Sept. 8, 1925. 1,552,968

W. F. TROTTER

UNDERFEED STOKER

Original Filed May 2, 1921 2 Sheets-Sheet 1

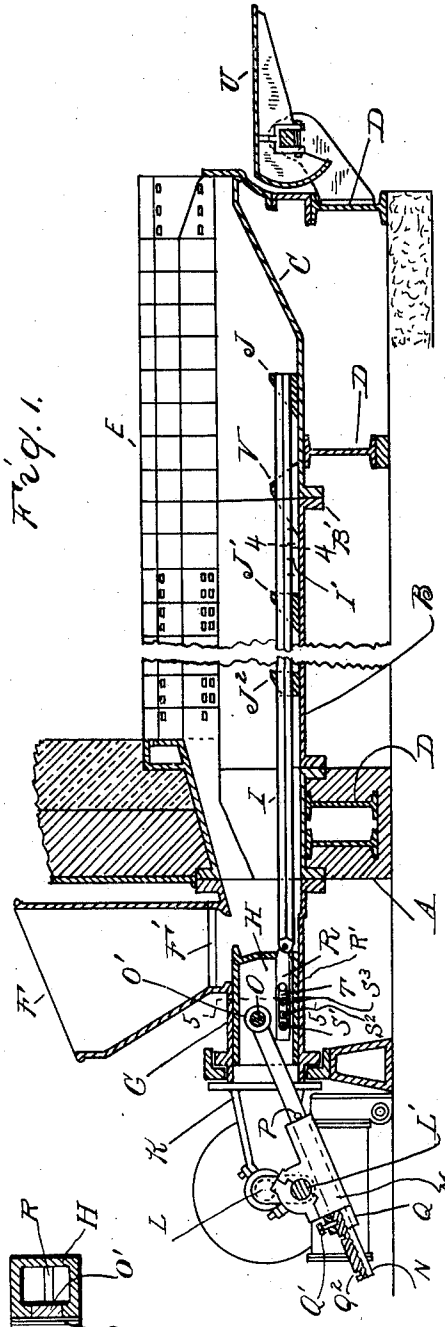


Fig. 1.

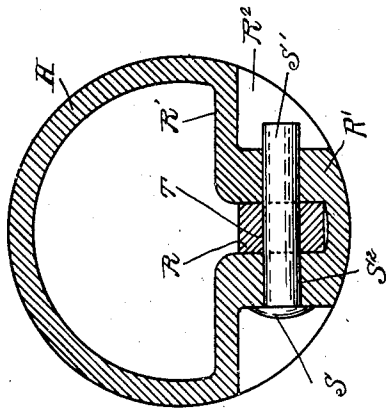


Fig. 5.

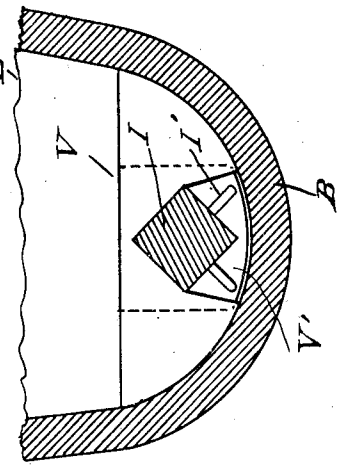


Fig. 4.

Fig. 6.

Inventor

Walter F. Trotter

By Whittemore, Hulbert & Whittemore, Belknap

Attorneys

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Fig. 2.

