Feb. 20, 1940. G. M. PELTZ 2,191,219

STOKER

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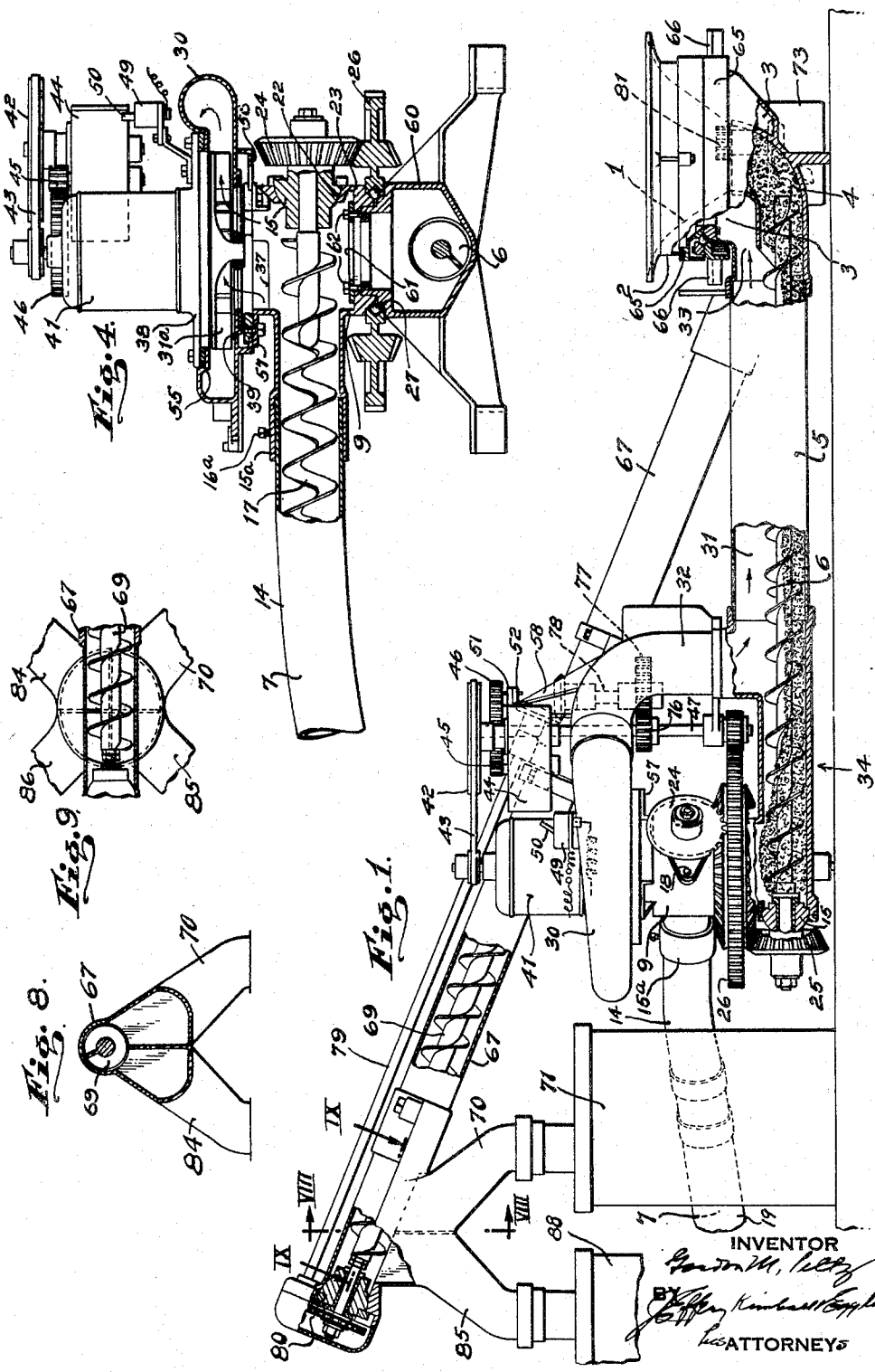


Fig. 4.

