

G. F. BURKHARDT.

Steam Engines and Boilers.

No. 116,019.

Fig. 1

Patented June 20, 1871.

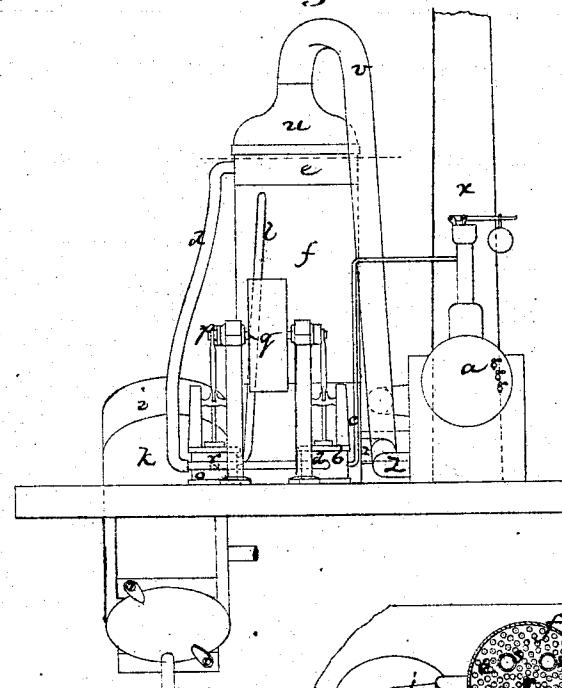


Fig. 2

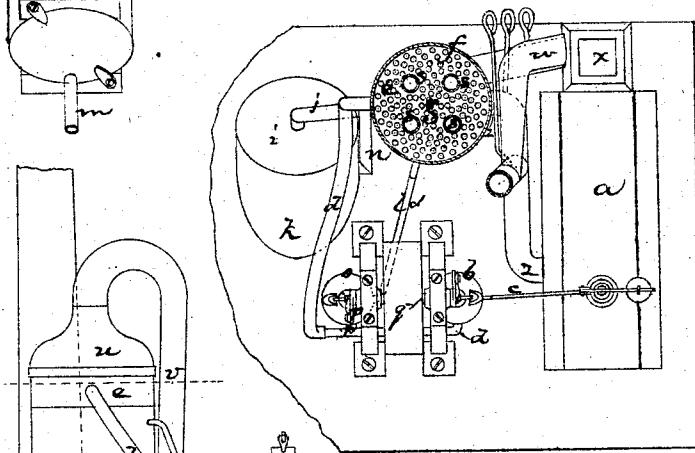
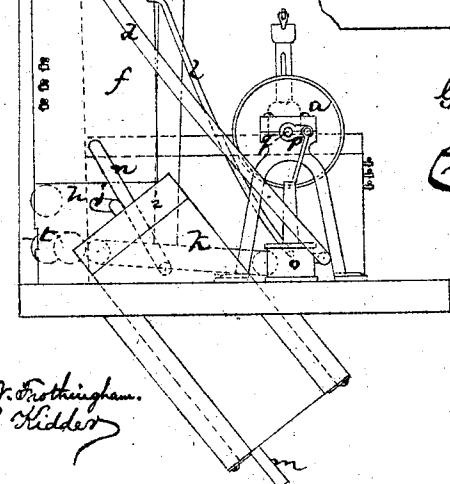


Fig. 3.



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By his Atty.
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Witnesses: { Mr. W. Frothingham.
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UNITED STATES PATENT OFFICE.

GOTTLIEB F. BURKHARDT, OF BOSTON HIGHLANDS, MASSACHUSETTS.

IMPROVEMENT IN STEAM-ENGINES AND BOILERS.

Specification forming part of Letters Patent No. 116,019, dated June 20, 1871.

To all whom it may concern:

Be it known that I, GOTTLIEB F. BURKHARDT, of Boston Highlands, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Steam-Engines and Boilers; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

The invention relates to the method of utilizing exhaust steam from steam-engines, or to the construction and arrangement of the auxiliary boilers with reference to the main boiler and the engines.

The drawing represents a construction and arrangement embodying my improvement.

Figure 1 shows the parts in front elevation. Fig. 2 is a plan. Fig. 3 is a side elevation of them.

a denotes the main boiler. *b* is an engine-cylinder, supplied with steam from the boiler *a* through a pipe, *c*. *d* denotes the exhaust-pipe from this cylinder, and this exhaust-pipe leads into a steam-chamber, *e*, in the upper part of a tubular boiler, *f*, from which steam-space opens a series of vertical tubes, *g*, leading through the boiler and into a steam-chamber, *h*, in the lower part thereof, from which space the steam passes (by means of a pipe, *j*) into a steam-space, *i*, at the top of a condenser, *k*, having tubes through which the steam passes, and from which the condensed steam flows (through a pipe, *m*) into the water-supply tank or well. The water-spaces around these tubes in the auxiliary boiler *f* and condenser *k* are kept supplied with water by a suitable pump, which forces water through the condenser *k* and through a connecting-pipe, *n*, into the boiler *f*, said pipe being provided with a suitable valve to prevent back movement of the water. The steam-room above the water-level in the cylinder *f* is connected, by a pipe, *l*, with the cylinder *o* of the auxiliary engine, the piston-rod of which may be connected with a crank, *p*, on the fly-wheel shaft *q*, to a crank upon the opposite end of which the piston of the cylinder *b* is connected. The auxiliary cylinder *o* exhausts (by a pipe, *r*) into the exhaust-pipe *d*, so that the steam from both cylinders passes into the steam-space *e* at the top

of the boiler *f*. Extending through the boiler *f* are vertical flue-pipes *s*, which extend from a fire-box, *t*, (below the boiler,) through the boiler into a flue-chamber, *u*, over the boiler, from which chamber a flue-pipe, *v*, leads, such pipe *v* conveying the smoke and volatile products of combustion into a flue, *w*, leading into the chimney *x*. The pipe *v* extends down and communicates with a pipe, *z*, leading from the fire-box of the main boiler into the fire-box of the auxiliary boiler, and by closing and opening the respective dampers the fire in the main fire-box may be carried through the flues of the auxiliary boiler; or, vice versa, the fire from the auxiliary fire-box may be conducted under the main boiler-flues.

By this arrangement of an auxiliary boiler and an auxiliary fire-box and flues it will be obvious that all of the heat of the exhaust steam may be utilized to heat the water in the auxiliary boiler, and, with the heat from the auxiliary fire-box (or with heat from the main fire-box,) to convert the water into steam, which, by means of the pipe *l*, may be used to run the engine, and that such exhaust steam may also be used to heat the water of supply, or to heat water for various other uses.

The steam from the auxiliary boiler may be conducted into the steam-room of the main boiler; but I prefer to use it in driving the engine-cylinder *o*.

I claim—

1. In combination with the main boiler and engine, an auxiliary tubular boiler, *f*, arranged as shown and described, and having a series of steam-tubes leading through it, surrounded by a water-space, above which space is a steam-space connected, by a pipe, *l*, with auxiliary steam-cylinder *o*, or with the steam-room of the main boiler.

2. In combination with the main boiler, the auxiliary tubular boiler *f*, the auxiliary fire-box *t*, and flue-pipes *s*, substantially as shown and described.

3. The arrangement of the auxiliary fire-box *t*, flue-pipe *v*, cylinder *f*, and flue-pipes *z w*, substantially as shown and described.

GOTTLIEB F. BURKHARDT.

Witnesses:

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