Specification of John Chanter and John Gray : furnaces of steam boilers.

Contributors

Chanter, John.
Gray, John.

Publication/Creation

London : Queen's Printing Office, 1854 (London : George E. Eyre and William Spottiswoode)

Persistent URL

https://wellcomecollection.org/works/c3bz38fs

License and attribution

Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
https://wellcomecollection.org

A.D. 1835 . . . . . N° 6920.

SPECIFICATION

OF

JOHN CHANTER AND JOHN GRAY.

FURNACES OF STEAM BOILERS.

LONDON:
PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY:
PUBLISHED AT THE QUEEN'S PRINTING OFFICE, EAST HARDING STREET,
NEAR FLEET STREET.

Price 9d.

1854.

A.D. 1835 . . . . . N° 6920.

Furnaces of Steam Boilers.

CHANTER AND GRAY'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, JOHN CHANTER, of Earl Street, Brackfriars, in the City of London, and of Upper Stamford Street, in the County of Surrey, Esquire, and JOHN GRAY, of Liverpool, in the County of Lancaster, Engineer, send greeting.

WHEREAS His present most Excellent Majesty King William the Fourth, by His Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Second day of November, in the Sixth year of His reign, did, for Himself, His heirs and successors, give and grant unto us, the said John Chanter and John Gray, His especial licence that we, the said John Chanter and John Gray, our exors, admors, and assigns, or such others as we, the said John Chanter and John Gray, our exors, admors, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick upon Tweed, our Invention of "**A NEW COMBINATION OF PARTS FORMING AN IMPROVED FURNACE FOR CONSUMING SMOKE AND ECONOMIZING FUEL, APPLICABLE TO LOCOMOTIVE CARRIAGES, STEAM BOATS, AND OTHER USEFUL PURPOSES**;" in which said Letters Patent is contained a proviso obliging us or one of us, the said John Chanter and John Gray, by an instrument in writing under our or one of our hands and seals, particularly to describe and ascertain the nature of our said Invention, and in what manner the same is to be performed, and to cause the same to be enrolled in His said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, we, the said John Chanter and John Gray, do hereby declare the nature of our said Invention to consist, as in the said Letters Patent is expressed, of a new combination of parts forming an improved furnace for consuming smoke and economizing fuel, applicable to locomotive carriages, steam boats, and other useful purposes, by which combination of parts we construct an additional fire grate, and are enabled to expose additional water surfaces to the action of heat, and consequently to obtain an increase of steam without a corresponding increase of fuel, and are also enabled to use a cheaper description of fuel than that at present adapted under particular circumstances, as by the arrangement herein-after described the smoke and other vapours arising from uncarbonized fuel is subjected to ignition and reduced to a state of perfect combustion or nearly so; and in further compliance with the said proviso, we, the said John Chanter and John Gray, do hereby describe the manner in which our said Invention is to be performed by the following statement thereof, reference being had to the Drawings annexed, and to the figures and letters marked theron, that is to say:—

Description of the Drawings.

Fig. 1 is a sectional elevation longitudinally of the furnace or fire box as applied to a locomotive engine, divided at the horizontal line A, A, in Figure 4, herein-after mentioned. Fig. 2 is a transverse section, divided at the vertical line B, B, Figure 1, and looking to the end of the fire box opposite the fire doors H, I. Fig. 3 is a transverse section, divided at the vertical line at C, C, Fig. 1, and looking in the direction of or towards the fire doors H, I. Fig. 4 is a plan of the water chamber passing through the furnace, as herein-after described, as shewn at the lines D, D, Fig. 1. The Drawings are made on a scale of one inch and a half to a foot, but we do not confine ourselves to the precise dimensions or form of any of the parts. The same letters of reference where used in different Figures refer to the same parts. E, F, Fig. 1, is the furnace or fire box constructed by external and internal metallic cases *a*, *a*, and *b*, *b*, in the mode usually adopted; *c*, *c*, being the water spaces between the inner and the outer casings of the fire box. The interior of the furnace or fire box is divided into two compartments E, F, by a water vessel or chamber passing through the furnace, and formed partly of tubular channels or hollow bars *e*, *e*, and partly by a water chamber *d*, *d*, and thus forming a water way or communication from the water space at *o*, to the water space at *p*. The hollow bars are constructed of any convenient number, and may be made