Fig. 9.

Fig. 8.

Fig. 1.

INVENTOR

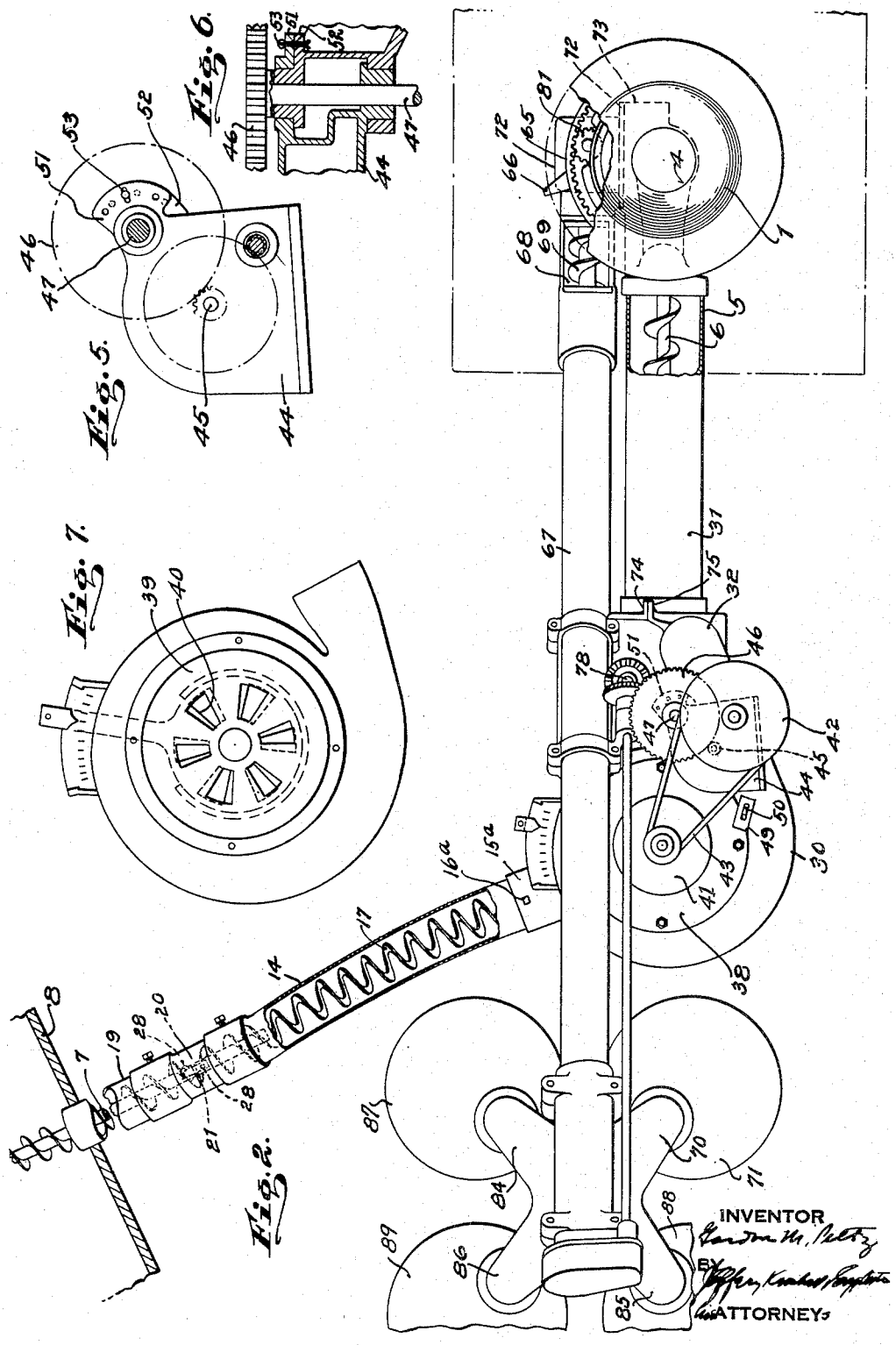
BY

ATTORNEYS

