(No Model.) 2 Sheets—Sheet 1.

E. MARSH.

APPARATUS FOR FIRING STEAM BOILERS.

No. 438,080. Patented Oct. 7, 1890.

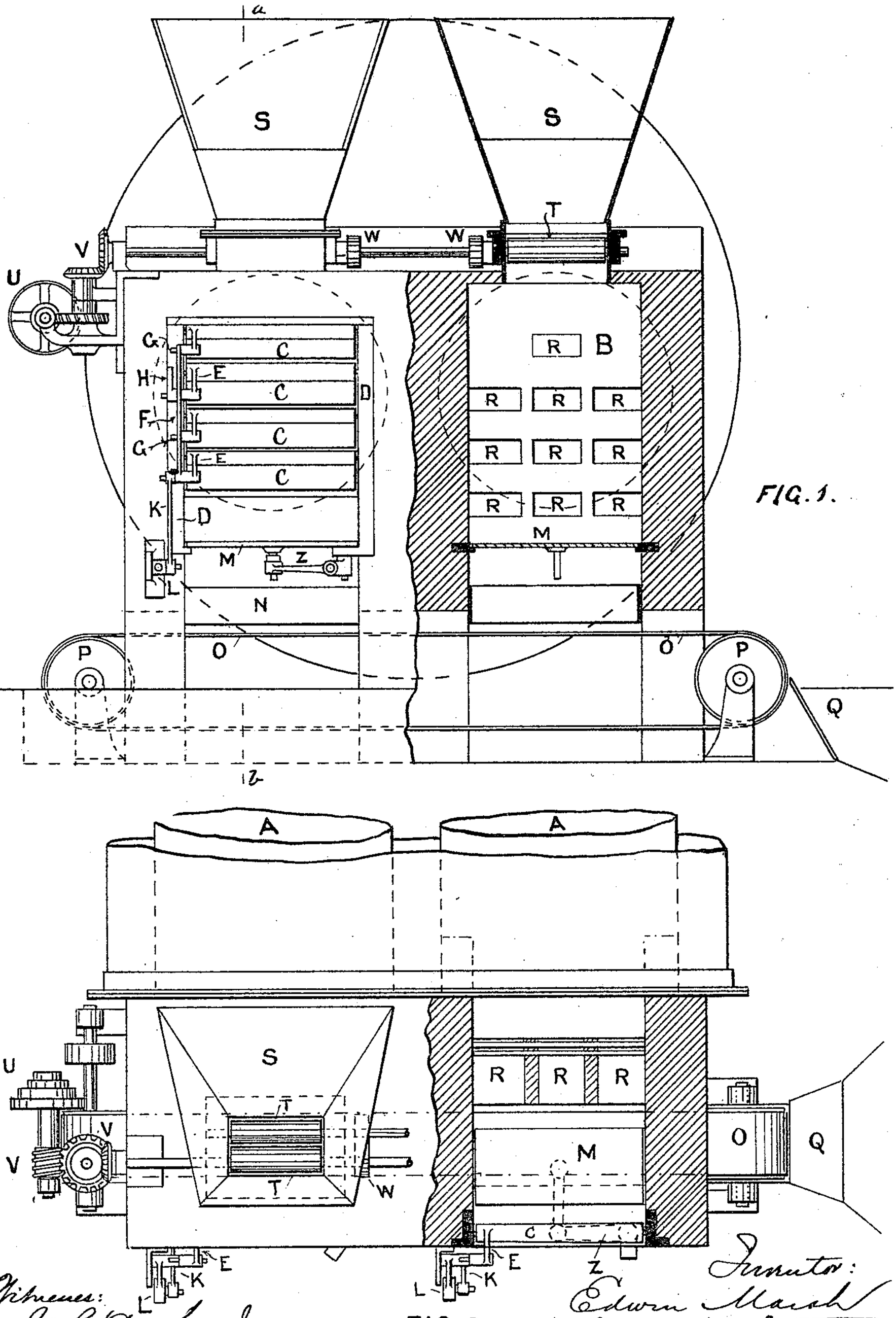

FIG. 1.

FIG. 2.

