Sept. 16, 1941. B. F. BOWER 2,255,841

COAL SPREADER UNIT

Filed Nov. 21, 1938 2 Sheets-Sheet 1

Fig. 1.

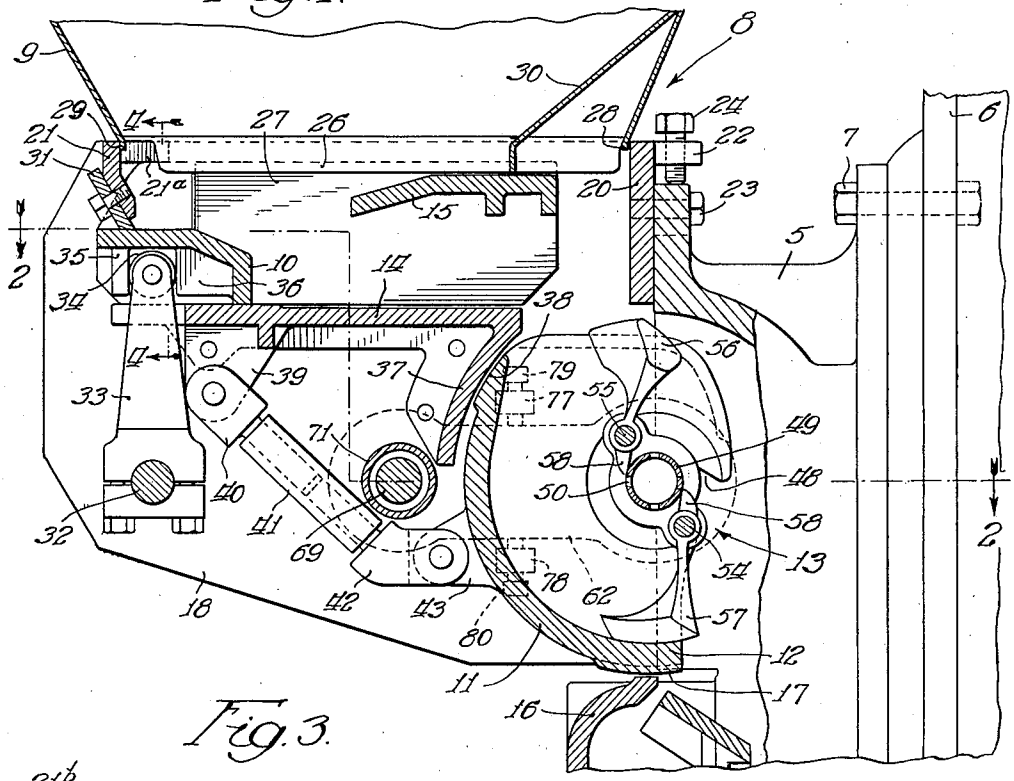


Fig. 3.

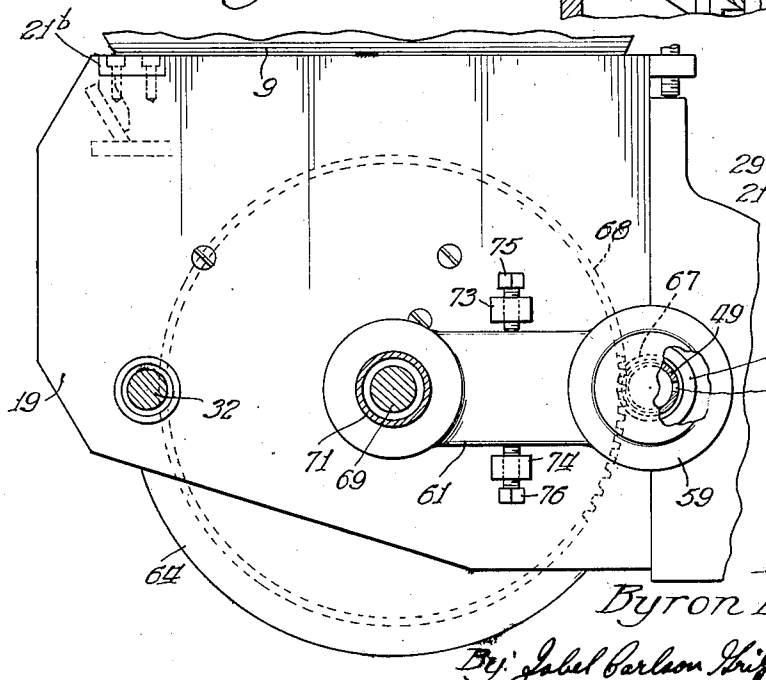
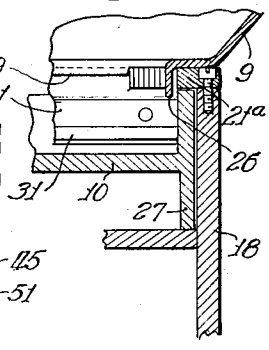


Fig. 4.



