

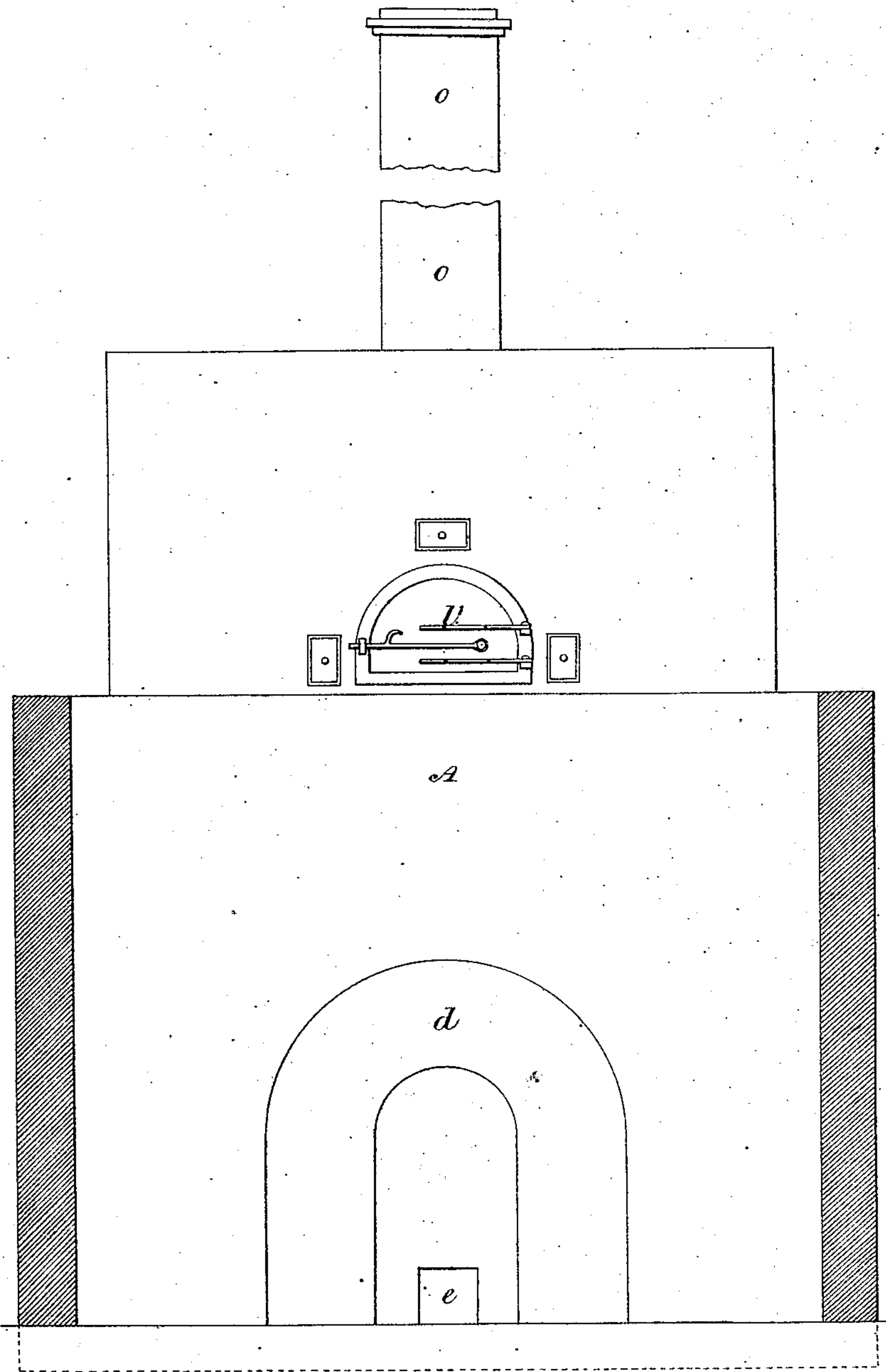
J. COWAN.

Apparatus for Heating Greenhouses, &c.

No. 157,276.

FIG. 1.

Patented Dec. 1, 1874.



