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STOKER

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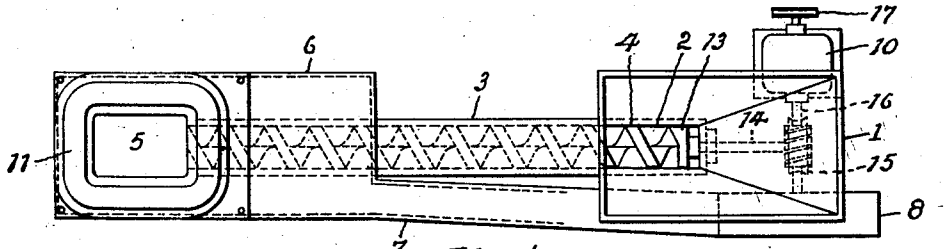


Fig. 1.

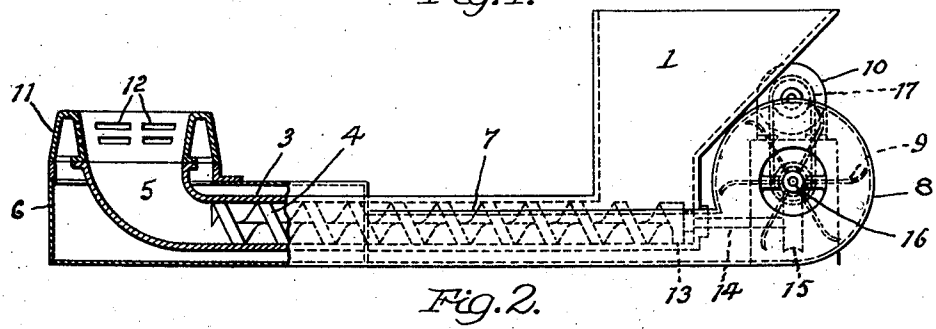


Fig. 2.

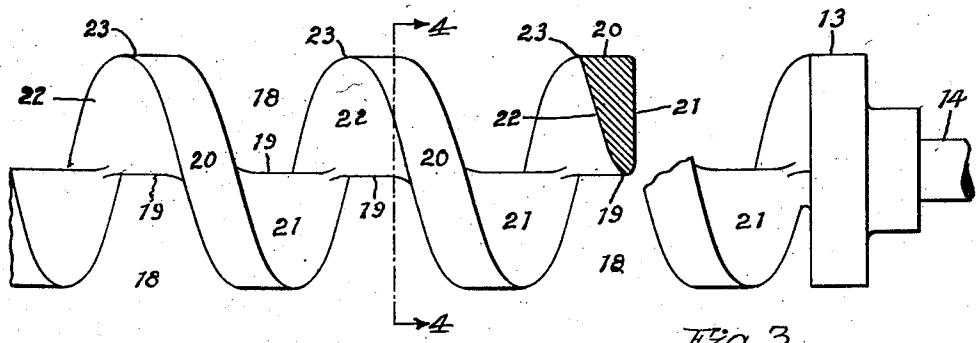


Fig. 3.

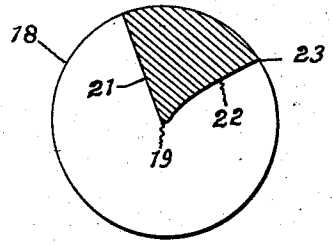


Fig. 4.

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# UNITED STATES PATENT OFFICE

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## STOKER

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3 Claims. (Cl. 198—213)

This invention relates to a stoker for feeding fuel from a hopper into a retort within the furnace and more particularly to small stokers adapted for use in connection with house furnaces.

An object of the present invention is to provide a screw for feeding coal from a hopper to the retort, which screw is so constructed as to permit the feeding of comparatively large lumps without danger of clogging, and also to provide a screw which is so shaped as to effect a mixing of the small and larged lumps of coal rather than a separating of these parts during the feeding operation.

