Oct. 28, 1941. P. WRIGHT 2,260,926

MEASURING MATERIALS FEEDER

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FIG. 1

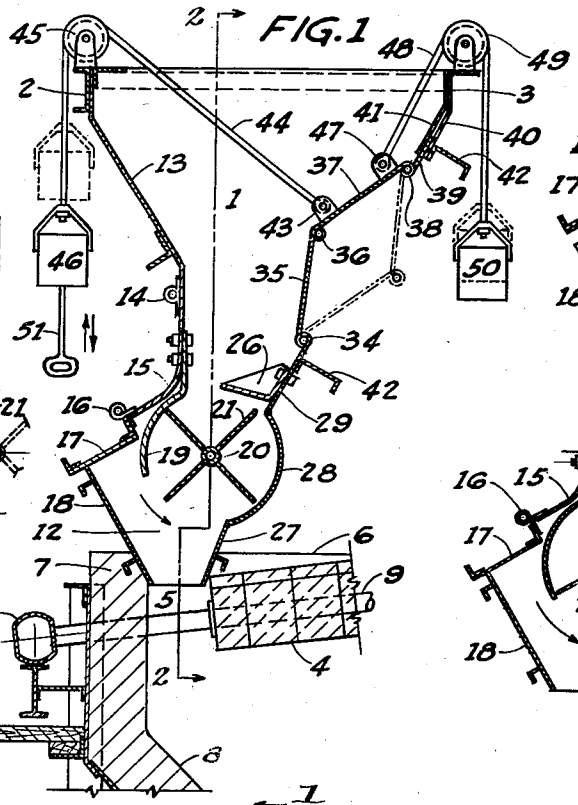


FIG. 3

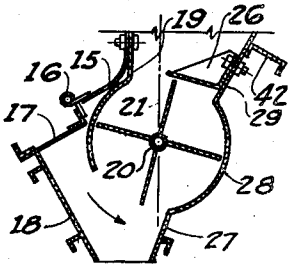


FIG. 5

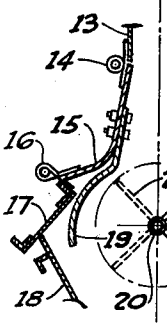


FIG. 4

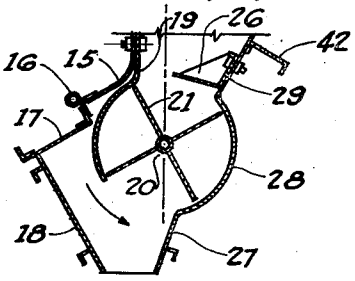
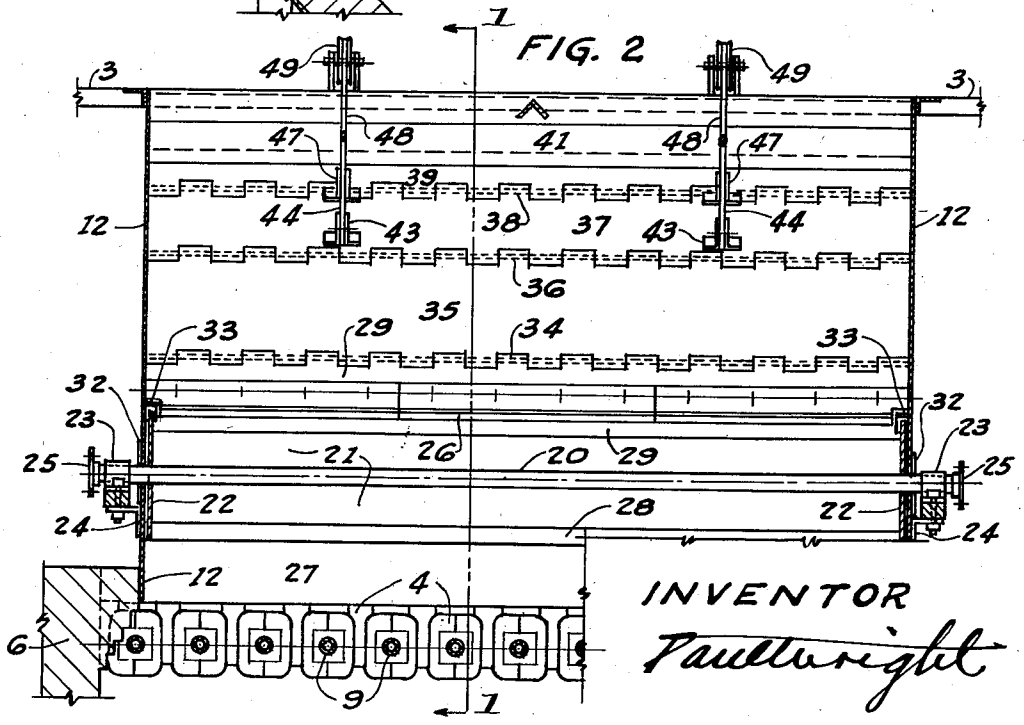


