

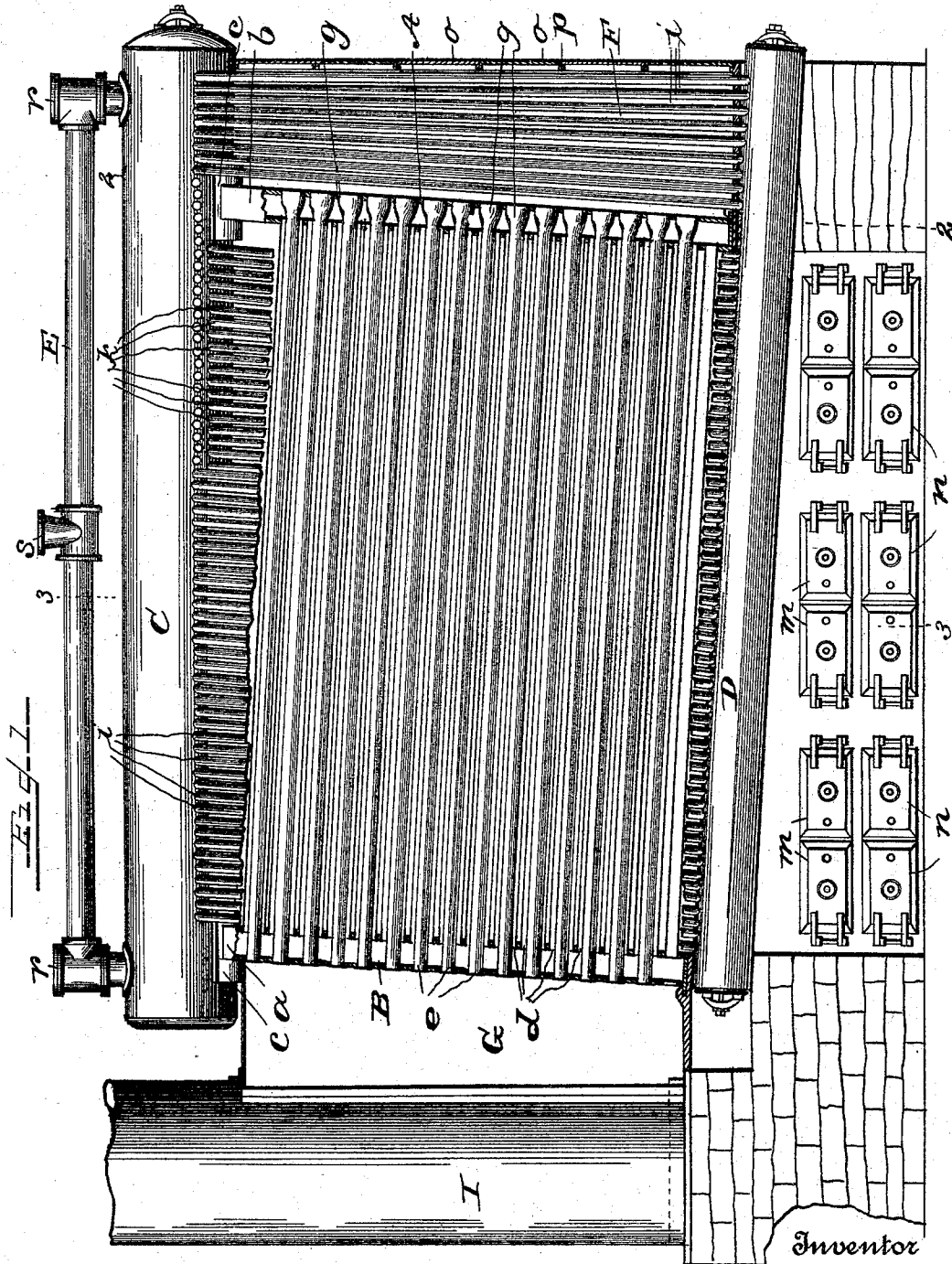
(No Model.)

2 Sheets—Sheet 1.

S. E. LIGHT.
STEAM GENERATOR.

No. 541,938.

Patented July 2, 1895.



