No. 743,491. PATENTED NOV. 10, 1903.

F. GRÜNEWALD.

STEAM GENERATOR.

APPLICATION FILED DEC. 26, 1901.

NO MODEL.

Fig. 1

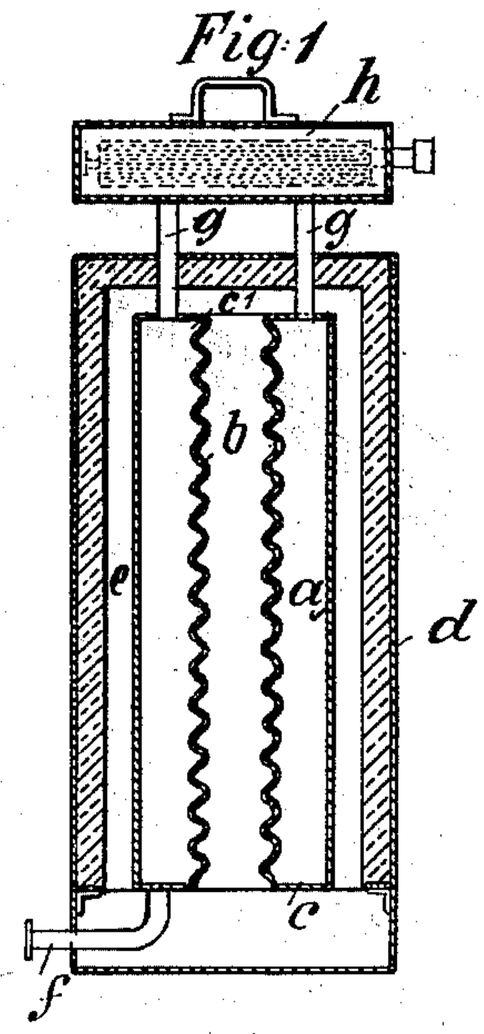
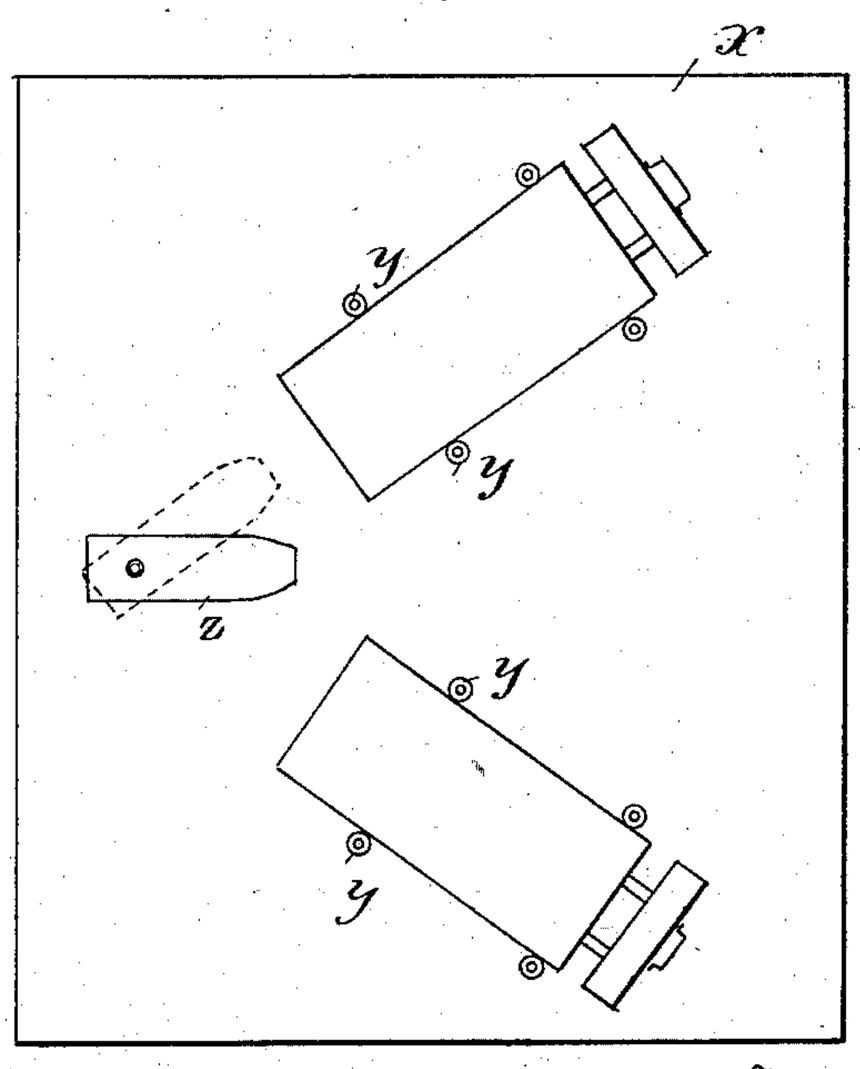


Fig. 2.