It is also an object to so feed the coal from the hopper to the retort that the coal will be evenly distributed throughout the retort with the small and large lumps so mixed as to give a better burning of the coal due to the fact that air penetration of the fuel bed is enhanced, thus preventing caking of the coal within the retort.

It is an object to so construct the screw feed as to cause the coal to be lifted thereby away from the feed tube through which the screw extends and the coal forced toward the axis of the screw to be fed freely in a longitudinal direction, and it is also an object to provide a screw so constructed as to provide a greater space between the flights or turns of the screw, thereby permitting the feeding of lumps of greater size without unduly crushing these lumps, and thus permitting of the feeding of coal having a greater range in lump sizes.

It is also an object to provide certain other new and useful features in the construction, arrangement and combination of parts, all as hereinafter more fully described, reference being had to the accompanying drawing, in which—

Figure 1 is a plan view of a stoker illustrative of an embodiment of the present invention;

Fig. 2 is a side elevation with parts broken away and in section to more clearly show the construction;

Fig. 3 is an enlarged detail of a feed screw illustrative of an embodiment of the invention and showing parts broken away and in section to disclose the construction, and

Fig. 4 is a transverse section substantially upon the line 4—4 of Figure 3.

Small or house stokers are usually provided with a hopper or bin into which the coal is placed and a retort located within the furnace with a tube connecting the retort and hopper and containing a feed screw which is formed with a longitudinal axial shaft.

To give efficient operation of these small screw feed stokers, the coal is usually graded in size, some taking only fine coal and others being able to handle coal containing lumps of somewhat larger size, but in any case it is necessary to grade the coal to suit the particular stoker which is designed to feed that particular grade, and in any event the coal contains only comparatively small lumps as larger lumps cannot be fed by these small house stokers due to the limited capacity of the screw feed and the construction of the screw which will in its operation, crush the larger lumps or will become clogged by them and prevent efficient operation of the device. In those stokers which employ a feed screw having an axial shaft, the tendency of the operation of the screw in feeding the coal along the feed tube, is to separate the small from the large lumps, the small sizes falling to the bottom of the tube and being carried along the tube and forced into the retort at the forward end or entrance to the retort so that the coal is not evenly distributed as to sizes throughout the retort, the smaller lumps pushing up through the retort at its forward end while the larger lumps are forced toward the rear end. This uneven distribution chokes the flow of air through the coal in the retort and an uneven fire is the result, these stokers commonly being provided with a blower which forces air to the retort and through the coal contained therein. If the smaller sizes or particles of coal are massed at the entrance end of the retort, the air will not penetrate this rather compact mass of fine lumps or particles and there will be a coking of the coal which will prevent the most efficient burning of the coal.

As illustrative of an embodiment of the present invention, a stoker of conventional type is shown in the accompanying drawing, said stoker comprising a suitable hopper 1 into which the coal is placed and the bottom of this hopper communicates through an opening 2 therein with the forward end of a feed tube 3 within which a feed screw 4 is positioned, this screw being of slightly less external diameter than the internal diameter of the feed tube. This feed tube 3 is connected at its end opposite the hopper, to the retort 5 which is enclosed within a suitable wind-box 6 connected by an air duct 7 to the casing 8 of a blower 9, which casing and blower are located adjacent the hopper 1 and associated with which blower is an electric motor 10 for driving the blower. The top of the wind-box 6 is open around the retort 5 and upon the retort is placed an upwardly extending tuyère 11 having slots or openings 12 in

its inner wall so that air passing from the blower through the feed duct 7 and into the wind chamber 6 will pass upwardly into the tuyère and out through the openings 12 into the coal bed within the retort and tuyère.

This is substantially a standard arrangement of stoker parts, the feed screw 4 usually being a screw having a longitudinal axial shaft, but the present construction includes a feed screw which is devoid of an axial shaft extending throughout its length, but as shown in Figure 3 is cast or otherwise formed without a shaft formed with screw flights or turns, but is formed with these flights or turns only, they being of sufficient strength to form a rigid screw, the end flight being formed with a suitable head 13 to which the drive shaft 14 is connected, this drive shaft having a worm wheel 15 on its forward end to engage a worm on the shaft 16 of the blower 9, which shaft is driven by the motor 10 by means of a chain 17 or other suitable power transmitting mechanism.