of greater width than depth where they emerge from the water chamber *d*, *d*, and tapering in breadth towards the centre of the boiler, increase in depth until their junction with the water spaces at *o*, as will be easily perceived and understood by referring to *e*, *e*, Figs 1 and 4. We prefer them thus constructed for the purpose of equalizing the action of the fire, maintaining an equal area throughout their length, and giving facility for driving the bolts or rivets through the side flanges which fix the bars to the casing of the fire box, as shewn at *f*, *f*, Fig. 4. This peculiar form is, however, not essential to the actual, and in some degree, beneficial working of the furnace, but it is the one we prefer. The water chamber and bars is connected at its upper and lower ends by flanges *f*, *f*, *f*, *f*, Figs 1 and 4, to the inner and outer casings of the fire box, the rivits being passed, as shewn by the dotted lines *r*, through hoops or thimbles *q*, *q*, which may, for practical convenience, be cast or constructed either separately in the usual manner or together, when they will form a solid bearing against the tension of the rivits when passed through the two casings *a*, *b*, of the fire box, as shewn by the dotted lines at *r*; they also act as a stay or support to the casings of the fire box, and they facilitate repairs, as the rivits and the water chamber and bars may be easily removed and replaced at the dead plate *n* (herein-after described) whenever it becomes necessary, without disturbing the casings of the fire box.

The water chamber extends to within a short space to the two opposite sides of the inner casing of the fire box, as shewn at *g*, *g*, in Fig. 4, which method of construction is adopted for the purpose of simplifying the manufacture. The passage of smoke or gas from the lower fire or uncarbonized fuel herein-after described between the sides of the water chamber and the sides of the fire box is prevented by fixing a plate of iron on and to the water chamber *d*, *d*, extending as far as the division or determination of that chamber into tubes or hollow bars fitting closely to the sides of the fire box, and covering the space between those sides and the sides of the water chamber, as shewn by the dotted lines *u*, *u*, Fig. 3. *k*, *k*, Fig. 1, is a solid metallic dead plate, having a descending flange from its sides which is rivitted to the inner casing of the fire box sufficiently close to prevent any escape or passage of smoke or gas between the joinings, and having a bracket plate *m*, on which one end of the grate bars *l* rests, their other ends resting on a horizontal bar of iron extending from side to side of the furnace, a transverse section of which bar is shewn at *i*. *n* is a dead plate rivitted to the bearing bar *i*, and resting at its upper side against the flange *f*; this dead plate is so placed for the purpose of reducing or preventing the intense action of the fire at the muzzle of the hollow bars *e*, which might otherwise partially prevent

the flow of water through those bars; it is also intended for the purpose of forming a terminus to the fire on the grate bars *l*, and it can be easily removed when necessary. *h* is an earthenware tile or fire lump or lumps extending from side to side of the fire box, and placed under the water chamber *d*, *d*, and assists in the process of roasting or coking, and extracting the gasses from the fuel beneath it, by reverberating upon the fuel on the dead plate *k* the heat which it receives by means of its position in the furnace, and it tends in some degree to the uniform operation of the furnace. Q is a chimney, furnished with a damper, which is to be opened for the purpose of increasing the draft of air through the furnace when found requisite, and for discharging the excess of heat when the steam from the boiler is shutt off from the cylinders; the damper must be kept closed at other times. This chimney is only useful in cases where the natural current or draft of air is but small, as in locomotive engines, and under most other circumstances it may be dispensed with. H, I, are the fire doors. L, L, is the frame or ring for uniting the inner to the outer casing of the furnace or fire box; and *s*, *s*, are the tubes or flues passing from the furnace to the cylindrical or other boiler T of the engine. By the management above described the gaseous products of the fuel on the dead plate *k* are nearly all compelled to pass over the fire on the grate bars *l*, where they will in a great measure become inflamed, and in cases where a small degree of smoke is not of importance, and the greatest degree of heat and consequent power is not required, a fire on the hollow grate bars *l* may be dispensed with.

