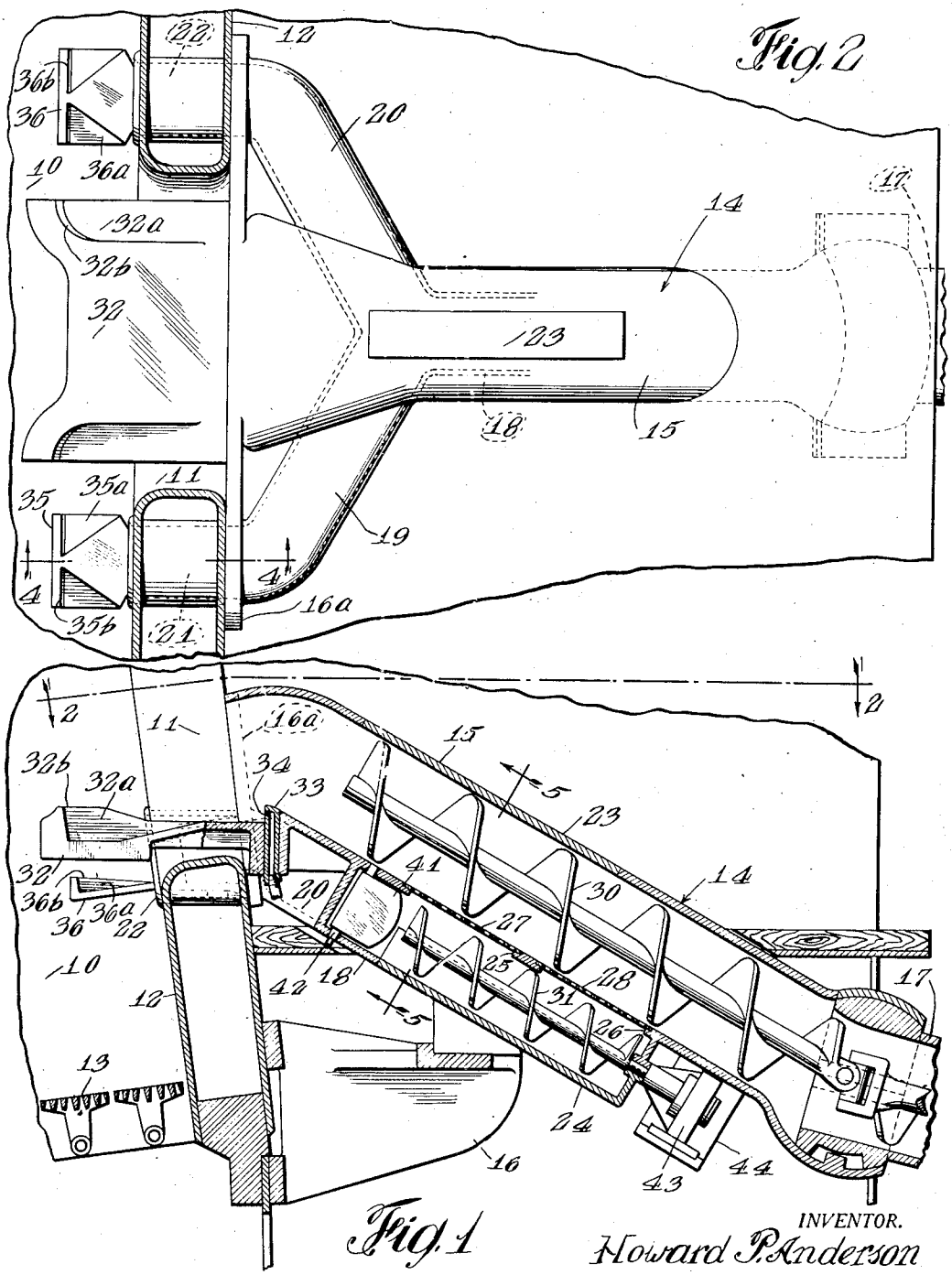
June 16, 1936. H. P. ANDERSON 2,044,043

LOCOMOTIVE STOKER

Original Filed Dec. 16, 1930 3 Sheets-Sheet 1



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LOCOMOTIVE STOKER

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