(No Model.)

2 Sheets—Sheet 1.

O. F. BURTON.

STEAM GENERATOR.

No. 261,996. Patented Aug. 1, 1882.

Fig. 2.

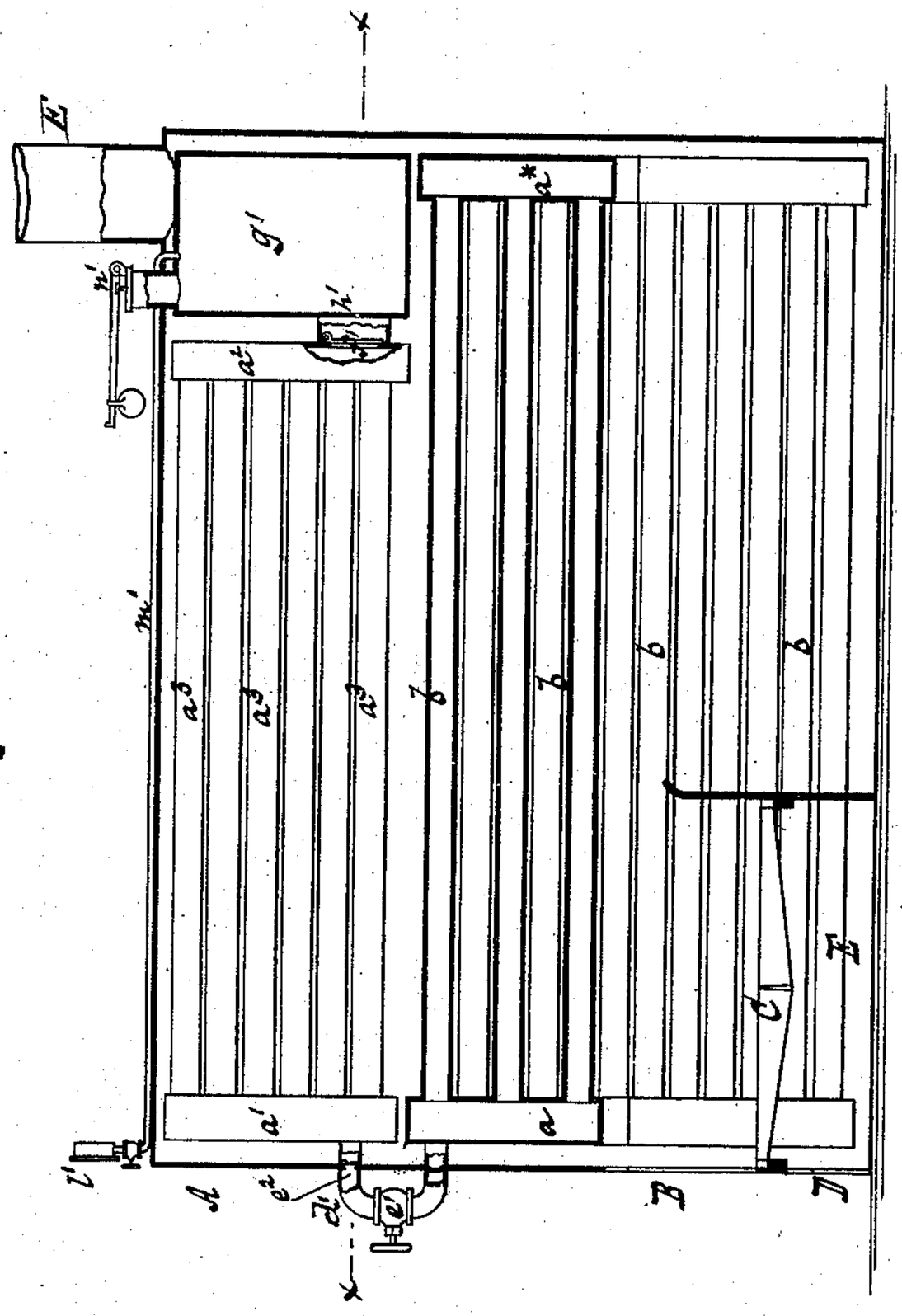
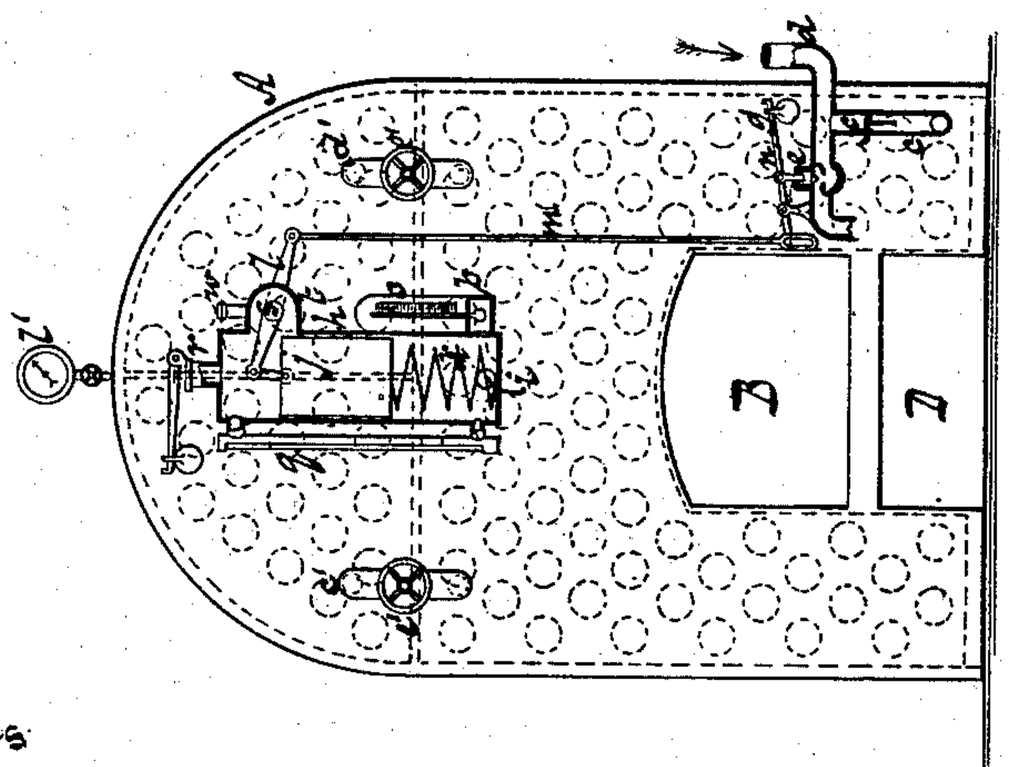