Witnesses;
Thomas Moore
E. M. Byrne

Inventor,
John Cowan

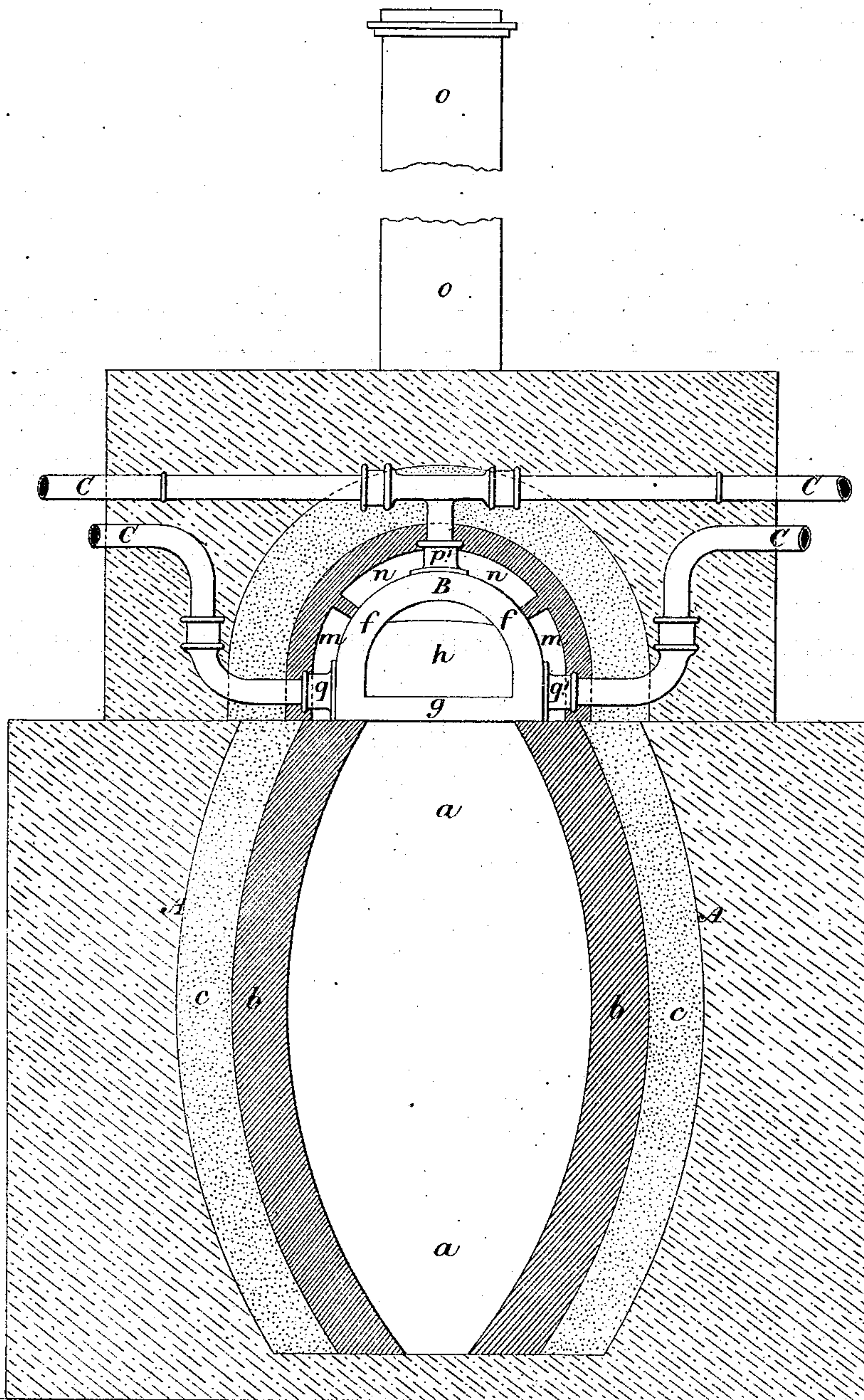
J. COWAN.

Apparatus for Heating Greenhouses, &c.

No. 157,276.

Patented Dec. 1, 1874.