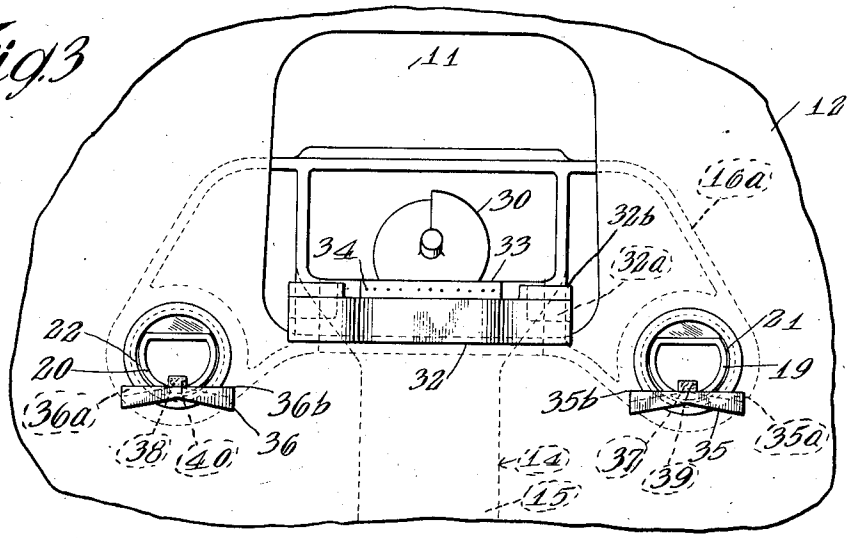
Fig. 3



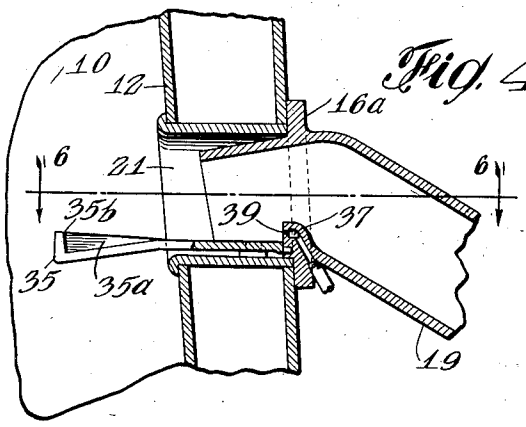


Fig. 4

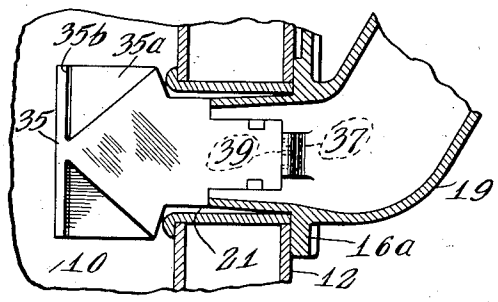


Fig. 6

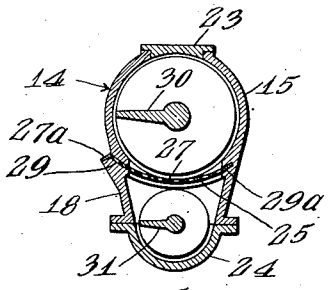


Fig. 5

INVENTOR.

Howard P. Anderson

BY

C. Archer Turner

ATTORNEY.

