

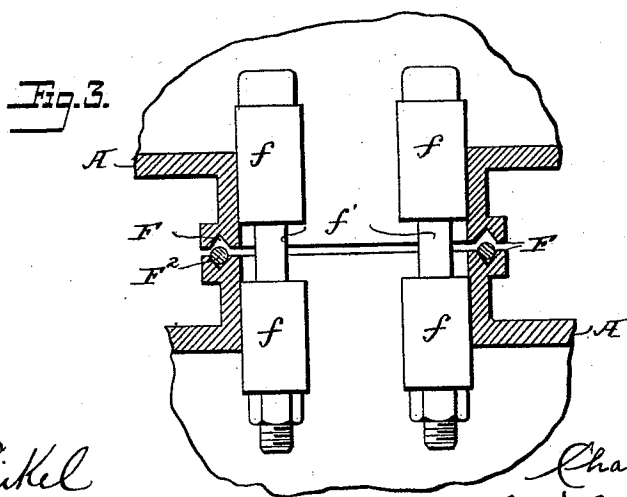
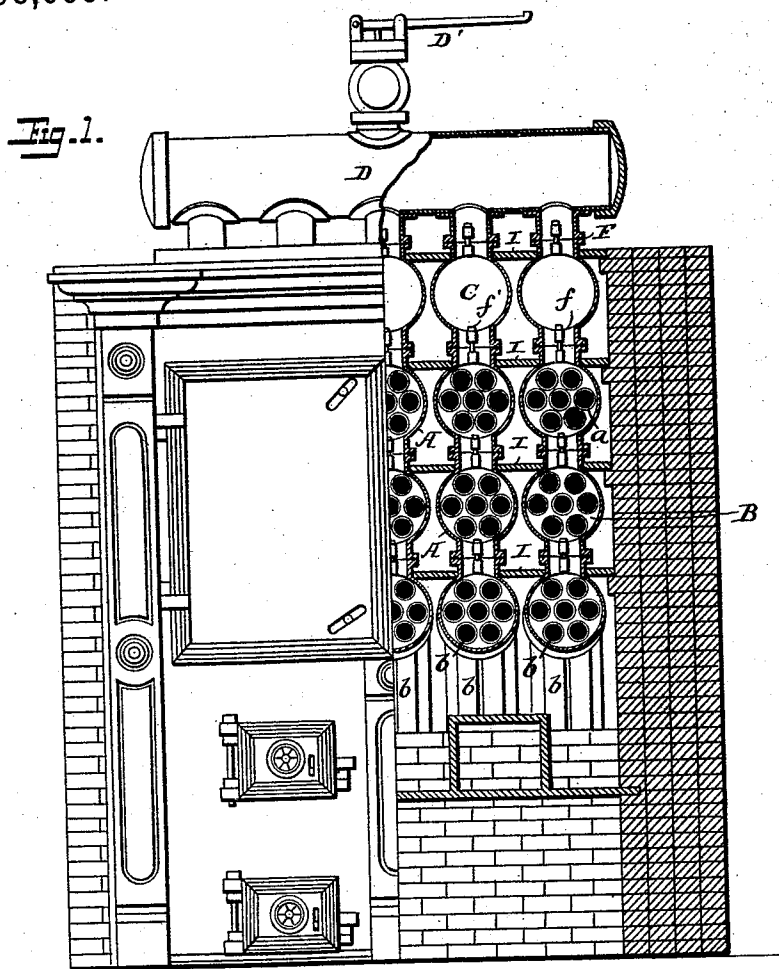
(No Model.)

2 Sheets—Sheet 1.

C. H. SHAW.
STEAM GENERATOR.

No. 498,699.

Patented May 30, 1893.



Witnesses
Geo. J. Hinkel
A. E. S. Pansmann.