FIG. 2



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FIG. 6

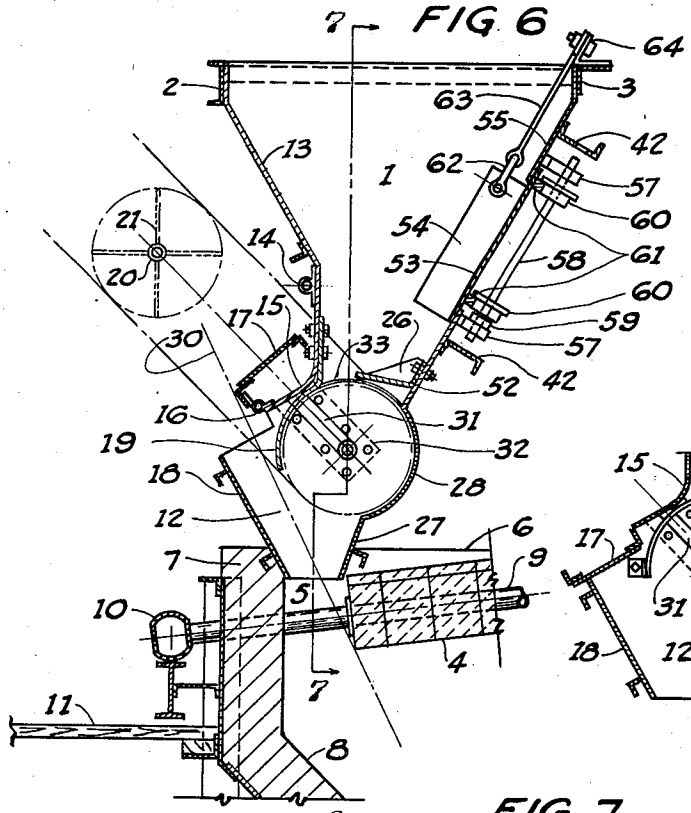


FIG. 8

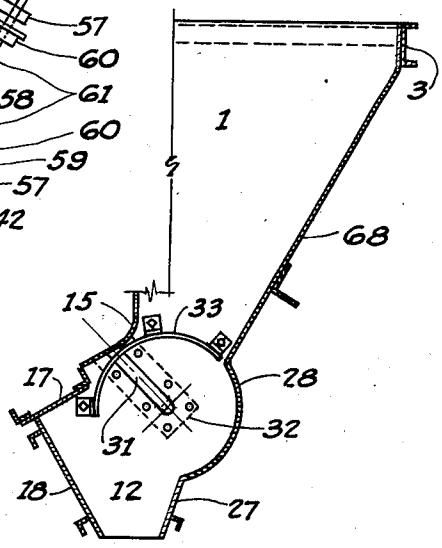
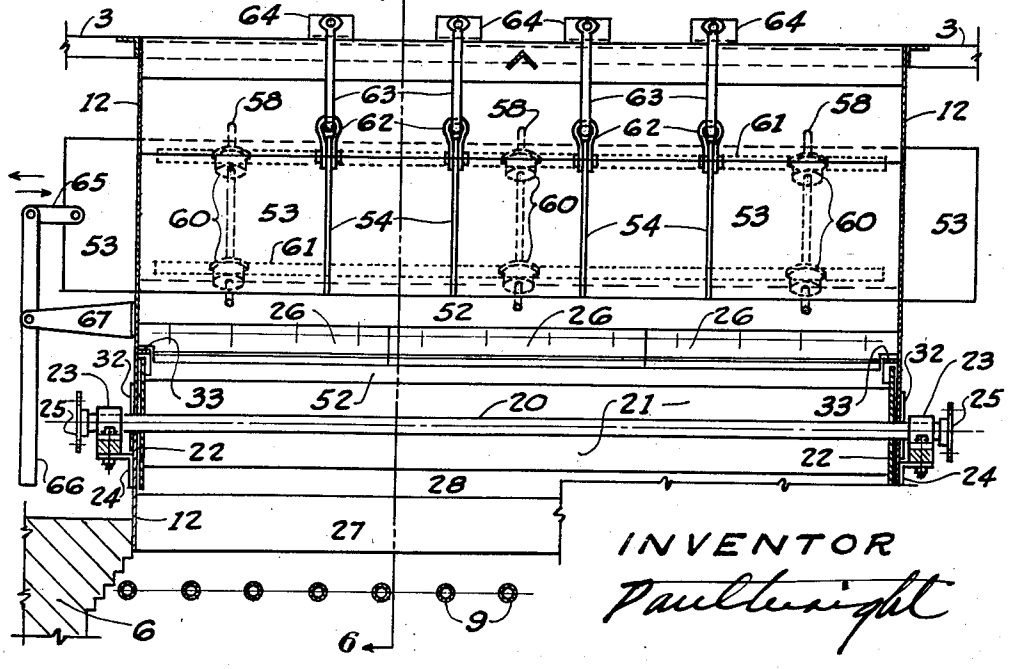


FIG. 7



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2,260,926

MEASURING MATERIALS FEEDER

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6 Claims. (Cl. 214—35)

This invention relates to measuring devices for bulk materials and particularly rotary feeders controlling fuel passage to furnaces.

A general object of my invention is the provision of a materials feeder of the character described, which is further characterized by its reliability to regulate the rate of passage of the materials.

A further object is the provision of a feeder that can actuate the movement of the materials in its receiving section so as to relieve a stoppage of flow to the feeder rotor.

A further object is the provision of a feeder arranged with a protecting shelf that guides the fuel at its entrance to the feeder rotor.

A still further object is the provision of a feeder that is capable of handling variable sizes of materials without clogging the rotating section, as characterized by a releasing side to accommodate disgorging materials to passage beyond the rotor without damage.

A further specific object is the provision of a feeder arranged with an air seal to prevent a passage of air or gas inward or outward, also with or without materials being fed and with the fuel rotor turning or stopped.