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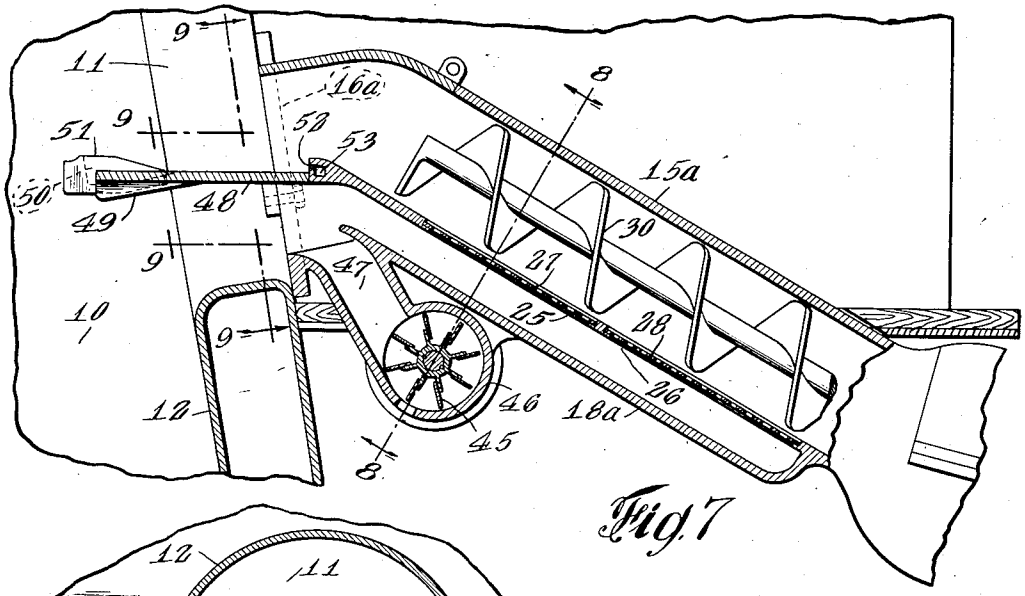

Fig. 7

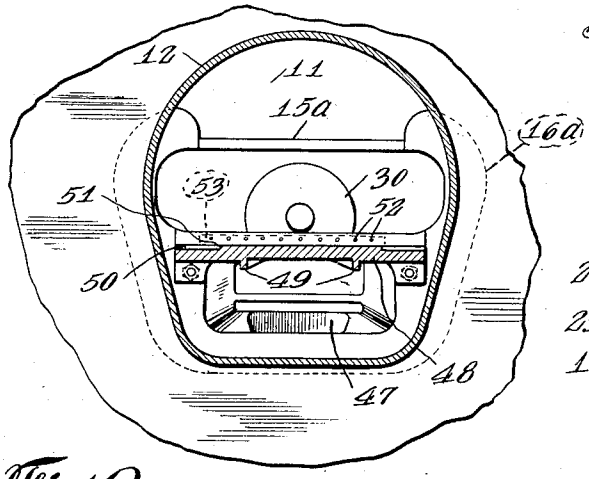

Fig. 9

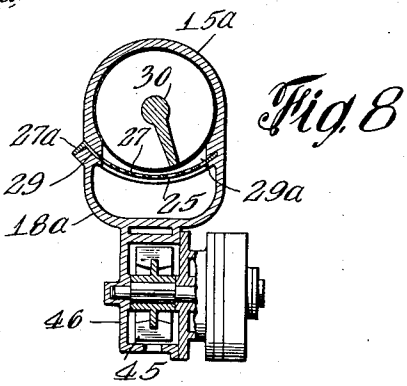

Fig. 8

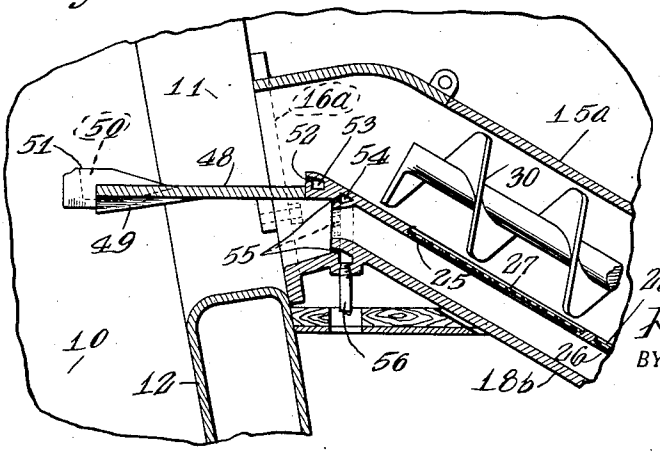

Fig. 10

INVENTOR.
Howard P. Anderson
BY
C. Archer Turner
ATTORNEY.

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UNITED STATES PATENT OFFICE

2,044,043

LOCOMOTIVE STOKER

Howard P. Anderson, Erie, Pa., assignor to The Standard Stoker Company, Incorporated, a corporation of Delaware

Application December 16, 1930, Serial No. 502,646
Renewed November 7, 1935

21 Claims. (Cl. 110—101)

This invention relates to stokers of the scatter feed type in which fuel is spread over a fire in aerial paths by a pressure fluid blast.