Witnesses:
J. A. Rutherford
Dennie Sunby

Inventor:
Edwin Marsh
By James L. Norris.
Attorney

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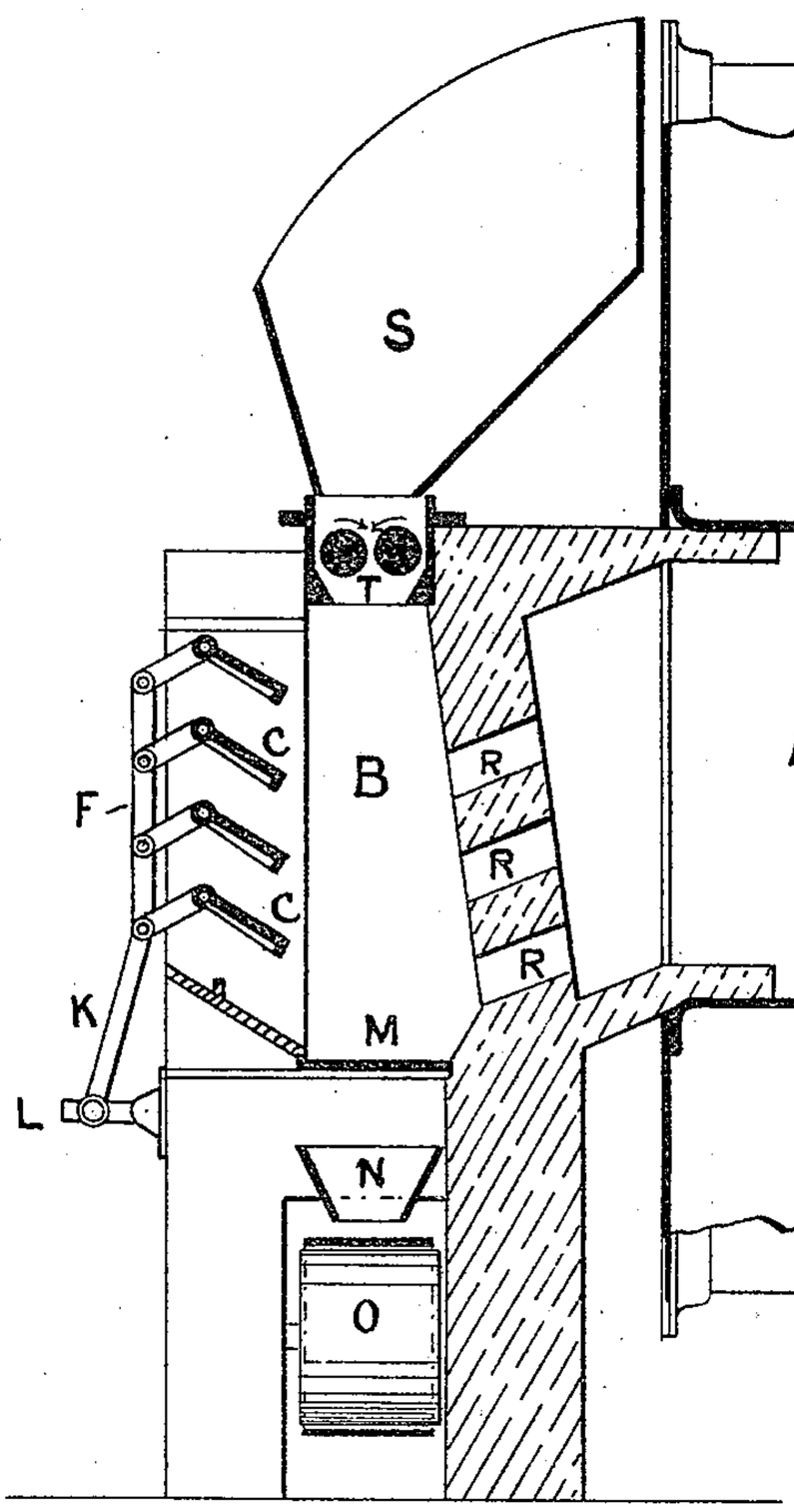


