

H. SCHWAGER.
STEAM GENERATOR.
APPLICATION FILED JAN. 17, 1908.

992,911.

Patented May 23, 1911.

Fig. 1

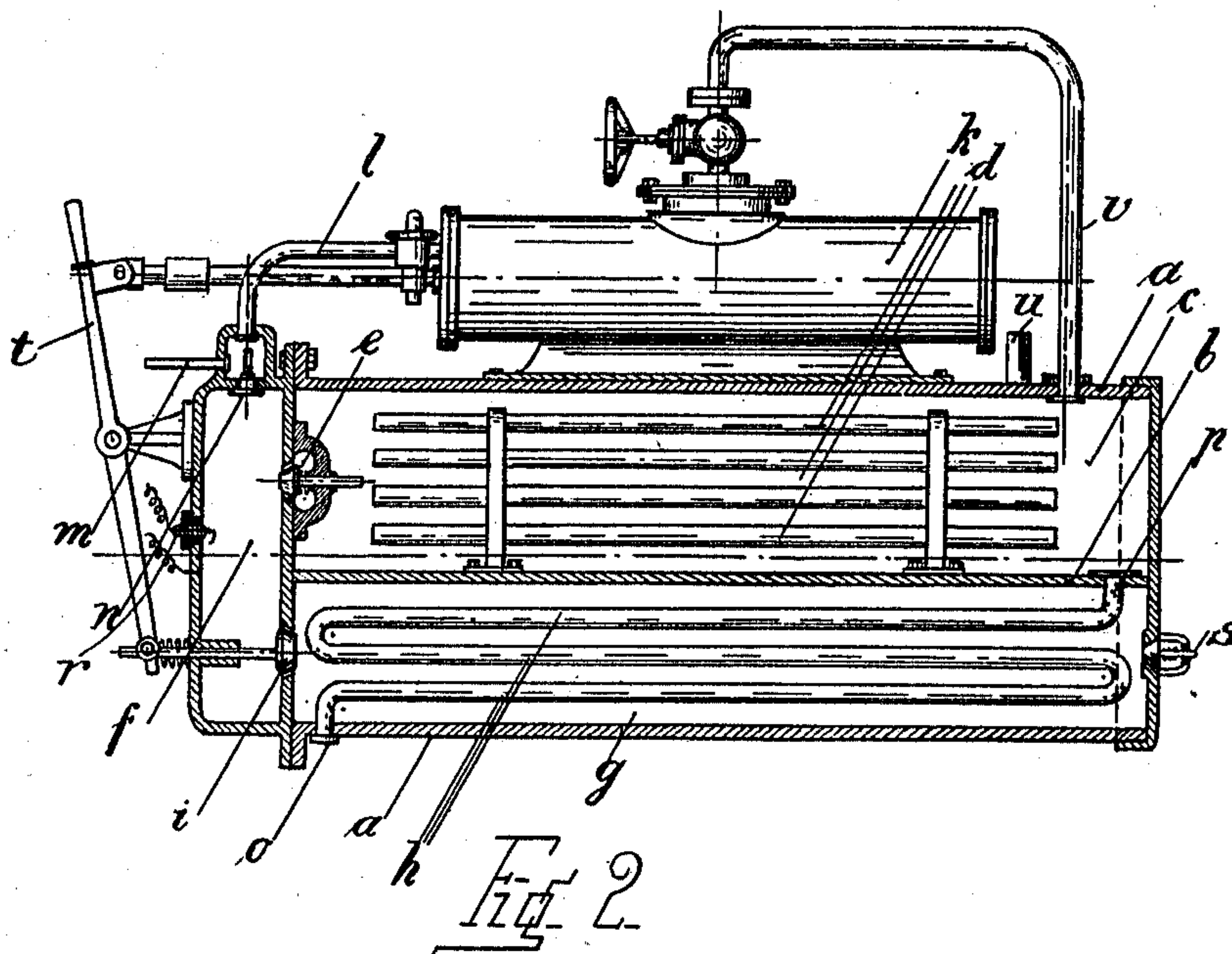
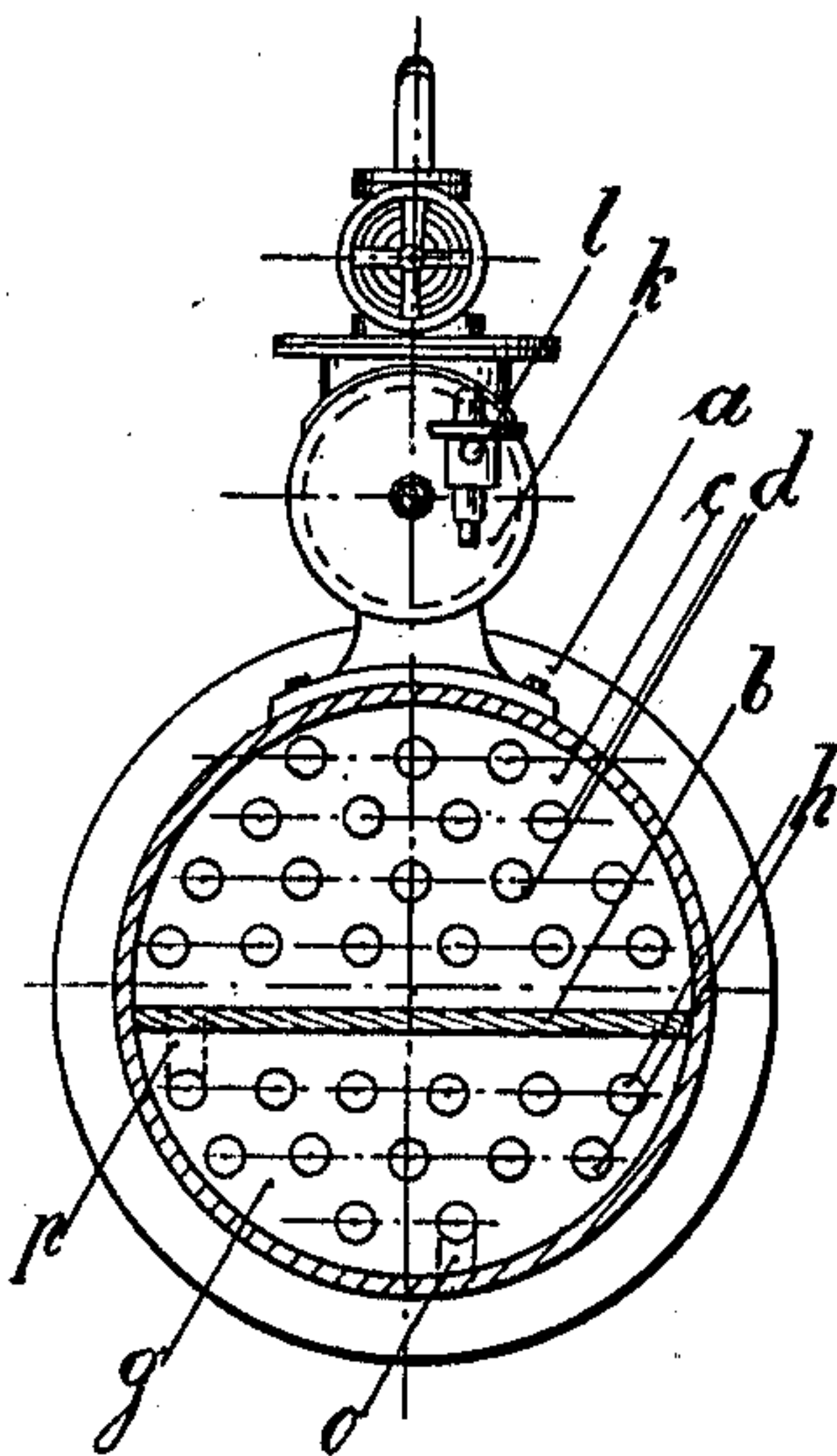