It is an object of the invention to provide a new and improved mechanism in a stoker of the type described for separating the fine fuel from the coarse fuel and simultaneously distributing the fine and coarse fuel over the fire by separate and independently controlled means.

A further object of the invention contemplates the provision of improved means whereby a substantially complete separation of the fine fuel from the coarse fuel is achieved and separate delivery of each to the firebox is provided.

To the above and other ends the invention consists in the arrangement of parts and in their relation and association one with the other or in combination as hereinafter described and as illustrated in the accompanying drawings, in which

Fig. 1 is a central longitudinal vertical section of a portion of a locomotive and a stoker therefor showing the invention in place;

Fig. 2 is a plan view taken on the line 2—2 of Fig. 1;

Fig. 3 is an end view of the delivery end of the stoker taken from within the firebox;

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

Fig. 5 is a section on the line 5—5 of Fig. 1;

Fig. 6 is a section on the line 6—6 of Fig. 4;

Fig. 7 is a central longitudinal vertical section of a portion of a locomotive and a stoker therefor showing a modified form of the invention;

Fig. 8 is a section on the line 8—8 of Fig. 7;

Fig. 9 is a section on the line 9—9 of Fig. 7; and

Fig. 10 is a section similar to Figs. 1 and 7 showing a further modification of the invention.

Referring now to the drawings, the numeral 10 designates a locomotive boiler firebox; 11, the conventional firing opening in the rear wall or backhead 12; and 13, the grates. The stoking mechanism is indicated as a whole at 14 and only so much is shown as is necessary for a complete understanding of the invention. The part of the stoking mechanism illustrated comprises a riser conduit 15 rigidly supported from the backhead 12 by suitable means, as by the bracket 16 and the lateral flange 16a, and a conduit 17 leading from a source of fuel supply and universally connected at its forward end with the lower end of the riser conduit 15.

Referring more particularly to the form of the invention as illustrated in Figs. 1 to 6, a riser casing 18 depends from and is preferably formed integral with the conduit 15 and divides at its upper end into the two diverging branches 19 and 20. The backhead 12 is apertured at 21 and 22 on either side of and somewhat below the firing opening 11 to receive the upper end of the branched conduits 19 and 20. The riser conduit 15 is provided with the removable cover 23 whereby access may be had to the interior thereof, and the riser casing 18 is provided with the removable floor portion 24 whereby access may be had to the interior thereof. Apertures 25 and 26 common to the riser conduit 15 and the riser casing 18 are provided in the bottom wall of the riser conduit 15, and arcuate shaped perforated plates or screens 27 and 28 are arranged to form closures for said apertures and are held in place in the curved slot 29 and groove 29a formed in the marginal edges of the bottom wall of the conduit 15 surrounding the apertures 25 and 26. The curved slot 29 opens at the side and exteriorly of the conduit 15 and casing 18, whereby the arcuate screens 27 and 28 may be conveniently removed for purposes of repair or replacement from the outside of the stoker without disassembling any portion of the stoker mechanism. For convenience in removing the screens 27 and 28 they may be provided with flanges, as 27a, or other suitable means.

Mounted in the riser conduit 15 is a screw conveyor 30 and in the riser casing 18 a screw conveyor 31. Fuel is advanced through the riser conduit 15 by the screw conveyor 30 and the finer particles of fuel pass through the perforated plates 27 and 28 onto the flights of the screw conveyor 31 in the riser casing 18. The coarse fuel is delivered from the screw conveyor 30 onto a distributor plate 32 which extends forwardly from the mouth of the riser conduit through the lower portion of firing opening 11 into the firebox 10 and forms an extended floor portion for the riser conduit. A distributor head 33 positioned vertically at the rear of the distributor plate is arranged to deliver a blast of pressure fluid through the jet openings 34 across the distributor plate which is so configured as by the channels 32a and their abutment walls 32b, as to distribute coarse fuel evenly over the entire grate area in conjunction with the pressure blast. The fine fuel is urged through the branched conduits 19 and 20 by the pressure of the screw conveyor 31 and onto the distributor plates 35 and 36 which extend forwardly through the apertures 21 and 22 from the lower forward edge of the branched conduits 19 and 20, into the firebox. The lower forward edge of the branched conduits 19 and 20 are cored at 37 and 38 forming pressure fluid chambers and are provided with the jet openings 39 and 40 connecting with the cored chambers 37 and 38 whereby a blast of pressure fluid issues across the distributor plates 35 and 36 which are so configured, as by the channels 35a, 36a and their abutment walls 35b, 36b, as to distribute fine fuel over the entire grate area.

