomotive having a backhead 11, firedoor opening 12, firebox 13, and grates 14 therein, all of which are of well known or usual construction. The frame of the locomotive is designated at 15. Coupled to the locomotive is the tender 16 comprising the fuel tank 17 having the usual elongated opening 18 in its bottom wall.

The means for advancing the fuel from the tender to the firebox comprises generally a conveyor A mounted beneath the floor of the tender, extending forwardly therefrom to the locomotive, a pair of forwardly inclined parallel elevators B and C communicating with the conveyor A through a hopper casting D disposed beneath the cab deck 19 elevating the fuel in separate streams and delivering it to a common receiving chamber E, through which it is advanced in a single stream to the firing opening 12 and is projected over the grates 14 by the action of a pressure fluid blast issuing from a distributor head 20.

The conveyor A comprises a tubular casing 21, constituting the forward portion of the conveyor A, having formed on its forward end the spherical ball 22. The hopper casting D is provided at its rearward end with the spherical seat 23 which together with the clamp 24, holds the spherical ball 22 of the casing 21 to form a flexible joint connection between the conveyor and elevator sections of the stoking mechanism.

The hopper casting D is provided with the chambers 25 and 26. The chamber 25 is arranged to receive fuel from the conveyor section A, from which the fuel is carried forwardly and upwardly to the firing opening by the elevating mechanism, presently described in detail. The chamber 26 forms a housing for the elevating drive mechanism which is hereinafter fully described. The hopper casting D is carried from the locomotive frame 15 by a pivotal support 27. The support consists of lugs 28 on the casting D, a bracket 29 which is mounted on the foot plate 30 of the locomotive frame 15 and a pin 31 passed through aligned bores of the lugs 28 and bracket 29.

The elevators B and C are shown in the drawing as comprising a pair of parallel sleeves or riser casings 32 and 33, however, the risers 32 and 33 may be formed in a single casting having a dividing wall. The risers 32 and 33 open at their upper ends into the common fuel receiving chamber or casing E which is rigidly secured through the flanges 34, 34a to the backhead 11 of the locomotive. The mouth of the receiving chamber E opens directly to the firing opening 12 and is adapted to deliver fuel to a distributing means including a distributor plate 35 and the rearwardly disposed distributor head 20 provided with openings 36, both of which serve in a known manner to uniformly spread the fuel over the grates 14 of the firebox 13.

The sleeves or riser casings 32 and 33 are received at their upper and lower ends by the

rabbetted or counterbored portions 37, 37a and 38, 38a of the receiving chamber E and the hopper casting D respectively. The spaces 39, 39a are provided between the upper edge of the riser casings 32 and 33 and the seats 40, 40a of the counter bored portions 37, 37a to allow for the expansion and contraction of the boiler.

Separated screw conveyors are provided for advancing fuel from the fuel bin to the firebox. The screw 41 mounted in the tubular casing 21 terminates adjacent the forward end thereof and advances fuel from the tender to the chamber 25 of the hopper casting D. The risers 32 and 33 are provided with the screw conveyors 42 and 43 respectively. The screws 42 and 43 extend downwardly into the chamber 25 terminating at their respective lower ends at the base thereof, and extend upwardly within the receiving chamber E, terminating at a point slightly at the rear of the forward face of the distributor head 20.

It has been found that the use of a helicoid screw as a conveying means results in the delivery of more fuel to one side of the receiving member than to the other. Thus, a screw that advances fuel forwardly when rotated in a right hand direction has a tendency to deliver most of its charge to the left side of its center line and vice versa. My invention produces a continuous fuel stream having a uniform cross-sectional area on both sides of the center line to the receiving chamber permitting of equal distribution of fuel to both sides of the firebed by the fluid pressure blast.

