Specification of John Sylvester : communicating heat to boilers.

A.D. 1835 . . . . . N° 6789.

SPECIFICATION

OF

JOHN SYLVESTER.

COMMUNICATING HEAT TO BOILERS, &c.

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A.D. 1835 . . . . . N° 6789.

Communicating Heat to Boilers, &c.

SYLVESTER'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOHN SYLVESTER, of Bloomsbury, in the County of Middlesex, 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 Eleventh day of March, in the fifth year of His reign, did, for Himself, His heirs and successors, give and grant unto me, the said John Silvester, His especial licence, full power, sole privilege and authority, that I, the said John Silvester, my exors, admors, and assigns, or such others as I, the said John Silvester, my 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, and also in all His said Majesty's Colonies and Plantations abroad, my Invention of "CERTAIN IMPROVEMENTS IN APPARATUS USED IN THE COMMUNICATION OR TRANSMISSION OF HEAT TO AERIFORM, LIQUID, AND SOLID BODIES;" in which said Letters Patent is contained a proviso that I, the said John Silvester, shall cause a particular description of the nature of my said Invention, and in what manner the same is to be performed, to be inrolled in His said Majesty's High Court of Chancery, within six calendar months next and immediately after the date of the said in part 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, I, the said John Silvester, do hereby declare that the nature of my said Invention, and the manner in which the same is to be carried into effect, are fully set forth and explained in the following description thereof, and elucidated by the Drawings hereunto annexed, reference being had to the figures and letters marked on the Drawings in correspondence with the same figures and letters herein contained (that is to say) :—

I shall first shew the nature of my Invention, and the practical operation of it, in its application to steam boilers, and to other vessels for the heating and evaporation of water or other liquids, and afterwards describe some of the variations required in the adaption of it to the heating of acriform and of solid bodies; and first, my Invention as applied to steam boilers or other vessels for the evaporation of water or other liquids consists of, and is carried into effect by, a number of conoidal protuberances ascending into the mass of water or other liquid to be heated, and also of a number of lower protuberances descending from the general plane of the bottom towards the fire, which protuberances being in one entire mass with the bottom of the vessel, may be strongly heated at the ends exposed to the fire without being destroyed by burning, because the heat is thence rapidly transmitted to the water or other liquid by the conducting power of the metal or other conducting material of which the vessel may be constructed.

Fig. 1 represents a portion of the bottom of my boiler or evaporating vessel, shewing the protuberances herein-before mentioned. A is a vertical section through the bottom of the vessel, and a view of the said protuberances; B is a section through the bottom of the vessel, and through the middle of the said protuberances. The proportionate elongation of these protuberances may be varied according to circumstances, but I generally prefer making them about the size, form, and proportions shewn in the Drawings, and placing them in rows at equal distances from each other, both in the length and breadth of the bottom of the vessel. A boiler bottom thus formed, I place as near down upon the fire as can be effected consistently with allowing space for feeding, for stoking, and for clear combustion, the nearer the lower protuberances are to the fire the more intense will be the heat which they absorb, and the longer may be the upper protuberances, so as to increase the quantity of freely transmitting surface, and thereby continually to abstract the heat from the metal or other conducting substance, as fast as the heat is received from the fire, and thus any injurious accumulate of heat in the substance of the boiler bottom tending to its being burnt away is avoided, and sometimes I make my protuberances in the bottom of the

boiler or other vessel in the form of continuous parallel ribs, each rib stretching across nearly the whole width or along nearly the whole length of the bottom, leaving grooves or channels between the ribs about equal to the spaces between the conoidal prolongations herein-before described, and across groove at one end or at each end of the parallel grooves, into which the liquor from all the parallel grooves may run and be drawn off through a cock at the end of the cross groove; when only one cross groove is used, the bottom may be inclined a little to the horizon, in order that all the liquor may be discharged, but when two cross grooves are formed the middle parts of the parallel grooves may be somewhat elevated, in order that the liquor may run both ways into the side or end grooves, which grooves also may be a little inclined to facilitate the running off of the liquor. The section B, Fig.1, will also represent a vertical section across the parallel ribs. The sides and top of the boiler may be made in any common manner. This rib form of bottom affords a great degree of strength beyond that of a plain bottom of ordinary thickness, and beyond that with the conoidal prolongations as herein-before described, the ribs allowing the means of making a boiler bottom of much larger dimensions, and yet possess greater capability of resisting the force of steam than either of the other two forms permit. The conoidal protuberances are most easily formed by casting, but the rib form will generally be made of iron or copper rolled into the figure represented by the section (B, Fig. 1). This form may be manufactured in plates of a convenient width, length, and number of ribs, and the plates rivetted together to make up the required dimensions. Another mode of forming a ribbed bottom is to roll or cast each rib in one piece with a projecting flanch on each side, and to bolt a number of such pieces together to make up the required width of the bottom. Fig. 2 shews a cross section of a bottom thus formed; (*a*), the ribs; (*b*), the bolt; (*c*) a portion of the side of the vessel; Fig. 3 shews a section of a plate with ribs of another form, which may easily be produced in rolled metal; a fireproof cement may be used in the joinings. The ribbed plates afford the means also of giving great strength to very broad and flat or shallow flues passing through steam boilers. But as the intensity of the heat in the flues will be less than that near the fire, the ribs do not require to be so thick or so numerous in the same space, and therefore the size and number of the ribs will be determined by the requisite strength of the flue to resist the pressure of steam. Fig. 4 represents a useful form and proportion for inch plates. As the strength is derived from the ribs, the plates of the flues may be made very thin without risk of being injured by heat, for the conducting power of the contiguous ribs will operate in aid of the water to abstract the heat from the