Located centrally at the point where the conduits 19 and 20 branch out from the riser casing

18 is a deflector 41 pivotally mounted on a vertical shaft 42, so that more or less of the fine fuel may be deflected into one conduit or the other as desired.

The fine fuel conveyor screw 31 is actuated by a small variable speed motor 43 supported in the housing 44 depending from the riser conduit 15. The conveyor screw 30 may be actuated in the customary manner by a motor located on the tender and hence is not shown in the drawings.

In operation, the fuel is advanced through the riser conduit 15, the rotation of the screw 30 and the vibration of the locomotive causing the fine fuel to pass through the perforated plates or screens 27, 28 onto the screw conveyor 31 in the riser casing 18, and the coarse fuel continues on through the riser conduit 16 and is delivered onto the distributor plate 32 where it is distributed evenly over the firebed by the pressure fluid blast issuing from the distributor head 33. The fine fuel is urged through branched conduits 19 and 20 onto the distributor plates 35 and 36 where it is distributed evenly over the firebed by the pressure fluid blasts issuing from the jet openings 39 and 40. The aerial path of the coarse fuel is above the path of the fine fuel thus forming a protecting blanket over the fine fuel and minimizing to a negligible degree the amount of the fine fuel which is ordinarily swept over the firebox arch and through the stack unconsumed. The coarse and fine fuel is delivered in aerial paths over and above the normal level of the fire. This is an important feature of the invention for it permits a uniform delivery and classification of the coarse and fine fuel to all parts of the firebed.

In Figs. 7, 8, and 9 another embodiment of the invention is shown. Separation of the coarse and fine fuel is effected in somewhat the same manner as hitherto described in connection with Figs. 1 to 6, but the separation is aided by suction means as will presently appear. In the modified form the riser casing 18*a* is straight instead of branching and opens at its upper end in the firing opening 11 directly beneath the riser conduit 15*a*. A fan 45 mounted in the casing 46, which may be formed integral with and depending from the riser casing 18*a*, discharges a blast of air through the passage 47 across the mouth of the casing 18*a*, whereby the injector action of the fan blast will create a suction of air at the mouth of the casing 18*a*, not only serving to exhaust the fine fuel from the casing, but also tending to draw the fine fuel through the screen from the riser conduit 15*a* to aid and facilitate its separation from the coarse fuel and to project the fine fuel into the firebox. Thus the blast from the fan 45 serves the manifold purpose of promoting complete and rapid separation and delivery of the fine fuel, of acting as a cooling medium for the distributor plate 48 and aiding thorough combustion of the fuel.

The distributor plate 48 is provided on its under side with outwardly diverging depending ribs or deflector members 49 which act to direct the fine fuel over all parts of the firebed in cooperation with the fan blast which, as will be observed from the drawings, is directed against the under side of the distributor plate. The upper side of this plate carries channels 50 and abutment walls 51 as described in the preferred form of the invention for deflecting the coarse coal projected by the pressure blast issuing from the jet openings 52 of the steam chamber 53 formed in the riser conduit 15*a*. Steam is supplied to the chamber in any suitable manner. Thus the distributor plate serves as a deflector for both the coarse fuel stream and the fine fuel stream.

Fig. 10 illustrates a modified form of the arrangement shown in Figs. 7, 8 and 9, the fan 45 being replaced by a steam blast which creates a suction in the riser casing 18*b* exhausting the fine fuel and projecting it forwardly into the firebox. A cored chamber 54 circumscribing the casing 18*b* is formed therein adjacent its upper end and is provided with the converging jets 55 connecting with the cored chamber 54. Steam is supplied to the chamber 54 by supply pipe 56. The operation of this form of the device is similar to the device shown in Figs. 7, 8, and 9 and needs no further explanation.