Fig. 1.



Witnesses
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William Miller

Inventor
Oscar F. Burton
by Van Santvoord & Hauff
his attys.

(No Model.)

2 Sheets—Sheet 2.

O. F. BURTON.

STEAM GENERATOR.

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Fig. 3.

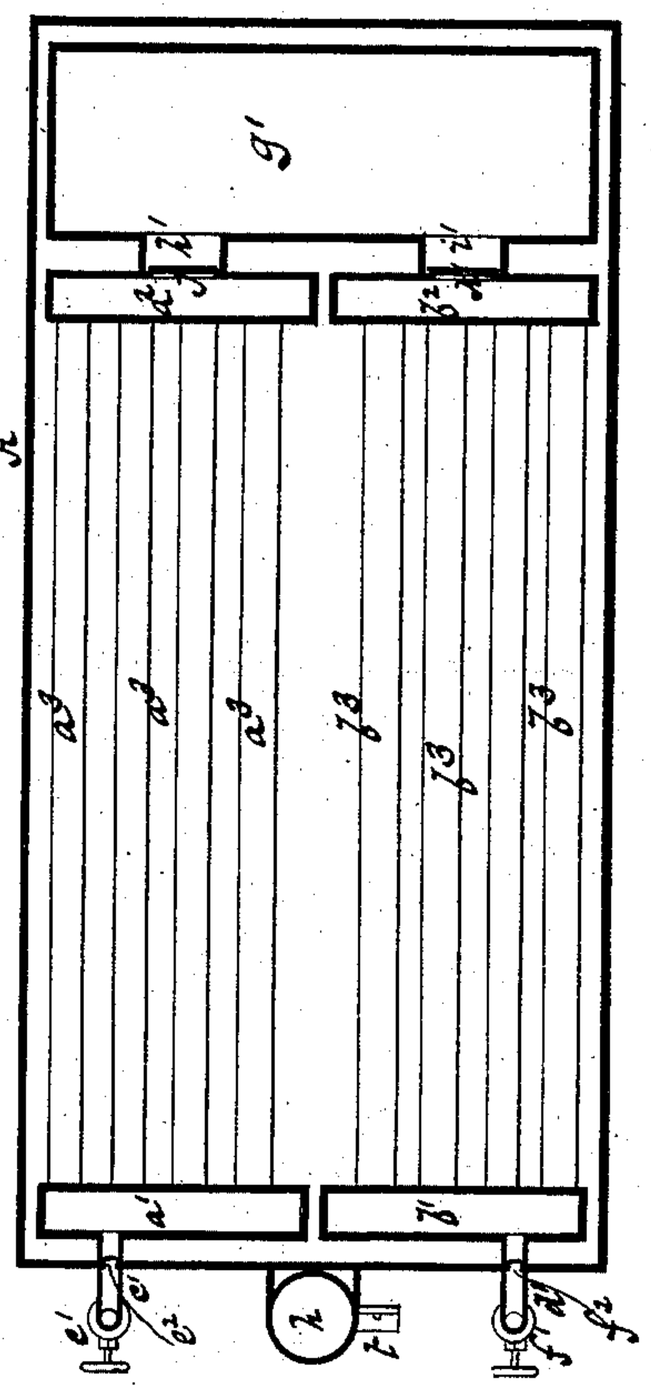


Fig. 4.

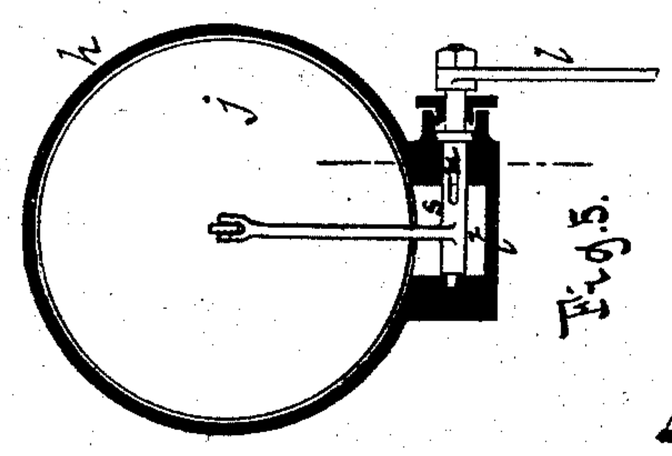
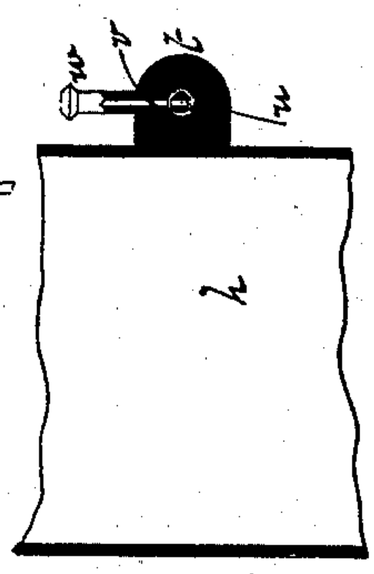


Fig. 5.



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UNITED STATES PATENT OFFICE.

OSCAR F. BURTON, OF BROOKLYN, NEW YORK.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 261,996, dated August 1, 1882.

Application filed December 17, 1881. (No model.)

To all whom it may concern:

Be it known that I, OSCAR F. BURTON, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Steam-Generators, of which the following is a specification.

This invention relates to improvements in apparatus for generating steam, and has for its object to provide a steam-generator in which water in regulated and small quantities is delivered from a water-chamber into a steam-chamber in an intermittent manner at determined or stated intervals, said intermittent charges or supplies of water successively flashing into steam in the steam-chamber, in which chamber the steam is superheated and delivered into a steam-dome, all in such manner that the quantity of steam generated can be well regulated and the steam chamber and dome never contain a quantity of steam sufficient to render an explosion possible, while the water-chamber is always maintained full of water, so that no steam is generated therein.

The invention also has for its object to automatically indicate the level of water in the water-chamber, to indicate the pressure of steam in the steam-dome, and to automatically supply and cut off the water to the water-chamber. These objects I accomplish by the apparatus illustrated in the accompanying drawings, in which—

Figure 1 represents a front view of my generator. Fig. 2 is a longitudinal vertical section. Fig. 3 is a horizontal section in the plane *x x*, Fig. 2. Figs. 4 and 5 are details which will be referred to as the description progresses.

Similar letters indicate corresponding parts.

