C. POTTIER.

HOT-AIR APPARATUS.

No. 191,779. Patented June 12, 1877.

Fig. 2.

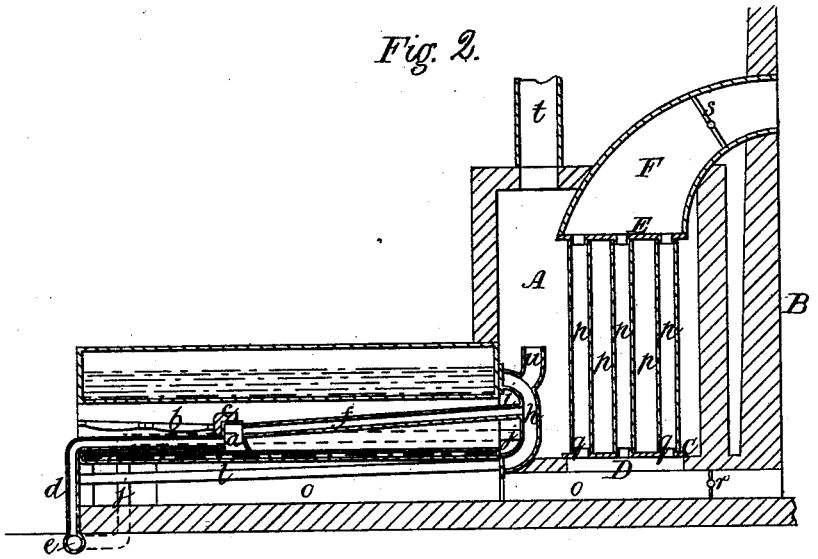


Fig. 3.

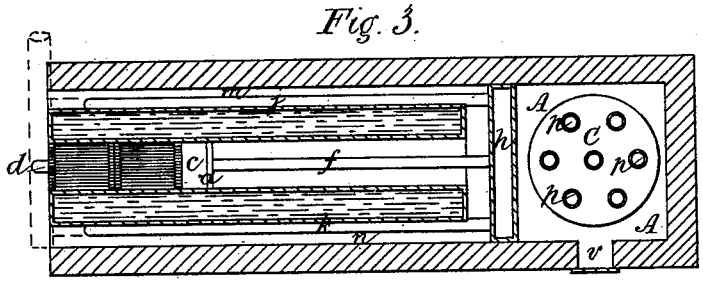


Fig. 4.

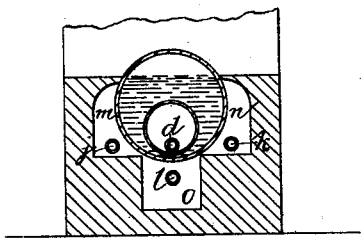
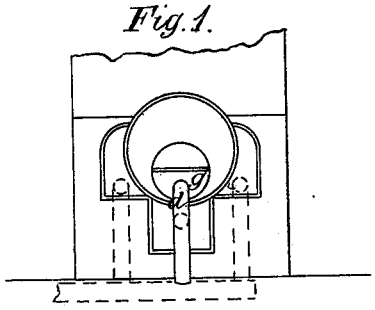


Fig. 1.



Witnesses,
G. H. Redfern
A. Hunt

Inventor.
Ch. Pottier

UNITED STATES PATENT OFFICE.

CHARLES POTTIER, OF LONDON, ENGLAND, ASSIGNOR OF ONE-HALF HIS RIGHT TO PIERRE AIMABLE VICTOR LE LUBEZ, OF SAME PLACE.

IMPROVEMENT IN HOT-AIR APPARATUS.

Specification forming part of Letters Patent No. **191,779**, dated June 12, 1877; application filed January 9, 1877; patented in England, April 20, 1876, for 14 years.

To all whom it may concern:

Be it known that I, CHARLES POTTIER, of London, England, have invented certain Improved Hot-Air Apparatus Connected with Steam-Boilers, (patented in England, April 20, 1876, No. 1,658,) of which the following is a specification:

The object of my invention is the construction of an improved hot-air apparatus to be applied to steam-boilers for utilizing the waste heat therefrom for various purposes.

To carry out my invention, I place within the tube or tubes of the boiler an air-chamber of cast or wrought iron, which I fix at the back of the fire-grate, and which is used as the bridge, being protected by fire-brick on the front and top. This air-chamber communicates with the outside atmospheric air by means of a pipe or tube passing along the ash-pit, and communicating with an outside air pipe or tube.

From the top part of the said air chamber or bridge another pipe or tube, of cast or wrought iron, passes along the boiler tube or flue, and communicates with another air-chamber at the back of the boiler.

To this second air-chamber are fixed three other pipes or tubes, taking their cold air from the said cold-air pipe, and which pass along in the side and bottom flues of the boiler.

