D. ABELL.

Steam-Generator.

No. 221,011. Patented Oct. 28, 1879.

Fig: 1.

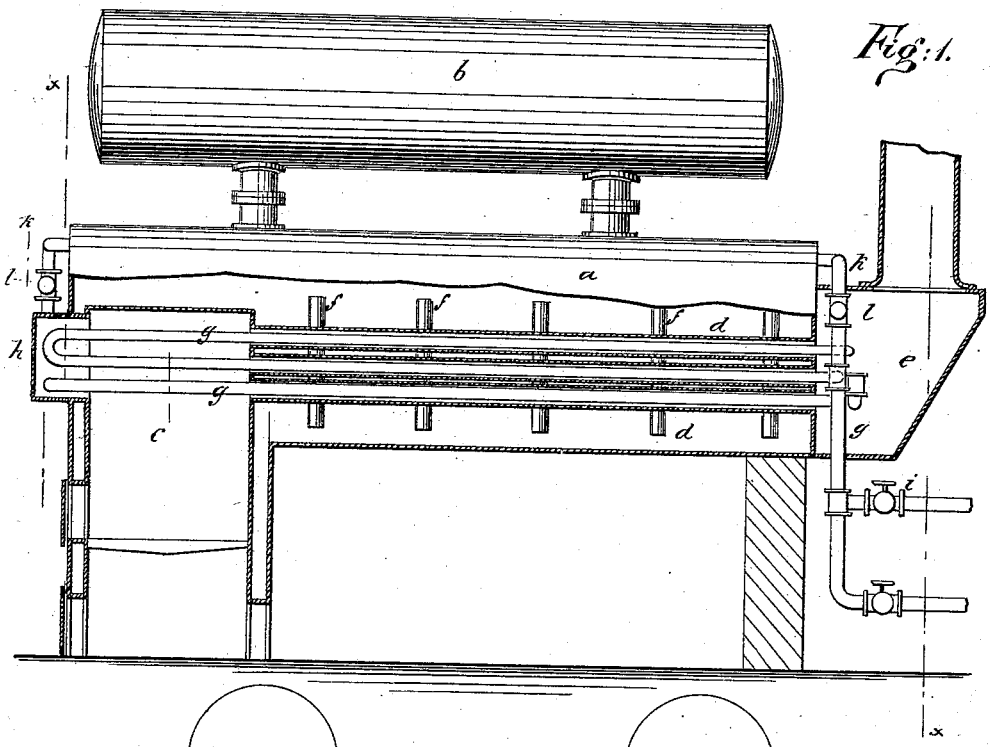


Fig: 2.

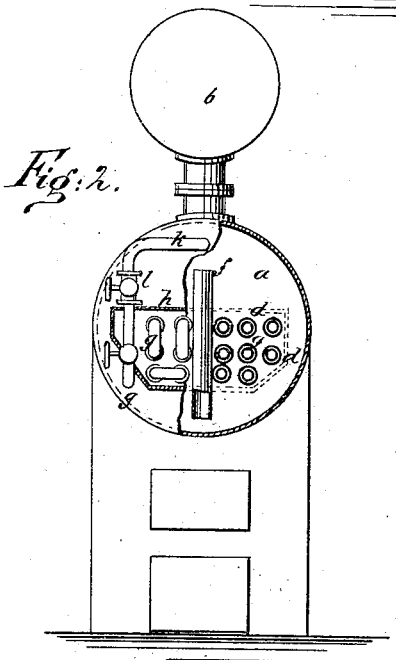
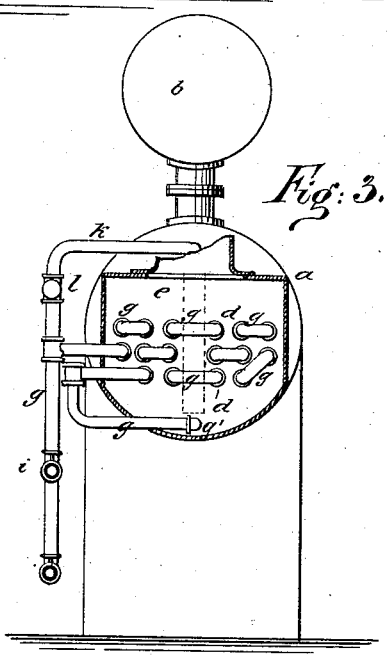


Fig: 3.



WITNESSES:

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UNITED STATES PATENT OFFICE.

DAN ABELL, OF CARSON CITY, NEVADA.

IMPROVEMENT IN STEAM-GENERATORS.

Specification forming part of Letters Patent No. **221,011**, dated October 28, 1879; application filed June 12, 1879.

To all whom it may concern:

Be it known that I, DAN ABELL, of Carson City, in the county of Ormsby and State of Nevada, have invented a new and Improved Steam-Generator, of which the following is a specification.

The invention consists in combining with a steam-generator feed-water pipes extending through the flues and projecting through an opening at the front and a cap for covering the ends, as hereinafter described.

The invention will be more particularly described in connection with the accompanying drawings, wherein—

Figure 1 is a vertical longitudinal section of a boiler constructed in accordance with my invention. Fig. 2 is a view at the front end, partially in section. Fig. 3 is a rear elevation, also in section.

Similar letters of reference indicate corresponding parts.

The drawings show a horizontal tubular boiler, *a*, being the main shell, *b* the steam-dome, *c* the fire-box, and *d* the flue-tubes, that discharge into a smoke-box, *e*, at the rear of the boiler. In the water-space of the boiler, and between the flue-tubes *d*, there is fitted a series of short vertical tubes, *f*, which project from below up to near the water-line, and are open at each end, so that they act to increase the circulation within the water-space. The feed-water pipes (marked *g*) connect with the pump at the rear of the boiler through the smoke-box, and pass through the flues *d* from end to end in a continuous coil, that finally enters the water-space near the bottom of the smoke-box at *g'*. These pipes *g* extend across the fire-box *c* and through an opening in the front of the boiler, where the return bends and opening are covered by a removable cap, *h*, whereby access may be had to the pipes when the boiler is in operation.

At *i* is a blow-off cock for blowing out the feed-water pipes, and at the front and rear of the boiler there are circulation-pipes *k*, which are connected with the water-space of the boiler and with the feed-water pipes *g*, and extend outside the boiler, so that access may be had to their cocks *l* for closing these pipes *k*. These pipes *k* are required for use to maintain a circulation in the feed-water pipes when starting the boiler or when no feed-water is being supplied, and thereby prevent the pipes *g* from burning out. They are brought into operation by opening the cocks *l*.

The pipes *g* will be connected at their ends with the return-bends by screw-joints, and screw-caps may be provided in the bends for permitting the pipes to be cleaned.

The construction described will give a rapid generation of steam with a small amount of fuel, and at the same time facility of access for cleaning and repairs.

By running the feed-water pipes through the flue-tubes and furnace the feed-water is subjected to temperature greater than that of the steam in the boilers. By extending the feed-pipes beyond the end of the boilers the pipes may be cleaned and repaired without interfering with the boiler. By the use of the circulation-pipes *k* the feed-pipes are preserved.

I do not limit myself to the special form of boiler shown, as my improvements are applicable to other forms.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

In combination with a steam-generator, the feed-water pipes *g*, extending through the flues, and projecting through an opening at the front of the boiler, and the cap *h*, for covering the ends of the water-pipes, substantially as and for the purposes set forth.

DAN ABELL.

Witnesses:
JOHN EHRHARDT,
J. Q. A. MOORE.