It is not essential that the part *e*, *e*, of the water chamber *d*, *d*, should be divided into bars of the particular form above described, and which we have specified as one mode of carrying our Invention into effect, but various plans may be adopted: for instance, a beneficial effect would be produced if the water chamber was perforated at *e*, *e*, with holes for the passage of the gasses and air from the lower fire; but we believe its action would not be so perfect as if it were made upon the construction above described.

When the furnace constructed as above described is put into full action a fire is to be made in the upper division E of the furnace or fire box on the hollow bars *e*, *e*, with coke, charcoal, or other carbonized or partially burnt fuel introduced through the upper fire door H; and a fire is also to be lighted on the bars *l* with coal or other uncarbonized and suitable fuel, producing smoke and gasses, introduced at the lower fire door I; the further supplies or charges of coke or other carbonized fuel are to be laid on the water chamber *d*, *d*, and of coal on the dead plate *k*, *k*; the coke and coal will thus respectively become

partially and progressively heated and prepared for combustion as that on the bars is consumed, and will either gradually descend on the fires or must be propelled or moved forwards by the fireman, and the charges replenished as occasion requires. As the fuel on the bars becomes consumed it is obvious that the coal on the dead plate *k* will become gradually heated or roasted, and together with the coal in a state of active combustion on the grate bars *l* will give out its gasses and moisture, which must pass through the openings *t*, *t*, between the hollow bars *e*, *e*, Figure 4, and the interstices of the ignited fuel on the same, the smoke and gasses arising from that part of the fuel which is under the water chamber *d*, *d*, being compelled by the extended form of that chamber to traverse a considerable portion of the surface of its own fire before it can make its escape at the apertures between the hollow bars, where it becomes subjected to the intense heat of the upper fire; by these means the passage of the gasses from the coal fire is retarded until the requisite quantity of atmospheric air passing from the ash-pit through the grate bars *l*, which is indispensable to their combustion, is combined with them; in passing through the inflamed fuel they become heated to the high degree which is alike indispensable to their ignition; the hydrogen and other combustible gasses, which constitute a large and valuable part of the weight of coal, and which in ordinary furnaces are distilled and wasted through the chimney, are thus rendered productive of heat and flame, and made available as fuel; and as the smoke is also by this means consumed or considerably reduced, a large proportion of coal instead of coke may be used, thereby effecting an important saving in the first cost of fuel, and converting that which was a nuisance to a profitable and useful purpose; and the heat thus obtained may be applied to the heating of places, fluids, and substances, and many other purposes.

When the combination of parts above described is applied to a different construction of the boilers of locomotive engines than that now usually adopted, or to the boilers of fixed or marine steam engines, or in other positions or for other purposes, slight modifications in the arrangements may be requisite to adapt it to its altered situation or form; but it is unnecessary particularly to enter into detail of such modifications or of the particular dimensions applicable to various cases, as they will vary according to circumstances, attention to the general remarks and the description given in the above statement, and to the Drawings referred to, being sufficient to lead any person conversant with the manufacture of such apparatus generally to adopt the dimensions and form to any particular case; and the arrangement and construction of many of the minor parts may be modified according to the size of the apparatus, the situa-

tion in which it is placed, and the circumstances governing the same, without at all deviating from our Invention as we define the same. The various parts may be constructed of such metals or substances as are suited to the nature of the work to be performed, and the degree of strength, power, and durability required; but we prefer a composition of one part zinc, one part tin, and twenty-eight parts of copper for the construction of the hollow water chamber above described.

