J. Laing,

Steam-Boiler Fire-Tube.

No. 31,985. Patented Apr. 9, 1861.

Witnesses:
W. Hauff
J. F. Buckley

Inventor:
John Laing

UNITED STATES PATENT OFFICE.

JOHN LAING, OF HOBOKEN, NEW JERSEY.

GAS-GENERATING STEAM-BOILER.

Specification of Letters Patent No. 31,985, dated April 9, 1861.

To all whom it may concern:

Be it known that I, JOHN LAING, of Hoboken, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Gas-Generating Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1, represents a front elevation of my invention. Fig. 2, is a longitudinal vertical section of the same, taken in the plane indicated by the line *x*, *x*, Fig. 1. Fig. 3, is a similar section of the same, the line *y*, *y*, Fig. 1, indicating the plane of section. Fig. 4, is a transverse vertical section of the same, the plane of section being indicated by the line *z*, *z*, Fig. 2. Fig. 5, is a similar section of the same, taken in the plane indicated by the line *x'*, *x'*, Fig. 2. Fig. 6, is a detached horizontal section of a portion of my invention on an enlarged scale, the plane of section being indicated by the line *y'*, *y'*, Fig. 2.

Similar letters of reference in all the figures indicate corresponding parts.

This invention consists in combining one or more retorts with a steam boiler in such a manner, that the same fire which is employed to convert the water in the boiler into steam, also heats the retort or retorts and that by introducing suitable materials into said retort or retorts, steam and illuminating gas are produced simultaneously; also in the arrangement of a series of gas pipes and air holes in combination with an additional fire chamber situated in close proximity to the ordinary, or main fire chamber in such a manner, that by the action of the gas and air thus introduced into said secondary fire chamber the smoke and other combustible gases escaping from the main fire chamber are consumed and an additional heating surface is obtained; further in the employment of a three-way cock in combination with a conical vessel with a conical bottom in such a manner, that the oil and water used for the manufacture of the illuminating gas are mixed before entering the retort or retorts; also in combining with said three-way cock two gasometers and a series of levers with weights or springs in such a manner, that the supply of the oil and water to the retorts is regulated by the quantity of gas in the gasometers.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation with reference to the drawing.

A series of retorts A, are arranged in the upper part of the fire chamber B, of a steam boiler C, in such a position, that the flame of the fire plays freely all around said retorts and that the same fire, which is employed to convert the water in the boiler into steam, also serves to heat the retorts. The retorts are charged with oil and water, or with some other material, which on being heated, forms illuminating gas, and the gas thus formed passes off through tubes *a*, which extend through the entire length of the boiler. The actual heating surface of the boiler is increased by a secondary fire chamber D, which communicates with the main fire chamber B, through short passages *b*, as clearly shown in Fig. 2, of the drawing. Gas is introduced into this secondary fire chamber through a series of pipes E, which pass transversely through it and which are perforated with a number of small holes *c*, and the requisite amount of atmospheric air is admitted to said secondary fire chamber through apertures or passages *d*, which when not needed, are stopped up by plugs *e*. On entering this chamber the gas ignites by the influence of the fire in the furnace, and the smoke and combustible gases which otherwise would pass off unconsumed, are ignited by the jets of gas emanating from the holes *c*, in the pipes E, so that with a comparatively small expenditure of fuel a large heat is produced and a large quantity of water can be evaporated. From the fire chamber D, the hot air passes through the pipes *f*, into the smoke box F, and back through the pipes *g*, into the secondary smoke box G, from which it escapes through the smoke stack H.

The pipes *a*, which conduct the gas from the retorts, extend through the end of the boiler, and they are connected by a cross pipe I, which receives the gas and conducts it to the cooler and purifier J. This purifier consists of two low cylindrical vessels *g'*, connected by vertical pipes *h*, clearly shown in Fig. 3. A cylinder *i*, occupies the center of the lower vessel *g'*, and it extends up through the center of the upper vessel, with the interior of which it communicates through holes *j*. The cylinder *i*, is partly filled with water or other suitable liquid and

its cover *k*, is provided with a cylinder *l*, which extends down within a short distance of the bottom of the cylinder *i*. Its diameter is somewhat smaller than that of the latter and it is open at the bottom. A pipe K, which extends up through the lower cylindrical vessel *g'*, and above the surface of the water in the cylinder *i*, conducts the gas from the cooler and purifier to the gasometer L, which as it fills, causes the rod *m*, to recede from the arm *n*, and allows the rock-shaft *o*, to follow the action of the weight M, that controls the position of the three-way cock N.

An arm *p*, which extends from the plug of the cock and to which the weight M, is attached, rests on the arm *q*, that extends from the rock-shaft *o*, in the direction opposite to the arm *n*, and as the rod *m*, which depresses the arm *n*, recedes, the arm *q*, is depressed by the action of the weight M, and the arm *n*, is carried up. A stirrup *r*, being pivoted to the arm *n*, and extending under an arm *s*, that is secured to the plug of a cock *t*, causes said arm *s*, to be carried up as the arm *n*, rises and the cock *t*, is opened. By these means a communication between the gasometer L, and the gasometer O, is effected and at the same time by the action of the three-way cock N, the supply of oil and water to the retorts is regulated. This cock communicates by means of the siphon tubes *n**, *n**, with the tanks P, P', one of which contains water and the other oil, and on passing from the cock the oil and water are mixed in the tube *v*, which communicates with the conical vessel Q, and from this vessel the liquid passes through the pipes *w*, to the several retorts. In order to cause the oil and water to mix thoroughly and to distribute the same uniformly through the several retorts a cone *a'*, is placed in the center of the conical vessel Q, and the pipes *w*, which lead from said vessel to the several retorts are arranged around the base of this cone. The liquid on passing through the cock N, is discharged upon the apex of the cone and it runs down over its sides to the several pipes *w*. The arm *p*, which extends from the plug of the three-way cock N, and the arms *q*, and *n*, are arranged in such relation to each other and to the gasometer L, that the cock is open, when the gasometer is empty, but as the gasometer fills, the weight M, gradually closes the cock and when the gasometer is full, the cock is closed and no more liquid is admitted to the retorts. It is obvious that instead of the weight M, a spring might be substituted.

The principal advantages derived from this invention are that by its aid steam vessels are enabled to manufacture their own gas without the necessity of building extra furnaces.

What I claim as new and desire to secure by Letters Patent, is—

1. Combining one or more retorts A, with a steam boiler C, substantially in the manner and for the purpose specified.

2. The arrangement of a series of gas pipes E, and air holes *d*, in combination with the secondary fire chamber D, of a steam boiler C, constructed and operating substantially in the manner and for the purpose shown and described.

3. The arrangement of the three-way cock N, and conical vessel Q, in combination with the tanks P, P', and retort or retorts A, constructed and operating substantially in the manner and for the purpose set forth.

4. Mixing the oil and water before it passes into the retort or retorts as and for the purpose described.

5. The arrangement of the two gasometers L, and O, rod *m*, weighted arm *p*, or its equivalent, three-way-cock N, and rock-shaft *o*, in combination with the supply tanks P, P', and retort or retorts A, constructed and operating substantially in the manner, and for the purpose specified.

JOHN LAING.

Witnesses:
W. HAUFF,
J. F. BUCKLEY.