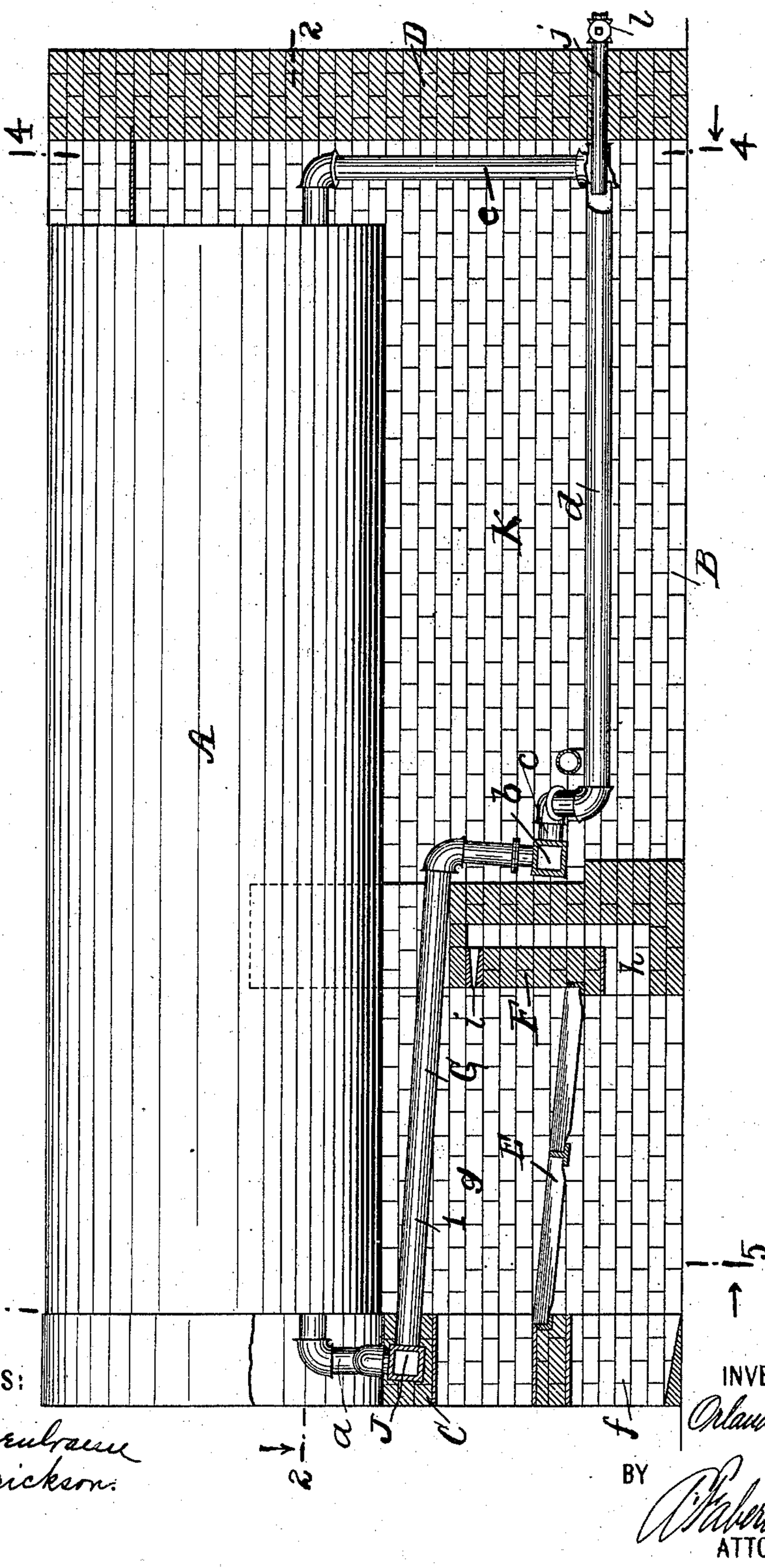
No. 686,120. Patented Nov. 5, 1901.

O. D. ORVIS.

STEAM GENERATOR.