Inventor
Charles H. Shaw,
by *Forster Freeman*
Attorneys

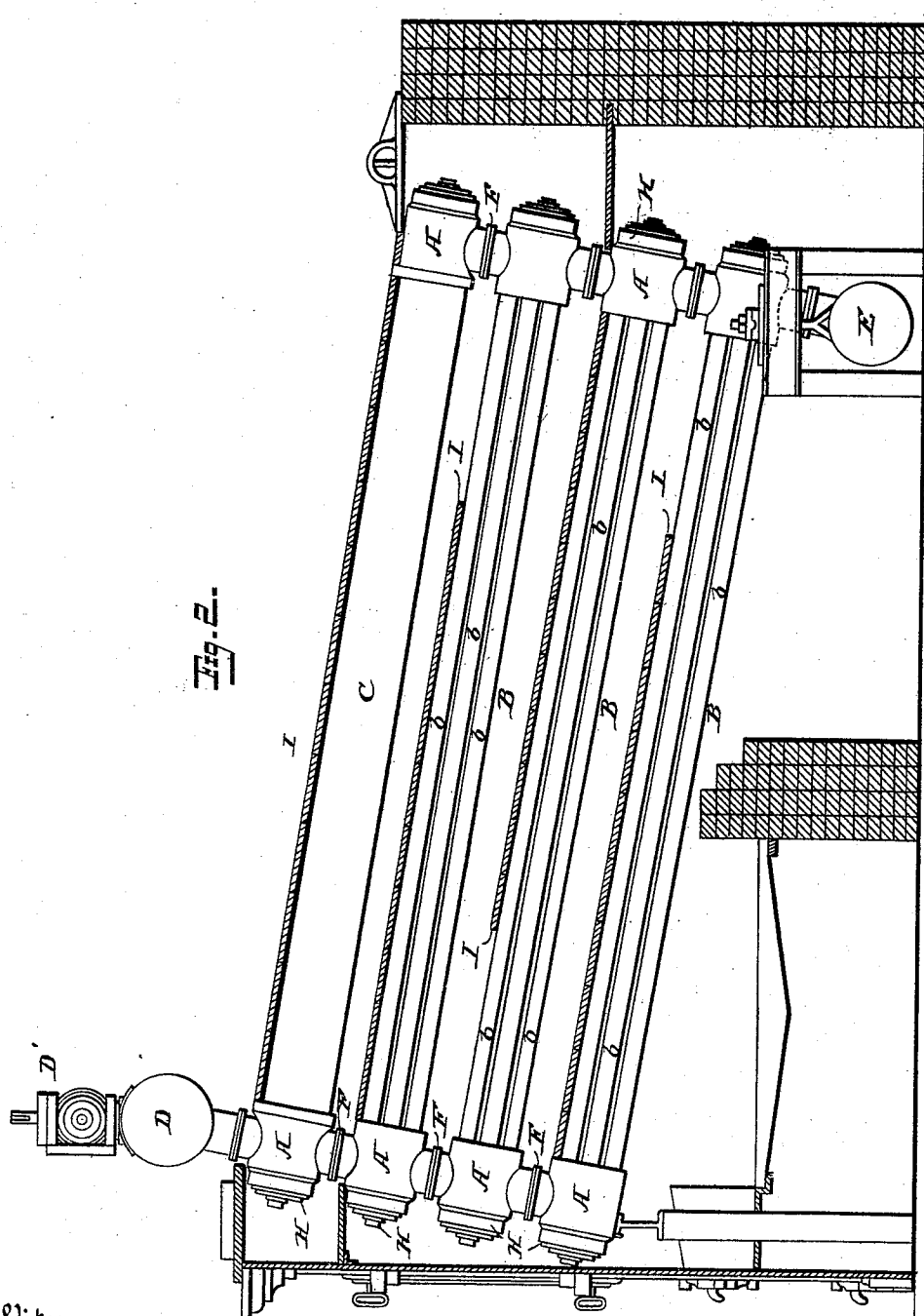
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UNITED STATES PATENT OFFICE.

CHARLES H. SHAW, OF DENVER, COLORADO.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 498,699, dated May 30, 1893.

Application filed September 19, 1892. Serial No. 446,323. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. SHAW, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification:

My invention relates to steam generators, and more particularly to that class of steam generators of the sectional water tube type.

The objects of my invention are to produce a water tube steam generator which shall be safe to operate, and shall be economical in use, that shall furnish a free unobstructed and direct circulation, that shall have sufficient water space to furnish a constant supply for the descending circulation, and a large water surface for the delivery of steam into the steam chamber, that shall have a large amount of steam space, that shall be simple of construction, and easy to get at for cleaning and repairs.

To these ends my invention consists in a steam generator embodying the features of construction, arrangement and having the mode of operation substantially such as is hereinafter more particularly pointed out.

Referring to the accompanying drawings in which I have illustrated an embodiment of my invention, Figure 1, shows a large front elevation and a part sectional end view on the lines 1—1 Fig. 2. Fig. 2, is a side elevation, the brickwork being removed to clearly show the construction and arrangement of the parts of the generator. Fig. 3 is a detailed enlarged sectional view of the metallic ring joints and bolts.

As above intimated my invention involves a water tube steam generator in which by means of certain features of construction and forms and arrangements of parts, I am enabled to provide a boiler fulfilling the objects of the invention above stated in an essential and practical manner, and I will now proceed to describe the various features of construction and arrangement whereby these objects are attained.

I may remark in general that I have shown the boiler as mounted in a conventional way having the usual brickwork supports, in which are mounted the usual doors for supplying fuel, removing ashes, and inspection of the boilers, and I do not deem it necessary to

describe these features in detail, as they are mere accessories, and their general features of construction and arrangement are well known to those skilled in the art.

The generator comprises a number of cylindrical chambers A, arranged at the front and rear portions of the boiler, and serving as a means for supporting the connecting tubes B. These chambers may be made of various materials, preferably of cast steel, and should be of such a character that they are capable of withstanding high pressure.