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COAL SPREADER UNIT

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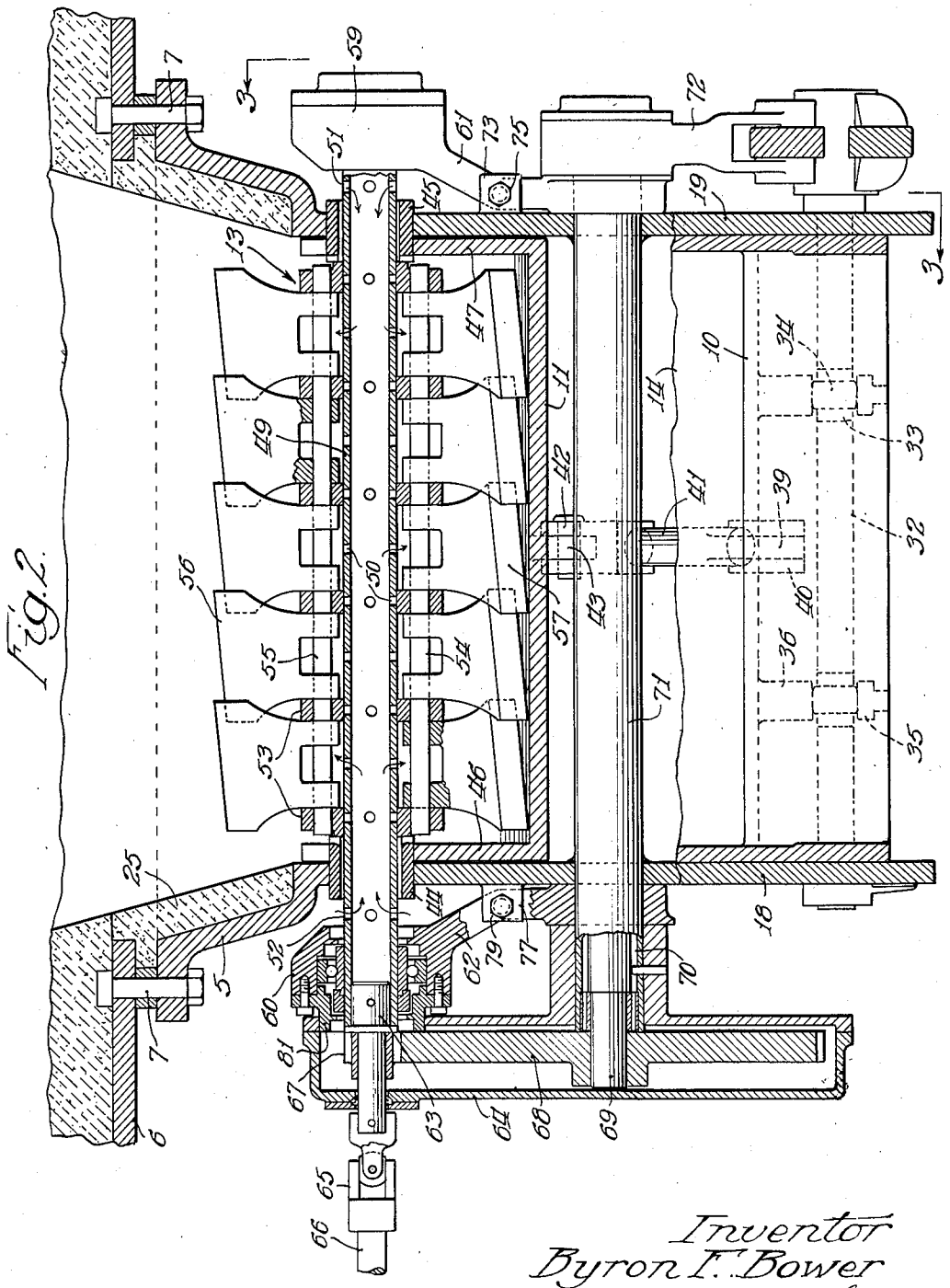


Fig. 2.