Now whereas we have by these presents, and the Drawings thereby referred, in compliance with the said proviso, described the nature of our said Invention of a new combination of parts forming an improved furnace for consuming smoke and economizing fuel, applicable to locomotive carriages, steam boats, and other useful purposes, and in what manner the same is to be performed, we claim as our Invention, first, the construction and application of the water chamber passing through the furnace constructed with hollow bars or apertures forming an upper fire grate, whereon coke or other carbonized or partially carbonized fuel may be used, and through which the air and gasses from a lower fire must pass before they can escape or be discharged by the flues of the furnace, and by which means the smoke and gasses will be ignited or consumed; and, secondly, the combination of parts herein-before described, and by means of which we apply the same; and such our Invention being to the best of our knowledge and belief entirely new and never before used within that part of His said Majesty's United Kingdom of Great Britain and Ireland called England, His said Dominion of Wales, or Town of Berwick upon Tweed, we do hereby declare this to be our Specification of the same, and that we do verily believe this our said Specification doth comply in all respects fully and without reserve or disguise with the proviso in the said herein-before in part recited Letters Patent contained. Wherefore we do hereby claim to maintain exclusive right and privilege to our said Invention. And, lastly, we declare that we do not claim originality in the partial distillation of the fuel employed previous to actual ignition in furnaces, nor in consuming smoke or inflaming gas by passing it over and through fire, various methods having been devised for that purpose; but the peculiarity of our Invention consists, as herein-before stated, in using for that purpose a water chamber of the construction or of a similar construction and in the general improved combination of parts as above described; and although we have described many parts of the said improved furnace and the means of connecting them which are not new, we have done so solely for the purpose of rendering our Invention clearly understood, and shewing the different combination of the parts, and not as claiming them,

A.D. 1835 Nov 2. N° 6920.
CHANTER & GRAY'S SPECIFICATION.

(1 SHEET)

FIG 1.

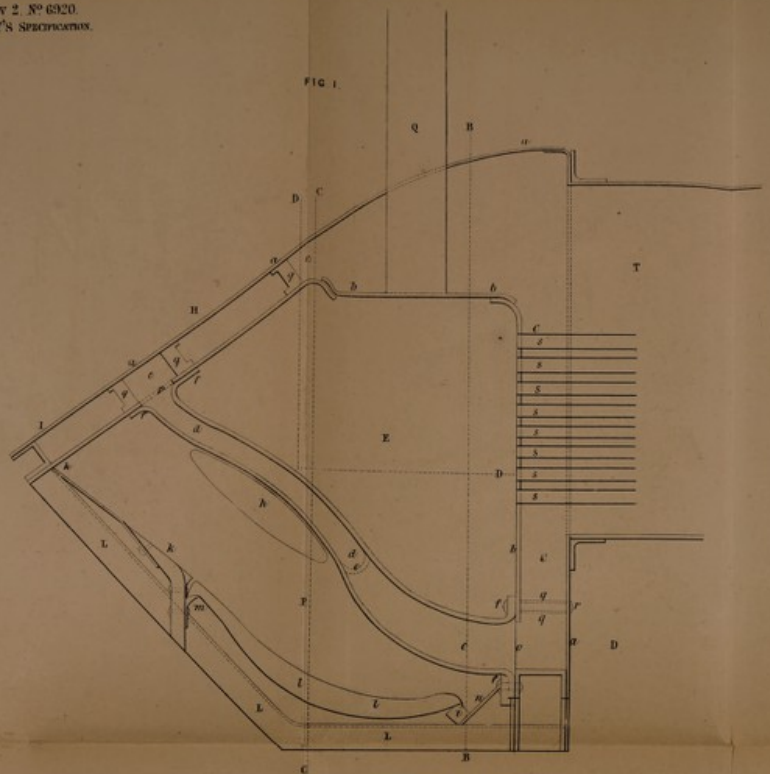


FIG 3.

