Specification of James Buchanan : smoke-consuming apparatus applicable to boiler and other furnaces.

Contributors

Buchanan, James.

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A.D. 1857, 4th DECEMBER. N° 3005.

SPECIFICATION

OF

JAMES BUCHANAN.

SMOKE-CONSUMING APPARATUS APPLICABLE TO BOILER AND OTHER FURNACES.

LONDON:
PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
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A.D. 1857, *4th December*. N° 3005.

Smoke-consuming Apparatus applicable to Boiler and other Furnaces.

LETTERS PATENT to James Buchanan, of Liverpool, in the County of Lancaster, Engineer, for the Invention of "IMPROVEMENTS IN SMOKE-CONSUMING APPARATUS APPLICABLE TO BOILER AND OTHER FURNACES."

Sealed the 25th May 1858, and dated the 4th December 1857.

PROVISIONAL SPECIFICATION left by the said James Buchanan at the Office of the Commissioners of Patents, with his Petition, on the 4th December 1857.

I, JAMES BUCHANAN, of Liverpool, in the County of Lancaster, Engineer, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN SMOKE-CONSUMING APPARATUS APPLICABLE TO BOILER AND OTHER FURNACES," to be as follows:—

My Invention consists in an arrangement of machinery by which I obtain a self-acting apparatus and perfect combustion or consumption of the gases or smoke. The action of these my said improvements will be clearly understood by reference to the accompanying two Sheets of Drawings, in which similar letters of reference are used to represent the same parts in the different views.

Fig. 1, Sheet 1, is a front or elevation view of a furnace door with my improvements; Fig. 2 is a section of a^1, part of Fig. 1. *a* represents the furnace door frame; *b*, the slides or shutters, shewn shut; *c*, shews (broken

off) the perforated boxes attached to the back of the furnace doors *d*. When the furnace doors are opened for adding fuel they move the lever *e*, which is attached to one of them. This lever opens a cock *f*, which allows water to run into the cistern a^1. When sufficient water has run in to raise the float *g*, Fig. 2, to the top, the small arm *h* will shut the cock f^1, the float *g* and spindle *i* being raised to the top, the balance lever *j*, j^1, will be raised at the end marked j^1, and lowered at the other end, and as the slides or shutters *b* are connected to the lever j^1, j^1, by the chains, links, or rods *k*, *k*, so the one will be raised and the other lowered in the same proportion as the lever, and the space for admission of air (viz^t, the furnace door box) will be opened. These slides or shutters move on a spindle working in the furnace door's hinges, and at the other end inside of catches *l*. When the doors are closed after firing, the shutters or slides will begin to close (that is, the one will be raised and the other lowered) over the furnace door box in consequence of the water in the cistern a^1 being reduced by running constantly off through the tap *m*. On this tap is a dial for regulating the quantity of water to be allowed to run from the cistern; this quantity may be regulated according to the state or pressure of the atmosphere. When a large quantity of air is required to cause a proper combustion of the gases, a smaller quantity of water is allowed to run off, the float *g* therefore falls slower, and the slides *b* do not shut in so short a time as when a large quantity of water is allowed to flow through the tap *m*.

Fig. 3, Sheet 2, is a plan view of a furnace bottom with my improved reciprocating bars; and Fig. 4 is a side elevation of my improved bars *n*, which are short and fitted on cross bars *o*, and are made to oscillate by moving the lever *p* up and down, a few turns of which will serve to keep the furnace bottom clean, and will allow air to pass up from beneath into or through the fire. By these my improvements the stationary bars *q* will last much longer from the support received from the cross bars *o*; the stoker can clean the furnace bars very easily, and he does not require to open the furnace doors to allow air to rush in to cool the flues, the regulation of the air giving sufficient time to ignite the whole of the gases arising from the fuel, and then when the smoke is perfectly ignited or lighted the air is shut off; by this means complete combustion is obtained and the flues can never get over-heated. A saving in fuel is obtained by the gases being perfectly consumed, and also in labour by the apparatus being completely self-acting, as described. All these my improvements can be applied to furnaces with one or more doors and to those at present in use.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said James Buchanan in the Great Seal Patent Office on the 4th June 1858.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JAMES BUCHANAN, of Liverpool, in the County of Lancaster, Engineer, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Fourth day of December, in the year of our Lord One thousand eight hundred and fifty-seven, in the twenty-first year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said James Buchanan, Her special licence that I, the said James Buchanan, my executors, administrators, and assigns, or such others as I, the said James Buchanan, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN SMOKE-CONSUMING APPARATUS APPLICABLE TO BOILER AND OTHER FURNACES," upon the condition (amongst others) that I, the said James Buchanan, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said James Buchanan, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement (that is to say):—