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Patented Sept. 16, 1941

2,255,841

UNITED STATES PATENT OFFICE

2,255,841

COAL SPREADER UNIT

Byron F. Bower, St. Charles, Ill., assignor to The Howell Company, St. Charles, Ill., a corporation of Illinois

Application November 21, 1938, Serial No. 241,483

3 Claims. (Cl. 110—115)

The present invention relates to fuel feeding devices for feeding coal and similar fuels into the fire box of a furnace. It is the principal purpose of this invention to provide an improved structure for distributing the coal within the furnace by means of a rotating spreader to which fuel is fed from a hopper by a reciprocating pusher block.

In devices of this character, the coal from the hopper is fed to a deflector housing where it is engaged by a series of paddles on a rotor shaft and thrown into the fire box. The housing which receives the coal from the pusher element in the bottom of the hopper usually has what is termed a deflector plate portion at the bottom thereof. In order to sweep this deflector plate clean, it is essential that the paddles of the rotor fit closely to the deflector plate. On the other hand, the paddles must not bind against the deflector plate, as this would wear them continuously and throw an excessive load on the operating unit which drives the rotor. It is the fundamental purpose of this invention to provide a novel construction for the rotor and deflector plate whereby the proper clearance may be readily maintained between the paddles of the rotor and the deflector plate surface.

It is also a purpose of the present invention to provide a structure of this character wherein sifting of the coal around the pusher block which feeds coal to the rotor is substantially eliminated.

In certain forms of mechanical spreader fuel feeding devices, such as that shown in the present application, considerable difficulty is encountered in the protection of the rotor and its shaft from the intense heat of the furnace. Various water cooled devices are employed with resultant complications because of the necessity for water connections to the rotor parts. The present invention contemplates a novel cooling system whereby the rotor with its paddles is subjected to a continuous stream of cooling air and thus protected from overheating.

Other and more detailed advantages of the invention will appear more fully as the description proceeds, reference being had to the accompanying drawings wherein a preferred form of the invention is shown. It is to be understood, however, that the drawings and description are illustrative only and are not to be taken as limiting the invention except insofar as it is limited by the claims.

In the drawings,

Fig. 1 is a vertical sectional view taken through a fuel feeding mechanism embodying my invention;

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

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2, and

Fig. 4 is a fragmentary sectional view taken on the line 4—4 of Fig. 1.

Referring now in detail to the drawings, the present invention is embodied in a fuel feeding device of the so-called mechanical spreader stoker type wherein a rotating paddle wheel is used to throw the fuel into the furnace and spread it over the fire box grate area. In the present invention, as illustrated, there is a door casting 5 bolted to a metal front facing 6 of the furnace by means of a series of bolts 7. This door casting 5 forms the support for a fuel feeding unit 8. The fuel feeding unit comprises a hopper 9, a reciprocating pusher 10, and a deflector housing 11 having a deflector plate portion 12 from which the fuel is swept into the furnace by a rotor 13. A base plate 14 is provided beneath the pusher 10, which also has an agitator bar 15 for breaking up the coal in the hopper as the pusher block 10 is reciprocated.

The deflector plate portion 12 is directly above and over fire door 16, a portion of which is shown in Fig. 1. Arrangement is made whereby air can be directed against the lower surface 17 of the deflector plate portion 12. This is done to keep the deflector plate cooled and to prevent rapid deterioration thereof. The entire fuel feeding mechanism is supported on the door casting 5 by means of two side frames 18 and 19 which are connected by cross frame members 20 and 21. The cross frame member 20 has ears 22 thereon and is bolted directly to the casting 5 by means of a plurality of bolts 23. Adjusting screws 24 are utilized to control the position of the fuel feeding mechanism with respect to the fuel entrance provided in the door casting 5. The side frames are welded to the member 20.

The door casting 5 is provided with an interior lining 25 of a refractory material. This lining is precast in the door casting and is adapted to protect the casting and the fuel feeding mechanism supported thereby from the heat within the fire box.

The side frames 18 and 19 extend up outside of the lower edges of the hopper 9. As shown best in Figs. 1 and 4, the hopper has side lip portions 26 which extend down over corresponding side walls 27 of the pusher block frame. The hopper portion has its front and back edges 28

and 29 extending down inside the cross frame members 20 and 21. Thus it is evident that sifting of coal dust around the bottom of the hopper portion is prevented. The hopper 9 has a shelf portion 30 which keeps the coal from falling between the agitator plate 15 and the frame member 20. The cross frame member 21 has an adjustable scraper 31 which rides on the pusher block 10 so as to keep dust from sifting out on top of the pusher block.