(Application filed June 15, 1901.)

(No Model.) 3 Sheets—Sheet 1.



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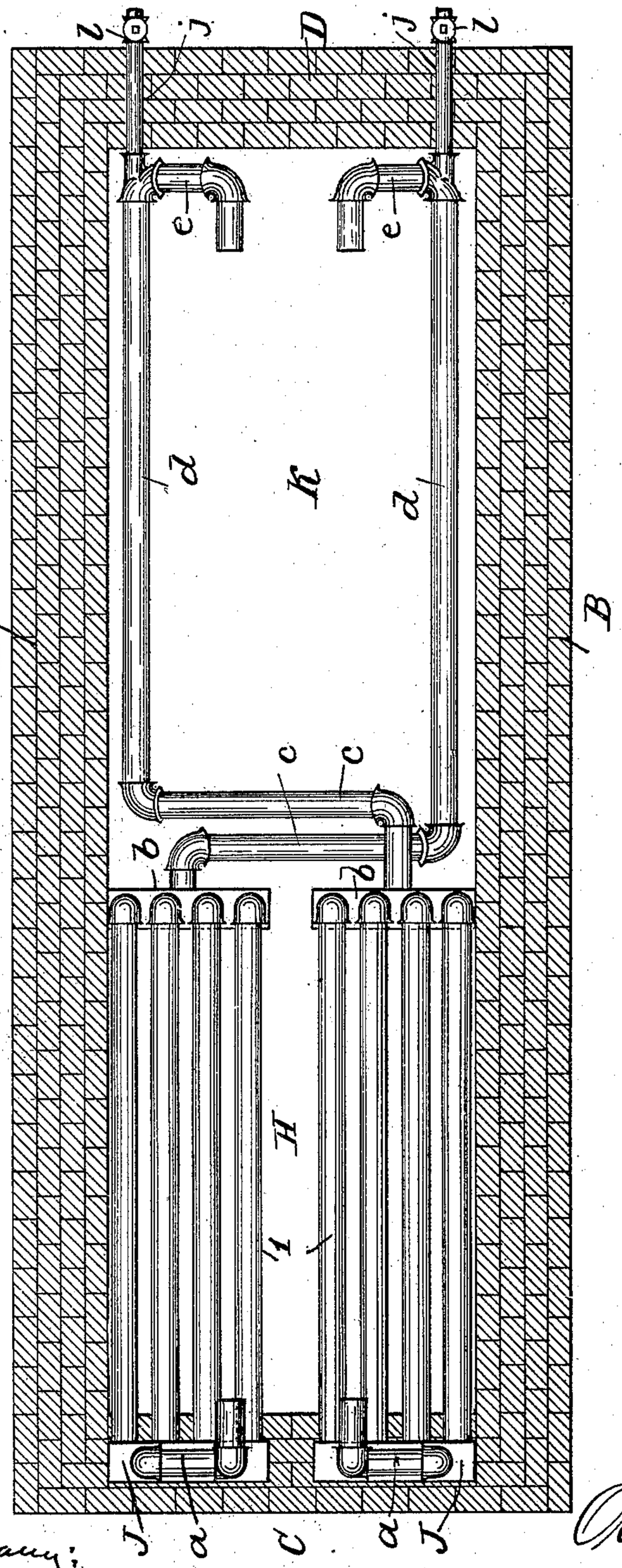
(No Model.) 3 Sheets—Sheet 2.

Fig. 2.



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STEAM GENERATOR.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 3.

