

W. G. CROSTHWAITE.  
MECHANICAL STOKER.  
APPLICATION FILED SEPT. 28, 1905.

955,388.

Patented Apr. 19, 1910.

2 SHEETS—SHEET 1.

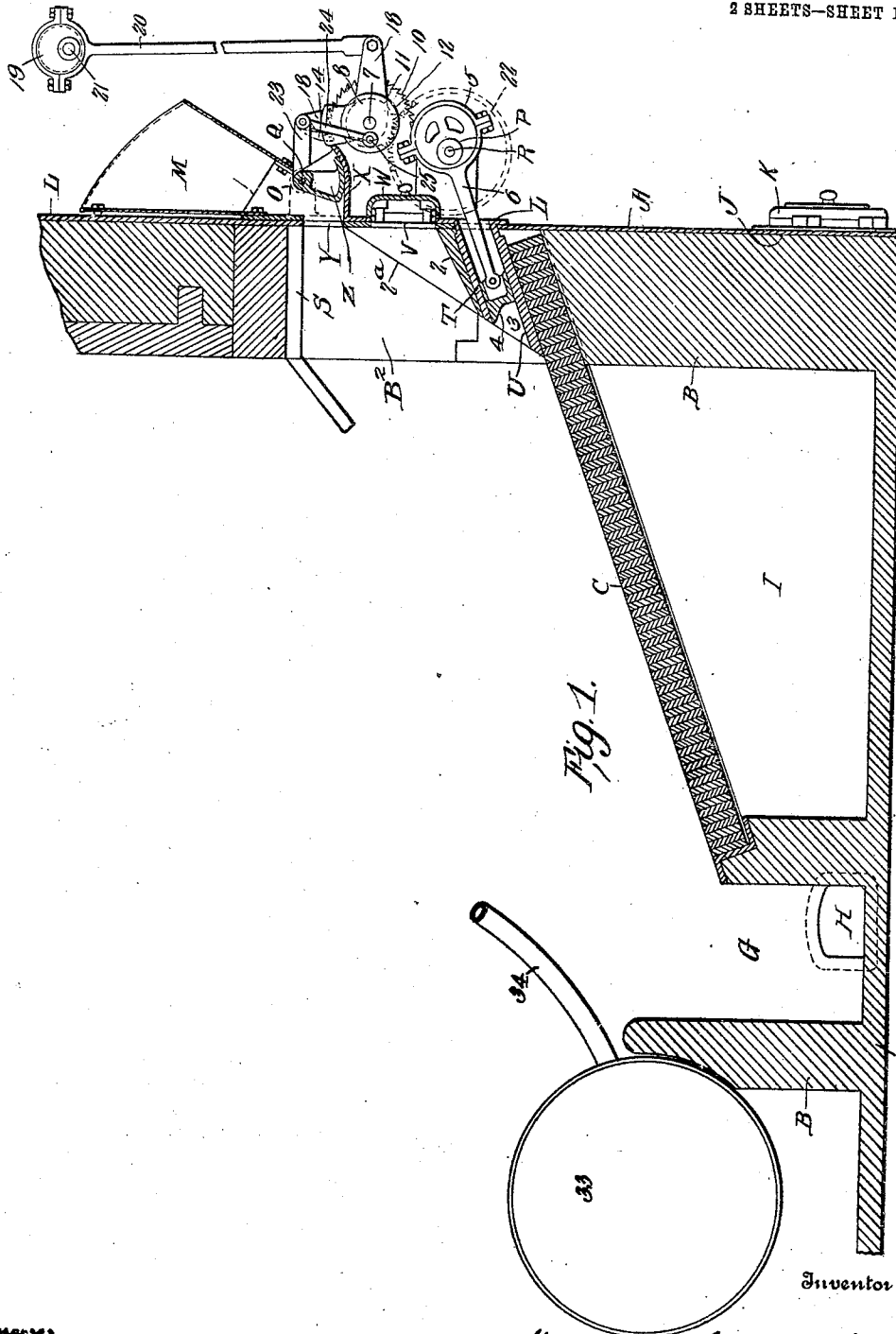


Fig. 1.

