July 5, 1938. T. H. BANFIELD 2,122,708

UNDERFEED STOKER AND ASH REMOVER

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FIG. 1.

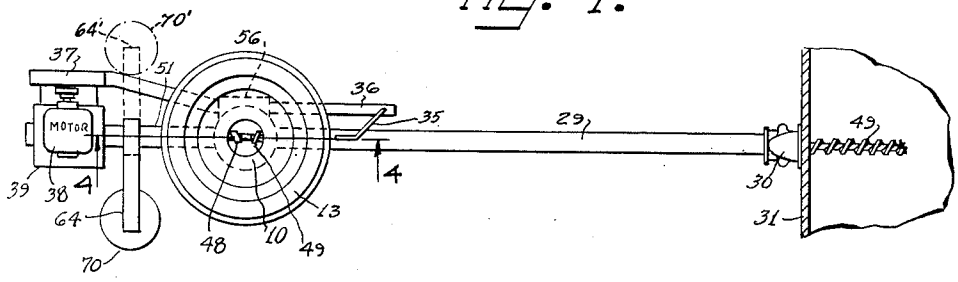


FIG. 2.

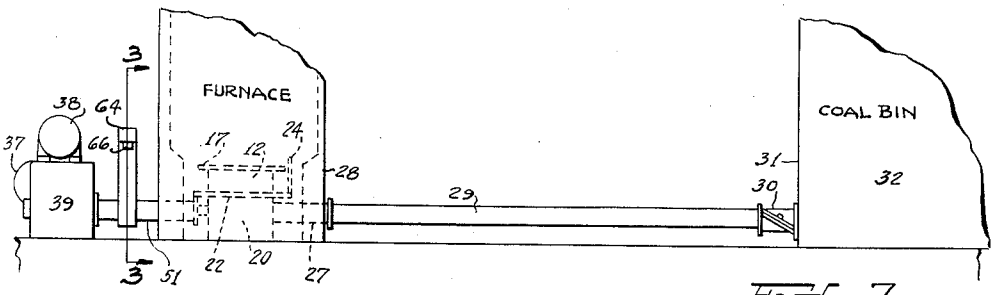


FIG. 7.

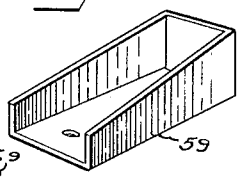
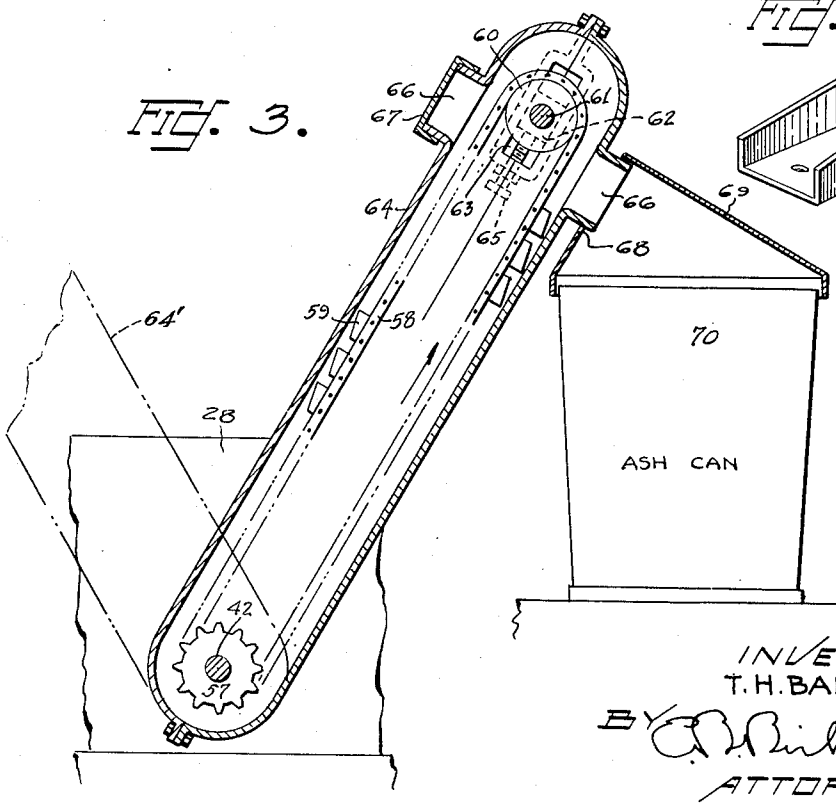


FIG. 3.