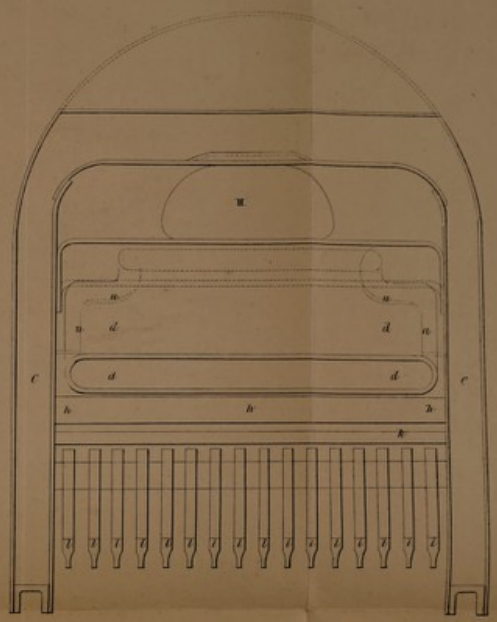


FIG 2

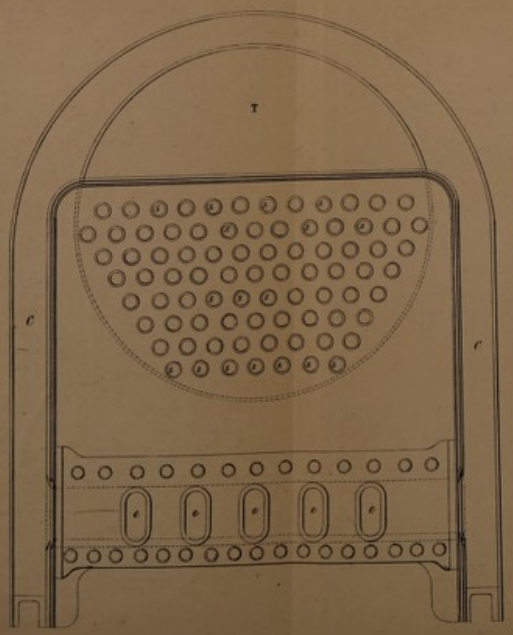
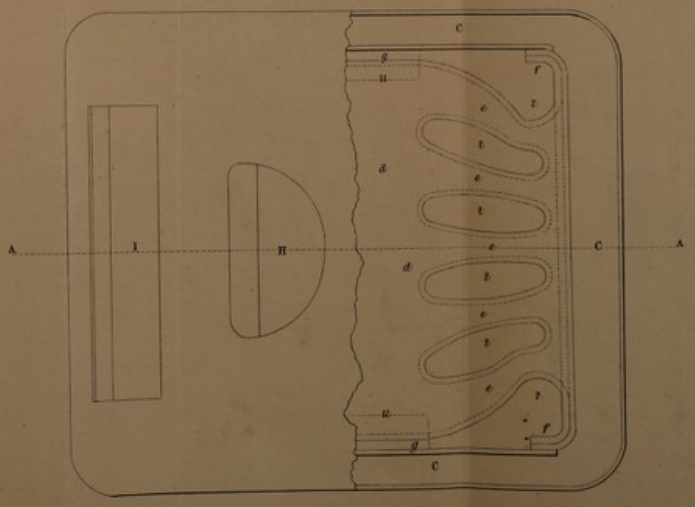


FIG 4.



The verified drawing is partly coloured.

Drawn on Stone by Bailey & Sons.

LONDON: Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE
Printers to the Queen's most Excellent Majesty. 1854.

and we accordingly disclaim the same, and do not confine ourselves to the particular modes described for that purpose, as other well-known plans, too numerous to be detailed, may be adopted as circumstances require.

In witness whereof, the said John Chanter and John Gray have hereunto set their hands and seals, the Thirtieth day of April, in the year of our Lord One thousand eight hundred and thirty-six.

JOHN (L.S.) CHANTER.
JOHN (L.S.) GRAY.

Signed, sealed, and delivered and acknowledged by the within-named John Chanter and John Gray in the presence of

H. ERNEST,
4, Gordon Street,
Gordon Sq.,
London.

AND BE IT REMEMBERED, that on the Thirtieth day of April, in the year of our Lord 1836, the aforesaid John Chanter and John Gray came before our said Lord the King in His Chancery, and acknowledged the Specification aforesaid, and all and everything therein contained and specified, in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statute made for that purpose.

HENLEY.

Inrolled the Second day of May, in the year of our Lord One thousand eight hundred and thirty-six.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1854.