Fig. 2



Witnesses:
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UNITED STATES PATENT OFFICE.

HANS SCHWAGER, OF BERLIN, GERMANY.

STEAM-GENERATOR.

992,911.

Specification of Letters Patent.

Patented May 23, 1911.

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To all whom it may concern:

Be it known that I, HANS SCHWAGER, a subject of the German Emperor, and resident of Berlin, Germany, have invented certain new and useful Improvements in Steam-Generators with Automatic Introduction of Heating-Gases into the Liquid to be Vaporized, of which the following is a specification.

This invention relates to improvements in steam generators, wherein the heating gases come into actual contact with the liquid to be evaporated.

Objects of the invention are to provide a device for generating steam, wherein the heating gases are not introduced in a continuous flow, as in the regular gas fuel boilers, but wherein they enter the interior of the boiler in rapidly following intervals.

In the drawing, Figure 1 is a horizontal sectional view. Fig. 2 is a transverse sectional view, of the improved generator.

The boiler *a* is divided into two compartments by a longitudinally arranged wall *b*. The feed water enters at *o* into pipes *h* disposed in the lower compartment *g*. Through outlet *p* of pipes *h* it passes into the upper compartment *c*. The ignition chamber *f* provided at one end of the boiler communicates with the upper compartment *c* through valve *e* and with the lower compartment through valve *i*, which is adapted to operate somewhat later than valve *e*. The inlet valve *n* admits a mixture of air and combustible gases into the igniting chamber *f*. Air is supplied through pipe *l* leading from the air pump *k* to valve *n*, while pipe *m* serves as supply pipe for the combustible gas, and for liquid fuel, as gasolene, benzin, or dry fuel in the form of coal dust, etc. A sparking device *r* ignites the mixture at intervals, and is indicated in the drawing as a spark plug, which may be supplied with current by the secondary of some ignition coil; but it is obvious that other suitable igniting devices as an incandescent tube, may also be used.

To increase the efficiency of the apparatus a plurality of open tubes *d* is arranged in the upper boiler compartment, said tubes serving as heat transferring members in the operation of the boiler.

The operation of the device is as follows: In starting the generator water is admitted through inlet *o*, which may be intermittently opened and closed or which may remain

open until the water has reached a certain level in the upper compartment *o*. Fuel is supplied through pipe *m* while air is conveyed into the chamber of valve *n* from the pump *k*. For this purpose the lever *t* connected with the piston rod *w* is first actuated by hand. As soon as the explosive mixture has obtained a certain pressure it will force valve *n* downwardly and enter the ignition chamber *f*. Valve *n* will then return again into closing position, which movement may be caused by the pressure in the chamber *f*. The mixture in the chamber is ignited by means of the spark plug *r*. The contact device, adapted to cause the ignition is not shown in the drawing and does not form the subject matter of this invention. It is either actuated by hand or by the lever *t* at a certain point of the path which said lever describes in its oscillating movement. The ignited gases enter through valve *e* into the upper generator compartment and heat the liquid contained therein. The lower end of the lever *t* is connected to the stem of the valve *i* and is adapted to lift said valve off its seat. This lifting movement takes place after the lever or another device caused the ignition which forced the gases through the valve *e*. Residuary gases which eventually remained in the heating chamber after actuation of the valve *e* will therefore enter the lower compartment *a* and will heat the feed water for the upper compartment. A spring *g* surrounding the stem of the valve *i* serves for pressing the same tightly on its seat. After steam is generated in the upper compartment the same may be conveyed through pipe *u* to the apparatus in which it is to be utilized. It may also be used for operating the pump *k*, to which it is conducted through pipe *v*, for actuating the lever *t* and for supplying air to the chamber of valve *n*. The vapors in the lower compartment may be discharged through the spring controlled valve *s*.

I claim:

1. A steam generator comprising in combination a steam generating compartment, a compartment for heating the feed water, an ignition chamber disposed outwardly of both of said compartments, means for supplying air and fuel to said ignition chamber, means for igniting the mixture therein and communicating devices between said ignition chamber and said compartments adapted to transmit the main portion of the

ignited gases into the steam generating compartment and the residuary portion of said gases into the compartment for heating the feed-water.

5 2. A steam generator comprising in combination a steam generating compartment, a compartment for heating the feed water, an ignition chamber disposed outwardly of both said compartments, means for supply-
10 ing air and fuel to said ignition chamber, means for igniting the mixture therein and communicating devices between said ignition chamber and said compartments adapted to bring the ignited gases into actual con-
15 tact with the liquid to be evaporated.

3. A steam generator comprising in combination a steam generating compartment, a compartment for heating the feed water, an ignition chamber disposed outwardly of
20 said compartments means for supplying air and fuel to said ignition chamber, and means for transmitting the exploded gases from the ignition chamber to the generating compartment, said means being adapted to
25 be actuated by the exploded gases.

4. In a steam generator the combination,

with a steam generating compartment, of a compartment for heating the feed water, an ignition chamber disposed outwardly of said compartments, means for supplying air 30 and fuel to said ignition chamber, means for transmitting gas from the igniting chamber to the generating compartment, said means being adapted to be actuated by the explosion in said ignition chamber and 35 a device for actuating said air supplying means by hand.

5. In a steam generator the combination with a steam generating compartment, of a compartment for heating the feed water, an 40 ignition chamber, valves communicating between said chamber and said compartments, the valve leading to said feed water compartment being adapted to operate later than the valve leading to the steam gener- 45 ating compartment.

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

HANS SCHWAGER.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.