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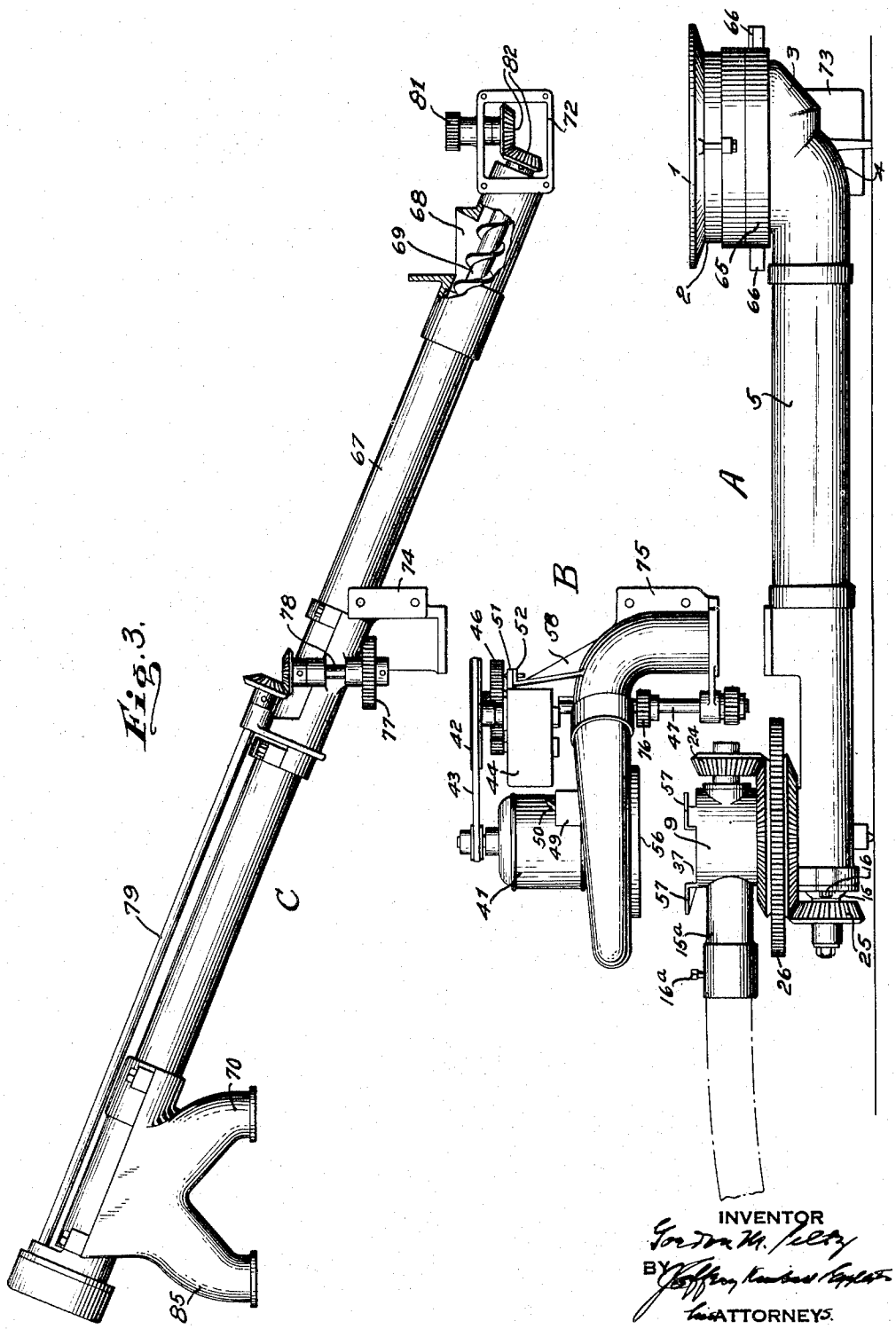


Fig. 3.