Witnesses
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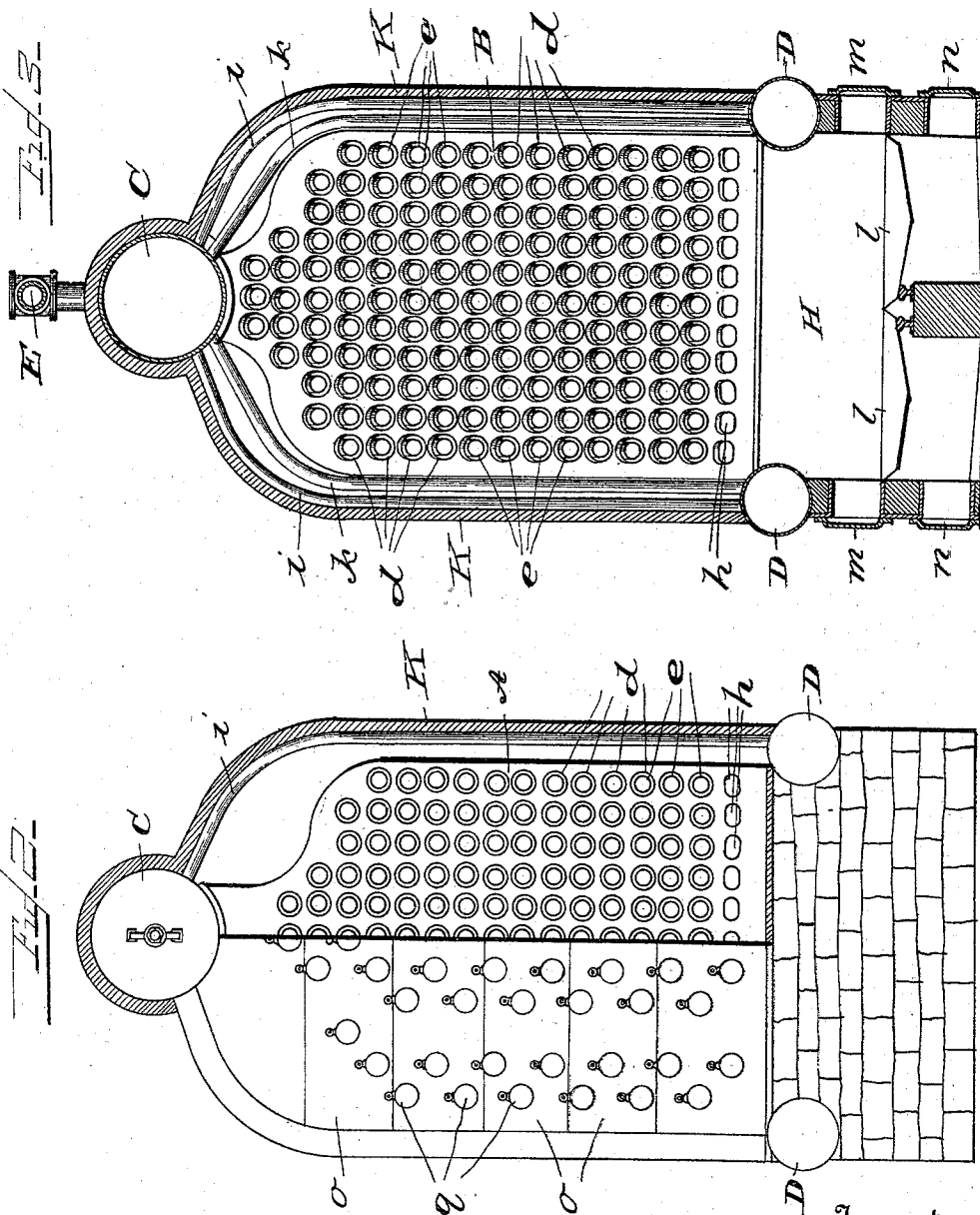
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Witnesses

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UNITED STATES PATENT OFFICE.

SAMUEL E. LIGHT, OF LEBANON, PENNSYLVANIA.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 541,938, dated July 2, 1895.

Application filed January 30, 1895. Serial No. 536,663. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL E. LIGHT, a citizen of the United States, residing at Lebanon, in the county of Lebanon and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Generators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to steam generators, and has for its object certain improvements in construction whereby the number of joints exposed to the products of combustion and consequent wear and tear is greatly reduced, the steam generating surface increased, the non conducting covering supported by the water circulating tubes on the sides of the generator, ample room provided in the uptake chamber at each end of the generator for the insertion and calking of the longitudinal fire and water tubes in the headers, and other minor details, all of which will be fully disclosed in the following specification and claims.

In the accompanying drawings, which form part of this specification, Figure 1 represents a side elevation, partly in section, of my improved steam-generator; Fig. 2, a front elevation and a vertical transverse section on line 2 2, and Fig. 3 a vertical section on line 3 3 on Fig. 1.

Reference being had to the drawings and the letters thereon, A indicates the front header; B, the rear header; C, the steam drum or separator; D, D, the water and mud drums; E, the dry steam pipe; F, the front uptake; G, the rear uptake; H, the furnace, and I the stack.