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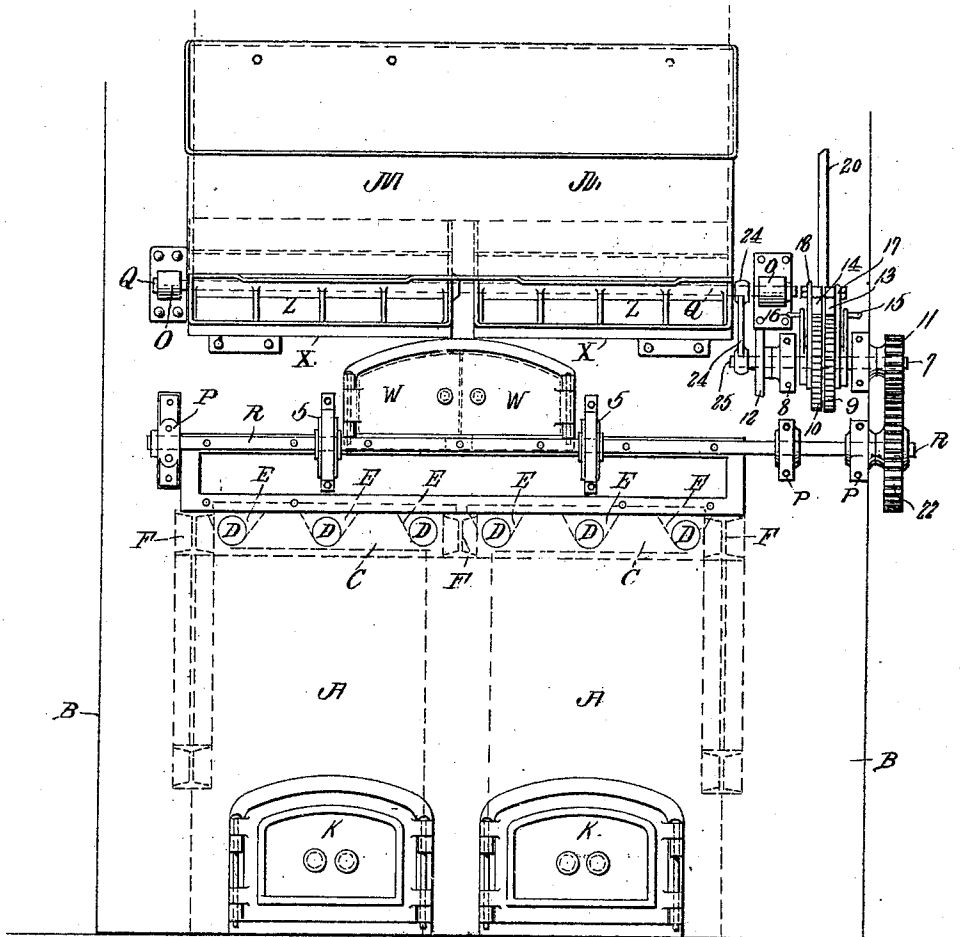
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2 SHEETS—SHEET 2.

Fig. 2



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By

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# UNITED STATES PATENT OFFICE.

WALTER GEORGE CROSTHWAITE, OF LEEDS, ENGLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNITED CIGARETTE MACHINE COMPANY, LIMITED, OF LONDON, ENGLAND, A CORPORATION OF GREAT BRITAIN.

## MECHANICAL STOKER.

955,388.

Specification of Letters Patent.

Patented Apr. 19, 1910.

Application filed September 28, 1905. Serial No. 280,520.

*To all whom it may concern:*

Be it known that I, WALTER GEORGE CROSTHWAITE, a subject of the King of Great Britain and Ireland, residing at York Street Mills, York Street, Leeds, in the county of York, England, have invented new and useful Improvements in Mechanical Stokers, of which the following is a specification.

This invention has reference to improved means for feeding fuel to the furnaces of, for example, tubular water, or Lancashire, or other boilers, in which the fire bars are arranged either at an angle sloping from the front to the rear of the furnace, or on the level.

The object of this invention is to provide mechanical means of the sprinkling type with either a scoop or rotary arrangement, whereby the fuel may be regularly and automatically fed at intervals to the fire by a simple yet efficient combination of parts arranged so as to be driven from any suitable source of power.

In the drawings hereunto annexed:—Figure 1 is a sectional elevation of the furnace portion of a tubular water boiler with this invention applied, and Fig. 2 is a front elevation of the same.

The general construction of the furnace shown in the annexed drawings is that usually employed for tubular water boilers say, of the Stirling type, and the mechanical stoker is of a similar construction to that known as the "Proctor stoker" adapted to the requirements of this invention, but I would have it understood that any other construction of mechanical stoker can be used.