FIG. 3

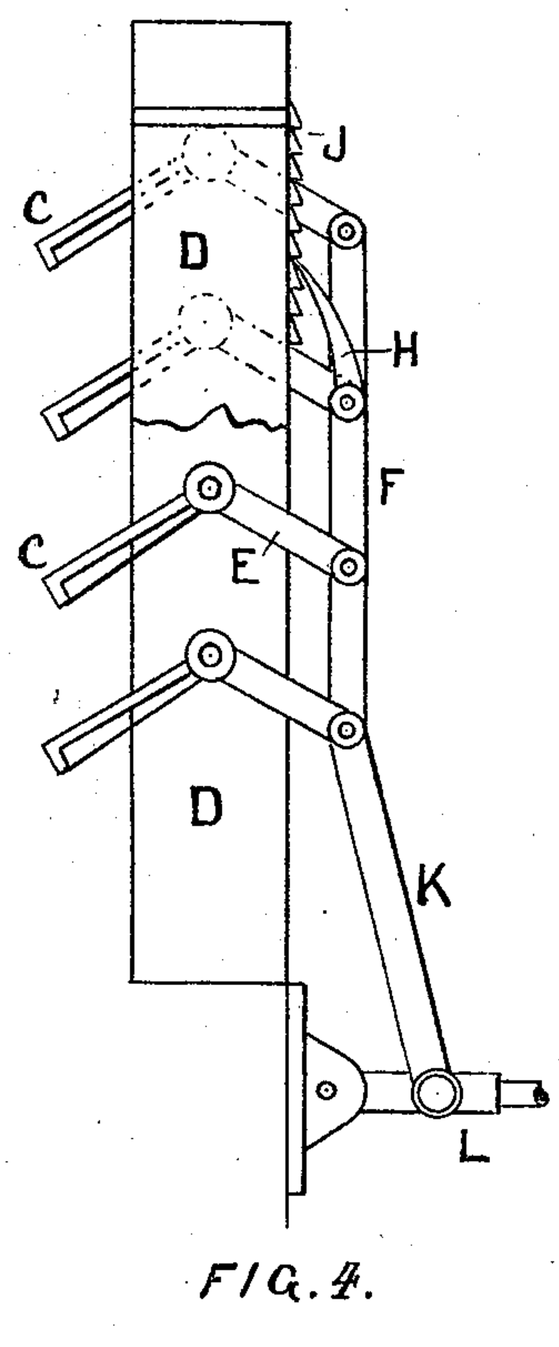
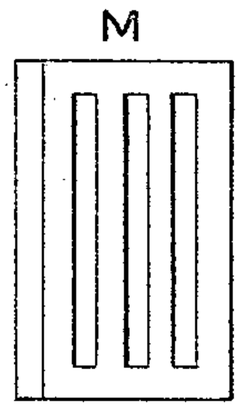


FIG. 4.



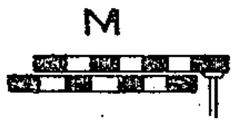


FIG. 5.