At the back of the boiler, between it and the chimney, is another and much larger air-chamber, in which a series of vertical pipes or tubes is fixed, and through these pipes or tubes the excess of heat and smoke from the combustion passes, thereby producing a large amount of heating-surface in the said air-chamber.

This air-chamber is formed of brick-work, and may also be in communication with the outside cold-air pipe or tube, if required, and the pipes in communication and connected with the bottom flue are made, by preference, of cast-iron, and fixed so as to allow of their being easily swept or replaced when worn out or damaged.

At the top of this air-chamber is a pipe for carrying and distributing the hot air to rooms or other places where hot air is required either for drying, warming, or heating purposes, as the case may be.

But, to make my invention better understood, I will now proceed to describe the same by reference to the accompanying drawing, in which—

Figure 1 is a front elevation of a Cornish boiler with my improved hot-air apparatus applied thereto; Fig. 2, longitudinal section of the same; Fig. 3, a horizontal section; and Fig. 4, a transverse section of the same.

Similar letters of reference are used in all the figures to represent similar parts.

In the drawing the details and some of the parts of the boiler are omitted, only sufficient thereof being shown to illustrate my invention.

a shows the hollow cast-iron bridge forming an air-chamber, and placed in the usual position at the back of the fire-grate *b*. *c* is the fire-clay covering, for protecting the bridge or air-chamber. *d* is the pipe or tube passing from the front of the bridge *a* along the bottom of the ash-pit *g* to the pipe *e* in front of the boiler and below the ground-level. This pipe *e*, which I call the cold-air pipe, is closed at one end, and the other end is open to allow of the admission of cold-air. *f* is the pipe passing from the top of the hollow bridge *a*, the other end opening into the air-chamber *h*, fixed at the back of the boiler. This air-chamber is made of cast-iron, and incloses or forms the back flue *i* of the boiler. The air-chamber *h* is connected to the cold-air pipe *e* by three pipes, *j*, *k*, and *l*. The pipes *j* and *k* pass along the side flues *m* and *n* of the boiler, and the other pipe *l* passes along the bottom flue *o*. A A is the large air-chamber built of brick-work and placed between the air-chamber *h* and the chimney B. *p p p p* are the pipes or tubes in the chamber A. The lower ends of these pipes *p* fit over collars or rims *q* in the perforated plate C, which is placed over an opening, D, in the bottom of the chamber A, communicating with the bottom flue *o* of the boiler. A similar perforated plate, E, is placed over the tops of the pipes *p*. F is a curved or elbow pipe or tube passing from the plate E and opening into the chimney B. It will thus be seen that the heated air, smoke, and other products of combustion can pass from the bottom flue *o* through the tubes *p* into the chim-

ney B, and leave an intense heat in the chamber A A. *r* is a damper in the flue *o*; *s*, damper in the pipe F. *t* is a pipe for conveying and distributing the heated air from the chamber A. *u* is a short pipe for allowing the passage of the heated air from the chamber *h* into the chamber A. *v* is an opening, closed by a door, which may be made in the side of the chamber A, to allow of the admission of cold air, if required.

The action of the improved apparatus is as follows: Cold air from the cold-air pipe *e* will pass along the pipe or tube *d* into the hollow bridge *a*, and will be heated and pass along the pipe *f* into the air-chamber *h*, from which it will escape, at a very high temperature, through *u* into the air-chamber A. Cold air from the pipe *e* will also pass along the pipes *j*, *k*, and, *l*, and, being heated in its passage by the heat in the flues, will also enter and pass from the chamber *h*, at a very high temperature, into the air-chamber A, from whence it passes through the pipe *t* to the places or rooms where it is required for drying or heating purposes. The air in the chamber A, as also the air which may be introduced through the opening *v*, will also be further heated by contact with the pipes or tubes *p*, through which the heated air, smoke, and other products of combustion pass from the flue *o*, as hereinbefore described.

It will be understood that where two or more boilers are placed side by side the air-chambers *h* and A may be made sufficiently large to extend to all the boilers.

Although my improvements have been shown and described as applied to a Cornish boiler, they are applicable with equal advantage to other steam-boilers.

Having thus described my invention, what I claim is—

1. In combination with a steam-boiler, the improved hot-air apparatus, substantially as shown and described, consisting of the series of horizontal and inclined tubes and air-chambers, applied to utilize the waste heat of the boiler, as set forth.

2. The vertical tubes *p p p* in the large air-chamber having direct communication with the bottom flue *o*, and also with the outlet-flue F, and serving to utilize the heat from such bottom flue before its passage to the chimney.

CH. POTTIER.

Witnesses:

G. F. REDFERN,

A. ALBUTT.