In this invention the furnace A is built of brickwork B and fitted with grate bars C, with or without feet. In the drawings the grate bars C are shown without feet, and the said bars are constructed according to the specification of United States Letters Patent granted to Thomas Westerby and Walter George Crosthwaite reissued May 23, 1905, No. 12,351. These grate bars are provided with a series of air holes D which, when the bars are placed side by side transversely in the furnace, form air passages which are closed to the ashpit I for preventing any air escaping therein. The said openings on their upper side are arranged to communi-

cate with a series of fan shaped recesses E formed, when the bars are placed together, for delivering a fan shaped current of air upward through the burning fuel. But in this invention, and as shown at Fig. 2, only one set of air holes D is employed, namely, those communicating with the fan shaped recesses E. The second set of air holes described in the said specification for conveying air to the back of the fire bridge are dispensed with in this case. The said bars C are arranged at an angle, as at Fig. 1,—on, say, iron girder F, Fig. 2, partially built in the walls,—so as to slope from the front to the rear of the furnace, that is to say, the fire bars are arranged on an incline with the lowest point at the rear of the furnace A. At the rear of the bars C a pit or cavity or recess, hereafter termed a rear pit G, is formed in the brickwork to receive the dust and ashes. An opening H,—closed with one or more covers or doors or dampers,—is made in one of the walls of the brickwork B which supports the rear end of the fire bars for the removal of the dust or ashes. Admission to the space or cavity, which may be termed the front ashpit I, under the fire bars C between the walls that support the front and rear ends of the said bars, is also obtained by means of one or more openings J in the outer supporting wall which is closed by one or more doors, K.

The front wall of the furnace A is preferably faced with a plate L cast singly or in a plurality of sections which plate is formed with one or more openings opposite an opening or openings B<sup>2</sup> in the wall B immediately above the fire-bars C for the stoking mechanism which projects into said opening or openings and is fastened to the face plate or furnace front L. Forming a part of the stoking mechanism is a hopper or hoppers M, bolted to said front plate L, for the reception of fuel to be intermittently supplied to the furnace from the bottom of said hopper or hoppers by one or more oscillating pushers Z fixed on a rocking shaft Q mounted in bearings O which project from the front plate of the furnace. R is a shaft parallel to the shaft Q and below the same, journaled in bearings P also fastened on the furnace front L, for actuating certain parts of the feeding mechanism. Within the open-

ing or openings B<sup>2</sup> in the front wall of the furnace are secured plates S, T and U arranged preferably at different distances apart. The plate S is situated at the top of the opening and may, when required, be carried inward and downward within the furnace to form a deflecting plate for better directing the fuel onto the fire-bars C. One or more sight or auxiliary holes V are made in the furnace front and covered by doors W which may be opened and closed when desired.

A slightly curved plate X is arranged to project outward at a suitable distance below each hopper, and said plate also is immediately adjacent the opening Y in the furnace plate L. A pusher Z mounted directly in front of the opening Y on the rocking shaft Q, is made to oscillate so as to force the fuel that falls from the hopper into a recess or chamber of a fuel deflecting block 2<sup>a</sup> located wholly within the furnace wall and beneath the delivery end of the fuel feeder. The fuel falling within the recess of the deflecting block is deflected or thrown inwardly toward the grate-bars by reason of the inclined bottom 2 of said recess. There is one such recessed deflecting block for each hopper. Each bottom plate 2 of a deflecting block is supported or additionally strengthened by the plate T beneath and immediately in contact therewith. Beneath the supporting plates T, and spaced therefrom is the plate or plates U constituting with the plates T slide-ways 3 within which plungers or pushers 4 are adapted to intermittently reciprocate for feeding the fuel to the furnace. An intermittent reciprocating motion is imparted to the plunger 4 by means of one or more eccentrics and rods. Two eccentrics 5 and rods 6 are shown in the drawings, and they are mounted upon the lower or eccentric shaft R. The bearings for the above named rocking shaft Q and eccentric shaft R may in some cases be made separate from the said casting or castings L.