The object of this Invention is to cause the gases arising from fuel in boiler and other furnaces to ignite, so that the smoke may be lessened and a saving in fuel obtained. This I effect by an arrangement of machinery which allows a quantity of air to enter the furnace and come in contact with the gases arising from the fuel. I regulate this quantity according to the quality of the fuel and state of the atmosphere.

The machinery by which I accomplish my object consists of two parts, the one attached to the furnace doors may be called self-acting, as the action is obtained by the opening and shutting of the doors; the other is a new and novel arrangement of the furnace bars; the former allows a larger or smaller quantity of atmosphere to pass into the furnace, a larger quantity imme-

diately after firing, which is gradually diminished or lessened as the fuel is consumed, the latter allows air to pass freely at all times into the furnace; it prevents the bars from "clinkering," consequently the doors do not require to be opened for "slicing," which wastes fuel, and they can be so arranged that the fires in ocean-going steamers' furnaces need not be burned down when sponging or cleaning the flues at sea.

But these my said improvements will be more clearly understood by reference to the accompanying Sheet of Drawings and the letters of reference thereon, in which Fig. 1 is a front elevation of a furnace door with my improvements attached; Fig. 2 is a section of a^1, part of Fig. 1; Fig. 3 is a section of an arrangement to do the same work as Fig. 2; Fig. 4 is a top view of Fig. 3; Fig. 5 is a plan view of a furnace bottom with my arrangement of bars; and Fig. 6 is a side elevation of my improved reciprocating or undulating bars.

In Figs. 1 and 2 the same letters of reference are used to represent the same parts in both views. *a* represents the furnace door frame; *b*, the slides, shewn shut; *c*, shews (broken off) the perforated plates or boxes for distributing air, attached to the back of the furnace doors *d*. When the furnace doors are opened for adding fuel they move the lever *e*, which is attached to one of them. This lever opens a cock *f* supplied with water, and allows it to flow into the cylinder or cistern a^1; when sufficient water has run in to raise the float *g* to the top, the small arm *h* will shut the cock f^1, the float *g* and spindle *i* being raised to the top, the balance lever j, j^1, will be raised at the end marked j^1 and lowered at the other end; and as the slides *b* are connected to the lever j, j^1, by the chains, links, or rods *k*, *k*, so the one will be raised and the other lowered in the same proportion as the lever, and the space for the admission of air (namely, the furnace door apertures or boxes) will be opened. These slides work on the furnace doors' hinge pins, and at the other end (or where necessary) on friction wheels. When the doors are shut after firing, the slides will begin to close (that, is, the one will be raised and the other lowered) over the furnace door apertures or boxes in consequence of the water in the cylinder a^1 being reduced by running constantly off through the tap *m*; on this tap is a dial for regulating the quantity of water to be run from the cylinder, which is adjusted according to the state or pressure of the atmosphere and the quality of the fuel. If a large quantity of air is required to cause proper combustion of the gases, a smaller quantity of water is allowed to run off; the float *g* therefore falls slower, and the slides *b* do not shut in so short a time as when a large quantity of water is allowed to flow through the tap *m*. The foregoing arrangement is intended for land

or stationary furnaces, and they can be applied to furnaces with one or more doors.

In Figs. 3 and 4 the same letters of reference are used to represent the same parts in both views. I attach the lever or connecting rod *a* (shewn broken off in Fig. 4) to the furnace door, the other end is jointed to a beam or double crank *b*, to which is attached the wedge *c*; this wedge when the door is opened for adding fuel raises the piston and rod *d* by the stud *e*, and as the slides are attached to the piston rod the apertures in the furnace door are opened, it also opens the spring valve *f* by causing it to press on the pin *g* and allows the water in the cylinder to flow under the piston; when the door is again closed the wedge *c* is withdrawn, and the helical spring *h* placed betwixt the cylinder cover and the piston, (which, when the door was open was contracted,) is now forcing the water through the tube *i* into the cylinder above the piston, and as the piston descends in the cylinder the slides are closing over the apertures in the furnace door. The quantity of atmospheric air required is regulated (as in Figs. 1 and 2) by allowing a larger or smaller quantity of water to pass the tap *j*. The arrangement last described is intended for marine and locomotive furnaces where there is one door, but it can be used where there are two doors and also for stationary furnaces. Other fluids than water may be used.