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2,191,219

STOKER

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Application April 24, 1935, Serial No. 17,954

13 Claims. (Cl. 110—45)

My invention relates to stokers for solid fuel, such as a graded coal, and especially to such stokers for heating homes, apartment houses and the like, and to stokers adapted to take their fuel from the bin which constitutes the primary source of fuel supply of the establishment. Such stokers may be called domestic stokers although in some instances they are used for industrial purposes.

Generally speaking it provides an improved stoker of the kind indicated. Various of its details can be used separately however, and in other assemblies than that illustrated herein, as will be apparent.

In the accompanying drawings, which illustrate the preferred form of my invention: Fig. 1 is an elevation, partly in section, of the stoker embodying my invention. Fig. 2 is a plan view thereof, showing also its relation to a coal bin. Fig. 3 is a side elevation of the same stoker, the three units into which the stoker is primarily divisible, being shown spaced apart. Fig. 4 is a sectional elevation substantially at the center of the transfer chamber. Figs. 5 and 6, in plan and section, illustrate details at the gear box. Fig. 7 illustrates the air adjustment at the blower. Fig. 8 is a section on the line VIII—VIII of Fig. 1. Fig. 9 is section on the line IX—IX of Fig. 1.

Referring to the specific machine illustrated in the drawings: A conventional form of grate 1 to support the graded coal while burning and perforated for the passage of combustion air, is surrounded by a wall 2 to provide an air chamber 3 whence the combustion air passes to the fuel. The grate 1 is of the underfeed type and as is conventional may receive its fuel by upward feed through an elbow 4. The coal is fed to the elbow through a conduit 5, later described in more detail, and by means of a screw conveyor 6, and also is forced upwardly through the elbow 4 and grate 1 (the ashes falling over the outer edge of the grate) by a screw conveyor 6. A second screw conveyor, indicated generally by the reference character 7, feeds coal to the first conveyor 6 from a coal bin 8 constituting the primary source of coal supply of the establishment. A transfer chamber 9 connects the two conveyors 6 and 7; the bin conveyor 7 opens into the upper part of this transfer chamber and the grate conveyor 6 takes its fuel from the lower part of the transfer chamber (Figs. 1 and 4). The coal falls through this transfer chamber by gravity.

In order that the bin conveyor indicated generally by 7, may reach to whatever level may be necessary or desirable at the bin, this conveyor is provided, preferably, with an adjustment to this end. Preferably the section 14 of this conveyor, adjacent the transfer chamber 9, extends away in an angular direction from its connection 15a to the transfer chamber 9, so that when, say, the set screw 16a holding section 14 to 15a is released, rotation of section 14 in 15a raises or lowers the opposite end of 14; preferably this angularity is secured by bending the conduit of this section on a slight curve as illustrated in the drawings, and making the screw within it flexible, e. g. the screw may consist of only the thread, the shaft portion usually found in screw conveyors being omitted, as appears in Fig. 2. Since the bin end of the section 14 can be raised and lowered, it is obvious that an extension beyond this end can be made to reach to higher or lower levels as may be necessary or desirable.

Preferably all the conveyor screws are so mounted and arranged with the other apparatus that each screw can be pulled out of its trough or conduit as necessary. Thus it will be observed that the journal bearing 15 of the grate screw 6, can be released from the conduit 5 by removing the screws 16 (Fig. 3), thus permitting this grate conveyor to be pulled out lengthwise. Likewise, the end of the conveyor section 17 adjacent the transfer chamber 9 is carried in a bearing 15 that is releasable by taking out the screws 18 (Fig. 1). Sometimes however the bin conveyor 7 must be of considerable length, and for this and other reasons it is desirable frequently that a section of the conveyor nearer the bin be removable by itself. For this reason, I prefer to make the short section 14 nearer the transfer chamber 9 (which may be, say, about four or five feet long) as an entity separate and distinct from the section 19 which is nearer the bin; to this end preferably I join 14 to 19 by a removable connection 20, into which the two ends of the conduit section may slip, and likewise join the screw conveyor section 17 to the screw conveyor section reaching to the bin, by a releasable connection 21 at or within the conduit connection 20. Preferably the connection 21 is a bar, the two ends of which extend into the two conveyor shafts and are held therein by a rivet 28 in each end, and the flight of one screw being practically, or in effect, continuous with the flight of the other screw. Obviously by this arrangement the connection 20 can be released from one or both of the conduit sections, and then say the conduit section at the bin slipped along until the conveyor connection 21 is exposed, and on this connection 21 being released