From the foregoing it will be apparent the invention provides an improved stoker arranged to separate the fine and coarse fuel with independent conveyance and delivery of each class, and wherein the coarse fuel is projected in aerial paths over and above the fine fuel which is introduced into the firebox above the normal level of the fire. This arrangement greatly minimizes fuel losses and enables the operator to build an even firebed composed of a substantially uniform classification of fine and coarse fuel throughout.

I claim:

1. In combination, a firebox provided with a grate and having a backwall with a firing opening therein above said grate, a fuel conduit opening into said firing opening, a fuel casing beneath said conduit communicating therewith and at its forward end portion arranged to deliver fuel through said backwall above the grate, a stationary screen disposed between said conduit and said casing and being removable from a side thereof, rotatable means operative over said screen for advancing fuel through said conduit, means operated independently of said first named means for advancing fuel through said casing, and distributing means for spreading the fuel from said conduit in aerial paths over the grate and above the delivery of the fuel from said casing.

2. In combination, a firebox provided with a grate and having a backwall with a firing opening therein above said grate, a fuel conduit opening into said firing opening, a fuel casing beneath said conduit communicating therewith and at its forward end portion arranged to deliver fuel through said backwall above the grate, a stationary screen disposed between said conduit and said casing and being removable from a side thereof, rotatable means operative over said screen for advancing fuel through said conduit, means for propelling fuel from said casing in aerial paths over and above the normal level of the firebed on said grate, and distributing means independent of said last named means for spreading the fuel from said conduit in the firebox above the aerial paths of the fuel delivered from said casing.

3. A fuel separating and conveying section of a stoker comprising a fuel conduit, a casing depending from said fuel conduit, an opening in the floor of said conduit communicating with said depending casing, an arcuate shaped screen mounted in said opening forming a perforated closure therefor, a longitudinally extending arcuate shaped slot in a side wall of said conveying section common to said conduit and casing, said slot communicating with said opening for inser-

tion and removal of said screen from without said conduit and casing and means formed in the side wall of said conveying section opposite said slotted wall for receiving said screen, said casing at its delivery end being forked to form two diverging branch conduits.

4. A fuel separating and conveying section of a stoker comprising a fuel conduit, a casing depending from and formed with said fuel conduit, an opening in the floor of said conduit communicating with said depending casing, a screen mounted in said opening forming a perforated closure therefor, a longitudinally extending slot in one sidewall of said conveying section common to said conduit and casing for insertion and removal of said screen from without said conduit and casing, and a groove in the side wall of said conveying section opposite said slotted wall for receiving said screen, the floor of said conduit having a pressure fluid receiving chamber formed therein adjacent its delivery end.

5. In a furnace provided with a firing opening, the combination of a conduit for conveying fuel to said firing opening, a riddle in the floor of said conduit rearward of said firing opening for separating the fine and coarse fuel, a casing receiving the fine fuel from said riddle and communicating at its forward end with said firing opening, means for projecting the coarse fuel into said furnace, means for projecting the fine fuel into said furnace and a plate in said firing opening arranged to distribute coarse fuel over its top surface and fine fuel along its bottom surface.

6. In a fuel distributing system for scattering fuel in aerial paths over a fire, means for separating the fine fuel from the coarse fuel, a fuel distributor plate forward of and separate and apart from said fuel separating means, means for projecting the coarse fuel across the top surface of said plate, means for projecting the fine fuel across the bottom surface of said plate, said top surface being configured to distribute the coarse fuel evenly over a fire and said bottom surface being configured to distribute the fine fuel evenly over a fire.

7. In combination, a firebox provided with a grate, and having a backwall with a centrally disposed hand firing opening therein above said grate and a pair of power firing openings disposed at opposite sides of said hand firing opening in a horizontal plane extending below the horizontal plane of the hand firing opening and being located above the normal level of the firebed on said grate, a fuel conduit delivering fuel into said hand firing opening, a section of said conduit being provided with a riddle permitting separation of the fine from the coarse fuel, and a casing beneath said conduit receiving the fine fuel from said riddle, said casing being forked to form two forwardly extending branch conduits, each communicating with the firebox through one of said power firing openings.