In the construction shown the screw 42 in the elevator B rotates toward the left and the screw 43 in the elevator C toward the right when viewed from above. More fuel is therefore delivered toward the center line of the receiving chamber. The screws 42 and 43 are spaced apart and since more fuel is delivered toward the center line of the receiving chamber, the two streams meet in a common stream upon being delivered from the ends of the screws and the volume of fuel on each side of the center line will be substantially equivalent. A uniform delivery of fuel is therefore obtained, permitting equal firing to both sides of the firebox.

In practice, conditions are frequently encountered such as uneven draft which makes it necessary to feed more fuel to one side of the firebox than the other. To provide for contingencies of this nature and permit more complete fuel feeding control, a fuel dividing member 44 is provided between the screw 41 and the screws 42 and 43 in the chamber 25. The dividing member 44 is mounted on a vertical shaft 45 having an angular head 46 adapted to be engaged by a wrench. By turning the shaft, the divider member swings with the shaft as an axis and the fuel delivered by the screw 41 may be divided between the two elevators in any desired proportion. The divider by proper adjustment may be made to trim the fire at either side of the firebox.

In general, the driving mechanism consists of worm gearing driven by an engine of a well known construction. The hopper casting D forms a frame work to maintain the gearing in proper relation and has chambers and bores in which it is housed.

At its lower portion the casting has a cylindrical bore 47 (Figs. 1 and 4) in which worms 48, 49 and 50 are connected by a sleeve 51 to operate as a worm shaft F lying transversely across the locomotive adjacent the lower ends of the forwardly inclined elevators. Adequate bearings for the worm shaft are provided as at 52 and 53. Worms 48 and 49 mesh with worm gears 54 and 55 connected with the elevating screw 42 and 43 respectively, and worm 50 meshes with the worm gear 56 which, through a flexible shaft 57 and suitable gearing at the rear of the trough, not shown, operates the conveyor screw 41. The driving engine 58 imparts motion to the worm shaft F through the coupling 59. The driving engine 58 is mounted on a bracket 60 which in turn is secured to the frame 15 of the locomotive.

The worm gears 54 and 55 are housed within the chamber 26 of the casting D as is also the shifting mechanism which is now to be described. Referring particularly, to Figs. 3, 5 and 7, the worm gears 54 and 55 employed to transmit motion to the screws 42 and 43 respectively, are shown as being loosely mounted on their shafts 61 and 62. On the forward faces of these worm gears 54 and 55 are attached clutch members 63 and 64 which are adapted to be engaged by corresponding clutch members 65 and 66 slidably mounted on the keys 67 and 68 of the shafts 61 and 62 respectively. The shafts 61 and 62 are journaled in the thrust bearings 69 and 70 contained within the covers 71 and 72 respectively. A nut such as 73 is utilized to render proper adjustment of the thrust bearings 69 and 70.

For the purpose of illustration, the clutch members have all been shown as being out of engagement. Engagement between clutches 63 and 65 and between clutches 64 and 66 is effected by partial rotation of the shafts 74 and 75 on which are mounted the shifting forks 76 and 77 respectively, as best shown in Fig. 5. When the clutch member which is slidably mounted on the keys of its shaft is in engagement with the clutch members mounted on a worm gear, the worm gear then becomes keyed to the shaft through the medium of the slidably mounted clutch and in this way transmits power for the rotation of its corresponding screw.

Referring particularly, to Fig. 6, which illustrates the lever arrangement used to operate the clutch, the shafts 74 and 75, which control the shifting forks 76 and 77 respectively, are connected by suitable arms 78 and 79 and cross-arms 80 and 81 which are within easy reach of the stoker operator. A simple catch arrangement 82 is employed to retain either or both of the slidably mounted clutches out of engagement whenever it is desirable to do this.

As has been previously stated, all of the drawings show the clutches as being out of engagement. To further explain the operation of these clutches, the screw 42 can be placed in operation by pushing the cross arm 80 in the direction of the arrow. In order to place the screw 43 in operation, the cross arm 81 is pulled in the direction of the arrow. The screws are cut out of operation by replacing the cross arms to the positions shown in Fig. 6.