In Figs. 5 and 6 the same letters of reference also represent the same parts in the different views. *a*, *a*, represent the stationary bars; *b*, *b*, my reciprocating or undulating bars, which are shewn placed alternately with the stationary bars fixed on cross bearers *c*; to the lower part or bottom of the bars is affixed the lever *d*; a few up-and-down movements of the handle or lever *e* which is attached to them will serve to keep the furnace bottom clean, and allow air to pass freely into or through the fuel. Where large furnaces are used the bottom may be divided into two or more parts by the arrangement of the levers *d* and handles *e*. In the case of ocean-going steamers' furnaces already mentioned, when "sponging of tubes" is necessary at sea, it may be necessary to have the back or two back rows of my bars separately connected, that is, on a lever by themselves. All these my improvements can be applied to furnaces at present in use.

Although I have described my Invention under certain forms and arrangements of the different parts as exhibited in the Drawings, still I do not confine myself thereto, as such may be varied or modified without departing from the principle of the same; but I claim as my Invention, and which to the best of my knowledge and belief has not been hitherto used within the realm,—

Buchanan's Improvements in Smoke-consuming Apparatus.

Firstly, the general arrangement of the furnace door apparatus, consisting of the cylinder and fluid regulating tap acting on the slides, the movements being received by the opening and shutting of the furnace doors.

And, secondly, the reciprocating bars fitted on cross bearers, and arranged so that the whole or part of them can be moved at once, as all such improvements are herein described, and illustrated in the accompanying Sheet of Drawings.

In witness whereof, I, the said James Buchanan, have hereunto set my hand and seal, this Third day of June, in the year of our Lord One thousand eight hundred and fifty-eight.

JAMES BUCHANAN. (L.S.)

Signed, sealed, and delivered by the within-named James Buchanan, in the presence of

GEORGE SMITH, Patent Agent,
4, Clayton Square, Liverpool.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1858.

A. D. 1857, Dec. 4, N° 3005.
BUCHANAN'S Provisional Specification

(2 SHEETS.)
SHEET 1.

FIG. 1.

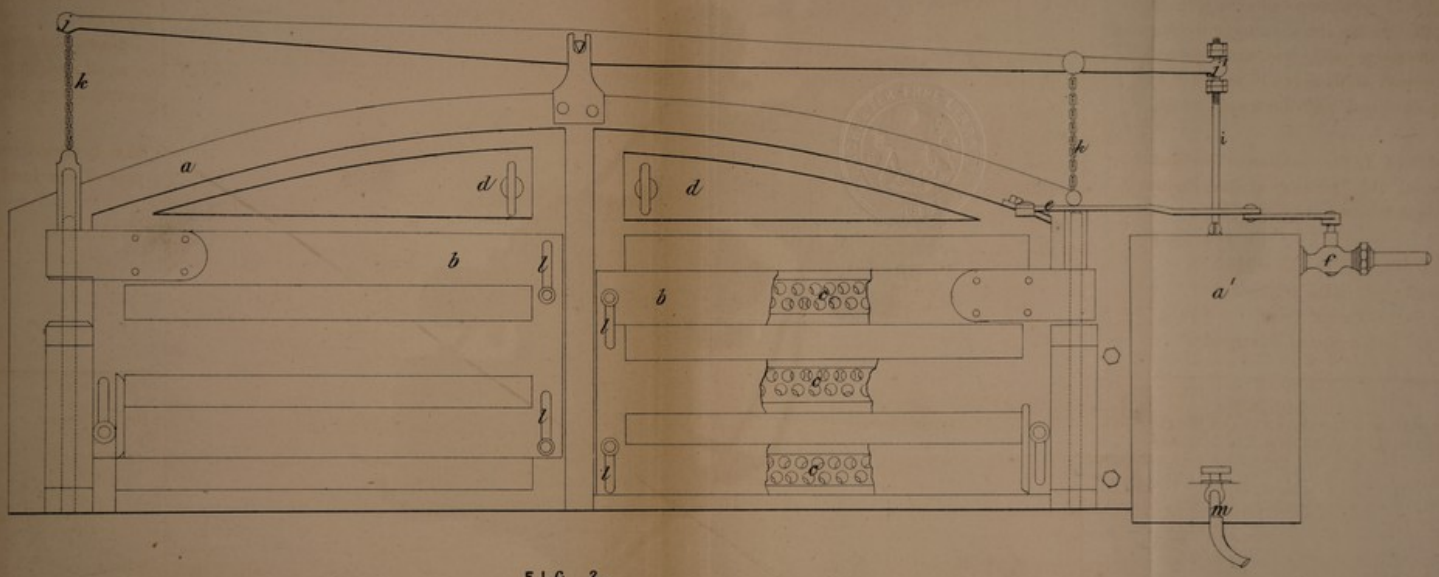
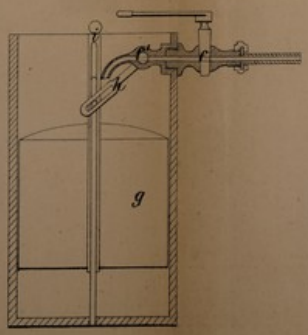