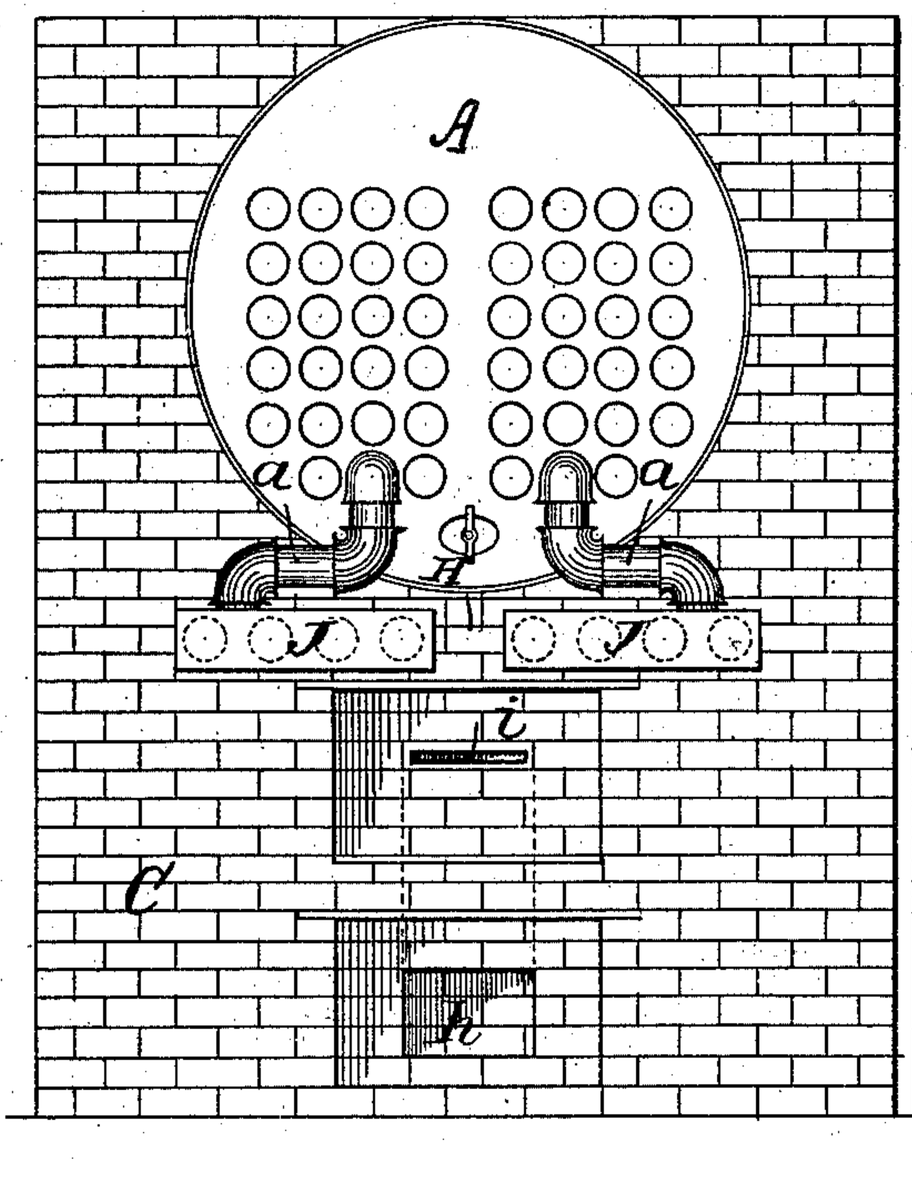


Fig. 4.