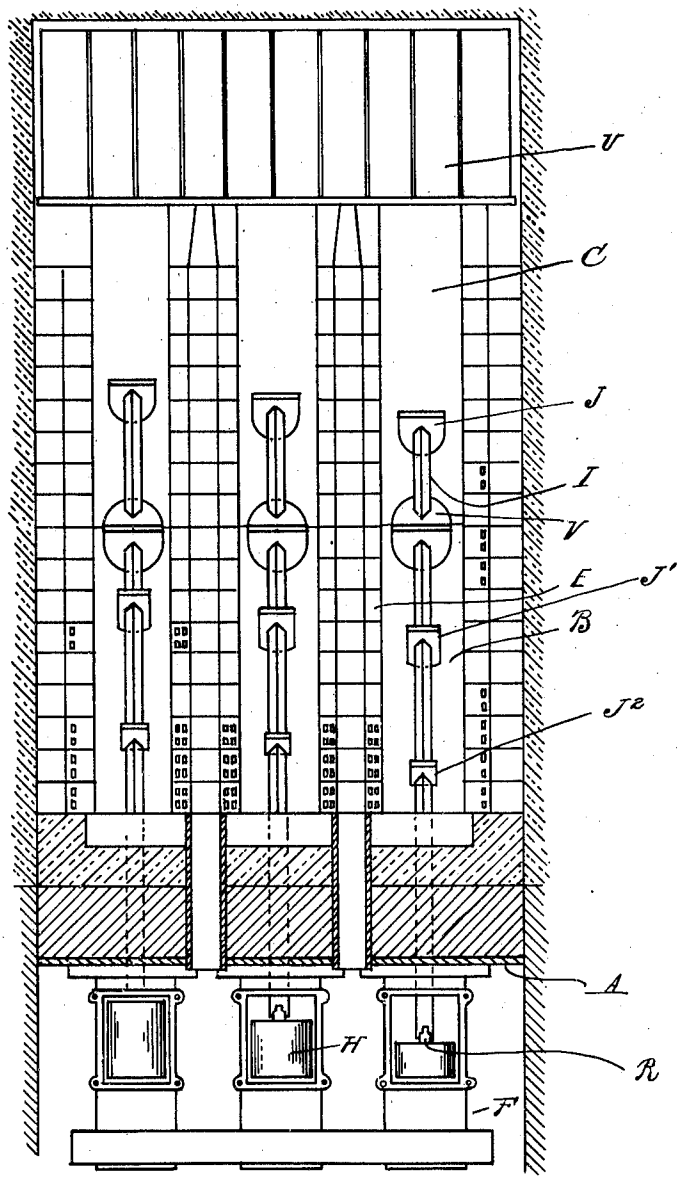
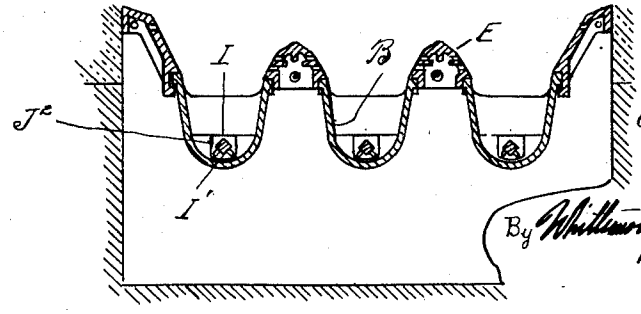


Fig. 3.



Inventor
Walter F. Trotter

By Whittemore Hulbert & Whittemore & Belknap.

Attorneys

Patented Sept. 8, 1925. 1,552,968

UNITED STATES PATENT OFFICE.

WALTER F. TROTTER, OF CINCINNATI, OHIO, ASSIGNOR TO DETROIT STOKER COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

UNDERFEED STOKER.

Application filed May 2, 1921, Serial No. 466,083. Renewed July 10, 1925.

To all whom it may concern:

Be it known that I, WALTER F. TROTTER, a citizen of the United States of America, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Underfeed Stokers, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to underfeed stokers of that type in which the green fuel is fed longitudinally of a trough beneath the burning fuel and is gradually elevated into the zone of combustion. The invention consists in various features of the construction which improve the operation, simplify the manufacture, and secure other advantages as hereinafter set forth.

In the drawings:

Figure 1 is a vertical central longitudinal section through the stoker;

Figure 2 is a sectional plan view thereof omitting the driving mechanism and hoppers;

Figure 3 is a cross-section;

Figure 4 is an enlarged detail section on line 4—4 of Figure 1;

Figure 5 is a similar detail view on line 5—5 thereof;

Fig. 6 is a horizontal section of the ram looking downward.

