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B. R. ROBINSON

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STOKER

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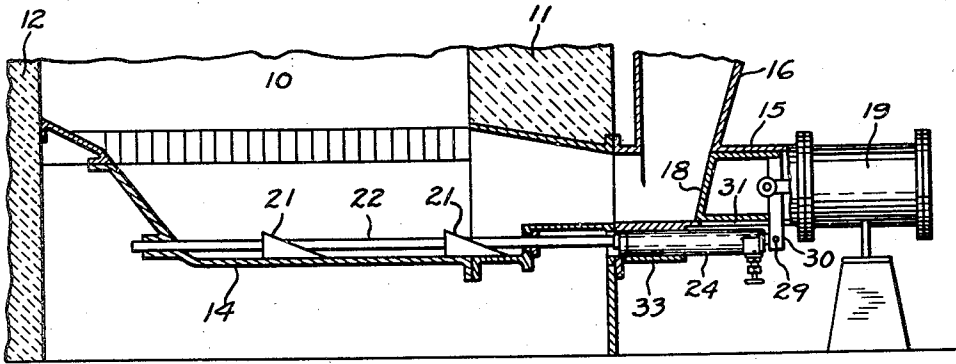


Fig. 1

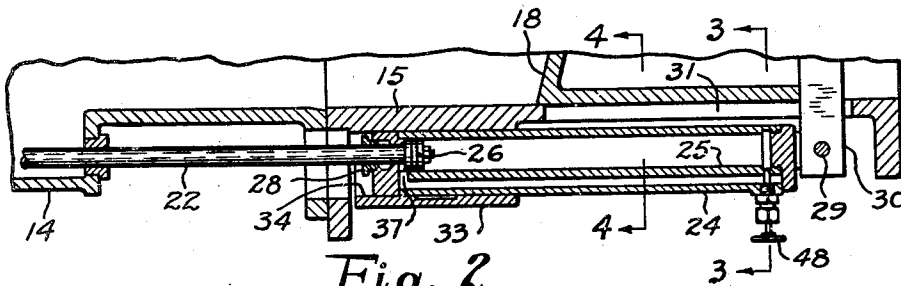


Fig. 2

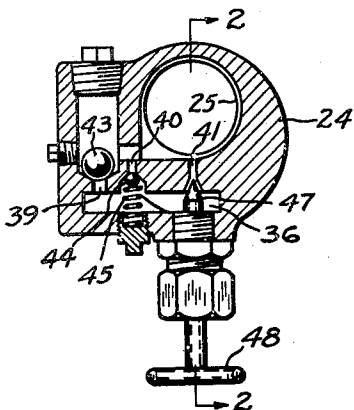


Fig. 3

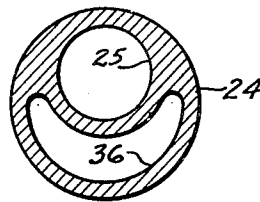


Fig. 4

Inventor

BENJAMIN R. ROBINSON

By *Albert G. Blodgett*

Attorney

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STOKER

Benjamin R. Robinson, Worcester, Mass., assignor
to Riley Stoker Corporation, Worcester, Mass.,
a corporation of Massachusetts

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This invention relates to stokers, and more particularly to stokers of the underfeed type having a retort to which fuel is delivered by a reciprocating main ram, the fuel being moved along the retort by a secondary ram or "pusher block."

It is the common practice in such stokers to reciprocate the pusher block through the medium of a mechanical lost-motion connection with the main ram, this connection being adjustable to vary the stroke of the pusher block. This provides a positive unyielding drive for the pusher block, and if the latter encounters an obstruction there is danger of breaking some part of the mechanism. The adjustment of the amount of lost motion is usually inconvenient, and in most instances it can be made only in steps, so that a fine adjustment is impossible. Furthermore, with prior constructions the main ram moves for a considerable distance along its fuel-feeding stroke before the pusher block moves at all, and as a result the fuel becomes tightly packed and the resistance to ram movement is great.

It is accordingly one object of the invention to provide an improved mechanism for driving the pusher block of an underfeed stoker, whereby the parts will be protected from damage in the event an obstruction is encountered.

It is a further object of the invention to provide a driving mechanism which can be easily and conveniently adjusted to control the stroke of the pusher block, and particularly to so arrange the various parts that fine adjustments in the length of stroke may be readily made.

It is a further object of the invention to provide an underfeed stoker so constructed as to avoid excessively tight packing of the fuel by the fuel-feeding ram.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawing illustrating one embodiment of the invention, and in which like reference numerals indicate like parts,

Fig. 1 is a longitudinal sectional view of an underfeed stoker;

Fig. 2 is an enlarged view of a portion of Fig. 1, shown in section on the line 2—2 of Fig. 3;

Fig. 3 is a section on the line 3—3 of Fig. 2; and

Fig. 4 is a section on the line 4—4 of Fig. 2.