The pusher block 10 and the agitator plate 15 are cast integral with the side walls 27. The mounting of the cross frame member 21 is by flanges 21a and 21b which extend over the side walls 27. The pusher block is operated by a rock shaft 32 and an arm 33 which carries a roller 34 at its upper end. The roller 34 fits between two depending lugs 35 and 36 on the under side of the pusher block 10. The base plate 14 is riveted to the side frames 18 and 19. This base plate has on its under surface a curved depending lip 37 which co-operates with a portion 38 of the deflector housing 11 to prevent coal sifting below the base plate 14. The base plate 14 also has a depending lug 39 to which one end 40 of a turn buckle 41 is pivoted. The other end 42 of the turn buckle is pivoted to a lug 43 on the deflector housing 11. This turn buckle is used to adjust the deflector housing 11 about its pivotal axis for changing the angle of discharge of fuel into the fire box upwardly or downwardly from the horizontal.

The housing 11 is supported upon two bushings 44 and 45. The bushing 44 is mounted in an opening 42, one-half of which is formed in the casting 5 and the other half of which is formed in the side frame 18. The bushing 45 is mounted in a similar opening provided jointly by the casting 5 and the side frame 19. The casting 11 has end walls 46 and 47 which are slotted as shown at 48 to permit the entry of a rotor shaft 49. The slot 48, of course, communicates with an opening that is large enough to receive the bushings 44 and 45. It is to be understood, of course, that there is a slot 48 in each of the end walls 46 and 47.

The rotor 13 is composed of the shaft 49 which is hollow, being preferably constructed of a material capable of withstanding a high heat without rapid deterioration such, for example, as a chromium steel alloy. This hollow shaft 49 has a multiplicity of openings 50 between the end walls 46 and 47 of the deflector housing 11. It also has openings 51 and 52 outside the side frames 18 and 19 so as to permit air to enter through the shaft 49. The shaft 49 is also spaced from the bushings 45 and 44 so that air may enter between the bushings and the shaft.

On the shaft 49 there are mounted a series of collars 53 which collars are bored to receive two shafts 54 and 55. The collars 53 also space the coal throwing paddles 56 and 57. As shown, the paddles 56 and 57 are arranged in two opposite groups, one group being adapted to throw the fuel angularly into the furnace to the right, and the other group being adapted to direct the fuel angularly to the left into the furnace. Each of the paddles is free to turn rearwardly from the direction of rotation indicated in Fig. 1 so as to ride over any obstruction that is encountered. Short lugs 58 are provided on the paddles to limit their movement in the reverse direction.

The shaft 49 is not carried by the bushings 44 and 45. Ample space is provided between the space 49 and the bushings to permit vertical adjustment of the shaft 49 so as to govern the engagement of the paddles 55 and 56 with the deflector plate 12. Clean sweeping of the deflector plate requires that the paddles 55 and 56 be adjusted rather closely, and the present invention provides a novel construction whereby this adjustment may be absolutely controlled so that the paddles neither bind nor ride too loosely on the deflector plate 12. As the paddles become worn and the plate becomes worn, the mounting is such that the wear may be readily compensated for without disturbing the driving connections for the shaft 49.

The shaft 49 is mounted in two bearings 59 and 60. These bearings are formed in the ends of two supporting arms 61 and 62 respectively. The hollow shaft 49 is connected rigidly to a stub shaft 63 that projects through a gear housing 64 and is coupled by a universal joint 65 to a suitable drive shaft 66. The drive shaft 66 may be driven from any suitable source, such as a small motor. The stub shaft 63 has a pinion 67 thereon which meshes with a gear 68. The gear 68 is keyed to a shaft 69 which is journalled in a bearing 70. The bearing 70 is mounted in a sleeve 71 that is carried by the two side frames 18 and 19. At the end opposite the gear 68 the shaft 69 has an eccentric connection to a link 72, which, in turn, is connected to the rock shaft 32 for actuating the pusher block 10. The particular connection between the link 72 and the shaft 32 forms the subject matter of my copending application, Serial No. 240,721 filed November 16, 1938, for Fuel feed control mechanism. The details of this structure are not important to the present invention.