and the conveyor section 14 turned to displace its end, the conveyor section adjacent the bin can be pulled out of its conduit; since section 14 is bent, as before mentioned and as shown in Fig. 2, it is obvious that by turning this section 14 in its connection 15a, the end of section 14 which is adjacent connection 21 will be moved away and displaced sidewise from the connection 21 and the adjacent end of the conduit section 19. Preferably all the bearings supporting screw conveyors, and especially those supporting fuel conveyors (due to the nature of the fuel and the foreign material sometimes found in it), are like the bearing 15 of Figs. 1 and 4. That is to say, preferably each of these bearings has a spherical outer surface 22 facing in the direction of the length of the conveyor shaft to resist endwise movement of the screw under load, this surface resting in a corresponding spherical seat in the respecting supporting plate 23. This provides the conveyor screws with that flexibility at their mounting that is desirable in stokers.

To drive the two fuel conveyor screws described, I prefer to provide each with a driving element adjacent the transfer chamber 9; both these driving elements can be driven by a single driving member at the chamber. This is represented by the gear wheel 24 mounted on the bin conveyor screw 17, the gear wheel 25 mounted on the grate conveyor screw 6, and the horizontal driving gear member 26, gear teeth on the upper face of which engage with 24 while other gear teeth on its bottom face engage with 25. This driving gear 26 can be mounted on a bearing 27 on the outside of the transfer chamber as shown in Fig. 4 for example, and can be driven by the driving motor of the stoker, preferably as later described.

Combustion air for the grate is provided by the blower 30, which has a rotating fan 31a. The combustion air and the fuel can be fed to the grate through separate conduits if desired, in well known manners, but preferably I employ a single conduit 5 for both fuel and air as appears in Fig. 1. To this end the conduit 5 and conveyor 6 are so arranged that adequate space 31 is provided in the conduit 5 for the air, above the coal level, between the outlet 32 of the blower and the entrance 33 into the combustion air chamber 3. To this end, a few turns of the thread of the screw 6 adjacent the bearing 15 may be of lower capacity than the remainder of the conveyor; for example, of lower pitch of thread. As a result, the level of the coal for the most part of the conveyor 6 will be below the top edge of its thread flights as shown in Fig. 1, so that there is no tendency for the fuel to fill the space 31 but this space is reserved for air flow. By making the internal diameter of the section of the conduit at 34, i. e. the section between the blower outlet 32 and transfer chamber 9 about equal to the diameter of the flights of the conveyor 6, the resistance to air flow back through this section 34 can be made adequately large for the purpose, or this resistance can be increased by arranging the conveyor to more or less pack coal at this section. Generally however a proper relation of screw thread diameter to conduit diameter at section 34 is sufficient, providing means are arranged for leading some volume of air from the transfer chamber (or farther back on the coal system) to some point whence gas escapes from the house; for example into the furnace, conceivably. Preferably for the latter purpose the inlet port of the blower 30 is located adjacent an opening into the transfer chamber 9, and this is particularly adapted to the present situation and arrangement. Preferably the inlet of the blower is placed directly above the transfer chamber 9, so that the blower acts as a cover for this chamber, and such openings 37 into the chamber are provided as may be necessary to provide the fan with adequate atmospheric air (see Fig. 4). Preferably then the opposite side of the blower is closed by a cover plate 38 having a diameter at least equal to the diameter of the blower fan 31, so that the fan can be removed for inspection and repairs by simply removing this cover plate 38. The rate of air flow to the grate can be adjusted by providing the inlet wall 39 of the blower with a few openings, and against this wall a rotatably adjustable plate 40 also having openings as will be apparent from Fig. 7.