The embodiment illustrated comprises a combustion chamber or furnace 10 having a front wall 11 and a bridge wall 12. Within the furnace there is mounted an underfeed stoker retort 14

of usual construction which is connected at its front end with a ram casing 15 having a fuel hopper 16 above the same. A ram 18 is reciprocated within the ram casing by means of a suitable motor 19, the ram serving to feed fuel from the hopper 16 rearwardly into the retort 14 in known manner. Within the lower portion of the retort there are provided two pusher blocks 21 of the usual wedge shape, these blocks being secured to a longitudinally extending reciprocable rod 22. This rod is reciprocated so that the blocks 21 will move the fuel rearwardly in the retort and ensure a fuel bed of the desired shape.

The present invention is chiefly concerned with the means for actuating the pusher blocks, and it provides an improved adjustable lost motion connection between the ram-actuating motor 19 and the pusher blocks. This apparatus comprises a hydraulic power transmission mechanism having two relatively movable parts, one part being driven by the motor 19 and the other part being connected to the rod 22 to drive the same. Relative movement of these parts causes a flow of liquid, which is restricted in such a manner that pressure will be produced in the liquid, and the pusher blocks will be moved in a desired manner.

The preferred construction illustrated comprises a body 24 mounted beneath the ram casing and having a cylindrical bore 25 therein for the reception of a slidable piston 26. This piston is secured to the front end of the rod 22, which extends through a suitable stuffing-box 28 at the rear end of the body 24. The front end of the body is connected by means of a bolt 29 to a lug 30 which extends downwardly from the ram 18 and through a slot 31 in the bottom of the ram casing. The body 24 is slidably supported in a suitable guideway 33 on the underside of the ram casing, and for convenience in manufacture the outer surface of the body is made cylindrical, the guideway 33 having a similarly shaped bore 34 to receive the same. As shown particularly in Fig. 4, the axes of the bore 25 and the cylindrical outer surface of the body 24 are offset to provide room for a chamber or reservoir 36 which is crescent-shaped in cross-section, this chamber being located in the lower portion of the body. The chamber 36 communicates with the rear end of the bore 25 through a port 37 (Fig. 2), and as shown in Fig. 3 the chamber communicates with the front end of the bore 25 through three separate ports 39, 40 and 41. A ball check valve 43 is associated with the port 39 to prevent flow therethrough except in a direction inwardly to-

ward the bore 25. A ball relief valve 44 is associated with the port 40 to prevent flow therethrough except under the influence of an excessive fluid pressure in the bore 25, this valve 44 being held in its closed position by means of a coiled compression spring 45. A needle valve 47 is associated with the port 41 to restrict the flow therethrough, this valve being provided with a handle 48 for manual adjustment thereof. A supply of a suitable liquid, preferably oil, is maintained in the chamber 36 at a level above the lower end of the port 39.

It will now be apparent that in the operation of the invention the motor 19 will reciprocate the ram 18 and thus feed fuel rearwardly from the hopper 16 into the retort 14. At the same time the body 24 will be reciprocated in its guideway 33 by the action of the lug 30 depending from the ram. During the forward movement of the body oil will be drawn upwardly from the reservoir 36 through the port 39 to the bore 25 by the suction effect of the piston 26, the pusher blocks 21 being held stationary by the weight of the fuel bed thereon until the rear end of the bore 25 engages the piston 26, whereupon the piston 26, rod 22, and pusher blocks 21 will be moved forwardly until the body reaches the limit of its forward stroke. As the body 24 starts its rearward stroke, the pressure of the oil in the bore 25 will increase until it is sufficient to overcome the resistance of the pusher blocks. When this occurs, the piston and the pusher blocks will be moved rearwardly but at a slower rate than the body, since some of the oil will escape from the bore 25 through the port 41 past the valve 47. Thus the stroke of the pusher blocks will be less than that of the body by an amount dependent upon the adjustment of the needle valve 47. This provides a very convenient means for controlling the movements of the pusher blocks and the resultant contour of the fuel bed. In the event these blocks encounter an excessive resistance during their rearward travel, the oil pressure in the bore 25 will increase and open the relief valve 44 against the force of the spring 45, so that the oil may escape through the port 40. This will allow the pusher blocks to remain stationary during the continued rearward travel of the body 24 without damage to the various parts. Any oil which may escape rearwardly past the piston 26 during the operation of the apparatus will return to the reservoir 36 through the port 37. Only a slight interval will elapse between the start of the rearward or fuel-feeding stroke of the main ram and the start of the rearward stroke of the pusher blocks. Hence the pusher blocks will move the fuel rearwardly in the retort while the ram is adding fuel to the retort at the front end thereof. This will greatly reduce the resistance to ram movement and prevent excessively tight packing of the fuel.

While I have described the preferred form of the invention, obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims appended hereto, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An underfeed stoker comprising a retort, a pusher block therein, a ram arranged to feed fuel to the retort, driving means connected to the ram; a mechanism having two relatively recipro-

cable parts one of which is a body having a bore therein containing liquid and the other of which is a piston slidable in the bore, means connecting the driving means to one of said parts to slide the same and thereby create a pressure in the liquid in the bore to slide the other of said parts, means connecting the said other part to the pusher block, a reservoir for liquid, means connecting the bore and the reservoir for flow of liquid therebetween in both directions, and an adjustable valve to control the flow of liquid from the bore to the reservoir and thereby control the speed of the pusher block relative to that of the ram.