Another object is a feeder arranged to discharge a regulated quantity of materials uniformly for its entire width and having a hinged access feeder side, which in raised position affords vision of the fed materials and easy access for poking possible lodgments beneath.

A further object is the provision of a feeder of the character described and equipped with a closed discharge section enabling the material to be dropped a distance to suit placement, like fuel in a furnace.

A still further object is the provision of a feeder of the character described whose construction facilitates the removal and replacement or change of the rotor, to suit a change of materials fed.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described preferred embodiments of my invention.

Of the drawings:

Fig. 1 is a sectional elevation taken on the line 1—1 of Fig. 2 which is a transverse sectional elevation taken on line 2—2 of Fig. 1 and these illustrate one embodiment of my invention. Fig. 3 is a partial section corresponding to Fig. 1 and particularly showing one position of the feeder rotor. In like manner Fig. 4 shows the rotor in a position advanced of that in Fig. 3. Fig. 5 is a partial section corresponding to Fig. 1 and shows the releasing side, as pushed outward in its swinging position, away from the rotor. Fig. 6 is a sectional elevation taken on the line 6—6 of Fig. 7 which is a transverse sectional elevation taken on line 7—7 of Fig. 6, and these embody my invention with a modified form of receiving section. Fig. 8 is a partial section corresponding to Fig. 6 and showing an end guard shelf, over the ends of rotor.