plates as fast as it enters. In adapting my improvements to the evaporation of saccharine, saline, or other solutions, I make the bottom of the evaporating vessel with ribs as in my steam boiler, but generally increase the dimensions both of ribs and spaces; and solid deposit in the grooves may, by means of a rake or scraper, made to fit the grooves, be scraped into cross grooves, from which a scraper fitted to that groove will convey the contents through a suitable opening in the end or side of the vessel. Fig. 5 shews a section of part of a ribbed bottom of an evaporating vessel for saccharine, saline, or other solutions, which bottom may be of cast metal or of burnt earth, according to the corrosion or anti-corrosive nature of the solution to be evaporated; (*a*) shews a perforation through the thin part of the bottom between the ribs, in order to intercept the heat, and prevent a too free communication of the same in cases where any deposit might be injured by an excess of temperature. Fig. 6 shows a section without the intercepting perforations; when the evaporating vessel is made of earthenware it may be constructed in pieces as large as can conveniently be burnt, and these pieces may be built together and supported upon walls, beams, or other bearers, allowing free access for the fire. In the transmission of heat to solid bodies, as in the roasting of ores, the extracting of gas from coals and other substances, I make the bottom of a retort in a similar manner to the bottom of the evaporating vessel last described, but allow the grooves to be of sufficient width for the reception of the lumps of ore, of coals, or of other substances, and this width must obviously be adapted to the dimensions into which such solid bodies may conveniently be broken; the less the width of the grooves, provided the lumps will fall down into them, the more effectually will the heat be transmitted into the masses of solid fragments, but the grooves must be large enough to allow the residue of the process to be easily removed. Retort bottoms may on this plan be made of large dimensions, and the sides and top formed of any convenient figure. In applying my improvements to the drying or roasting of malt, grain, or other substances, a floor may be made of ribbed metal in the manner described for the bottom of my steam boiler; but I prefer in this case making the floor compactly burnt earth or earthenware, in order that there may be no danger of the heat being too rapidly transmitted to the malt, grain, or other substances, by which their quality might be injured. This floor may conveniently be made of ribbed tiles, supported at their joinings in such a manner as to allow of the free action of the fire under them. Fig. 7 shews a section of part of a drying floor when made of earthenware, but a metal floor will admit of protuberances more slender and still deeper; and sometimes, for the purpose of roasting grain, coffee, cocoa, and other berries, I construct a revolving hollow cylinder with

longitudinal ribs, like the bottom of my steam boiler, herein-before described, the ribs being placed inside the cylinder, whereby I greatly increase the surface in contact with the article to be roasted, and thereby transmit the heat more equally to the same. And for the transmission of heat to aeriform bodies I make a conoidal prolongation of earthenware, or other convenient material, and surround it by a tube of the same or other material, which tube has several perforations around through its lower end, all the perforations taken together being equal to the area of the mouth of the tube. These perforations allow air to flow in and impinge against the protuberance, and abstract the heat, and carry it up and out of the mouth of tube into any fit receptacle. Fig. 8 represents a section through the middle of a block of burnt earth or other convenient material, composed of a conoidal prolongation, projecting above and below a quadrangular base, upon which base stands a tube or funnel, surrounding the prolongation, and extending above it, the funnel terminated by a quadrangular cap at the top, of about the same lateral dimensions as the base. Fig. 9 is an exterior view of the same. (*e*), the tube or funnel; (*f*), the quadrangular cap; (*g*), the quadrangular base; (*h*), the prolongation; (*i*), apertures through the bottom of the tube, to admit currents of air, the directions of which are exhibited by arrows, and I extend the heating power of this apparatus by affixing and cementing any convenient number of these blocks together, base to base, and cap to cap, and enclosing the whole to form a chamber around the outsides of the tubes, through which chamber the air is supplied to the apertures in the tubes; and I form another distinct chamber over the mouths of the tubes, from which the heated air may be conveyed to any required situation. And although I have, for the sake of clearer explanation, described my heat-conducting conoidal prolongations and ribs as being protuberant upwards and downwards from the general plane of the bottom of my boiler or other vessel of the retort, and of the bases of the blocks, yet I do not hold that circumstance to be indispensable to the successful operation of my Invention; for when the fire is applied very near to the surface to be heated, and the upper prolongations are proportionally increase in height, the under surface of the bottom of the boiler or other evaporating vessel of the floor of the retort, and of the blocks may present a plane surface to the fire.