2. An underfeed stoker comprising a retort, a pusher block therein, a ram arranged to feed fuel to the retort, driving means connected to the ram, a body having a bore therein containing liquid, a piston slidable in the bore, means connecting the driving means to the body to move the same and thereby create a pressure in the liquid in the bore to move the piston, means connecting the piston to the pusher block, a reservoir for liquid, means connecting the bore and the reservoir for flow of liquid therebetween in both directions, and an adjustable valve to control the flow of liquid from the bore to the reservoir and thereby control the speed of the pusher block relative to that of the ram.

3. An underfeed stoker comprising a retort, a pusher block therein, a ram arranged to feed fuel to the retort, driving means connected to the ram, a mechanism having two relatively reciprocable parts one of which is a body having a bore therein containing liquid and the other of which is a piston slidable in the bore, means connecting the driving means to one of said parts to slide the same and thereby create a pressure in the liquid in the bore to slide the other of said parts, means connecting the said other part to the pusher block, a reservoir for liquid, two ports between the bore and the reservoir, a check valve associated with one port to prevent flow therethrough in a direction toward the reservoir, and an adjustable valve to control the flow through the other port and thereby control the speed of the pusher block relative to that of the ram.

4. An underfeed stoker comprising a retort, a pusher block therein, a ram arranged to feed fuel to the retort, driving means connected to the ram, a mechanism having two relatively reciprocable parts one of which is a body having a bore therein containing liquid and the other of which is a piston slidable in the bore, means connecting the driving means to one of said parts to slide the same and thereby create a pressure in the liquid in the bore to slide the other of said parts, means connecting the said other part to the pusher block, a reservoir for liquid, three ports between the bore and the reservoir, a check valve associated with one port to prevent flow therethrough in a direction toward the reservoir, an adjustable valve to control the flow through a second port and thereby control the speed of the pusher block relative to that of the ram, and a relief valve associated with the third port and arranged to open when the liquid pressure in the bore exceeds a predetermined value.

5. An underfeed stoker comprising a retort, a pusher block therein, a ram arranged to feed fuel to the retort, driving means connected to the ram, a mechanism having two relatively reciprocable parts one of which is a body having therein a bore containing liquid and a reservoir for liquid and the other of which is a piston slidable in the

bore, means connecting the driving means to one of said parts to slide the same and thereby create a pressure in the liquid in the bore to slide the other of said parts, means connecting the said other part to the pusher block, two ports between the bore and the reservoir, a check valve associated with one port to prevent flow therethrough in a direction toward the reservoir, and an adjustable valve to control the flow through the other port and thereby control the speed of the pusher block relative to that of the ram.

6. An underfeed stoker comprising a retort, a pusher block therein, a ram arranged to feed fuel to the retort, driving means connected to the ram, a mechanism having two relatively reciprocable parts one of which is a body having a cylindrical outer surface and a cylindrical bore containing liquid and the other of which is a piston slidable in the bore, means connecting the driving means to one of said parts to slide the same and thereby create a pressure in the liquid in the bore to slide the other of said parts, means connecting the said other part to the pusher block, a reservoir for liquid, means connecting the bore and the reservoir for flow of liquid therebetween in both directions, an adjustable valve to control the flow of liquid from the bore to the reservoir and thereby control the speed of the pusher block relative to that of the ram, and a stationary guideway having a cylindrical bore which slidably supports the body.

7. An underfeed stoker comprising a retort, a pusher block therein, a ram arranged to feed fuel to the retort, driving means connected to the ram, a hydraulic mechanism having two relatively reciprocable parts one of which is a body

and the other of which is a piston, the body having a cylindrical outer surface and a cylindrical bore containing liquid and offset with respect to said surface to provide space for a reservoir for liquid crescent-shaped in cross-section and located between the bore and the outer surface, the piston being slidable in the bore, means connecting the driving means to one of said parts to slide the same and thereby create a pressure in the liquid in the bore to actuate the other of said parts, means connecting the said other part to the pusher block, means connecting the bore and the reservoir for flow of liquid therebetween in both directions, an adjustable valve to control the flow of liquid from the bore to the reservoir and thereby control the speed of the pusher block relative to that of the ram, and a stationary guideway having a cylindrical bore which slidably supports the body.

8. An underfeed stoker comprising a retort, a pusher block therein, a ram arranged to feed fuel to the retort, driving means connected to the ram, a slidably supported body shaped to provide a reservoir and a bore, both the reservoir and the bore containing liquid, a piston slidable in the bore, a rod connecting the piston to the pusher block, means connecting the driving means to the body to slide the same and thereby create a pressure in the liquid in the bore to move the piston, means connecting the bore and the reservoir for flow of liquid therebetween in both directions, and an adjustable valve to control the flow of liquid from the bore to the reservoir and thereby control the speed of the pusher block relative to that of the ram.

BENJAMIN R. ROBINSON.