In these drawings, the letter A designates the shell of my steam-generator. In the front of this shell is an opening, B, which leads to the fire-grate C, and another opening, D, which leads to the ash-chamber. From the top of the shell, near its rear end, rises the smoke-stack E. The space in the interior of the shell, with the exception of that required for the fire-grate and the ash-chamber, is occupied by the water-chamber and the steam-chamber, and in the example shown in the drawings these parts are constructed as follows:

The water-chamber consists of two hollow heads, *a a**, Fig. 2, one in front and the other in the rear, and a series of pipes, *b*, which connect said heads. Both said heads must be so constructed that the pipes secured in the same clear the fire-place, as indicated in dotted lines in Fig. 1; but in fact said pipes form an open arched top and open sides of a combustion-chamber, which extends from the fire-place back to the head *a**. The head *a* communicates by a pipe, *c*, Fig. 1, with the feed-pipe *d*, and one end of this feed-pipe communicates with a suitable force-pump, while its other end leads into a water-tank intended to receive the water which is not required for the boiler. In the feed-pipe *d* is a valve, *e*, and if this valve is closed the water forced in by the pump enters through the pipe *c* into the water-chamber of the boiler; but if this valve is open, as shown in Fig. 1, the water forced in by the pump passes into the water-tank. A check-valve, *f*, situated in the pipe *c*, retains the water in the water-chamber. The valve *e* in the feed-pipe *d* is loaded with a weight, *g*, the gravity of which is such that it retains said valve in a closed position against the maximum pressure desired—that is to say, if the water-chamber is completely filled with water and the pressure therein reaches the maximum pressure, then the valve *e* is lifted and the water forced in by the pump passes back into the tank. If the water in the water-chamber sinks down, the valve is closed by the following means: On the upper part of the front plate of the shell is secured a closed tube, *h*, which communicates by a pipe, *i*, with the head *a* of the water-chamber. In said tube is contained a float, *j*, which is supported by a spring, *k*, and connects with the inner end of a lever, *l*, from the outer end of which extends a rod, *m*, to the lever *n*, which supports the weight *g* of the valve *e*. The rod *m* is slotted at its lower end, and, if the float *j* is raised up by the action of the water, its action on the valve-lever *n* assists in opening the valve *e*; but if the water in the tube *h* sinks down the float descends and its weight co-operates with the gravity of the weight *g*, so as to close the valve *e*.

It is obvious that the weight of the float must be so regulated in regard to the weight

g that the above-named results are produced; and the operation is such that a slight change in the level of the water in the tube *h* opens or closes the valve *e*, so that the water-chamber of the boiler is kept full all the time.

As already stated, the water in the water-chamber is heated to a temperature of 250° to 400° Fahrenheit, and in order to ascertain the temperature a thermometer, *o*, is applied to a well, *p*, which connects with the tube *h*. With this tube is also connected a common glass gage, *q*, to indicate the water-level, and a safety-valve, *r*, which blows off when the pressure of the steam in the upper part of the tube exceeds a certain limit.

The lever *l* is mounted on the end of a plug, *s*, which has its bearings in the sides of a chamber, *t*, formed on the tube *h*. (See Fig. 4.) In this plug is a slot, *u*, which, when the float sinks down, communicates with a channel, *v*, Fig. 5, leading to an alarm, *w*, so that by the sound of this alarm the attention of the engineer is called to the fact that the water is low.

The steam-chamber, which occupies the upper portion of the shell A, is composed of four hollow heads, a' a^2 b' b^2, which are connected respectively by pipes a^3 b^3. The heads a' b' are connected with the head *a* of the water-chamber by U-shaped pipes c' d', each of which is provided with a stop-valve, e' f', respectively. By alternately opening and closing these stop-valves jets of water are thrown first into the head a' and then into the head b', and as this water escapes from the water-chamber it immediately flashes into steam, which, in passing through the pipes a^3 b^3, respectively, is dried and superheated, and finally collects into a steam-dome, g', from which it is drawn off to the engine. To prevent the steam from reacting, check-valves e^2 and f^2 are placed in the pipes c' d'. The heads a^2 b^2 connect with the steam-dome g' by channels h' i', respectively, and each of these channels is provided with a check-valve, j' k', whereby the steam in the dome g' is prevented from passing back into the heads a^2 b^2. The pressure of the steam in the dome g' is indicated by a gage, l', which communicates with said dome by a pipe, m', Fig. 2. With the dome is also connected a safety-valve, n'.