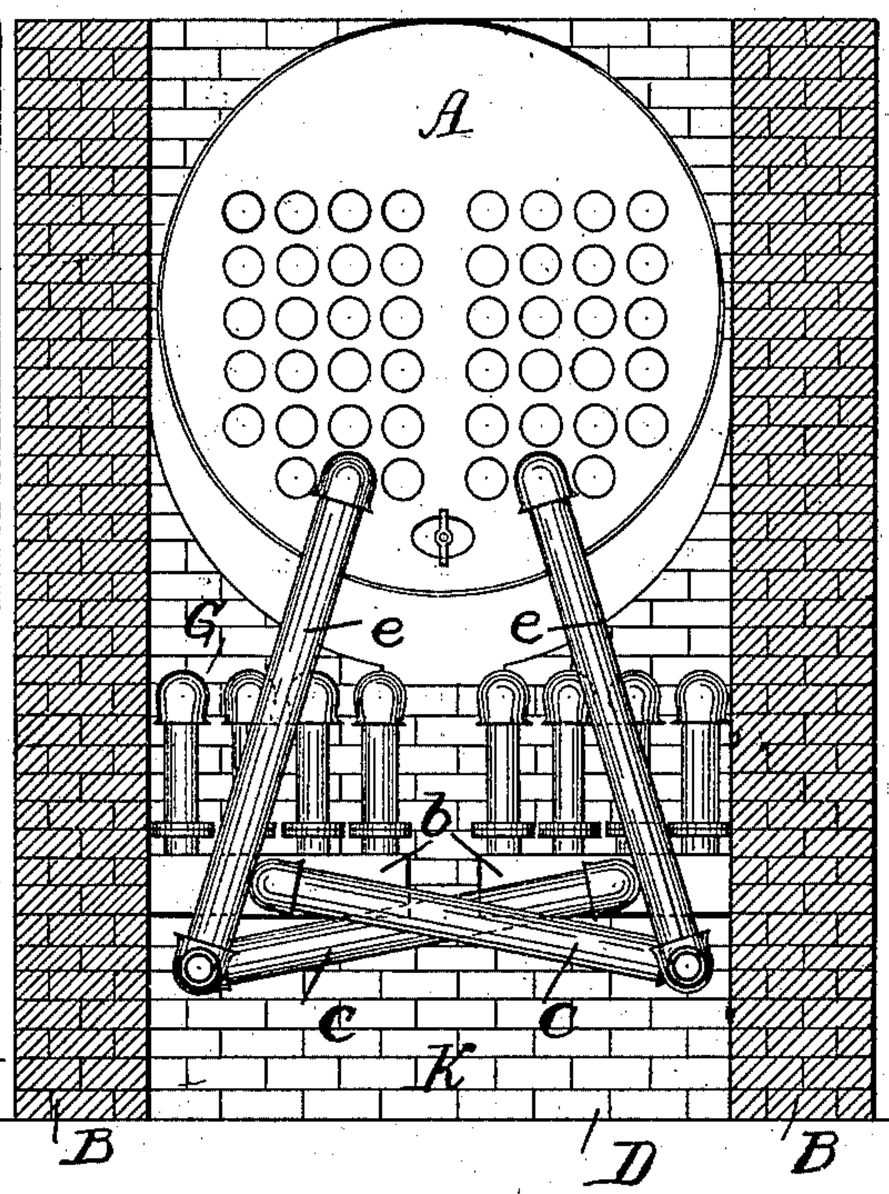
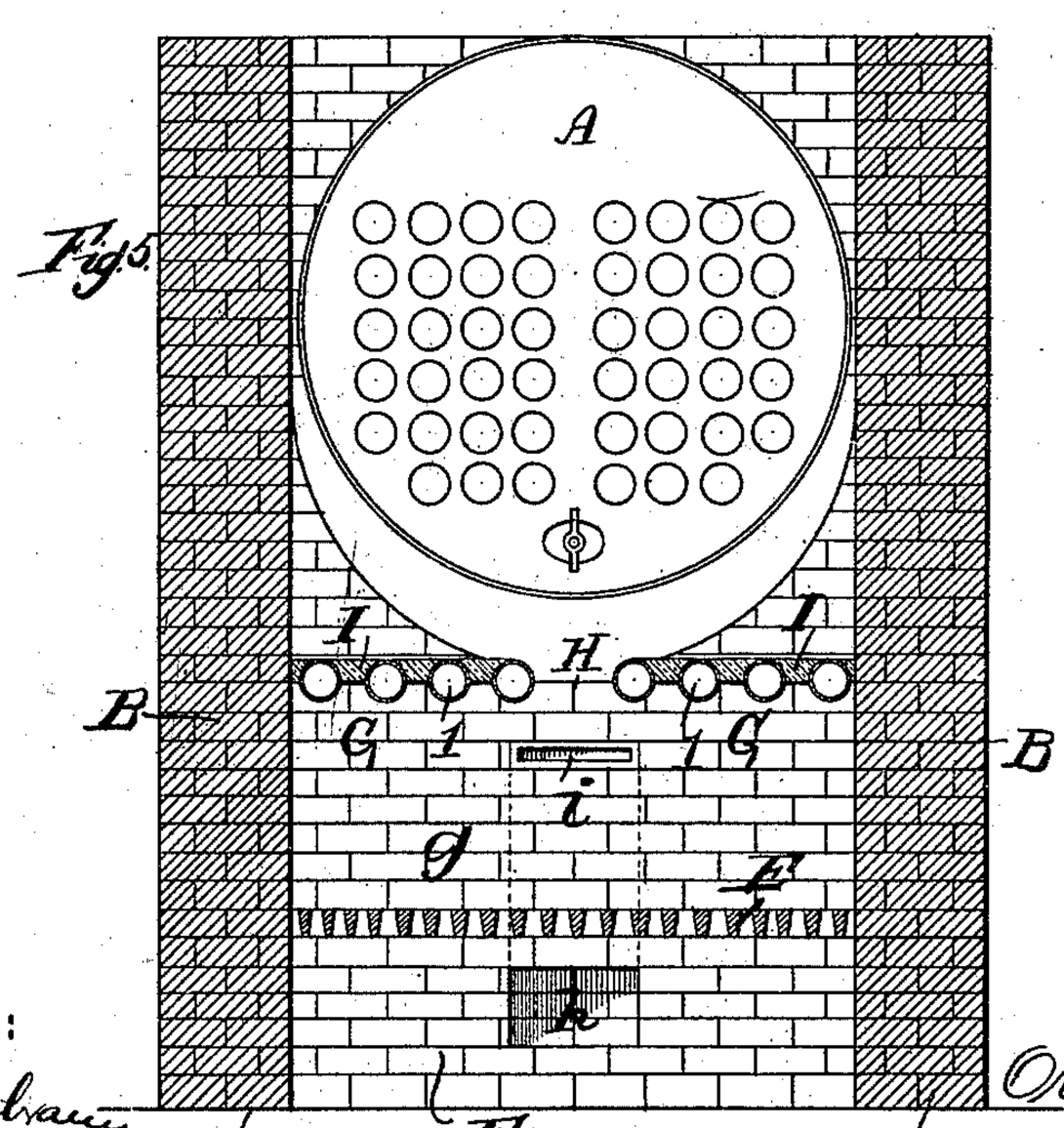