In the rotary feeder embodying my invention, as illustrated in Figs. 1 to 8 of the drawings, the receiving section comprises a hopper 1 supported by transverse members 2 and 3 in relation to a furnace roof 4, which has a fuel entrance 5 across the front between side walls 6 and adjacent to an upper front wall 7. The upper front wall 7 extends downward to join an inclined portion 8 on which fuel is dropped from the feeder. As an explanation of the convenient ways of arranging the feeder in the present embodiment I show for example, the feeder serving a boiler furnace, having spaced roof tubes 9 joined to a forward header 10 and beneath is positioned an operator's platform 11. However, the feeder is readily adapted to other furnace constructions such as dutch ovens, and without regard to the type of grates or firing arrangements of said furnaces; further it may be used to feed materials for other uses, than in furnaces.

The hopper 1 is bounded by two ends 12 which may be disposed vertically as shown by Figs. 2 and 7 and closed on the upper forward part by a fixed side 13 that extends from the top at member 2 downward to a hinged type joint 14 as indicated in Figs. 1, 5 and 6. Suspended from the hinged joint 14, the intermediate forward side comprises two panels also hinge connected, there being an upper panel 15 shaped to join a hinge at 16 and a lower cover panel 17 joined by hinge 16, all in the manner illustrated by Figs. 1, 5 and 6. The hinged construction illustrated provides that the intermediate side, made up of panels 15 and 17 hinged at 14 and 16, suspends itself from 14 in a manner to close panel 17 against the lowermost front fixed side 18 of the hopper. In like manner, panels 15 and 17 come in contact with ends 12.

An air seal inner closure 19 is provided and

this has a shape in cross-section as shown by Fig. 1. This air seal 18 is fastened to panel 15 in removable manner and it may swing out or in from the suspension hinge 14. Its operation will be explained later.

Furnaces have heretofore been equipped with rotary fuel feeders but difficulties have been experienced in maintaining the rotor parts in practical working order, on account of clogging action of the materials. This invention furnishes improvements that overcome such difficulties as are specified herein.

Referring to Fig. 1, adjoining the furnace roof 4, the hopper's lowermost rear side 27 inclines rearwardly upward to the curved shaped side portion 28 that suits the rotor as shown. The curvature of side 28 extends in this embodiment, almost to a plane at 45° to the vertical that would pass through the rotor shaft. Thence the side 29 continues in a rearwardly inclined position as shown; however, this side 29 may be positioned vertically or approximately so.

One embodiment of my invention comprises a protecting shelf for the rotor and this shelf guides the fuel to properly enter the rotor as will be explained. Referring to Figs. 1, 2, 3 and 4, the rotor comprises for example, a tubular steel shaft 20, to which are welded steel blades 21, there being four such blades used in this present illustration, although I do not limit the number of blades or their shape. The ends of blades 21 are welded to circular ends 22, through which the shaft 20 projects beyond to be supported in shaft bearings 23. Bearings 23 can themselves be supported from the hopper ends 12 by attached brackets 24. Shaft couplings 25 at each end of the rotor shaft, can utilize a connection at one end for a mechanical drive and when this is released, the opposite shaft end can be manually turned at convenience.

Furthermore, the lateral position of the rotor with relation to the hopper is shown in my illustrative drawings Figs. 1, 3 and 4, as particularly accommodating the employment of a longitudinal shelf 26. The shelf 26 may comprise a steel plate section shaped as shown, that extends transversely of the hopper and is removably fastened to hopper side 29. The shelf as here illustrated, is so located that its forward edge projects almost to a vertical plane passing through rotor shaft 20. Furthermore, the intermediate upright part 15 of the hopper's front side, is spaced so as to provide a suitable throat or width of entrance between the forward edge of shelf 26 and itself, as shown.