Witnesses:
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No. 743,491. Patented November 10, 1903.

UNITED STATES PATENT OFFICE.

FRIEDRICH GRÜNEWALD, OF BERLIN, GERMANY, ASSIGNOR TO HERMANN ENGELHARDT, OF BERLIN, GERMANY.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 743,491, dated November 10, 1903.

Application filed December 26, 1901. Serial No. 87,352. (No model.)

To all whom it may concern:

Be it known that I, FRIEDRICH GRÜNEWALD, a subject of the King of Bavaria, residing at the city of Berlin, in the Kingdom of Prussia, Germany, have invented a new and useful Steam-Generator, of which the following is a specification.

My invention relates to steam-generators which require no special furnace and are readily portable.

The invention consists in the combination of two hollow cylinders—one located within the other—with a casing or shell to receive said cylinders. The shell is provided with an aperture at one end to receive a heating-nozzle. At this end is also a pipe to supply water to the hollow cylinders, while at the opposite end outlet-pipes are provided for the steam generated in the space between the said cylinders.

The invention is illustrated by the annexed drawings, in which—

Figure 1 is a section of the apparatus; Fig. 2, a plan view showing a special application of the same to be hereinafter described.

The hollow cylinders *a b* together form a water-space, inclosed by the exterior walls of said cylinders and by the ends *c c'*. A water-inlet pipe *f* passes through the end *c*, and steam-outlet pipes *g g* are provided at the opposite end *c'*. The water-space formed by the cylinders *a b* is located in an outer receptacle or shell *d*, the walls of which may be coated with non-conducting composition. The shell *d* is provided at one end with an aperture for the entrance of the flames from a heating-nozzle. The pipes *g g* at the opposite end conduct to a steam-receiver *h*. The walls of the inner cylinder *b* are corrugated in order to present a larger heating-surface.

The operation of the apparatus is as follows: The water-space formed by the walls of the cylinders *a b* is heated by means of an ordinary petroleum heating-nozzle, (not shown in the drawings,) the heating-gases entering the open cylinder *b* and passing through the space *e*, whereby they heat the exterior wall of the cylinder *a*. During this operation water is allowed to enter the space between the two cylinders *a b* by the pipe *f*. The water may be conducted slowly into the space *a b*, being permitted to flow gently along the heater-walls, or it may be projected against the walls by being conducted into thin pipes under pressure, so as to leave in jets. Through the slow entrance of the water every particle will be at once converted into steam, whereby a continuous active generation of steam takes place and the steam, leaving between the heated walls, will undergo supplemental heating by the latter.

If it is desired to employ the apparatus so that it can be removed from the heating-nozzle and supplied with feed-water at a distance, the form of construction shown in Fig. 2 is used. According to this arrangement a heating-nozzle *z* is pivotally secured between two generators. Rollers *y y* are provided for the purpose of readier removal and return of the latter. One of the generators is then removed after being heated, and while it is giving off its steam the other generator is heated.

In my new apparatus there is thus presented a portable steam-generator by means of which steam can be generated more plentifully and more rapidly than by steam-generators as at present employed, and the steam-supply is dry and continuous without any opening and closing of the apparatus.

I claim—

1. A portable steam-generator comprising three horizontally-arranged concentric shells to form three similar chambers, the outer chamber open at one end and the inner chamber open at both ends, a steam-collector outside of said chambers and in communication with one end of the intermediate chamber, means to feed water at the opposite end, an independent heating device capable of being positioned to heat the open-ended internal chamber, and means to removably hold the generator in relative position to the heating device, substantially as described.

2. A steam-generator comprising a portable shell closed at one end, a water-chamber therein comprising an inner corrugated and an outer cylinder connected by suitable heads to form a central passage and a free space between the water-chamber and shell, a steam-chamber, pipes passing through the shell and connecting the steam and water chambers, an inlet for water at one end of the water-chamber

and an outlet-pipe for steam connected to the steam-generator, substantially as described.

3. In combination, a plurality of open-ended steam-generators each removably secured in position and a pivoted heating-nozzle adapted to be positioned to heat any one of said generators, substantially as described.

4. In combination, a plurality of open-ended steam-generators arranged in the arc of a circle, comprising a shell, a tubular water-chamber therein and a steam-chamber outside of said shell and connected to the water-chamber, of a pivoted heating-nozzle adapted to be moved to heat any one of said generators and rollers *y* holding the generators removably in position, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

FRIEDRICH GRÜNEWALD.

Witnesses:

HENRY HASPER,

WOLDEMAR HAUPT.