S. G. CLARK.

Steam-Boiler Furnace.

No. 219,344. Patented Sept. 9, 1879.

Fig. 1.

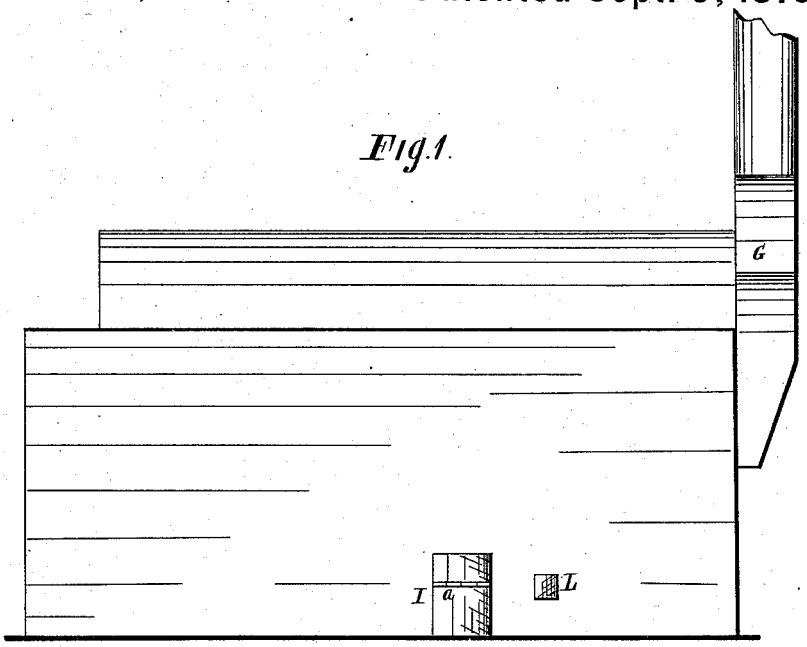
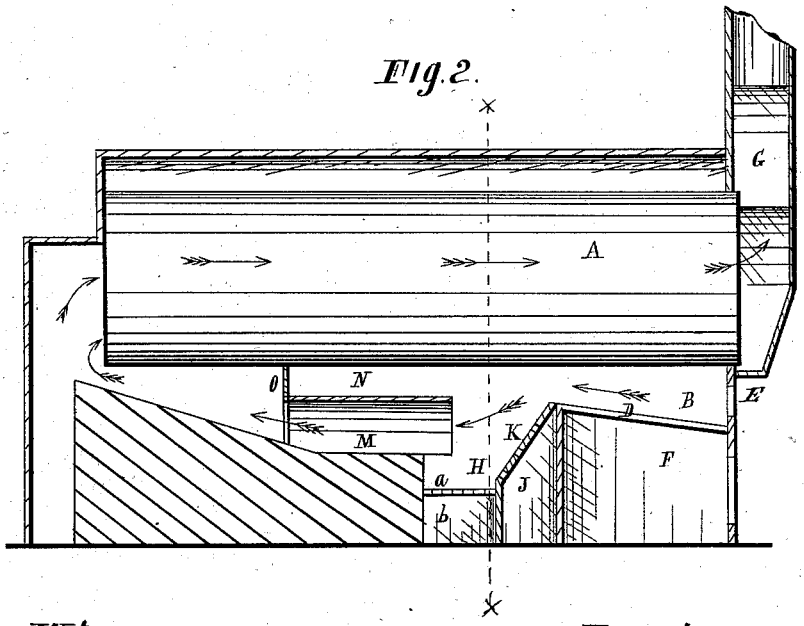


Fig. 2.



WITNESSES.

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2 Sheets—Sheet 2.

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Fig. 3.

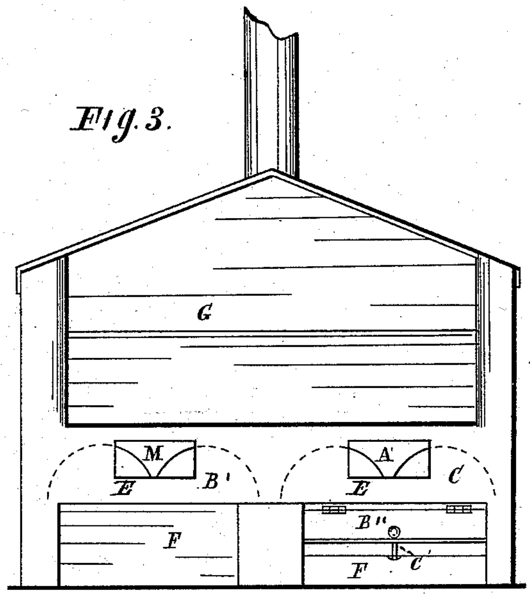


Fig. 4.