The arms 61 and 62 are journalled upon the sleeve 71. The arm 61 is held by an upper lug 73 and a lower lug 74 provided on the side frame 19. Adjusting screws 75 and 76 determine the position of the arm 61. Similarly, the arm 62 is held between an upper lug 77 and a lower lug 78 by suitable screws 79 and 80. It will be evident that, by turning the arms 61 and 62 on the sleeve 71, the shaft can be raised or lowered within the limits provided by the bushings 44 and 45. The adjusting screws 75, 76, 79 and 80 enable one to position the rotor shaft 49 with a fine degree of accuracy. This shifting of the shaft 49 does not disturb the meshing of the pinion 67 and the gear 68 because the adjustment is made about the axis of the gear 68 as a center. The housing 64 of course turns with the arm 62 as it is connected to this arm.

The bearings 59 and 60, only one of which is shown in section, include suitable ball bearings for the shaft 49. It will be noted that the bearings are beyond the openings 51 and 52 so that whatever heat reaches the bearings is that conducted through the material of the shaft, and most of the heat is carried away by the flow of air through the shaft 49. The bearing 60 includes a mounting head 81 upon which the housing 64 is fitted.

I have found that for operating purposes a good material for the shaft 49 and the paddles 56 and 57 and their associated collars and shafts is an alloy of the nature of stainless steel. This material wears well and is capable of standing considerable heat without losing its strength. I have provided only two sets of paddles, as I have found this to be more effective from the fuel feeding standpoint than the usual four paddles provided in this type of construction. The reason for this is that the paddles are moving at a relatively

high rate of speed and do not move any substantial amount of coal upon each rotation. They will, therefore, be less apt to break up the coal particles if they are spaced 180° than they would if they were spaced 90°. In addition, the coal being fed into the deflector housing has a better opportunity of spreading before it engages the paddles. The fewer number of paddles lightens the load on the shaft 49.

The rotation of the paddles within the deflector housing 11 tends to throw air centrifugally outward and to thus create a vacuum to draw air into the deflector housing through the shaft 49. This vacuum also draws air into the housing between the shaft 49 and the bushings 44 and 45. I have found that this air cooling is effective to maintain the shaft and its paddles at a sufficiently low operating temperature to prevent serious deterioration thereof.

From the foregoing description it is believed that the features and advantages of my invention will be readily apparent to those skilled in this art. Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a mechanical spreader type of fuel feeding device for furnaces, a hopper, a frame supporting said hopper, a deflector plate in said frame below and laterally offset from said hopper, a shaft carried by said frame and extending across the frame over the deflector plate, bearings for said shaft on the exterior of said frame, a pusher block beneath said hopper, a second shaft journalled on said frame, means operatively connecting said second shaft to the pusher block, a gear and pinion connecting said shafts, spreader paddles on said first named shaft, and means for adjusting said paddles with respect to the deflector plate, said means comprising arms pivotally supported by said frame for movement about the axis of said second shaft, said bearings being carried by said arms, and means on the frame for holding the arms in a position to which they are adjusted.

2. In a mechanical spreader type of fuel feeding device for furnaces, a hopper, a frame supporting said hopper, a deflector plate in said frame below and laterally offset from said hopper, a shaft carried by said frame and extending across the frame over the deflector plate, bearings for said shaft on the exterior of said frame, a pusher block beneath said hopper, a second shaft journalled on said frame, means operatively connecting said second shaft to the pusher block, a gear and pinion connecting said shafts, spreader paddles on said first named shaft, and means for adjusting said paddles with respect to the deflector plate, said means comprising arms pivotally supported by said frame for movement about the axis of said second shaft, said bearings being carried by said arms, means on the frame for holding the arms in a position to which they are adjusted, and a housing for said gear and pinion, said housing being carried by one of said arms.

3. In a mechanical spreader type of fuel feeding device for furnaces, a frame having spaced side portions, a deflector plate in said frame, a shaft extending across the frame and through the side portions, spreader means on said shaft adapted to advance fuel from the deflector plate into the furnace, said side portions having openings therein larger than said shaft to permit adjustment of the shaft and spreader means toward and away from the deflector plate, bearings for said shaft, said bearings being spaced outwardly from said side portions, a fuel feeding device in said frame for feeding fuel to said spreader means, a second shaft journalled in said frame and operatively connected to said fuel feeding means, a gear and pinion connecting said shafts, supporting arms for said bearings, said arms being pivotally supported by said side portions about the axis of said second shaft, and means on said side portions for holding the arms in a position to which they are adjusted.

BYRON F. BOWER.