A is the front wall of the furnace and B is the trough-shaped casing forming the retort into which the green fuel is fed and which extends through the front wall and rearward therefrom. The rear end of this retort is inclined upward, as indicated at C, and suitable supports, such as the I beams D, are arranged at intervals. E are air tuyères arranged between adjacent troughs and preferably formed of short units arranged end to end and clamped together.

The green fuel is fed into the retort B from a hopper F, which is arranged outside and in front of the furnace. G is a cylindrical casing arranged below the hopper and communicating therewith through the port F', said casing being aligned with and secured to the retort B. H is a ram which is reciprocated within the casing G and which pushes the fuel forward in the retort.

When the fuel is pushed inward by the ram H, it meets not only the frictional resistance of the walls of the retort, but also the resistance of the coked mass of fuel constantly formed thereabove, and this resistance is so great that it is necessary to provide means within the retort itself for assisting in advancing the fuel. For this purpose I have provided a pusher bar I which extends longitudinally adjacent to the bottom of the retort and which has mounted thereon a series of pusher blocks J, J' and J^2 actuated thereby. These blocks have their lower faces resting upon the bottom of the retort, their forward faces at right angles to the axis of the bar and their rear faces obliquely inclined to permit of the retraction of the bar without drawing the fuel backward. Thus when the bar is reciprocated, the forward movement will cause each of the blocks to advance the fuel adjacent thereto, while in the rearward movement of the bar the blocks will pass beneath the fuel, lifting the same but not drawing it rearward. Successive operations will cause a step by step advancement of the fuel and also a lifting of the mass, which will bring the coked portions within the zone of combustion adjacent to the air tuyères E.

In the operation of such a feeding mechanism there is always danger of a clogging, which will increase the resistance beyond the strength of the operating parts and will result in breakage. I have therefore provided a construction of drive mechanism for the ram which in case of an over-stress will automatically free itself without doing injury to any other part of the mechanism, the construction being as follows:

K is a frame mounted in front of the casing G and carrying a housed transmission mechanism (not shown) for operating a rotary crank L. The crank L is connected by a pin L' with a block M sleeved upon a pitman rod N which is connected by a pin O to the ram H. The block M is coupled to the rod N through the medium of pins capable of being sheared off in case of an abnormal resistance. Thus when said pins are sheared, the rotation of the crank L will only cause a sliding of the block M upon the rod N without communicating any longitudinal movement to the latter. As shown, a shearing pin P engages a transverse aperture in the rod N at the forward end of the sleeve M and in rear of said sleeve there is arranged upon the rod a collar Q having a shearing pin Q'

for attaching the same to the rod. The pin Q′ is engageable with any one of a series of apertures Q^2, which permit of adjusting the collar Q so as to provide a greater or lesser amount of lost motion, thereby changing the length of stroke of the rod N.

The rod N is arranged between parallel bearings O′ of the ram H and is pivoted thereto by the pin O. The bar I is driven by the ram and is connected thereto through the medium of a link R which passes through an aperture in the forward head of the ram and between parallel bearings R′. These bearings are formed by inwardly deflected portions of the cylinder, which leave recesses R^2 providing clearance for the head S of the pin S′ for coupling the link to the bearings. The link is formed with a slot T therein and the pin S′ is engageable with any one of a series of spaced apertures S^2 in the bearing R′ registering with said slot. Thus by using the pins S′ and S^3 they may be so adjusted in relation to the apertures S^2 and slot T as to provide different amounts of lost motion in the link connection.

With the construction of pusher bar I as thus far described, there is a tendency for the fuel to be fed out from the end of the retort and onto the ash receiver U before complete combustion has occurred. To avoid such a result I have provided additional means for lifting or pushing the fuel upward, this consisting in an inclined deflector V mounted on the bottom of the retort in the central portion thereof. The deflector V extends completely across the section of the retort and therefore all of the fuel which is forced past the bearing is lifted, thereby causing the bulging up of the center of the mass. The deflector V is preferably located opposite a flanged joint B′, which unites sections of the retort B and these flanges form an additional reinforcement for resisting the downward reaction of stresses from the deflector V.