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UNDERFEED STOKER AND ASH REMOVER

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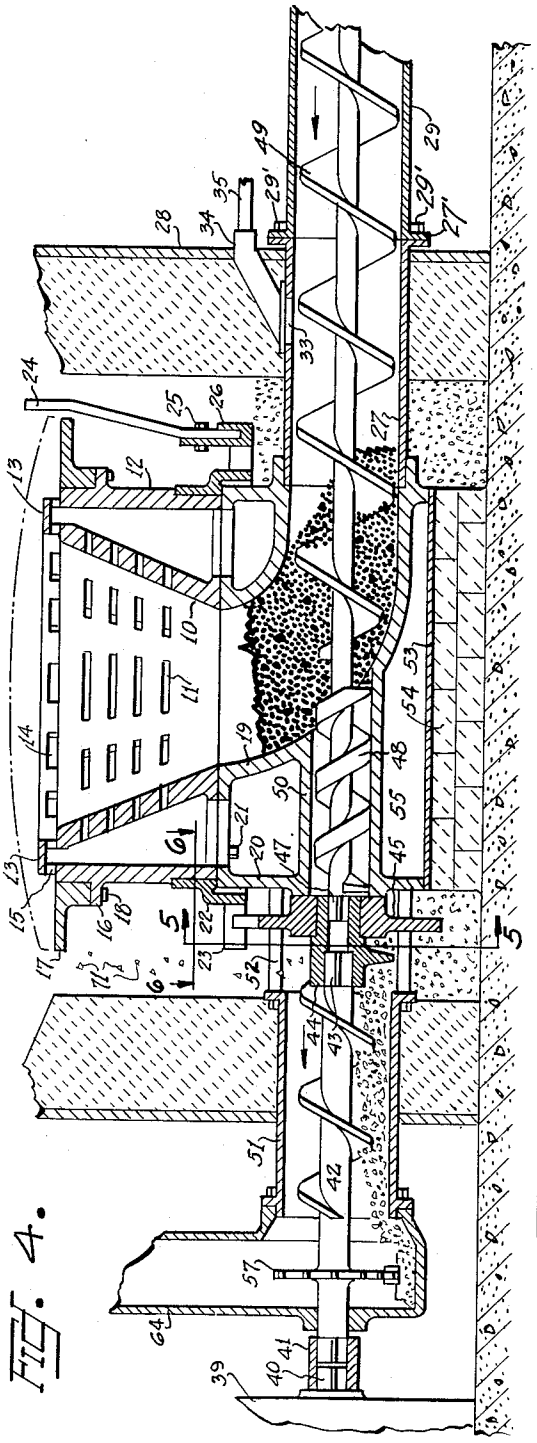


FIG. 4.

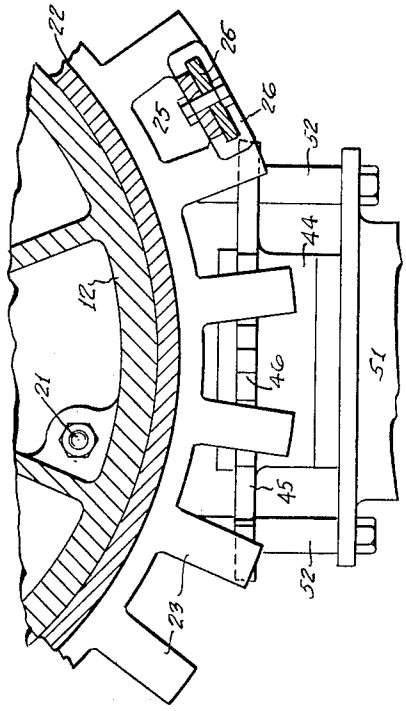


FIG. 6.