The operations attendant to moving the fuel immediately entering and leaving the rotor, will be better understood by first observing certain difficulties and obstructions of operation without the shelf 26 installed. In the present illustration of Fig. 1, the rotor blades are in symmetrical position about a vertical plane and when rotating anti-clockwise as shown, fuel fills the space between the two upper blades. As the rotor turns, the right upper blade tends to lift the fuel somewhat and forcibly thrusts fuel against closure 19. At the same time, some fuel begins to drop in between the side 28—29 and the adjacent upper blade, thence falls on the uprising blade beneath. Assuming hogged or macerated wood fuel is being fed, the coarse parts naturally wedge between the blades and curved hopper side. Assuming the rotor has advanced from the position in Fig. 1 to that shown in Fig. 3, it is seen that the blade almost vertical, tends to shear the mass of fuel to effect a cut-off, in passing to contact the side 18 as shown by the upper blade in Fig. 4. As shown in Fig. 3, the right hand blade is in a position causing a thrust upward of the fuel within the rotor, against the mass of fuel in the hopper above.

These difficulties of obstruction without the shelf 26, are more aggravated with heavier materials, particularly such as will pack, as when wet.

A comparison of similar operations with my novel shelf arrangement provided, shows,—in Fig. 1, the entering fuel passes into the space between the two upper blades but the forward edge of shelf 26, prevents an entire filling of the compartment until the upper right blade has advanced to its position shown in Fig. 3, where its upper edge is just beneath the edge of shelf 26. The entire mass of fuel above, as shown in Fig. 1, does not press on the upper rotor blades, as the shelf upholds much of the mass; however, the weight of fuel on the left upper blade is greater than some on the blade passing beneath the shelf. Then in the blade's position as shown in Fig. 3, it is seen that the deposited fuel in the upper left quadrant, tends to rotate the left blade due to the fuel's weigh on same. Progressing to the position shown by Fig. 4, the two left blades carry a measurement of fuel, whereas the opposite two blades on the right are without fuel between them and the curved side 28, by reason of the functioning of shelf 26.

The shape of the shelf is made to suit the path of the periphery of the blade edges, as well as provide a partial coverage over the rotor as may be determined in practice to suit the various materials to be fed. Making the shelf removable permits variations in its size to accommodate varying fuels fed.

Referring to Fig. 8, the shelf protector feature is provided over the ends of the rotor by placing curved shapes 33 as shown in Figs. 2, 7 and 8 and these prevent lodgment of materials between disc parts 22 and ends 12.

Further referring to Fig. 8, I do not limit the angular location of the intersection (or joining at the bend) of side portion 28 with side 68 to that shown. Where the feeder is used with materials, enabling a narrow throat between sides 15 and 68 to be used, this intersection between sides 28 and 68, may be located more nearly toward the vertical plane passing through rotor shaft 20, or in a location approximating the corresponding edge of shelf 26.

An embodiment of my invention, to provide a rotary feeder that is capable of handling variable sizes of materials without clogging the rotating section, is characterized by the provision of a releasing side of the hopper, in combination with a curved closure as illustrated in Figs. 1 to 6. Operation of the rotary feeder in combination with hopper 1 and shelf 26 but omitting closure 19, shows by the position of blades in Fig. 3 that fuel would pass into the chamber bounded by the two upper left blades and front side parts 15, 16 and 17 of the hopper; that this quantity of fuel might be more than the quantity contained between the two blades were the curved closure 19 in place to limit the quantity to that of a sector shape in cross-section. Thus without closure 19, the thrust of the rotor blades against the fuel could be released by the swinging out of the hopper side as illustrated in Fig. 5. It is observed that the hinged cover 17 rests slidably on the upper side 18 of the hopper effecting a closure

during the movement of the releasing side. Also as shown by Fig. 6, the cover 17 can be raised upward and over to lean against side 15 so as to provide access to the inside as shown.

A further improvement characterized by the use of closure 19 will be understood from Figs. 1, 3 and 4 concerning its use to assist in measuring the quantity of fuel uniformly as the rotor blades revolve. Observing the position of the two left blades in Fig. 4 and assuming fuel is held between them and closure 19, the fuel contained does not begin to spill or pass below, until these blades assume a position like Fig. 1 shows. Furthermore, assuming the hopper contained an easy flowing fuel similar to granular material, and that the rotor blades stood still in a vertical and horizontal position; then without the provision of closure 19, it would be possible in my present illustration, for the fuel in hopper 1 to flow uninterrupted to furnace entrance 5 below.