Where fine fuel is subjected to the compression of the ram H, there is the tendency for the same to pack about the rod I so as to interfere with the free movement of said rod. To loosen up such packed material, the rod I is provided with projecting pins or teeth on its lower sides, it being preferably arranged diagonally or with one of the corners projecting downward. These pins or teeth I′ must pass through the deflector V, which latter is therefore cut away beneath the bar, as indicated at V′. The passage of the pins through this clearance space will loosen up the material and will prevent any wedging which would interfere with the free movement of the bar.

With the construction as described, in use, the stroke of the ram can be varied by adjustment of the collar Q on the rod N so as to vary the amount of lost motion. Also, the stroke of the rod I may be varied by adjusting the pins S′ and S^3 in different apertures S^2 to change the amount of lost motion. When these adjustments are made, the rotation of the crank L will impart a reciprocating movement of the desired length to both ram and rod I, which will cause the periodic feeding of the green fuel from the hopper F longitudinally of the trough or retort. Inasmuch as the blocks J, J′, J^2 bear upon the bottom of the trough, the frictional resistance is reduced over that resulting from the pushing of such members through the mass of fuel. Also, as before stated, the pins or teeth I′ by constantly loosening up the material beneath the rod I will lessen the frictional resistance to its movement. Each forward stroke will advance the mass and the upward deflection caused by the deflector V will bow up the center of the mass and will avoid the pushing of unconsumed fuel onto the ash holder.

When it is desired to bank the furnace, the ram H is adjusted to its forward position, where it acts as a cut-off for the hopper F and prevents access of air or exit of gases. To facilitate such adjustment the collar Q is first adjusted to its outermost position on the rod N, as indicated at Q^2, after which the rotation of the crank L will push the ram forward, but will not return the same as the clearance or lost-motion is equal to the full stroke.

The arrangement of the axis of movement of the rod I parallel to the axis of movement of the ram is advantageous and rendering effective the full power of the crank and diminishing the resistance incident to any change in direction. Also the attachment of the rod I to the ram through the medium of the link R and pins S′ and S^3 is advantageous, in that the pins S′ and S^3 can be sheared by an over-stress, which will prevent breakage of the rod. This protects the rod from injury and facilitates quick repair. In case of any clogging which would obstruct the ram, the pin P will be sheared off before any stress is developed sufficient to break any of the other parts and the same is true of the pin Q′, which will be sheared off by any over-stress tending to pull the rod N rearward. The whole arrangement is therefore one adapted to meet practical conditions and to facilitate the maintenance of an apparatus in operative condition.

What I claim as my invention is:

1. In a stoker, the combination with a sectional retort having a trough-shaped bottom, of a deflector rising from the bottom of said retort above the adjacent ends of two of said retort sections, said deflector having an aperture formed therein, a rod extending longitudinally of said retort and passing through the aperture in said de-

flector, pusher blocks mounted on said rod and actuated thereby, and means for reciprocating said rod.

2. In a stoker, the combination with a retort, of a deflector rising from the bottom of said retort and fixed thereto, said deflector having an aperture formed therein and having an inclined face for directing the fuel upward, a pusher rod extending longitudinally of said retort and passing through the aperture in said deflector, pusher blocks mounted on said rod and slidable upon the bottom of said retort, and a plurality of pins carried by said rod for loosening up the packed fuel and lessening resistance to the feeding movement.

3. In a stoker, the combination with a retort, of a deflector rising from the bottom of said retort and fixed thereto, said deflector having an aperture formed therein, of a pusher rod extending longitudinally of said retort and passing through the aperture in said deflector, pusher blocks mounted upon said rod and slidable upon the bottom of said retort, and means carried by said rod for loosening up the packed fuel and lessening resistance to the feeding movement, said means being movable through the aperture in said deflector.