8. In combination, a firebox provided with a grate, and having a backwall with a centrally disposed hand firing opening therein above said grate and a pair of power firing openings disposed at opposite sides of said hand firing opening in a horizontal plane extending below the horizontal plane of the hand firing opening and being located above the normal level of the firebed on said grate, a fuel conduit delivering fuel into said hand firing opening, a section of said conduit being provided with a riddle permitting separation of the fine from the coarse fuel, a casing beneath said conduit receiving the fine fuel from said riddle, said casing being forked to form two forwardly extending branch conduits, each communicating with the firebox through one of said power firing openings, a screw in said fuel conduit for advancing the coarse fuel therethrough, and a screw in said casing advancing the fuel therein and forcing it through said branch conduits thereof, said last named screw being operated independently of said first named screw.

9. In combination, a firebox provided with a grate, and having a backwall with a centrally disposed hand firing opening therein above said grate and a pair of power firing openings disposed at opposite sides of said hand firing opening in a horizontal plane extending below the horizontal plane of the hand firing opening and being located above the normal level of the firebed on said grate, a fuel conduit delivering fuel into said hand firing opening, a section of said conduit being provided with a riddle permitting separation of the fine from the coarse fuel, a casing beneath said conduit receiving the fine fuel from said riddle, said casing being forked to form two forwardly extending branch conduits, each communicating with the firebox through one of said power firing openings, a screw in said fuel conduit for advancing the coarse fuel therethrough, a screw in said casing advancing the fuel therein and forcing it through said branch conduits thereof, said last named screw being operated independently of said first named screw, distributing means at each power firing opening for spreading the fine fuel delivered thereto in aerial paths over the normal level of the firebed on said grate, and distributing means at said hand firing opening for spreading the fuel delivered thereto in aerial paths into the firebox above the delivery of the fine fuel.

10. In combination, a firebox provided with a grate, and having a backwall with a centrally disposed hand firing opening therein above said grate and a pair of power firing openings therein disposed at opposite sides of said hand firing opening in a horizontal plane extending below the horizontal plane of the hand firing opening and being located above the normal level of the firebed on said grate, a fuel conduit delivering fuel into said hand firing opening, a section of said conduit being provided with a riddle permitting separation of the fine from the coarse fuel, a casing beneath said conduit receiving the fine fuel from said riddle, said casing being forked to form two forwardly extending branch conduits, each communicating with the firebox through one of said power firing openings, a screw in said casing for advancing the fine fuel therein, a prime mover at the rear of said casing driving said casing screw, and a screw in said conduit operated independently of said casing screw.

11. In a furnace provided with a grate and a furnace wall having a firing opening, therethrough above the level of the grate the combination of a riser conduit for conveying fuel to said firing opening, a section of said conduit being provided with a riddle for separating fine fuel from the coarse fuel, a casing extending forwardly and upwardly and arranged to receive the fine fuel from said riddle, said casing communicating with said furnace through said furnace wall above the level of said grate, a screw in said conduit for delivering the coarse fuel to said firing opening, a screw in said casing for elevating the fine fuel, and a prime mover at the base of said casing for operating said casing screw.

12. A stoker comprising in combination, a fire-

box provided with a firing opening, a fuel conduit feeding fuel to the firebox through said firing opening, a fuel separating riddle associated with said conduit, a casing receiving the fine fuel from said riddle, and an inspirator means drawing the fine fuel through said riddle and constituting the sole means for advancing such fuel from said casing and delivering it into the firebox through said firing opening.

13. A stoker comprising in combination, a firebox provided with a firing opening, a fuel conduit feeding fuel to the firebox through said firing opening, a fuel separating riddle in a section of said conduit rearward of said firebox, a casing receiving the fine fuel from said riddle and at its forward end opening into said firebox, and means discharging a forwardly directed pressure fluid blast at the forward end of said casing forward of said riddle whereby the fine fuel is drawn forwardly through the casing and delivered into the firebox through said firing opening.