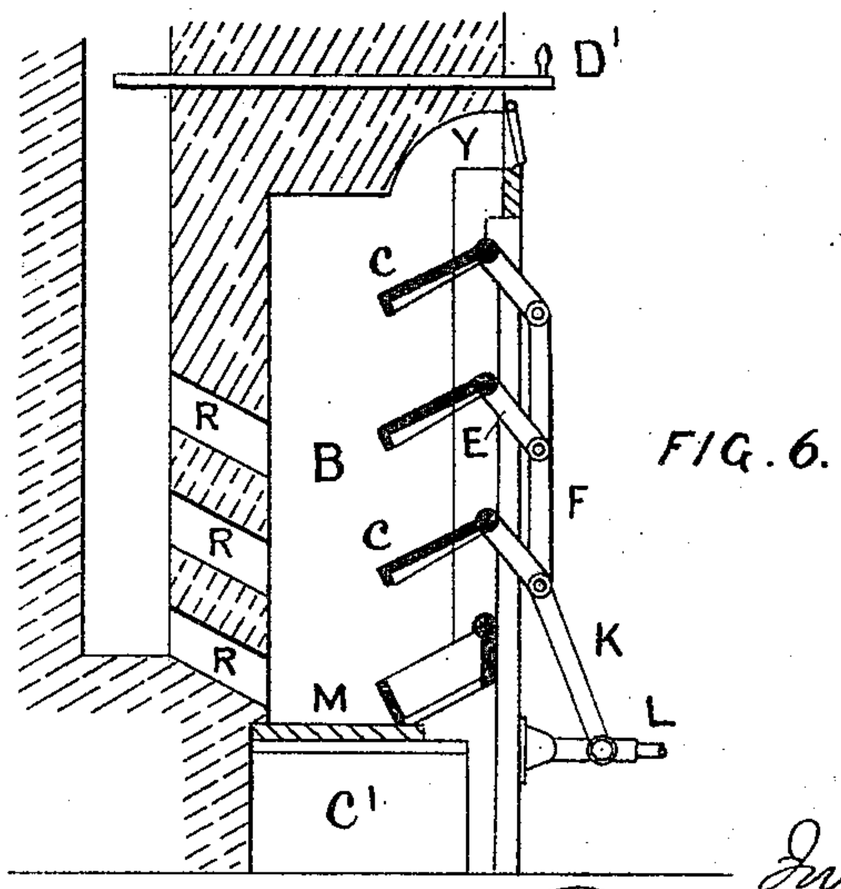


FIG. 6.

Witnesses:
J. A. Rutherford
Dennis Sunby.

Inventor:
Edwin Marsh
By James L. Norris
Attorney.

UNITED STATES PATENT OFFICE.

EDWIN MARSH, OF LEEDS, ASSIGNOR OF ONE-HALF TO HENRY LEGGOTT, OF BRADFORD, ENGLAND.

APPARATUS FOR FIRING STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 438,080, dated October 7, 1890.

Application filed March 25, 1890. Serial No. 345,231. (No model.) Patented in England November 13, 1888. No. 16,409.

To all whom it may concern:

Be it known that I, EDWIN MARSH, a subject of the Queen of Great Britain and Ireland, and residing at Leeds, in the county of York, England, have invented certain Improvements in Apparatus for Firing Steam-Boilers and the Like, (for which I have obtained Letters Patent in England, No. 16,409, dated November 13, 1888,) of which the following is a specification.

This invention relates to certain improvements in apparatus for firing steam-boilers and the like, whereby a slow or fast rate of combustion, at the will of the attendant, may be obtained in the fire, coal economized, and more perfect combustion and greater freedom from smoke obtained. By my arrangement I am enabled to effect the removal of ashes and waste products of combustion by mechanical means, thereby effecting a saving of labor on the part of the attendants and with certain other advantages in regard to the main object of this invention—the economization of fuel and the prevention of smoke from the furnace. The furnaces of boilers for the raising of steam have been hitherto supplied with what are generally known as "dead-plates," "furnace-bars," and "bridge" behind the bars. Upon the latter the fire is placed, in the case of internal-flued boilers of the "Lancashire" and "Cornish" type, within the flue, and in other classes of boilers in a chamber built of fire-brick underneath the boiler. The air for combustion is supplied, for the most part, to the under side of the furnace-bars and caused to pass through the spaces between the bars to the fire. Air is also admitted by various means automatically or by hand through the door along the top of the fire. In all these arrangements when it is desirable to remove the "clinker ashes" from the fire some portions of the furnace-bars are uncovered, when a large quantity of cold air rushes in. It is well known that at such times the efficiency of the boiler is for the time very much diminished; but by my arrangement no such drawback occurs when the clinker ashes are removed. The fire is during that operation effective, as no air can enter the flue except by first passing through the fire. My arrangement of furnace is also applicable to domestic ranges and stoves, as shown by Fig. 6, which represents a section through a domestic range or stove fitted with my improvement.

In the accompanying drawings, Figure 1 represents the front view part in section of a two-flued Lancashire boiler fitted with my apparatus. Fig. 2 is a plan of the same part in section. Fig. 3 is a section through line *a b*, and Fig. 4 a detail showing the connections between the louver-bars and catch for keeping same in the required position.