FIG. 2.



The drawing left with Provisional Specification is not colored.

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FIG. 3.

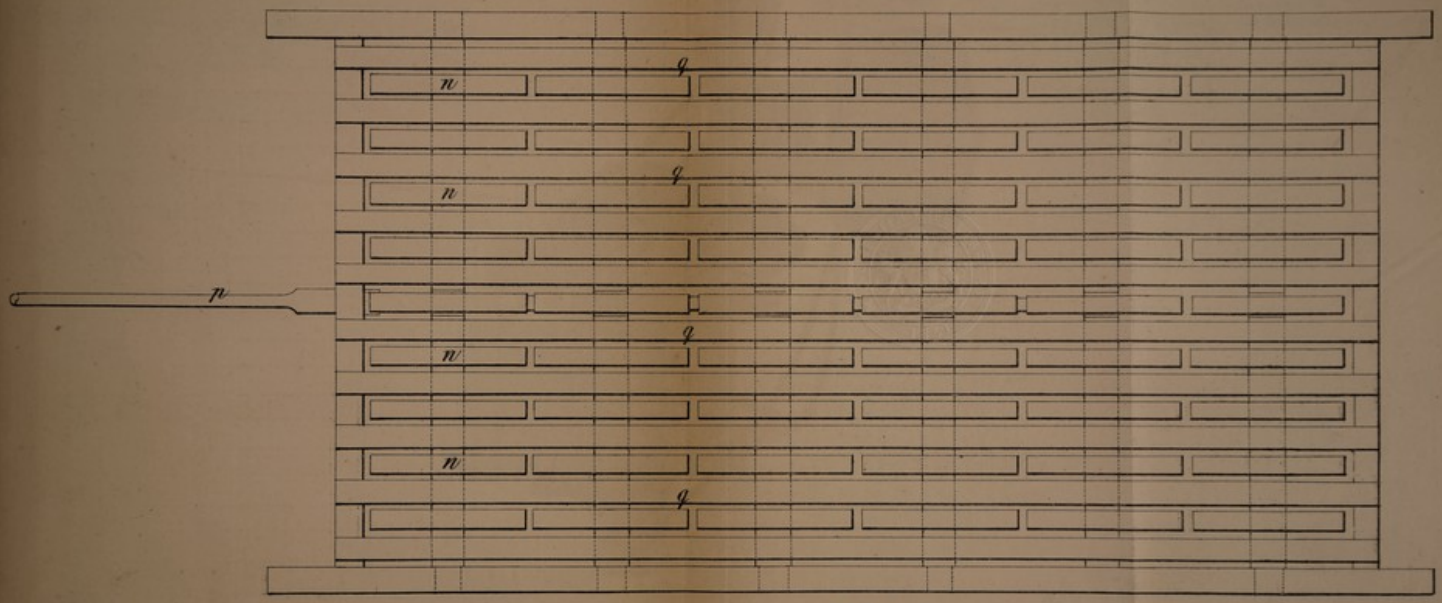
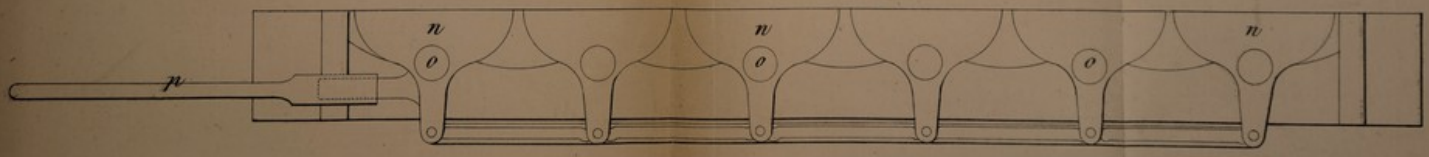