In the event larger than customary fuel pieces are present in the hopper, these will usually get placed in a manner to cause jamming between the blades 21 and closure 19; but the improved releasing side construction will permit same to pass. Occasionally such larger pieces will repose on the spaced tubes 9 at entrance 5 but they can be pushed beyond by access afforded between side 18 and closure 19, as shown by Fig. 6 where cover 17 is in raised position.

An assurance of improved regularity of feeder operation is gained by my provision for easy inspection and good vision of the fuel as it passes to the furnace, whereby the operator can partially observe combustion conditions. In Fig. 6, an operator standing on platform 11 can look through the opening between hopper side and limiting plane 30 to judge performance of the feeder.

From previous specifications and descriptions recited in this application, it will be readily understood by those skilled in the art, that the embodiments of the present invention illustrated by the drawings provide an effective air seal between the hopper and furnace roof. The feeder and hopper is also sealed to prevent the passage of furnace gases upward into the hopper, which arrangement constitutes an improvement preventing the fuel from catching fire from the furnace. A further advantage of the closed feeder resides in the advantage of being able to drop the fuel a determined distance to suit its desired placement in the furnace, with regulation of the rate of delivery in the manner described.

To provide for the removal, replacement or change of the rotor, it will be understood in Fig. 6, that clearance is afforded through the hopper's front sides, between hinge 14 and front part 18, to withdraw the rotor. The direction of withdrawal is provided by slots 31 made in end plates 12 and covered by removable plates 32, and the removed rotor is indicated by dot and dash lines, located forward of the hopper. Also curved guard strips 33 over the ends of rotor as shown in Fig. 8, may be readily removed and put back.

Hoppers with provision for feeding the received materials out of the bottom, frequently experience stoppage in passage of the materials, due to bridging-over, hanging-up or failure of the materials to pass uniformly downward. This is especially true of a hopper constructed with a narrow throat as may be suited to a rotary feeder having much greater length than width. As a means for providing a fuel feeder that can actuate the received materials, to cause an effectual passage to the feeder below, my present invention provides a movable side for a feed hopper, as will be understood by reference to Figs. 1 and 2, showing one form of movable side.

This construction of the movable side comprises a plate 35 joined to a fixed hinge 34 at its bottom edge and having at its upper edge a movable hinged connection 36 which joins another plate 37 having an upper hinged connection 38 to a slidable plate 39.

From the upper rear top edge of the hopper supported by member 3, there incline downward two plates 40 and 41 suitably spaced apart to permit plate 39 to move between them. Structural member 42 may be utilized to hold plate 40 in rigid manner. I further provide two sets of weights and connections for holding the hinged side in approximate equilibrium when the hopper contains fuel. Reference to Figs. 1 and 2 show pin connected fastenings 43 on plate 37 and pulled by weight 46 over sheave 45 by cable 44. In similar manner, fastening 47 attaches to the upper part of plate 37, to pull same by cable over sheave 49 from weight 50 as shown. Connected to weights 46 are stiff operating members 51 which provide for moving weights 46 up or down.

By moving sides 35 and 37 downward, to a dotted position shown in Fig. 1, a bridging over of the material above can be relieved and the materials actuated to pass downward. Thereafter the sides 35 and 37 can be returned to the position first shown by solid lines.