Fig. 5.



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UNITED STATES PATENT OFFICE.

ORLAND D. ORVIS, OF NEW YORK, N. Y.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 686,120, dated November 5, 1901.

Application filed June 15, 1901. Serial No. 64,649. (No model.)

To all whom it may concern:

Be it known that I, ORLAND D. ORVIS, a citizen of the United States of America, residing in the borough of Manhattan, New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

My invention has reference to improvements in steam-generators, and has for its objects, first, to obtain a more rapid and perfect combustion of the furnace-gases than heretofore; secondly, to induce a rapid and regular circulation of the water, thus reducing liability to scale formation; thirdly, to insure that in the act of blowing-off the water passes not only from the boiler, but also from the generating-pipes, and, fourthly, to prevent leakage in the heating-tubes and circulating system by arranging the connections in such a manner as to permit considerable spring without affecting the tightness of the joints or fittings.

With these objects in view my invention consists, essentially, in a steam-generator comprising a continuous grate extending across the width of the furnace, water-tube mantles extending longitudinally through the fire-chamber from opposite sides of the furnace, with the formation of an intermediate longitudinal space for the passage and direction of the products of combustion and flame against the boiler, said mantles being arranged in close proximity to the boiler, and connections of the water-tubes of said mantles with the front and rear of the boiler for establishing circulation of water.

The nature of my invention will best be understood when described in connection with the accompanying drawings, in which—

Figure 1 represents a longitudinal section of a steam-boiler furnace embodying my invention. Fig. 2 is a longitudinal section on the line 2 2, Fig. 1, with the boiler omitted. Fig. 3 is a front view with the front of the furnace removed. Fig. 4 is a vertical transverse section on the line 4 4, Fig. 1. Fig. 5 is a similar section on the line 5 5, Fig. 1.