The headers A, B, consist of a continuous and seamless chamber the height and width of the main generator, and terminate in a neck *a b* by which the headers are connected to the steam drum or separator by a suitable flange *c*, and said headers are preferably cast of a high grade of steel having great tensile strength. The headers thus constructed not only present an unbroken surface but are without a seam which can be attached by the products of combustion or which can be subject to the wear and tear of expansion and contraction. The headers are connected by

water tubes *d* which engage the inner walls of the headers and are secured thereto in the usual manner by expanding the ends of the tubes in the holes or openings for the purpose in the wall of the header, and by fire tubes *e* which connect with the outer walls of the headers, are within and concentric to the water tubes *d*, and are secured to the rear header B in the same manner as the water tubes are secured; but they are connected to the front header by expanding their ends across the chamber of the header to fill the openings in the outer wall of the header, as shown at *f* in Fig. 1. It will be observed that the outer openings are of a diameter equal to the external diameter of the water-tubes, and in the construction of the generator the water tubes *d* are calked through the openings in the outer-wall of the headers A and B, and the fire tubes are then pushed through the opening in the outer wall of header A into the openings in the outer wall of the header B, and secured by calking. By thus expanding the ends of the fire tubes *e* at their inner ends all screw threaded rings heretofore used are dispensed with and only one joint for each tube is required to secure it to the outer wall of the header. In expanding the tube an "ogee" is formed in the tube as shown at *g* which provides for expansion and contraction of the tubes. These headers are provided with the usual hand holes *h* for cleaning the headers, the covers of which are omitted.

In addition to the longitudinal tubes just described, the generator is provided with two tiers of vertical or side water circulating tubes *i, k*, on each side, which extend from the front end of the generator to the inside of the rear header, as shown in Fig. 1, connect the steam drum or separator C below the horizontal median line on each side with the water drum D, D, are secured to each by calking on the inside of the drums to avoid external and exposed joints and the outer tier of pipes *i* are arranged between the pipes *k* or over the spaces between said pipes to make a fire wall on the front and rear of the combustion chamber of the generator and the furnace as shown in the transverse sections Figs. 2 and 3. The inner tiers *k* are omitted opposite the front header A to form a passage for the products of combustion around or across the edges of

said header, as shown in Figs. 1 and 2, and for the purpose of illustration some of the tubes *i* in the outer tier are omitted in Fig. 1.

To prevent the escape or loss of the heat of the furnace a covering K of a suitable plastic and refractory material, such as fire clay or the like is applied directly to the outer surface of the pipes *i* so as to fill the spaces between the pipes and secure the covering to the pipes. This covering extends from the water drum D, D, up to the point of junction of the pipes *i* with the drum C and surrounds the exposed portion of the drum, as shown in Figs. 2 and 3.

The furnace H extends transversely across the generator and is provided with the usual grate bars *l, l*, and doors *m m* and ash pit doors *n, n* on both sides of the furnace so that it can be operated from either side or both sides as required as shown in Figs. 1 and 3, and the uptake chambers F and G are of a depth sufficient to enable an artisan to work comfortably within them for the purpose of repairing the joints of the tubes *d, e*, should they require repairing. The outer end of the uptake chamber F is closed by a series of metallic plates *o o* which are provided with inwardly projecting flanges *p* to provide space for the covering K which is applied to the inside of these plates, but is not shown so applied in the drawings to avoid confusion, and in the plates *o* are peep holes provided with covers *q*, and the uptake G communicates with the stack I from which access to the up-take is had through a suitable door in the stack. Not shown. Safety valves, not shown, are attached to the steam pipe E at *r r* and the steam supply pipe not shown is attached at *s*. The generator thus constructed requires no separate body of sheet metal or brick-work to inclose the working parts above the furnace.

The water supply pipes, not shown, may be

connected to the water drums or to one of the headers or to both as may be desired.

Having thus fully described my invention, 45 what I claim is—

1. In a steam generator, continuous and seamless headers the height and width of the generator, provided with contracted necks at their upper ends and with holes or openings 50 in their inner and outer walls, in combination with concentric water and fire tubes, the latter expanded across one of the headers from the inner to the outer wall and to the diameter of the water tubes. 55

2. In a steam generator a header provided with tube openings of the same diameter in its inner and outer walls, in combination with concentric water and fire tubes, the latter of less diameter than the former and expanded 60 across the header from the inner to the outer wall and to the diameter of the water tube.

3. In a steam generator, front and rear headers connected by longitudinal tubes, in combination with a steam drum or separator, 65 water drums on each side of the generator and at the lower end thereof and vertical water tubes arranged in tiers on each side of the generator from the front end of the front uptake to the rear header and connecting the 70 steam drum to the water drums.

4. In a steam generator, a steam drum, and water drums on each side of the generator, tubes connecting said drums and arranged in two tiers one overlapping the other, in combination with a coating of refractory material 75 applied to and supported by the outer tier of pipes.

In testimony whereof I affix my signature in presence of two witnesses.

SAMUEL E. LIGHT.

Witnesses:

FRANK S. BECKER,

H. G. VAN DEVENDER.