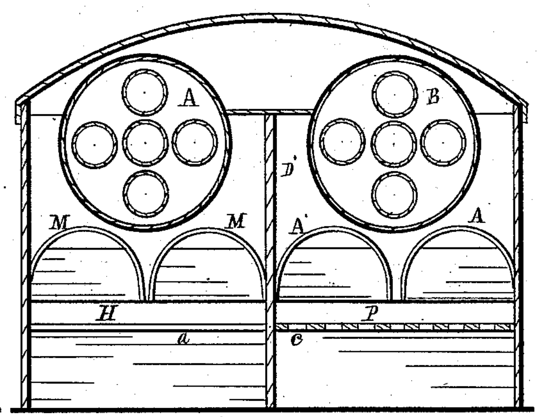
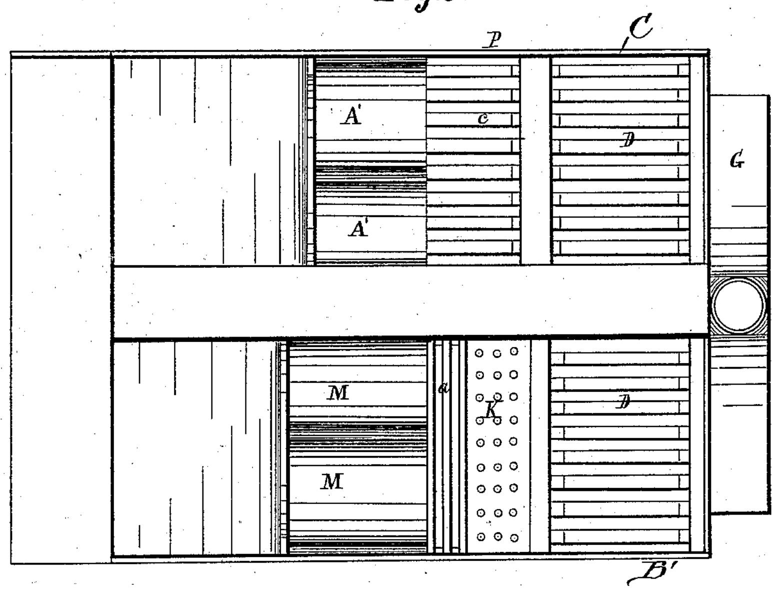


Fig. 5.



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UNITED STATES PATENT OFFICE.

SAMUEL G. CLARK, OF CLEVELAND, OHIO.

IMPROVEMENT IN STEAM-BOILER FURNACES.

Specification forming part of Letters Patent No. **219,344**, dated September 9, 1879; application filed May 2, 1879.

To all whom it may concern:

Be it known that I, SAMUEL G. CLARK, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Furnaces for Steam-Boilers and other similar purposes, of which the following is a description, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is an external side view of the furnace. Fig. 2 is a vertical longitudinal section. Fig. 3 is a front elevation. Fig. 4 is a vertical transverse section in direction of the line *x x*, Fig. 2. Fig. 5 is a plan view with the boilers removed.

Like letters of reference refer to like parts in the several views.

Operation: I utilize the heat in the cinders and partially-burned coal by removing them from the front of the furnace to the rear of the grate-bars, where they fall into an auxiliary furnace or cinder fire-place, the heat of which consumes the smoke and gases as they pass back from the front or primary furnace to the flues. Fresh coal or fuel is fed to the front furnace as fast as the incandescent coal and cinders are raked back into the auxiliary or rear fire-place, where sufficient air is admitted to continue the combustion of the coals raked back, which, in turn, consumes the smoke, &c., passing over it from the front furnace.

A further and more complete description of the invention is as follows: As represented in the drawings, there are two boilers, A and B, Fig. 4, with their respective furnaces B′ and C, Fig. 3, of which D D, Fig. 5, are the grate-bars; E, the doors of the furnace; F, the ash-pits, and G the jacket and smoke-stack, in which the front end of the boiler terminates, as shown in Fig. 2, all which are or may be constructed like steam-boiler furnaces in ordinary use.

