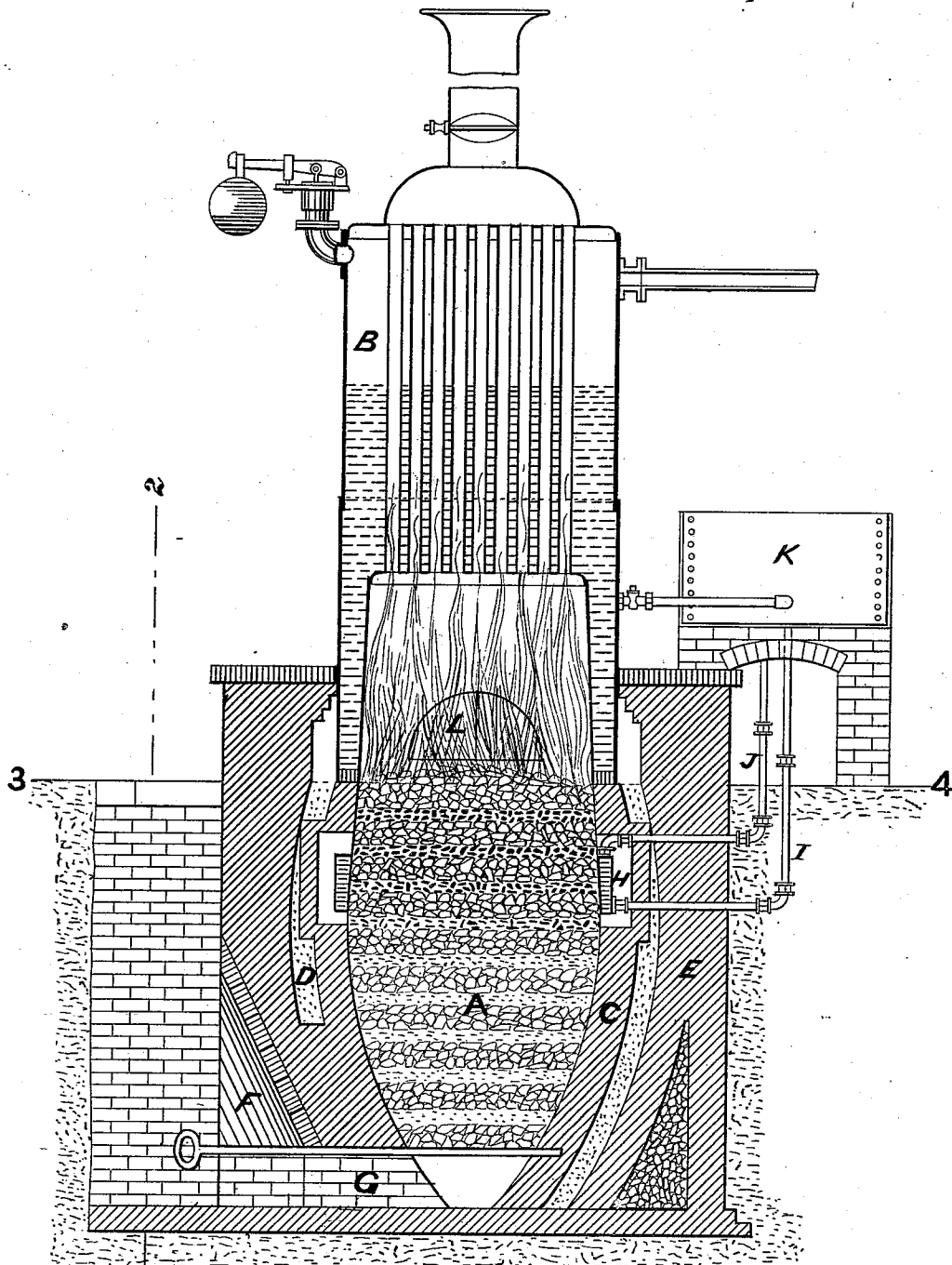


J. COWAN.
 COMBINED BOILER AND LIME-KILN.
 No. 184,843. Patented Nov. 28, 1876.

FIG. 1.