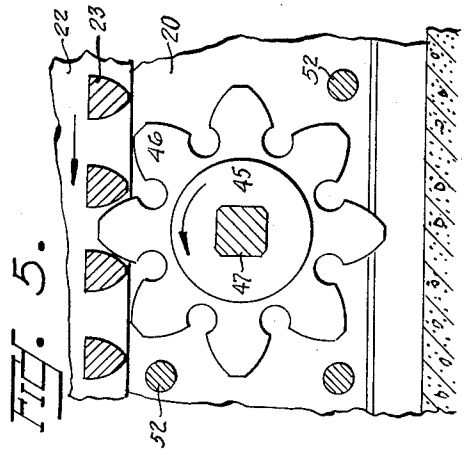


FIG. 5.

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UNDERFEED STOKER AND ASH REMOVER

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Application March 30, 1936, Serial No. 71,704

16 Claims. (Cl. 110—45)

This invention relates generally to underfeed stokers and particularly to a stoker having a rear end drive and ash remover.

The main object of this invention is to provide an exceedingly simple and efficient form of stoker in which the coal is drawn from a bin by means of a drive mechanism and delivered to a retort disposed between the drive mechanism and bin.

A second object is to provide a stoker of the class described employing a screw for conveying the coal to the retort and employing a continuation of said screw for the removal of ashes formed in the retort.

A third object is to provide a stoker of the class described in which the parts thereof are easy to manufacture and assemble and are accessible for replacement and in which the wearing parts are protected against the abrasive action of the fuel and in which the power required to drive the mechanism is reduced to a minimum.

A fourth object is to provide a stoker of the class described having a pivoted ash elevating mechanism which can discharge to the right or to the left of the vertical plane passing through the longitudinal pivotal axis of the ash worm.

These, and other objects, will become more apparent from the specification following as illustrated in the accompanying drawings, in which:

Fig. 1 is a plan of the stoker showing a fragmentary section of the coal bin.

Fig. 2 is a side elevation of the structure shown in Fig. 1.

Fig. 3 is a section taken along the line 3—3 in Fig. 2.

Fig. 4 is a longitudinal section through the retort including a portion of the coal feeding worm as well as the ash removing worm and the intermediate reverse flight worm.

Fig. 5 is a vertical section taken along the line 5—5 in Fig. 4.

Fig. 6 is a fragmentary section taken along the line 6—6 in Fig. 4.

Fig. 7 is a perspective view of an ash conveyor bucket.

Similar numbers of reference refer to similar parts throughout the several views.

Referring in detail to the drawings, there is shown a perforated tuyère section 10 having air outlets 11 and having a cylindrical outer wall 12 which is joined to the perforated portion of the tuyère section 10 by means of a cap 13 having inwardly discharging air openings 14 and outwardly discharging air openings 15. The wall 12 is provided with a flange 16 upon which is secured a rim 17 by means of the bolts 18. The perforated portion of the tuyère section 10 rests upon the retort 19 while the cylindrical portion 12 rests upon the cylindrical base 20 which surrounds the retort 19. The members 12 and 20 are secured together by means of the bolts 21. The lower portion of the wall 12 is reduced in diameter to form a journal for the toothed ring 22 whose radially arranged teeth 23 project outwardly around the base 20. A clinker slicing bar 24 is secured by means of a bolt 25 to a bracket 26 which projects upwardly from a pair of the teeth 23. The under side of the ring 22 rides upon the upper edge of the base 20.

Communicating with the retort 19 is the coal conveying sleeve 27 which projects through the wall 28 of the furnace. Connected to the sleeve 27 is a coal tube 29 which extends to the cleanout box 30 on the side 31 of the coal bin 32. The connection between the sleeve 27 and the tube 29 is preferably of the flange and bolt type as shown at 27', 29' to permit rotative adjustment of the tube 29 about its longitudinal axis where found desirable. The details of the cleanout box 31 will not be given here as they form no part of the present invention; this construction is fully disclosed in the Webb Patent Number 1,967,693, dated July 24, 1934 and in the Carter Patent No. 1,974,133, dated September 18, 1934.

The sleeve 27 is provided with an opening 33 which communicates with an air injector nozzle 34 whose pipe 35 receives air from the air duct 36 to which air is supplied by means of the fan 37. The fan 37 is driven by a motor 38 mounted on the gear case 39 whose power takeoff shaft 40 is joined by a coupling 41 to an ash worm 42 whose square end 43 engages the coupling 44 on which is secured the drive pinion 45 whose teeth 46 mesh with the teeth 23 of the ring 22.