A convenient method of imparting the required intermittent motion to the rocking and eccentric shafts Q, R, is as follows:—A countershaft or spindle, hereafter termed a spindle 7, (mounted in bearings 8) is arranged horizontally above and parallel with the eccentric shaft R as well as between it and the rocking shaft Q. On the spindle 7 are mounted and fixed two ratchet wheels 9, 10. A spur pinion 11 and disk 12 are respectively mounted and fixed on opposite ends of the spindle 7. In some cases the ratchet wheels may be mounted loosely upon the said spindle. In this case they will be provided with long bosses upon which the said disk and spur pinion are mounted and fixed. An intermittent rotary motion is imparted to the ratchet wheels 9, 10, by means of pawls 13, 14,—each capable of separate

adjustment by any suitable means, such as regulating handles 15, 16—mounted in bell crank or other rocking levers or arms 17, 18. The pawls and their levers are actuated by any convenient means, such as an eccentric 19 and rod 20, mounted on a rotating shaft 21. An additional set of pawls may be provided if so desired to prevent any return motion. This additional set of pawls is not shown in the drawings. The spur pinion 11 is arranged to gear with a spur wheel 22 mounted on the eccentric or cam shaft R; while the disk 12 on the spindle 7 is connected with a lever 23 fixed on the rocking shaft Q by a rod 24 and disk pin 25 fixed to disk 12. The pusher Z and plunger 4 may be arranged to work alternately, that is to say, when the pusher Z is at its outward position for allowing the fuel to fall on to the plate X from the hopper, the plunger 4 will then be at its innermost position and have fed forward a fresh supply of fuel to the furnace. When the pusher Z is at its innermost position it will thereby have closed the lower orifice of the hopper and have stopped for the time the supply of fuel falling from the hopper.

33 is a boiler provided with water tubes 34 of ordinary construction.

The action of the apparatus is as follows:—The hoppers M having been filled with fuel by hand or mechanical means, motion is imparted to the above described mechanism by eccentric 19 and rod 20, to bell crank lever 18 for actuating the ratchets 13, 14, ratchet wheels 9, 10, disk 12, rod 24, and pusher Z, whereby the fuel, such as coal, is made to fall from the plate X upon the inclined bottom 2 of the recessed block 2<sup>a</sup>. The fuel is intermittently fed forward by the pusher until it falls down the inclined bottom of the recess on to the fire bars C, when it is fed forward by the plunger 4 into the furnace A. The operation is continued *de novo*, and at each stroke of the plunger 4 the portions of the fuel previously delivered from the hopper or hoppers are being pushed forward over the surface of the inclined fire bars until the whole has been burned or consumed. At each stroke of the plunger a portion of the burned or consumed fuel in the form of dust and ashes is passed over the rear end of the fire bars into the pit G formed for its reception. By means of the said pit provision is made for the introduction of a fresh supply of fuel on to the bars C, and for its main mass to be intermittently moved over the fire bars.

Although in the drawings certain mechanical means are described and illustrated for intermittently supplying the fuel in given quantities and at regular intervals on to the grate bars, I would have it understood that I do not limit myself to such precise forms of mechanical means, as other ar-

rangements, may be readily used in combination with fire bars arranged as herein described.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, what I claim as my invention, and desire to secure by Letters Patent, is:—

1. In combination with a furnace having grate bars and a fuel opening in its front wall, a hopper for containing fuel fixed above said opening, a plate exterior to the furnace adapted to receive fuel from said hopper and guide the same into the fuel opening of the furnace, a pusher arranged to oscillate over said plate and force the fuel thereon toward its delivery end, a recessed block located wholly within said fuel opening, said block having a downwardly inclined bottom directed toward the grate bars on which bottom the fuel falls from said receiving plate and is deflected inwardly, a plunger adapted to reciprocate below the bottom of said recessed block to push the fuel into the furnace, and means for imparting motion to the pusher and plunger.

2. In combination with a furnace having grate bars and a fuel opening in its front wall, a hopper for containing fuel secured to the furnace wall above said opening, a hori-

zontal plate exterior to the furnace adapted to receive fuel from said hopper and guide the same into the fuel opening of the furnace, a pusher to oscillate over said plate and force the fuel thereon toward its delivery end, a recessed block located wholly within said fuel opening, said block having a downwardly inclined bottom directed toward the grate bars on which the fuel falls from said receiving plate and is deflected inwardly, a pair of spaced plates below said inclined bottom and parallel thereto and to each other, the upper of said plates forming a support for the inclined bottom, a plunger adapted to reciprocate between said spaced plates to push the fuel deflected from the inclined bottom into the furnace, ratchet mechanism for operating the pusher, means for varying the throw of the ratchet mechanism, an eccentric for operating the plunger, separate shafts upon which the ratchet mechanism and eccentric are mounted, and means for rotating said shafts.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WALTER GEORGE CROSTHWAITE.

Witnesses:

W. FAIRBURN-HART,

WILLIAM SADLER.