Similar letters and numerals of reference designate corresponding parts throughout the several views of the drawings.

Referring to the drawings, the letter A designates a fire-tube boiler supported in the usual manner and having a usual setting, consisting of the side walls B B, the front wall C, and the rear wall D.

E is a grate extending centrally across the furnace, and F the bridge-wall.

G G are water-tube mantles arranged in the fire-chamber *g* intermediate of the grate E and the boiler in two substantially horizontal series and forming an intermediate longitudinal flame-space H substantially central in the present instance with the boiler A. These mantles extend inwardly from the side walls of the furnace and in proximity to the boiler, the same being at a sufficient height above the grate to permit of ready firing. Each mantle comprises a series of water-tubes 1, extending longitudinally and having the spaces between them closed by a covering I, made of any suitable refractory material. Of course it is to be understood that the tubes 1 could be arranged to be contiguous with each other and so render the covering unnecessary. At the front of the boiler the tubes of the water-mantles are connected with headers J J, which latter in turn are connected by suitable fittings *a a* with the water-space of the boiler. At the rear ends the tubes are connected with headers *b b*, Fig. 1, located at the rear of the bridge-wall F, and said headers are connected by horizontal pipes *c c d d* and vertical pipes *e e*, all located in the combustion-chamber K and connected with the water-space of the boiler at the rear head of the same. The horizontal pipes *c c* and *d d* are located below the level of the mantles G G in the fire-chamber, and in view of this difference of level a positive circulation of water from the rear to the front of the boiler is established. It is of course to be understood that the headers J J and *b b* are not absolutely necessary, as the connections could be made in the usual manner without the use of said headers.

Referring particularly to Figs. 2 and 4, it will be seen that the pipes *c c* are crossed—that is to say, the pipes leading from the two headers *b b* are conducted to the farther side of the furnace—and consequently the pipes *d d* are capable of springing to a great extent without causing leakage.

The air necessary for combustion is ad-

mitted to the grate from below, as usual, and in addition thereto I prefer to admit air to the fire-chamber *g* by a passage *h*, formed in the bridge-wall, Figs. 1, 3, and 5, adapted to take air from the ash-pit and discharge it through an inwardly-opening orifice *i*, arranged below the mantles and in a vertical line with the longitudinal space H between the same. This additional supply of air induces more perfect combustion.

In order to insure an effective blowing off of the pipes and tubes for the purpose of removing sediment, I provide a nozzle *j* for each of the pipes *d d*, which said nozzles extend in the longitudinal direction of the pipes and have their inner ends extending beyond the connection with the vertical pipes *e*, leading to the boiler. Each of said pipes is provided with a cock *l* of the usual construction. When either of the cocks *l* is opened, the combination of pipes *e*, *d*, and *j* act as an ejector, causing the current to flow through the water-tube mantles and the connecting-pipes, thus clearing the pipes from sediment.

While in the present instance I have shown two water-tube mantles located above the grate and forming a central longitudinal flame-passage, it is of course to be understood that a greater number of such mantles could be made use of, thus forming a plurality of longitudinal flame-passages where such greater number of mantles would be conducive to greater efficiency.

In the practical operation of the generator the products of combustion evolved from the incandescent bed of fuel on the grate pass upwardly and inwardly under the influence of the furnace-draft, part of the flames and gases impinging upon the tubes of the water-mantles, but all finally passing upwardly through the longitudinal flame-space H and contacting with the shell of the boiler, in the present instance at or near its center, the flames and gases then spreading outwardly and passing rearwardly over the bridge-wall to the return-tubes in the boiler and from thence to the stack. By the use of the contracted flame-passage arranged at a distance above the grate and nearer to the boiler than the grate a rapid draft is produced and a better combustion insured, thus resulting in higher efficiency.

It will readily be seen that by the use of the straight or substantially straight water-mantles arranged as described the firing of the furnace is not at all interfered with and that such mantles can be applied to an ordinary furnace without changing its structure. It will also be seen that the mantles as constructed permit the use of a continuous grate extending across the furnace.