Extending into the coupling 44 is a square end 47 of the shaft of the reverse worm 48 which is formed on the end of the coal worm 49. The coal worm 49 extends through the sleeve 27 and the coal tube 29 into the bin 32 while the reverse flight worm 48 occupies the cylindrical connection 50 between the retort 19 and the base 20.

It will be noted that the worm 48 is reversed with relation to the flights of the worms 42 and 49 for the purpose of giving a slight agitation to the fire bed by causing an increased upward movement of coal within the retort 19 and for the further purpose of resisting the entrance of coal into the cylindrical connection 50 which forms an intermediate journal for the worms 42, 48, and 49. The ash worm 42 is surrounded by an ash duct 51, one end of which is united by means

of the spacer bolts 52 to the base 20. On the under side of the base 20 is placed a floor plate 53 which rests upon the brickwork 54.

The space 55 constitutes the plenum chamber and air is supplied thereto from the duct 36 through the connection 56.

On the worm 42 is disposed a sprocket wheel 57 around which passes an ash conveyor chain 58 provided with buckets 59. The chain 58 also passes around the idler sprocket wheel 60 which is mounted on the shaft 61 which in turn journals in the bearings 62 which are slidably mounted in the slots 63 in the ash conveyor housing 64. The chain 58 is adjusted by means of the screws 65 which engage the bearings 62. The housing 64 is provided with outlets 66 on opposite sides thereof, one of which is covered by the cap 67 while the other extends through the opening 68 in the ash can cover 69 which is disposed over the ash can 70. As shown at 64' in Figures 1 and 3 the elevator housing 64 may be swung about its lower axis to bring the discharge into an ash can 70' on the opposite side of the ash conveyor. Of course in this case the cap 67 is shifted from the outlet shown in Figure 3 to the opposite discharge spout or outlet 66.

The operation of the device is as follows: When the motor 38 is operated in response to any control which may be provided therefor, it causes the worms 42, 48, and 49 to rotate in unison, at the same time causing the fan 37 to deliver air to the plenum chamber 55. As the worms turn, the pinion 45 is also turned causing the ring 22 to rotate about the wall 12 and also causing the bar 24 to travel around the rim 17 above which it projects.

It will be seen that the worm 49 draws coal from the bin 32 and delivers it to the retort 19. The final portion of the delivery movement is upward, this movement being facilitated by the action of the reverse flight worm 48 which worm also prevents the coal from entering the connection 50. The coal now travels upwardly past the openings 11, 14, and 15 during which time its combustibles are burned and the incombustibles moved outwardly over the rim 17 by the oncoming fuel. The incombustibles which pass over the rim 17 are sliced away by means of the bar 24 and fall as relatively small particles 71 into the space between the wall 28 and the base 20 from whence they are carried around by means of the ring 22 to the ash worm 42 and carried thereby through the ash duct 51 to the conveyor housing 64 from whence they are elevated and discharged through either of the outlets 66 into the ash can 70 or 70'.

It can be seen from the foregoing that the construction herein described is extremely simple and efficient and direct in its operation. Attention is drawn to the application of Jacobus N. Van Rijswijk, Ser. No. 34,041 over which this device is an improvement.

I claim:

1. An underfeed stoker comprising a tuyère section and a retort section, an ash removing ring rotatably mounted below the top of the tuyère section, said sections being connected together and having an upwardly curved coal passageway therethru, a coal conduit leading to the entry end of the curved passageway, a screw conveyor within the conduit for conveying coal from a coal storage space through said conduit to said retort section, the shaft of said screw conveyor passing through and extending beyond the wall of the curved passageway, an ash conveyor tube having an ash receiving opening below said ash removing ring, an ash conveying screw in said tube coupled to said extended end of the coal screw conveyor shaft, and means at the coupled ends of said shaft and screw for engaging said ash ring in driving relation.

2. In combination, a retort, a coal conduit communicating therewith, an ash chamber to receive ashes from the retort, an ash conduit communicating with said ash chamber, a coal conveying screw in the coal conduit for feeding coal upwardly through the retort, and an ash conveying screw in said ash conduit for removing ashes from the ash chamber, said screws having their axes in a single right line and having their shafts coupled together so that one shaft drives the other shaft.

3. The device of claim 2 with a driving wheel mounted at the junction of the shafts, its hub forming the coupling between the two shafts.

4. The device of claim 2 with ash removing means including a ring rotatable about the retort, and a driving wheel coaxial with said coupled shafts and driven thereby for rotating the ring.