14. In combination, a furnace provided with a firing opening, a fuel riser conduit communicating at its upper end with said firing opening, a section of said conduit being provided with a riddle for separating fine fuel from the coarse fuel, a casing receiving the fine fuel from said riddle and communicating at its upper end with said firing opening, means in said riser conduit for conveying the coarse fuel to said furnace, a fan mounted adjacent the discharge end of said casing arranged to issue a blast across the upper end thereof and into said furnace for exhausting the fine fuel from said casing and projecting it into said furnace.

15. In combination, a furnace having a backwall provided with a firing opening, a riser conduit communicating at its upper end with said firing opening, a section of said conduit being provided with a riddle for separating fine fuel from the coarse fuel, a casing receiving the fine fuel from said riddle and communicating at its upper end with said firing opening, means in said riser conduit for conveying the coarse fuel to said furnace, and means arranged to exhaust the fine fuel from said casing and project it into said furnace.

16. In combination, a firebox provided with a grate and having a backwall with a firing opening therein above said grate, a fuel conduit opening into said firing opening, a distributor plate at said firing opening forming a continuation of said conduit, conveying means in said conduit advancing fuel therethrough onto the upper side of said plate, a fuel casing beneath said conduit at its forward end opening into said firing opening below said plate, a riddle disposed rearwardly of said plate between said conduit and said casing forming a restricted passage between the two permitting the finer particles of fuel to pass into said casing, means discharging a forwardly directed pressure blast forward of said riddle across the upper end of said casing into the firebox through the firing opening and below said plate, and means associated with the upper side of said plate disposed forwardly of said riddle for propelling the coarse fuel therefrom over the grate in aerial paths, said pressure fluid blast acting to draw the fine fuel forwardly through said casing and deliver it into the firebox above the normal level of the firebed on said grate and beneath the delivery of the coarse fuel.

17. In combination, a firebox provided with a grate and having a backwall with a firing opening therein above said grate, a fuel conduit opening into said firing opening, a fuel casing beneath said conduit communicating therewith and at its forward end portion arranged to deliver fuel through said backwall above the grate, a removable screen disposed between said conduit and said casing permitting fine fuel to pass from the conduit into the casing, rotatable means operative over said screen for advancing fuel through said conduit, means operated independently of said first named means for advancing fuel through said casing, and distributing means for spreading the fuel from said conduit in aerial paths over the grate and above the delivery of the fuel from said casing.

18. In combination, a firebox provided with a grate and having a backwall with a firing opening therein above said grate, a fuel conduit opening into said firing opening, a fuel casing beneath said conduit communicating therewith and at its forward end portion arranged to deliver fuel through said backwall above the grate, a removable screen disposed between said conduit and said casing permitting fine fuel to pass from the conduit into the casing, rotatable means operative over said screen for advancing fuel through said conduit, means for propelling fuel from said casing in aerial paths over and above the normal level of the firebed on said grate, and distributing means independent of said last named means for spreading the fuel from said conduit in the firebox above the aerial paths of the fuel delivered from said casing.

19. In a stoker, in combination, a conveyor, means associated with said conveyor for separating the fine from the coarse fuel, and a fuel distributing system for scattering fuel in aerial paths over a fire comprising a fuel distributor plate at the discharge end of the conveyor forward of and separate from said fuel separating means, means for projecting the coarse fuel across the top surface of said plate, and means for projecting the fine fuel underneath said plate.

20. In combination, a firebox provided with a grate and having a backwall with a firing opening therein above said grate, a fuel conduit opening into said firing opening, a distributor plate at said firing opening positioned to receive fuel from said conduit, means associated with said conduit spaced rearward of and apart from said plate for separating the fine from the coarse fuel, means associated with the upper side of said plate disposed forwardly of said fuel separating means for propelling the coarse fuel from said plate over the grate in aerial paths, and means for delivering the fine fuel over the grate in aerial paths at a level below the coarse fuel.

21. In combination, a firebox provided with a grate and having a backwall with a firing opening therein above said grate, a fuel conduit opening into said firing opening, a distributor at said firing opening positioned to receive fuel from said conduit, conveying means in said conduit for advancing fuel to said distributor, means associated with said conduit spaced rearward of and apart from said distributor for separating the fine from the coarse fuel, said distributor being arranged to propel the coarse fuel from said conduit over the grate in aerial paths, and means for delivering the fine fuel over the grate in arial paths at a level below the coarse fuel.

HOWARD P. ANDERSON.