In accomplishing my object the dead-plate and fire-bars now in ordinary use are dispensed with, and in front of each furnace-tube A, I construct a chamber B, wider at the bottom than the top, of silica or other fire-bricks capable of standing a very high temperature, such as are used for blast-furnaces. The front of each chamber is fitted with louver-bars C, working on trunnions or short projecting shafts supported by side plates D, and which are capable of adjustment as to amount of opening by mechanical arrangement hereinafter described.

When the louver-bars C are closed, the air is excluded from the fire in the chamber B, and therefore the combustion is retarded, and when opened to varying degrees of inclination the combustion is more rapid—perhaps most rapid and efficacious when at an angle of about forty-five degrees.

Each louver-bar C is prepared with an arm or lever E, which are connected by bars F, mounted on the respective stud-pins G of the levers. One of the pins is extended, on which is mounted a pawl H, which engages with a ratchet J for keeping the louver-bars C in the desired position. A link K connects the lever L with the louver-bars C, and when the said lever is operated on its bearing-stud in an upward or downward direction the louver-bars C are opened or closed accordingly and retained in the desired position by the pawl H engaging with one of the teeth of the ratchet J.

The bottom of the chamber B is fitted with a sliding plate M, which may have a plain flat surface, or may be of grid form, some-

what as shown by detail, Fig. 5, in which case it is made to slide on a fixed plate having corresponding openings, so that when the openings are opposite the ashes are allowed to drop below, and when moved by the lever and connections Z, so that the solid part of the plate is opposite the openings of the other, it is closed and all air excluded. In the case when a plain plate M is fitted to the apparatus, as shown in drawings, when it is desirable to let out the ashes the louver-bars C are raised in the manner as before described toward their horizontal position, thereby lifting the bulk of the fire in chamber B from the bottom, so that when the sliding plate M is operated by the lever and connections Z the ashes drop down into a hopper N, below which is a traveling endless non-combustible belt O of any length, revolving over pulleys P, which conveys the ashes from the hoppers N away from the boiler or boilers to any desired position, depositing them down an incline, as at Q. The back portion of the chamber B is heated to redness, and by the air and smoke passing through the fire and inclined openings R it is consumed, thereby adding to the efficiency of the boiler, no cold air being allowed to enter the furnace-tubes A except that which passes through the body of the fire in chamber B.

The fuel may be supplied to the fires by any of the well-known mechanical stokers.

In the drawings the fuel is fed from the hoppers S by the revolving crushing-rollers T, operated by the driving-pulley U, coned for the regulation of speed through the train of gearing V. The shafts of the two crushing-rollers in each hopper are connected by spur-wheels W W, so that both revolve in the direction of the curved arrows, thus crushing and depositing the coal onto the fire below in the respective chambers B. It is, however, well known that the principal object of all mechanical stokers hitherto in use is to project fuel evenly over the fire, involving various mechanical contrivances for accomplishing that object. The drawback to the more general adoption of such mechanical stokers is the great wear and tear of the mechanical parts which effect the projection of the fuel to varying distances onto the fire. In my improved means of stoking all such parts are dispensed with and the fuel falls vertically onto the fire in quantities capable of regulation by well-known mechanical means.

In Fig. 6 the louver-bars C are mounted, as before described, and capable of regulation as to amount of opening by the operating-lever L. The fuel in this case may be supplied through an opening at Y, which may be provided with a door.

All the air required for combustion is drawn from the outside and inclined downward onto the fire through the openings between louver-bars C and through the openings R, formed in the brick-work in the fire-back, into the main flue provided with an ordinary damper D′.

The bottom of the fire-chamber B is provided with a sliding plate M, which on being withdrawn allows the ashes to fall into the chamber C′, constructed similar to that of an ordinary range or stove.

What I claim is—

1. The combination of hopper S, from which the fuel falls vertically into a chamber B, having adjustable louver-bars C, a sliding plate M, ash-hopper N, and a carriage-belt O, all arranged and operated substantially as described.

2. In a mechanical stoker, the combination of the louver-bars C and operating mechanism with the chamber having a perforated and inclined back, and a sliding plate M at the bottom, all arranged and operated substantially as described.

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

EDWIN MARSH.

Witnesses:
JOHN WAUGH,
JOHN GILL.