In operation, motion is imparted to the conveyor screw 41 and the elevating screws 42 and 43 by the driving engine 58 through suitable gearing. The fuel received by the conveyor A from the tender 16 is carried forward by the direct action of the impelling flights of the screw into the hopper casting D where it is divided equally or unequally as desired into two streams by the dividing member 44. The fuel thus divided is then elevated forwardly and upwardly through the

casings B and C by the screws 42 and 43, respectively. Screws 42 and 43 project into the common receiving chamber E and the fuel conveyed by said screw, converges into a single stream at the rear of the distributor jet 36 for distribution over the grates 14 in a volume and a position with relation to said distributor jet that is predetermined by the setting of the dividing member 44. Should it be desirable to eliminate the delivery of fuel to either side of the grates, the screw controlling delivery to that side of the grates may be cut out of operation by the clutching mechanism as explained.

From the foregoing it will be readily seen by those familiar with the stoker art that a stoking mechanism has been provided which is highly efficient, flexible in operation and free from bends within its conduits that would tend to pulverize fuel. The novel clutch construction illustrated and described herein is the subject matter of my co-pending divisional application, Serial No. 707,526, filed January 20, 1934.

I claim:

1. In a stoker mechanism, the combination with a furnace having a firing opening and a fuel receiving chamber communicating with said firing opening, a fuel distributor head at the forward end of said chamber, and means for delivering a plurality of separated streams of fuel to said receiving chamber comprising a plurality of substantially parallel conveying screws having opposed pitches and terminating closely adjacent the rearward end of said receiving chamber said screws being rotated in opposite directions and so positioned as to cause said plurality of streams to be converged into a single stream upon delivery of the fuel to said receiving chamber and to urge the fuel through said receiving chamber in a single stream to said fuel distributor head.

2. In a stoker mechanism, the combination with a furnace having a firing opening and a fuel receiving chamber communicating with said firing opening, a fuel distributor head at the forward end of said chamber, means for delivering a plurality of separated streams of fuel to said receiving chamber comprising a plurality of substantially parallel conveying screws having opposed pitches and terminating closely adjacent the rearward end of said receiving chamber said screws being rotated in opposite directions and so positioned as to cause said plurality of streams to be converged into a single stream upon delivery of the fuel to said receiving chamber and to urge the fuel through said receiving chamber in a single stream to said fuel distributor head, and mechanism for rotating said conveying screws independently of one another.

3. In a stoker mechanism, the combination with a furnace having a firing opening and a fuel receiving chamber communicating with said firing opening, a fuel distributor head at the forward end of said chamber, a fuel hopper spaced therefrom, means for delivering a plurality of separated streams of fuel from said hopper to said receiving chamber comprising a plurality of substantially parallel screw conveyors, extending from said hopper to said fuel receiving chamber, the screws in said conveyor being of opposite pitch and terminating closely adjacent the rearward end of said chamber, said screws being so arranged and rotated in opposite directions to cause said plurality of streams to be converged into a single stream upon delivery of the fuel to said receiving chamber, said conveying screws urging the fuel through said receiving chamber in a single stream to said fuel distributor head, and means within said hopper operable to vary the relative amounts of fuel in said separated streams of fuel.

4. In a stoker mechanism, the combination with a furnace having a firing opening and a fuel receiving chamber communicating with said firing opening, a fuel distributor head at the forward end of said chamber, a fuel hopper spaced therefrom, means for delivering a plurality of separated streams of fuel from said hopper to said receiving chamber comprising a plurality of substantially parallel screw conveyors, extending from said hopper to said fuel receiving chamber, the screws in said conveyor being of opposite pitch and terminating closely adjacent the rearward end of said chamber, said screws being so arranged and rotated in opposite directions to cause said plurality of streams to be converged into a single stream upon delivery of the fuel to said receiving chamber, said conveying screws urging the fuel through said receiving chamber in a single stream to said fuel distributor head, means within said hopper operable to vary the relative amounts of fuel in said separated streams of fuel, and mechanism for rotating said conveying screws independently of one another.

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