And I do lastly declare that I claim as my Invention of improvements in apparatus used in the communication or transmission of heat to aeriform liquid and solid bodies, the elongated heat conducting conoidal protuberances; and also the same united into ribs, both kinds ascending into and among the masses of aeriform liquid or solid bodies to be heated; and also, in the pro-

jecting downwards towards the fire of continuations from the same protuberances when it shall be desirable to increase the effect by receiving the heat from a more intense fire.

And I disclaim the mere extension of surface by corrugation or waving of plates of metal or other material, because that mode does not afford a sufficient body of heat-conducting material to allow the lower part to receive an intense degree of heat, and conduct it rapidly into the mass to be heated, and thus prevent the destructive accumulation of heat in the parts next the fire.

In witness whereof, I, the said John Sylvester, have hereunto set my hand and seal, this Tenth day of August, in the year of our Lord One thousand eight hundred and thirty-five.

JOHN (L.S.) SYLVESTER.

ROUPELL.

AND BE IT REMEMBERED, that on the Tenth day of August, in the year of our Lord 1835, the aforesaid John Sylvester came before our said Lord the King in His Chancery, and acknowledged the Specification aforesaid, and all and every thing 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.

Inrolled the Eleventh day of September, in the year of our Lord One thousand eight hundred and thirty-five.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1857.

A. D. 1835, March 11, N° 6769.
SYLVESTER'S Specification.

1 SHEET

FIG. I.

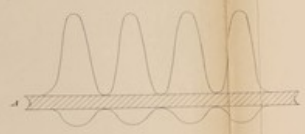

FIG. II.

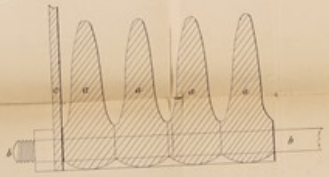

FIG. III.

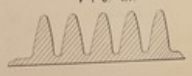

FIG. IV.

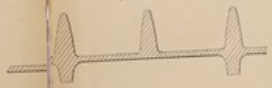

FIG. V.

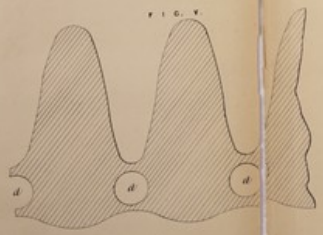

FIG. VI.

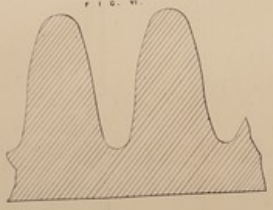

FIG. VII.

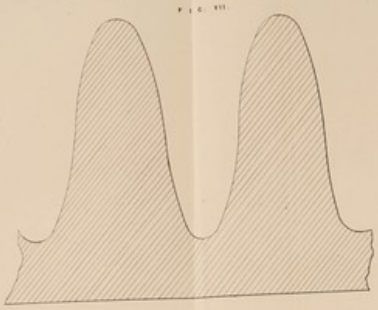

FIG. VIII.

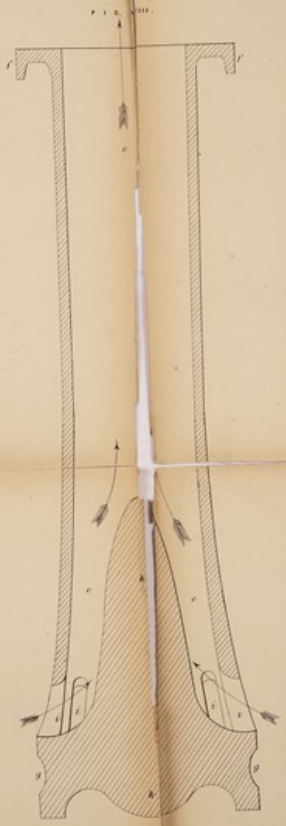

FIG. IX.

The accidental shewing is not coloured.

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