These tubes are arranged in groups, each group consisting of a number of small tubes *b*, having their ends connected to the chamber A, by expanding the ends of the tube in the openings *a*, formed therein, and while a different number of tubes can be grouped together, I find it convenient and desirable to arrange a series of openings in a circle as six, and a single one in the center of the circle, so that each group of tubes consists of seven small tubes *b*, having their respective ends united in a single chamber A. There may be any desirable number of these groups of tubes according to the purposes for which the generator is to be used, but it will be observed that each group or any number of groups of chambers and tubes form a complete generating and circulating system. These groups of tubes are of the desired size, length and number, and are suitably mounted and connected together preferably in the manner hereinafter set forth, and above each group or series of groups is arranged a plain cylinder tube or series of tubes C, and these tubes are connected to the circular heads or chambers A at each end, so that they may readily be connected to the group or groups of tubes. Above these plain cylindrical tubes C, is arranged a steam drum D, at right angles to the groups of tubes, and this steam drum is provided with the usual safety valve D', or other appliance, while below and preferably at the rear of the groups of tubes is arranged a mud drum E.

The chamber A carrying the groups of tubes, as well as the plain cylindrical tubes are provided above and below with metallic ring joints by means of which any number of groups of tubes may be readily united, and while these joints may be variously shaped, I prefer to form them in the manner shown in

Fig. 3, in which the bearing surface or edge of each ring joint F, is grooved as at F', for the reception of the rings F², and are provided with projections f, having bolt holes for the reception of the bolts f', whereby the sections can be readily and securely joined. The cylindrical chambers are also provided with threaded plugs H, which are accessible from the outside, and by means of which the tubes can be readily cleaned. The groups of tubes being thus united are arranged over the usual grate, and interposed between each layer or row of groups of tubes I have arranged fire-brick tiling I, I, &c., extending nearly the entire length of the tube, and leaving a space at one end of each group alternately for the purpose of carrying the products of combustion throughout the length of the several series of groups of tubes, and the cylindrical tube to the combustion exit.

Such being the general construction and arrangement of the generator, it will be found that the objects aimed at are accomplished, in that by making the generator in sections, and these sections of small diameter, it is almost absolutely safe under very high pressure. Furthermore, great economy in fuel is the result of presenting the water to the action of the fire in small bodies, and in my construction the water circulates through the fire-chamber in the small tubes of the groups which are preferably not over three inches in diameter, and as the products of combustion are controlled and directed by the tiling I, to impinge upon each and all of the tubes, the greatest economy is produced, and the heat and gases are prevented from passing away through the smokestack until all the available heat has been utilized. Furthermore by this arrangement, I obtain a free unobstructed and direct circulation of the water, as the heat applied to the small tubes of the groups causes it to ascend through the front chamber A, and to pass into the top and large cylindrical tube C, from whence it passes to the rear chambers A, and down through these chambers and distributes itself to the small tubes B. The large size of the opening between the chambers A and the unobstructed flow of the water through the large cylinder C, reduce the velocity at which the water travels, thereby giving a water line that is comparatively steady, and free from agitation, and there is a sufficient space to furnish a constant supply for the descending circulation, and a large water surface for the delivery of steam into the steam chamber.

In use the rear portions of the plain cylinder C, are preferably kept constantly full of water, the water line extending from the front head of the cylinders to a point a little in front of the middle of the cylinder, and this not only gives a full supply of water to the chambers and tubes below, but furnishes a large surface for the delivery of steam and tends to reduce the agitation at the water line. The steam drum extending at right

angles to the large cylinders in connection with the space in the cylinders above the water gives adequate steam room. It will also be seen that the construction of the boiler is exceedingly simple, the generator being made in small sections, each composed of a front and back chamber to which the small tubes constituting each group are connected, and these sections can be readily transported and secured together when the boiler is set up, and by the use of the threaded plugs all parts are easy of access for cleaning and repairing, and for the removal and replacing of any of the tubes when necessary, and the whole arrangement has been found to be efficient and economical.

What I claim is—

1. A sectional steam generator comprising a series of circular groups of tubes, each group of tubes being provided with a circular head or chamber at each end, and the heads or chambers being provided with metallic ring joints by means of which they are united to form the generator, substantially as described.

2. A steam generator comprising a series of circular groups of small tubes, each group being provided with a circular head or chamber at each end, the heads or chambers being provided with metallic ring joints by means of which they are united, and also having the threaded plugs at their outer end, substantially as described.

3. A steam generator comprising a series of groups of small tubes, each group consisting of a number of tubes connected at their ends by hollow chambers, the chambers being provided with metallic ring joints, a series of plain cylinders also provided with chambers arranged above the groups of tubes and parallel thereto, a steam drum arranged above the plain cylinders at right angles thereto, and a mud drum arranged below the groups of cylinders, substantially as described.

4. The combination with a suitable fire-grate, of a steam generator comprising a number of groups of tubes arranged at an angle, each group being connected to a cylinder at each end, each cylinder having metallic ring joints by means of which they are connected together, and provided with screw plugs at their outer ends, a plain cylinder provided with chambers at each end arranged parallel to the groups of tubes, a steam drum arranged above the plain cylinders at right angles thereto and connected by metallic ring joints, and tiling arranged above each series of groups of tubes leaving a space at one end of each group alternately, the whole being constructed and arranged substantially as and for the purposes set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES H. SHAW.

Witnesses:

WILLIAM H. HOLMES,
JOHN A. LIMB.