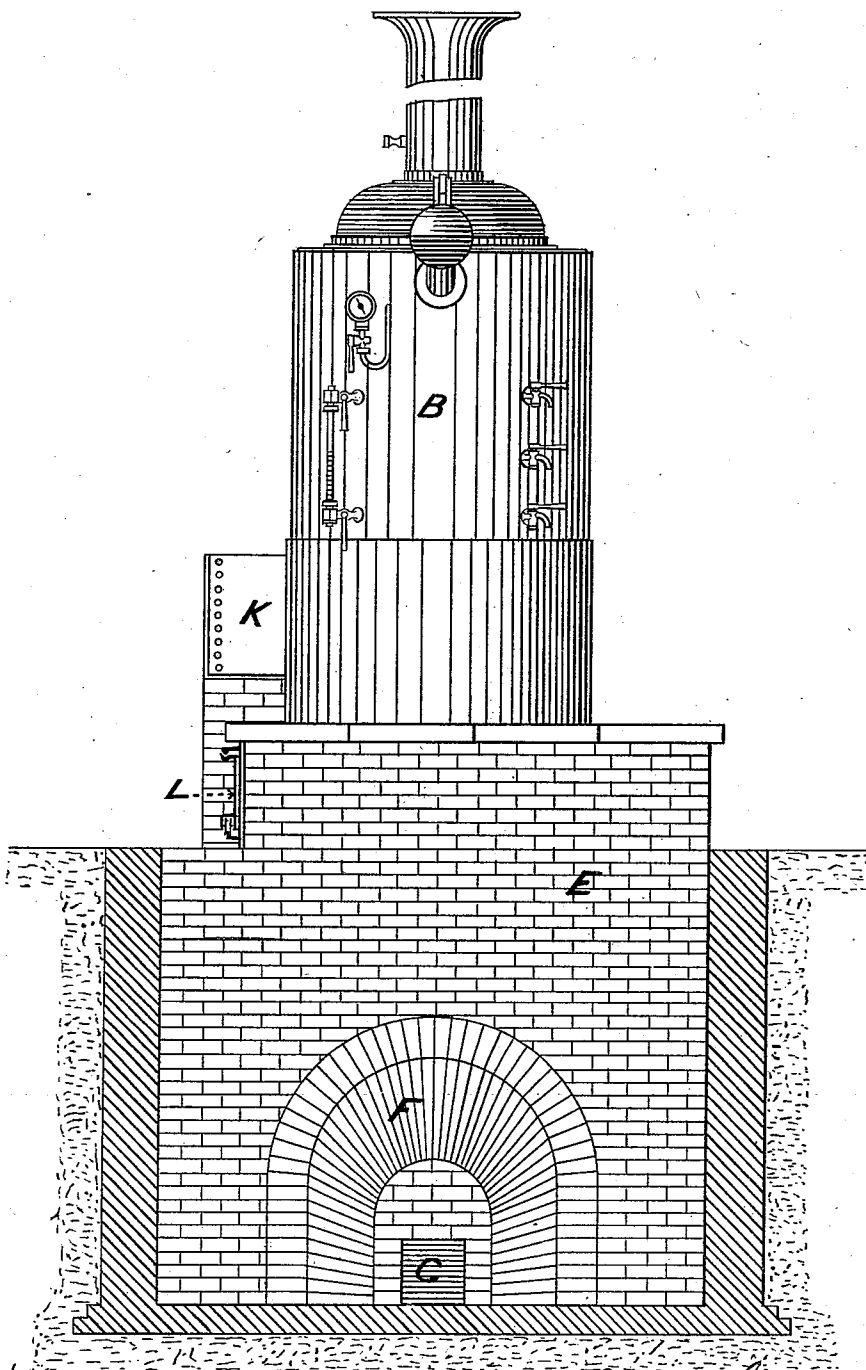


Witnesses
J. G. Shideman
Henry Smith

John Cowan
 by his Attorneys.
Howson and Co.

J. COWAN.
COMBINED BOILER AND LIME-KILN.
No. 184,843. Patented Nov. 28, 1876.

FIG. 2.



Witnesses
J. H. Skidmore
Harry Smith

John Cowan
by his Attorneys,
Howson and Son

UNITED STATES PATENT OFFICE.

JOHN COWAN, OF GARSTON, LIVERPOOL, ENGLAND.

IMPROVEMENT IN COMBINED BOILER AND LIMEKILN.

Specification forming part of Letters Patent No. **184,843**, dated November 28, 1876; application filed September 26, 1876.

To all whom it may concern:

Be it known that I, JOHN COWAN, of Garston, Liverpool, England, have invented an Improvement in Combined Boiler and Limekiln, of which the following is a specification:

The object of my invention is to so combine a steam-boiler with a limekiln that all the waste heat from the latter shall be utilized in generating steam.

In the accompanying drawing, Figure 1, Sheet 1, is a vertical section of my combined limekiln and steam-boiler; and Fig. 2, Sheet 2, an exterior view of the same.

A is the chamber of the kiln, the wall C of this chamber being made of fire-brick or refractory stone, and having a thickness, D, of sand or an air-space, surrounded by an outer or retaining wall, E, in which is an arched recess for affording access to the drawing and lighting hole G at the base of the kiln. The boiler B is of the vertical tubular type, and the inner wall of the kiln is built to conform with the boiler, so as to form an appropriate foundation for the same, and so that the interior of the fire-box shall form a continuation of the chamber of the kiln, from which the entire products of combustion of the fuel pass into the fire-box, and thence directly through the tubes of the boiler to the chimney. There is a feed-opening, L, in the fire-box, corresponding with a like opening in the outer wall of the kiln. In the inner wall C of the kiln is a recess containing a supplementary boiler or

water-heater, H, which communicates through tubes I and J with a tank, K, for containing feed-water for the boiler, and between which and the heater H a circulation is constantly maintained. This feed-water heater, however, forms no part of my present invention. A steam-boiler of the locomotive type may be substituted for the vertical boiler shown in the drawing; but in this case, also, the fire-box of the boiler should be so adapted to the wall of the kiln that the interior of the said fire-box shall form a continuation of the chamber of the kiln, so that the entire waste products of the kiln shall pass into the said fire-box.

I wish it to be understood that I do not desire to claim, broadly, the combination of a limekiln with a water-heater or boiler, as such a combination is shown in my Patents Nos. 157,275 and 157,276; but

I claim as my invention—

The combination of a steam-boiler with a limekiln, in the manner described, so that the fire-box of the boiler shall rest on the top of the wall of the kiln, and so that the interior of the fire-box shall form a continuation of the chamber of the kiln, all as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN COWAN.

Witnesses:

HENRY HOWSON, Jr.,
HARRY SMITH.