The present feed screw which is shown in detail in Fig. 3 is formed with any desired number of turns of the blade or wall 18 and this blade is of a width radially of the screw, to extend from substantially the longitudinal axial line of the screw to its exterior diameter which is substantially the interior diameter of the feed tube within which it is designed to operate. This blade is preferably of a substantially triangular shape in cross section with the apex of the triangle forming the inner edge of the blade, terminating substantially at the longitudinal axial line of the screw. This inner edge 19 of the blade is sharp or thin as compared with the outer side 20 of the blade which is of extended width and forms the peripheral surface of the screw to run in close proximity to the wall of the feed tube 3, and the rear side or wall 21 of the blade lies in a substantially radial plane of the screw, that is, the surface of this side of the blade extends at substantially right angles to the longitudinal axis of the screw. The opposite or forward side 22 of the blade is inclined outwardly and forwardly, meeting the peripheral surface of the blade in a substantially sharp angle 23.

The blade 18 which constitutes the screw, is therefore self-supporting, that is, it is without an axial shaft or any part serving that purpose, but the blade itself, being thick and wide at its periphery, has sufficient strength to withstand the feeding strains of forcing the coal along the feed tube, the wide periphery of the blade lying close to the wall of the tube, and as the screw is turned the coal which drops in between the first flights of the screw from the hopper, will be fed along the tube and by reason of the forwardly inclined side 22 of the blade, there will be a lifting effect of the blade upon the coal, tending to force the coal toward the axis of the screw and thus not only lifting the finer particles from the bottom of the tube but also causing them to mix with the larger particles or lumps, thus maintaining the even distribution of large and small lumps so that when the coal enters the retort there will be no tendency for the smaller lumps to pack together at the entrance side of the retort and the coal will be evenly distributed throughout the length of the retort. Friction of the coal against the surface of the feed tube is reduced by the form of the screw blade which tends to lift the coal away from the bottom of the feed tube and cause it to move toward the axis of the screw, along which axis the comparatively acute angle or inner edge portion of the blade is located, thus leaving the screw without an axial shaft or any semblance of such a shaft so that a much greater space is provided between the flights of the blade at the axis of the screw, and, therefore, more room is provided within the area of the screw between the flights to receive coal and coal containing lumps of much greater size may, therefore, be fed by this present screw, as these larger lumps will be held by the form of the blade, adjacent the longitudinal axis of the screw and fed along without being crushed and without danger of blocking the screw so that it will not turn.

What we claim is:

1. A feed screw comprising a single helical blade of a depth transversely of the screw substantially equal to one-half the diameter of the screw and having a forward face inclined forwardly in the direction of movement of the fuel and arranged to feed toward the axis of the screw.

2. A feed screw comprising a single blade with an outer edge face of extended width in the direction of the length of the screw and a forward side face inclined inwardly and rearwardly, said outer edge face meeting said forward side face at an acute angle, arranged so that rotation of the screw brings said forward face of said blade into contact with the fuel and operates to move the fuel toward the longitudinal axis of the screw and feed the fuel without crushing the lumps in the fuel and with a mixing action.

3. A feed screw comprising a helical blade extending in cross section of said blade from the periphery to substantially the longitudinal axis of the screw, said blade having forward and rear side faces meeting in an angle at substantially the longitudinal axis of the screw, and an outer peripheral face of extended width longitudinally of the screw, said forward side face being inclined inwardly and rearwardly from said peripheral face, said forward and peripheral faces meeting in a sharp angle, arranged so that upon rotation of said screw said sharp forward angle of said blade cuts beneath the fuel being fed by the screw and said inclined forward side of said blade tends to move the fuel toward the axis of the screw.

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