The valves e' f' may be operated by hand; but in practice I intend to provide suitable mechanism connected to the engine, so that as soon as the engine is started said valves are opened and closed automatically at the proper intervals.

It will be seen from this description that in my steam-generator the water-chamber, which is kept full of water all the time, is thrown in communication with the steam-chamber at intervals by alternately opening and closing the valves e' f', and whenever one of these valves is opened a limited quantity of heated water escapes into the steam-chamber, where it instantly flashes into steam, which, after having been dried and superheated, is collected in the dome g', ready to be admitted to the steam-cylinder of the steam-engine. By these means the quantity of steam generated can be regulated to correspond to the supply required for the engine, and the steam chamber and dome g' never contain a quantity of steam sufficient to render an explosion possible, while the water-chamber is always kept full of water, so that no steam can form therein, and the danger of an explosion is reduced to a minimum. At the same time the steam supplied to the engine is perfectly dry.

A steam-generator has heretofore been composed of an upright boiler or vessel for heating the water and connected at its lower end with the lower portion of an upright vessel in which the heated water is converted into superheated steam, the water from the said upright boiler or vessel being injected in successive charges into the upright steam-generating vessel. Such arrangement and combination are therefore disclaimed, and, moreover, such are essentially different from my invention, because in my arrangement and combination of parts the water-chamber is located horizontally below the steam-chamber, and its tubes form the sides and top wall of a combustion-chamber, and the upper portion of the water-chamber is connected with the lower portion of the steam-chamber through the medium of a curved connecting-pipe provided with a valve capable of being operated from the exterior of the casing which incloses the steam and water chambers, and the arrangement is such that the steam formed in the steam-chamber cannot accumulate therein to such an extent as to render an explosion possible; but such steam, as fast as generated, is conveyed into a steam-dome, from whence it is delivered to the cylinder of an engine.

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

1. In a steam-generator, the combination of a steam-chamber composed of front and rear heads, connected by longitudinal tubes and communicating with a steam-dome, with a water-chamber located below the steam-chamber, and composed of front and rear heads connected by longitudinal tubes and constituting an arched top and open sides to a combustion-chamber, a feed-pipe connected with the water-chamber and containing a valve, a float located in a tube communicating with the upper part of the water-chamber, a connection between said float and the valve in the feed-pipe, and means, such substantially as described, for intermittently or at determined intervals supplying small charges of water from the water-chamber to the steam-chamber, substantially as and for the purposes described.

2. In a steam-generator, the combination of a steam-chamber located within the upper part of an inclosing shell, and composed of front and rear heads connected by longitudinal pipes and communicating with a steam-dome, with

a water-chamber located within said shell below the steam-chamber, and composed of front and rear heads and longitudinal pipes connecting said heads and constituting an arched top and open sides to a combustion-chamber at the front of the shell, a feed-pipe connected with the lower part of the water-chamber and containing a valve, a vertical tube having its lower end connected with the upper part of the water-chamber, and containing a float, a lever-and-rod connection between the float and the valve in the feed-pipe of the water-chamber, and pipes and valves for delivering water from the upper part of the water-chamber to the steam-chamber, substantially as and for the purpose described.

3. In a steam-generator, the combination of two steam-chambers located in the upper part of a surrounding shell, and composed of two sets of independent front and rear heads, arranged side by side and connected by longitudinal tubes, and both of the rear heads communicating with a common steam-dome, with a water-chamber located below the steam-chamber, and composed of front and rear heads connected by longitudinal tubes, forming the top and sides of a combustion-chamber, automatic mechanism for keeping the water-chamber constantly filled with water, two pipes connecting the respective front heads of the steam-chamber to the upper portion of the water-chamber, and valves located in said pipes and operated at stated intervals to intermittently and alternately deliver small charges of water from the water-chamber into the two steam-chambers, where such charges of water successively flash into steam, substantially as and for the purposes described.

4. In a steam-generator, the combination of the water-chamber, composed of the heads a a^* and longitudinal pipes b, two steam-chambers, located above the water-chamber and composed of the heads a' a^2 b' b^2 and pipes a^3 and b^3, the steam-dome g', connected with both the said steam-chambers, pipes c' d', connecting the respective steam-chambers with the upper portion of the water-chamber, and stop-valves e' f', operated to intermittently and alternately charge the steam-chambers with small quantities of water from the water-chamber, all substantially as and for the purposes described.

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

OSCAR F. BURTON.

Witnesses:
W. HAUFF,
E. F. KASTENHUBER.