Preferably the electric motor 41 to drive the stoker conveyors is mounted vertically on the blower cover plate 38. Preferably a speed reducing gearing is employed between the motor and the conveyors as will be understood. Preferably this speed reducing gearing is employed also to open the circuit to the motor and stop the motor, and also relieve the conveyors of the driving fly-wheel effect of the blower fan, on the occurrence of overload on any conveyor. Thus the motor 41 may drive a pulley 42 through a belt 43, the pulley 42 in turn driving speed reducing gearing within the box 44, the low speed shaft pinion 45 of which can drive a larger gear 46 carried on the vertical shaft 47 geared to the large driving gear 26 before mentioned (Figs. 1 and 2). The box 44 of speed reducing gearing is hinged in a fixed bracket 58 and around its low speed shaft 47 (Fig. 6), and under the driving action of the motor this box 44 tends to rotate around the low speed shaft 47. This tendency to rotate can be restrained in various ways. Preferably a yielding connection is provided, that holds the box against rotation under normal loads but yields on overload, thereby permitting the box 44 to rotate in the clockwise direction (Fig. 2), and thus loosen the tension on the belt 43. By placing a switch 49 so that its operating lever 50 is in the path of the gear box 44 as the latter turns on overload, and employing this as the motor switch (to open and close the supply circuit of the motor 41) the motor and fan are stopped as an incident to the bodily movement of the speed reducing gearing, i. e. of the box 44. The relieving of the tension on the driving belt 43, relieves the gearing and conveyors of the fly-wheel effect of the fan which tends to continue driving after the motor switch is opened. For a yielding connection to hold the gear box against turning, I preferably use cooperating plates 51 and 52 (Figs. 1, 2 and 5), having holes differently spaced as appears in Fig. 5, and a frangible pin 53 passed through cooperating holes to lock the two plates together; plate 52 can be carried on a bracket rising from the base portion of the machine (Figs. 1 and 3), while the cooperating plate 51 is attached to the gear box 44. By differently spacing the holes of the series in the two plates, a sort of vernier arrangement is provided whereby a combination of two holes is readily found suitable for the desired operating tension on the belt 43. It will be understood that the connecting pin 53 is designed to hold the box 44 against rotation under normal loadings, but to shear on an excessive overload.

A rubber or similar gasket 55, beneath the

blower cover-plates 38 tends to produce a quiet machine, and advantageously this can be supplemented by a friction belt drive 43 between the motor 41 and the high speed side of the speed reducing gearing.

As illustrated in Fig. 3, the parts of the machine so far described are broadly divisible into two units A and B, the unit A comprising the coal system as it were, and the unit B the motor, blower and gearing system. As shown in Fig. 4, the upper part of the transfer chamber 9 is separable from the lower portion 60 (at the bearing 27), and the two are tied together by a holding plate 61 and bolts 62 (Fig. 4). As a result, the upper part of the chamber may constitute a separate unit, or sub-division of unit A. Primarily however the purpose of the division of the transfer chamber into two parts, and the use of an attachment between the two of the kind indicated, is to permit the grate screw 6 and its conduit 5 to be extended away from the furnace in whatever direction may be desirable, and then the transfer chamber, or rather its upper part, turned to whatever position may be necessary to enable the bin conveyor 7 to reach to the coal bin 8. A continuous ring 56 on the blower and, say, three brackets and clamps 57, provide for attachment of the unit B to unit A with the blower outlet in proper position.