4. In a stoker, the combination with a retort, of a deflector rising from the bottom of said retort and fixed thereto, said deflector having an aperture formed therein, a pusher rod extending longitudinally of said retort and passing through the aperture in said deflector, pusher blocks mounted upon said rod and slidable upon the bottom of said retort, and a plurality of pins carried by said rod for loosening up the packed fuel and lessening resistance to the feeding movement, certain of said pins being movable through the aperture in said deflector.

5. In a stoker, the combination with a retort, of a deflector rising from the bottom of said retort and fixed thereto, said deflector having an aperture formed therein, a pusher rod extending longitudinally of said retort and passing through the aperture in said deflector, pusher blocks mounted upon said rod, and a plurality of inclined pins carried by said rod for loosening up the packed fuel and lessening resistance to the feeding movement.

6. In a stoker, the combination with a retort, of a ram for feeding fuel to said retort, a pusher rod extending longitudinally of said retort, said ram having inwardly deflected portions, a link connected to said rod and extending into said ram between said deflected portions, and a headed pin connecting said rod to said deflected portions, one of said deflected portions housing the head of said pin.

7. In a stoker, the combination with a retort, of a ram for feeding fuel into said retort, a pusher rod extending longitudinally of said retort, said ram having an opening in one end thereof and inwardly deflected portions upon opposite sides of said opening providing parallel bearings, a link connected to said rod and extending through said opening and between said bearings, and a shearable adjustable connection between said link and said bearings.

8. In a stoker, a plurality of retorts arranged to support a substantially horizontal fuel bed, an ash receiver at the rear ends of said retorts, casings in alignment respectively with said retorts having inlet orifices for fuel, hoppers communicating with the inlet orifices in said casings, and means for feeding fuel from said hoppers longitudinally of said retorts toward said ash receiver, including rams adapted to be reciprocated in said casings across said inlet orifices to a predetermined point in the direction of feed and means for actuating said rams including a rotary crankshaft, and separate connections between the rams and crank portions of said shaft adjustable independently of each other to alter the strokes of each ram independently of the others to thereby vary the passage of fuel through the orifices into the ram casings.

9. In a stoker, a plurality of retorts arranged to support a single fuel bed, an ash receiver at the rear ends of said retorts, casings in alignment respectively with said retorts having inlet orifices for fuel, hoppers communicating with the inlet orifices in said casings, means for feeding fuel from the said hoppers longitudinally of said retorts toward said ash receiver including rams adapted to be reciprocated in said casings across said inlet orifices to a predetermined point in the direction of feed and means for actuating the rams to feed fuel from said casings to said retorts, said actuating means including a driving member, and a connection between each ram and said driving member adjustable to alter the stroke of each ram independently of the others to thereby vary the passage of fuel through the orifices into the ram casings.

10. In a stoker, the combination with a retort, and a ram for moving fuel longitudinally of said retort, of means for reciprocating the ram including a single pitman rod pivotally connected to the ram, a rotary crank shaft at one end of said retort, a block having transversely disposed bores, one of said bores rotatably receiving a crank of said shaft, the other of said bores slidably receiving the pitman rod, and stops upon the pitman rod limiting the movement of the block relative thereto.

11. In a stoker, the combination with a retort, and a ram for moving fuel longitudinally of said retort, of means for reciprocating the ram including a single pitman rod

pivotally connected at one end to the ram and fashioned at its opposite end to detachably receive a stop, a rotary crank shaft at one end of said retort, a block having transversely disposed bores, one of said bores rotatably receiving a crank of said shaft, the other of said bores slidably receiving the pitman rod, and stops for limiting the movement of the block relative to the pitman rod one of said stops being located on the pitman rod between the block and ram, and the other of said stops detachably engaging the fashioned end portion of the pitman rod.

12. In a stoker, the combination with a retort, and a ram for moving fuel longitudinally of said retort, of means for reciprocating the ram including a rotary crank shaft at one end of the retort, a pitman rod secured directly to said ram, a direct drive connection between said shaft and pitman rod including a block slidably receiving the pitman rod and rotatably receiving a crank of said shaft, and adjustable means for limiting the sliding movement of the block on said pitman rod.

In testimony whereof I affix my signature.

WALTER F. TROTTER.