In the modification of my invention of a movable side, Figs. 6 and 7 illustrate another form, in which 52 is the lower inclined fixed side of hopper 1 as continued from curved part 28, and corresponding to 29 in Fig. 1. The movable plate 53 laps over plate 52 at the lower side so that materials will not get into the joint and similarly fixed plate 55 extends downward from supporting member 3 to lap over movable plate 53. The removable plate 53 has a transverse movement, operating on rollers and being suspended as shown by Figs. 6 and 7, in which bearings 57 fastened to fixed plates 52 and 55, hold a shaft 58 on which a thrust collar 59 is provided to prevent the shaft from slipping through the bearings 57. Mounted on the shaft 58 are two flanged rollers that engage and support tracks 61 which are secured to movable side 53 in a manner to have plate 53 clear the lapped plates 52 below and 55 above. Furthermore, to movably hold side 53 so that it may be moved sidewise, it is suspended by clevis and pin connections 62 through upstanding ribs 54 which are made of bars welded to plate 53 in the spacings shown by Fig. 7. Holding links 63 are connected by pins to a fastening 64 as shown. The movable plate 53 projects through a slotted opening in end plates 12, to accommodate full closure of the hopper side when side 53 is moved, as by a lever 66 pivoted at a bracket 67 and joining a link 65, pin connected to the side 53 for movement as shown by the arrows appearing near link 65. The movement of the side 53 having ribs 54 that engage the materials reposing on same, furnishes a motion transversely that accommodates downward passage or flow of the materials without obstruction. The extent and rapidity of movement of the movable side can be suited to the class of material to be fed. The movement tends further to spread any accumulation of heavier parts that temporarily lodge on shelf 26. This construction is free of engaging joints or connections that lodge accumulations of materials fed.

The combination of the movable side and related shelf over the rotor, provide for temporarily storing a reduced quantity of fuel above the shelf, and means for releasing said stored fuel, as in case the hopper is otherwise about empty.

In Fig. 8 there is illustrated a rear sloping side 68 of hopper 1 not equipped with movable side features and this side may be positioned inclined or vertically, as may suit the materials handled.

What is claimed is:

1. A device for measuring bulk materials,—comprising a receiving hopper with means for actuating the movement of materials therein, to an integral rotor having a plurality of compartments that are partially bounded by a curved side of said hopper which has a preceding shelf effecting guidance of the materials to said rotor; means for operating said rotor which is further partially bound by a curved section effecting an inner closure of a rotating compartment during its filling until discharge; a releasing hopper side to which said closure section is fastened, the releasing side being hinged so as to disgorge jammed material; the releasing side arranged to afford access to said rotor for removal and effecting means for visualizing and poking materials.

2. A device for measuring bulk materials,—comprising a hopper arranged with an integral rotor having a plurality of compartments; means for turning said rotor which is partially bounded by a curved side of said hopper arranged with a preceding shelf effecting guidance of the materials to said rotor which is further partially bounded by a curved inner section effecting a closure of a rotating compartment during its filling until discharge; a releasing hopper side to which said closure section is fastened, the releasing side being arranged so as to disgorge jammed material and without substantially admitting outside air passing through the hopper and rotor.

3. In combination with a furnace, a fuel measuring device comprising a hopper arranged with an integral rotor having a plurality of compartments and means for turning said rotor; the rotor being partially bounded by a curved side of said hopper which has a preceding shelf effecting guidance of the materials to said rotor which is further partially bounded by a curved inner section effecting a closure of a rotating compartment during its filling until discharge; a releasing hopper side to which said closure section is fastened, the releasing side being arranged so as to disgorge jammed material and without substantially admitting outside air passing through the hopper and rotor to the furnace, when said device is joined to the furnace.

4. A device for measuring bulk materials, comprising a hopper arranged with an integral rotor having a plurality of compartments and means for turning said rotor which is partially bounded on its delivering side, by a curved inner section effecting a closure of a rotating compartment during its filling until discharge; a releasing hopper side to which said closure section is fastened, the releasing side being arranged so as to disgorge jammed material.

5. A furnace fuel feeder having an integral rotor made with a plurality of compartments; means for turning said rotor which is partially bounded on its delivering side by an inner section shaped to effect a closure of a compartment during its filling until discharge; a releasing feeder side to which said closure section is fastened, the releasing side being arranged so as to disgorge jammed material and without substantially admitting outside air passing through the feeder, effecting means for fuel being dropped a suitable distance for placement within the furnace and without admitting excess air at the fuel entrance.

6. A furnace fuel feeder having an integral rotor made with a plurality of compartments; means for turning said rotor which is partially bounded on its delivering side by an inner section shaped to effect a closure of a compartment during its filling until discharge; a releasing feeder side to which said closure section is fastened, the releasing side being arranged so as to disgorge jammed material and without substantially admitting outside air passing through the feeder, effecting means for fuel to be charged into the furnace.

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