FIG. 4.



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A.D. 1857. Dec. 4. N°3005.
BUCHANAN'S Specification.

(1 SHEET)

FIG. 1.

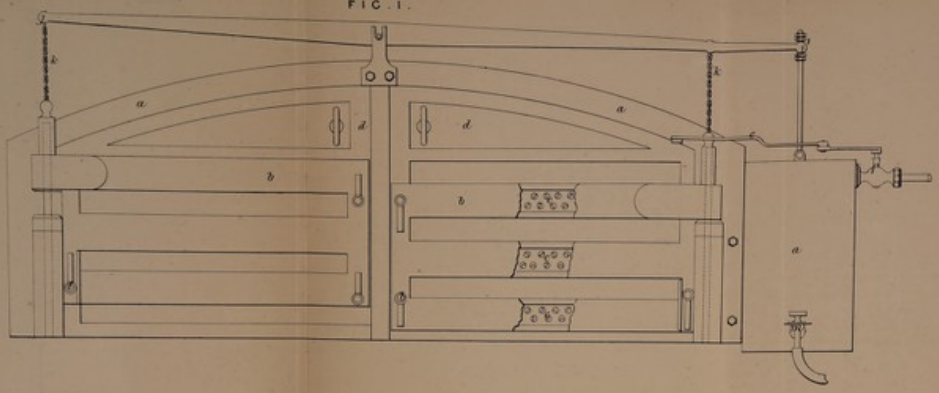

FIG. 2.

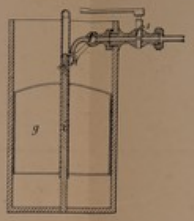

FIG. 5.

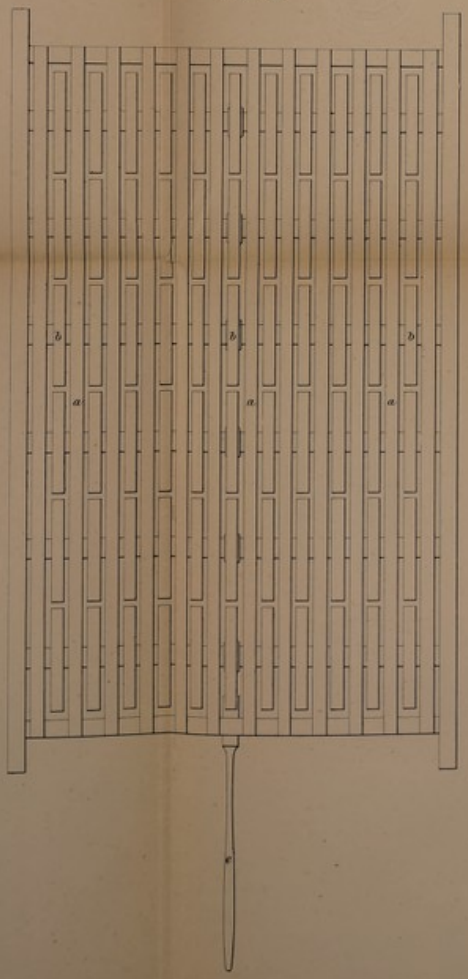

FIG. 6.

FIG. 3.

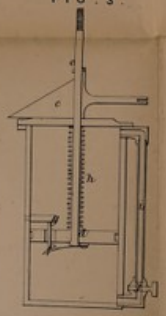

FIG. 4.

The filed drawing is not colored.

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