As before mentioned, the ashes fall from the upper edge of the grate 1. They may be hauled out from the floor of the ashpit of the furnace by hand, or removed otherwise. The machine as so far described is adapted however to receive an additional unit C (Fig. 3) to remove the ashes. To get the ashes around the grate to the entrance to the ash remover, the outer wall 2 of the grate air chamber may be provided with a rotating ring 65, which may be carried on a ball bearing on the outer surface of the wall 2 as shown in Fig. 1, this rotating ring 65 being provided with one or more projecting arms 66 or the like to drag ashes around the grate as the ring 65 is rotated. The ash removing unit of Fig. 3 comprises essentially a conduit or trough 67 having an intake opening 68 adapted to be placed beneath, or at the path of the ash arms or ash paddles 66 (Fig. 2), a conveyor 69 in the circuit, and an outlet or outlets to discharge the ash to an ash receptacle or receptacles. The ash conduit 67 and its conveyor can be inclined upwardly to reach above the ash receptacles as illustrated in Fig. 1, and the conveyor 69 is preferably a screw conveyor. Various driving arrangements can be employed, and various modes of attachment of the ash system to the remainder of the stoker. Preferably the ash unit C is attached to one side of the grate unit by means of bolts in plates 72 on the unit C and 73 on the grate member; and also is attached to the stoker externally of the furnace say by cooperating plates 74 and 75 (Figs. 2 and 3) pierced for bolts. Preferably too the ash mechanism is driven by the gearing already described, as for example by a gear 76 on shaft 47 driving a gear 77 on a stub shaft 78 which by two gears drives an external shaft 79 coupled by a chain 80 to the outer end of the ash conveyor 69. To drive the ash ring 65 with its paddle 66, the ash ring 65 may be provided with internal teeth (see Fig. 1) meshing with a gear 81 carried by a stub shaft geared to the lower end of the ash conveyor 69 as indicated at 82 (Fig. 3).

Inasmuch as the stoker described is adapted to take its fuel directly from the house coal bin (whereat a relatively large amount of coal is available) it is desirable that the ashes be delivered or deliverable to a number of ash receptacles, for example to four ash cans 71, 87, 88 and 89. Four branch conduits 70, 84, 85 and 86 leading from the main ash conduit 67 may be used to direct the ashes to these cans respectively.

It will be understood that my invention is not limited to the details of construction and operation described above and illustrated in the accompanying drawings, except as appears hereafter in the claims.

I claim:

1. In a stoker having a grate, means providing a substantially vertical fuel passage including a base element and an upper element that is adjustable on the base element around a substantially vertical line of said passage, a motor supported by said base element, a gear rotatable around said means, means connecting the motor to said gear to drive the latter, a fuel conduit leading from said base element to said grate, a conveyor in said conduit, a gear connecting said conveyor to the first-mentioned gear whereby said conveyor is driven, a second fuel conduit one end of which is connected to and delivers into said upper element, a conveyor in said second conduit, and a gear connecting the last-mentioned conveyor to the first-mentioned gear through which the first-mentioned gear drives the last-mentioned conveyor, whereby said second conduit and its conveyor with their delivery ends placed at a higher level than the first-mentioned conduit may be adjusted to various positions around said substantially vertical fuel passage and the conveyor of the second conduit driven in all such positions.

2. The subject matter of claim 1 characterized by the fact that said motor is supported by said base element in a position above said upper element and in a fixed position with respect to said base element.

3. In a domestic stoker having a grate, and a fuel conduit leading to said grate, means at the end of said conduit remote from the grate providing a substantially vertical passage leading into said conduit, said means including a member adjustable around substantially the vertical center line of said passage, a second fuel conduit at least a portion of which is bent, and means to attach one end of said second fuel conduit to said member at an angle to the vertical and with the second conduit adjusted to any one of a plurality of different angular positions around the axis of the passage through said second conduit, at said means, to enable the opposite end of the second conduit to be placed at any one of a plurality of different levels.

4. A stoker having a grate and conduit means providing a passage for fuel to the grate, characterized by the fact that said conduit means includes a bent portion, means to support the end of said bent portion nearer the grate and hold said end at a large angle to the vertical, and said bent portion is adjustable around the axis of the passage through it, at said means, to enable the opposite end of the bent portion to be placed at any one of a plurality of different levels.