In the rear of the furnace B is an auxiliary furnace or cinder fire-place, H, of which *a* are the grate-bars, and *b* the ash-pit. Access is had to said fire-place from the side of the furnace-structure through a door, I, Fig. 1. Between the ash-pit F and the fire-place H is an air-chamber, J, Fig. 2, closed against the ash-pits of the two fire-places, but open to the cinder fire-place H through a perforated wall, K. Said chamber is open to the outside by an aperture, L, Fig. 1, of which further mention will be made.

M are arched flues leading directly from the fire-place H (over which the flues partially project) toward the end of the boiler, and through which the smoke, &c., from the fire-places pass. The space N, Fig. 2, above the flues and directly under the boiler, is closed in the rear by the wall O supporting the boiler, so that no smoke, &c., can pass over the flues to the rear. The said space N forms a chamber, the purpose of which will presently be shown.

In the rear of the furnace C is also an auxiliary furnace or fire-place, P, Figs. 4 and 5, of which *c* are the grate-bars, and A′ the arch-flues. The said fire-place and flues are substantially like the fire-place and flues above described, and hold the same relation to their respective boiler.

In building or locating the furnace-structure it may not always be convenient or practicable to have the auxiliary or cinder fire-place open at the side of the structure, as shown at I in Fig. 1, in which event there is no perforated wall nor an air-chamber required. Instead of a perforated wall, the bridge-wall of the furnace C is provided with an opening along the bottom immediately above the grate-bars. Said opening is furnished with a drop-door or damper, B″, Fig. 3, which is opened for the admission of fresh air to the fire-place by the handle C′, attached thereto, and extending therefrom to the door of the ash-pit, within easy reach of the fireman.

The auxiliary fire-place P, having no outside opening or door, discharges its ashes, &c., into the ash-pit of the furnace C. The ash-pit extends under the fire-place for that purpose.

The two furnaces B′ and C, with their respective auxiliary fire-places and boilers, are separated from each other by a partition-wall, D′, Fig. 4; hence one furnace and boiler can be used separately, or both of them together, as the case may be.

The practical operation of the above-described furnace is as follows: On building a fire in the furnace B the unconsumed smoke and gases therefrom pass over the auxiliary fire-places into and through the flues M; thence

along to the end of the boiler, through which they pass to the stack G. The direction of the smoke, &c., is indicated by the arrows in Fig. 2.

The cinders from the furnace, and with them more or less of the incandescent coal, are raked back from time to time from the grate-bars of the furnace into the auxiliary fire-place, wherein their combustion is continued by the admission of fresh air into the fire-place from the air-chamber J through the perforated bridge-wall K. This increment of heat in the auxiliary furnace consumes the combustible matter contained in the smoke and the unburned gases passing with the smoke from the furnace over the fire-place.

The heat produced by the consumption of the smoke and gas contributes largely to the generation of steam in the boiler, thus utilizing the heat-producing matter which ordinarily passes off with the smoke and is lost.

The space N above the arch-flues acts as a reverberatory chamber, from which the smoke and gases filling it are reflected back upon the auxiliary fire-place, they not being able to escape from the fire-place except through the arch-flues. The combustible matter in the form of smoke, &c., reflected back upon the fire-place serves to maintain and continue the heat at that place, thereby consuming more completely the heat-producing matter of the smoke and gases.

Fresh coal is supplied the furnace at or near the front ends of the grate-bars, which is gradually worked back to the auxiliary fire-place, into which more or less of it falls along with the cinders, where it is wholly consumed, or nearly so, together with the heat-producing elements of the smoke and gases, as and for the purpose specified.

No fresh coal is placed in the auxiliary fire-place, the fire therein being wholly supplied by the waste from the front fire-place or furnace.

It will be obvious from the above-described furnace that most, if not all, of the combustible elements of the smoke and gases eliminated in the furnace are consumed and utilized in the generating of steam, and that a large saving is made in the consumption of fuel.

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

In combination with a furnace, B, for steam-boilers, an auxiliary rear furnace arranged below said furnace B, and separated therefrom by a perforated hollow bridge-wall, and provided with arched flues M, projecting partially over the rear fire-place, and having above said flues a space or chamber, N, in which smoke, &c., from the furnace B are arrested and reflected therefrom upon the rear fire place, as described, and for the purpose specified.

SAMUEL G. CLARK, M. D.

Witnesses:
W. H. BURRIDGE,
WM. F. BEECHER.