What I claim as new is—

1. A steam-generator comprising a continuous grate extending across the width of the furnace, closed water-tube mantles extending longitudinally through the fire-chamber from opposite sides of the furnace with the formation of an intermediate longitudinal space for the passage and direction of the products of combustion and flame against the boiler; said mantles being arranged nearer to the boiler than to the grate, and connections of the water-tubes of said mantles with the front and rear of the boiler for establishing circulation of water, substantially as described.

2. A steam-generator comprising a continuous grate extending across the width of the furnace, closed water-tube mantles extending longitudinally through the fire-chamber from opposite sides of the furnace with the formation of an intermediate longitudinal space for the passage and direction of the products of combustion and flame against the boiler; said mantles being arranged nearer to the boiler than to the grate, and connections of said water-tubes passing through the combustion-chamber and having transversely-crossed members, substantially as described.

3. A steam-generator comprising a continuous grate extending across the width of the furnace, water-tube mantles extending longitudinally through the fire-chamber from opposite sides of the furnace with the formation of an intermediate longitudinal space for the passage and direction of the products of combustion and flame against the boiler; said mantles being arranged nearer to the boiler than to the grate, connections of the water-tubes of said mantles with the front and rear of the boiler for establishing circulation of water, and a bridge-wall provided with air-passages opening below the grate for the induction of air and opening above the grate into the fire-chamber for the discharge of air, substantially as described.

4. A steam-generator comprising a continuous grate extending across the width of the furnace, water-tube mantles extending longitudinally through the fire-chamber from opposite sides of the furnace with the formation of an intermediate longitudinal space for the passage and direction of the products of combustion and flame against the boiler; said mantles being arranged nearer to the boiler than to the grate, front headers connecting the water-tube mantles, rear headers located behind the bridge-wall, and connections between said headers and the water-space of the boiler, substantially as described.

5. A steam-generator comprising a continuous grate extending across the width of the furnace, water-tube mantles extending longitudinally through the fire-chamber from opposite sides of the furnace with the formation of an intermediate longitudinal space for the passage and direction of the products of combustion and flame against the boiler; said mantles being arranged nearer to the boiler than to the grate, front headers connecting the water-tube mantles, rear headers located behind the bridge-wall, front connections for

the front headers, and rear connections for the rear headers having transversely-crossed members, substantially as described.

6. In a water-circulating system for steam-boilers having a substantially horizontal system of water-tubes located respectively within the fire and combustion chambers and having upright connecting members with opposite ends of the boiler, a blow-off pipe extending into the horizontal member of the said system located within the combustion-chamber beyond the connection of said member with the rear of the boiler—all for the purpose of insuring perfect clearing of the pipe system, substantially as described.

7. A steam-generator comprising a continuous grate extending across the width of the furnace, flat water-tube mantles transversely closed and extending longitudinally through the fire-chamber from opposite sides of the furnace and located in planes substantially parallel to the plane of the grate; said mantles being formed with an intermediate space or spaces for the passage and direction of the products of combustion against the boiler, and connections of the water-tubes of said mantles with the front and rear of the boiler for establishing circulation of water, substantially as described.

8. A steam-generator comprising a continuous grate extending across the width of the furnace, flat mantles transversely closed and extending longitudinally through the fire-chamber from opposite sides of the furnace and located in planes substantially parallel to the plane of the grate; said mantles being formed with an intermediate space or spaces for the passage and direction of the products of combustion against the boiler, substantially as described.

9. A steam-generator comprising a continuous grate extending across the width of the furnace, closed water-tube mantles extending longitudinally through the fire-chamber from opposite sides of the furnace with the formation of an intermediate longitudinal space for the passage and direction of the products of combustion and flame against the boiler, connections between said water-tube mantles and the front of the boiler, connections with said water-tube mantles located within the combustion-chamber and placed at a lower level than the water-tube mantles, and connections with the rear of the boiler, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ORLAND D. ORVIS.

Witnesses:

EUGENIE P. HENDRICKSON,

A. FABER DU FAUR, Jr.