5. The device of claim 2 with an ash elevator wheel secured to the shaft of the ash conveying screw, and ash elevating mechanism driven by said wheel to convey away the ashes transferred from the ash chamber to the elevating mechanism by said ash conveying screw.

6. The device of claim 2 in which the shaft of the ash conveying screw is larger than the shaft of the coal conveying screw and the coupling means is joined to at least one of the shafts by a non-rotatable sliding connection, whereby the shafts may be coupled by sliding one shaft axially.

7. The device of claim 2 and a reversely directed flight on the shaft of the coal conveying screw, the outer curved edge of said flight rotating in a bearing in the retort wall so that said flight forms an intermediate journal for the two coupled shafts.

8. An underfeed stoker consisting of a fuel container, fuel feeding means including a screw for drawing fuel from said container, a retort fed by said means and beneath which said screw extends, an ash passageway thru which ashes from the retort may be discharged, and an ash conveying screw in said passageway coupled to the end of said fuel feeding screw distant from the fuel container and means for driving said screws from the outer end of the ash conveying screw.

9. In an underfeed stoker the combination of a retort having a tuyère section mounted thereon, a fuel container disposed on one side of said retort, fuel conveying means including a screw for moving fuel from said container to said retort, said fuel conveying screw having a shaft projecting through the wall of said retort, an ash conduit, an ash screw therein coupled in driving relation with the projecting end of the shaft of said fuel conveying screw, means for driving said ash screw and thereby driving said fuel conveying screw and means for moving ashes to the receiving end of said ash screw.

10. In combination, a retort, a coal conduit communicating therewith, an ash chamber to receive ashes from the retort, an ash conduit communicating with said ash chamber, an intermediate conduit coaxial with both the ash conduit and the coal conduit, a coal conveying screw in the coal conduit for feeding coal upwardly through the retort, an ash conveying screw in said ash conduit for removing ashes from the ash chamber, an intermediate screw in said interme-

diate conduit to oppose movement of coal into the ash conduit, said screws having their axes in a single right line and having their shafts coupled together so that the three screws turn as a unit, the flight of said intermediate screw forming an intermediate journal for said unit.

11. The device of claim 10 with an ash conveying housing pivotally secured to the ash conduit, an ash elevating mechanism in said housing and a driving means therefor rotatable with the unit.

12. In a coal burning stoker, a retort comprising two detachably connected sections mounted one upon the other and having a reduced diameter at the junction of the two sections to form a groove to serve as a guiding bearing for a ring, a rotatable ring in said groove, resting upon the lower section and being held against axial movement by the upper and lower walls of said groove, ash engaging means carried by the ring to facilitate the conveying away of the ashes and means to feed coal to said sections and to drive said ring.

13. A sectional conveyor unit for stokers comprising a coal conveying shaft having a coal conveying screw flight associated therewith, an ash conveying shaft having an ash conveying screw flight associated therewith, a motor driven power take-off shaft, a coupling operatively joining the power take-off shaft to the ash conveying shaft, and a coupling operatively joining the ash conveying and coal conveying shafts, all of said shafts, flights, and couplings turning as a unit with their axes in a single right line.

14. The device of claim 13 in which the conveyor unit carries two driving wheels with their axes in said right line, said ash conveying flight being located between the two driving wheels.

15. A coal stoker having in combination a coal tube, a coal compartment communicating with one end of said coal tube, a retort communicating with the opposite end of said coal tube, a coal feeding worm within said tube extending into said coal compartment and retort, said worm having at one end thereof a shaft extending through said retort and having one end projecting therefrom, an ash removing worm having its intake end drivably connected to the projecting end of said coal worm shaft, means for driving said ash removing worm from its discharge end and means for preventing the movement of coal from said retort along the projecting end of the coal worm shaft, said stoker being characterized by having the coal worm driven from its discharge end by the ash removing worm.

16. A coal stoker having in combination a retort, a coal storage compartment associated with said retort, a coal tube communicating between said compartment and retort, a coal feeding worm within said tube extending into said compartment and having a shaft at the discharge end thereof projecting from said retort, an ash removal duct extending into the ash pit of the furnace, an ash worm within said ash duct having a driving connection to the projecting shaft of said coal feeding worm and means for driving said ash worm from the discharge end thereof.

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