5. In a domestic stoker having a grate, and a fuel conduit leading to said grate, means at the end of said conduit which is remote from the grate to provide a passage leading into said conduit, a second fuel conduit having at least two sections, one section to take fuel from the

source of fuel and deliver to the other section and said other section being connected to said passage-providing means and having its end which is adjacent the first mentioned section displaceable sidewise from said first mentioned section, a conveyor in the first mentioned section of the second fuel conduit, and releasable means to connect the two sections in operating relation.

6. In a domestic stoker, the combination of a grate, a fuel conduit leading to said grate, means at the end of said conduit remote from the grate providing a substantially vertical passage leading into said conduit, a second fuel conduit leading to said passage-providing means, and a blower to supply combustion air to said grate, said passage-providing means being provided with an opening and said blower being located at said means and with its inlet port adjacent said opening so as to take gas therefrom.

7. In a domestic stoker, the combination of a grate, a fuel conduit leading to said grate, means at the end of said conduit remote from the grate providing a substantially vertical passage leading into said conduit and the upper end of said means being open, a second fuel conduit leading to said passage-providing means, and a rotary blower, the shaft of which is substantially vertical, resting on the upper end of said means and with the blower intake port adjacent said opening in said means.

8. The subject matter of claim 7, conveyors being provided in said conduits, characterized by the fact that the wall of the blower opposite said intake port thereof includes a plate member having a diameter at least equal to the diameter of the rotary member of the blower, a motor to drive said rotary member is mounted on said plate and driving means connect said motor and conveyors.

9. In a stoker having a grate, a conveyor to feed fuel to the grate, an electric motor, means connecting said motor to said conveyor to drive the latter, said means including a speed-reducing gearing having high speed and low speed elements and tending to move as a unit as it is driven and drives said conveyor, and a switch to open the supply circuit of the motor, characterized by the fact that said speed-reducing gearing is movably mounted, means are provided to hold said gearing against movement as it is driven and drives said conveyor but said means being yielding on the occurrence of overload, and said switch being so related to said speed-reducing gearing as to be opened as the speed-reducing gearing moves on the occurrence of overload.

10. In a stoker having a grate, and a conveyor to feed fuel to the grate, means to drive said conveyor including a belt-connected electric motor and a speed-reducing gearing, one of which is movable toward the other on the operating pull of the belt thereon, and means resisting such movement, said means yielding under overloads to permit such movement.

11. In a stoker having a grate, a conveyor to feed fuel to the grate, a blower to supply combustion air to the grate, a motor connected to said blower to drive the same, a speed-reducing gearing connected to the conveyor to drive the conveyor, and a belt connecting the motor to the speed-reducing gearing through which the speed-reducing gearing is driven, characterized by the fact that said speed-reducing gearing is movable toward the motor on the operating pull of said belt thereon, and means are provided to resist such movement but which is yielding under overloads to permit such movement, whereby the driving effects of both the motor and the blower on the conveyor are relieved on the occurrence of overloads.

12. In a domestic stoker having a grate, a fuel conduit leading to said grate and a conveyor in said conduit, means at the end of said conduit remote from the grate providing a passage leading substantially vertically downwardly and also leading into said conduit, said means including a member adjustable around substantially the vertical center line of said passage, a second fuel conduit one end of which is connected to and delivers into said member, said second conduit being provided with means providing for the placement of its opposite end at any one of a plurality of heights including placement at a point lower down than said end of said second conduit which is connected to said member, a driving gear rotatable around said means, a fuel conveyor in said second conduit, gears connected to said conveyors and meshing with said driving gear to drive the conveyors, and means to drive one of said gears.

13. In a domestic stoker having a grate, a blower to supply combustion air to said grate, a fuel conduit leading to said grate and a conveyor in said conduit, means at the end of said conduit remote from the grate providing a passage leading substantially vertically downwardly and also leading into said conduit, said means including a member adjustable around substantially the vertical center line of said passage, a second fuel conduit one end of which is connected to and delivers into said member, means connecting the interior of the fuel system to the intake of said blower, a driving gear rotatable around said means, a fuel conveyor in said second conduit, gears connected to said conveyors and meshing with said driving gear to drive the conveyors, and means to drive one of said gears.

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