FIG. 2.



Witnesses,
Thomas Moore
E. M. Byrne

Inventor,
John Cowan

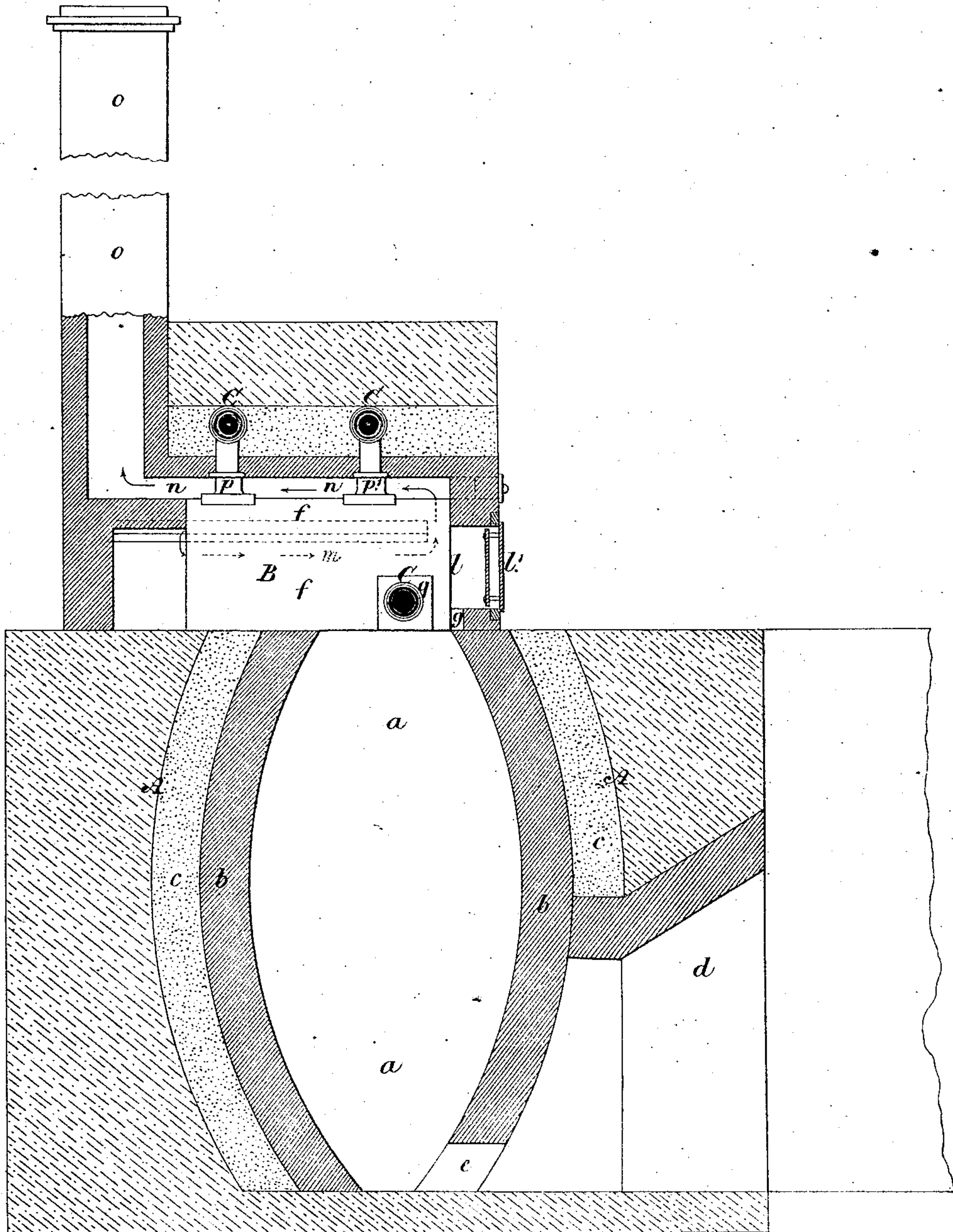
J. COWAN.

Apparatus for Heating Greenhouses, &c.

No. 157,276.

Patented Dec. 1, 1874.

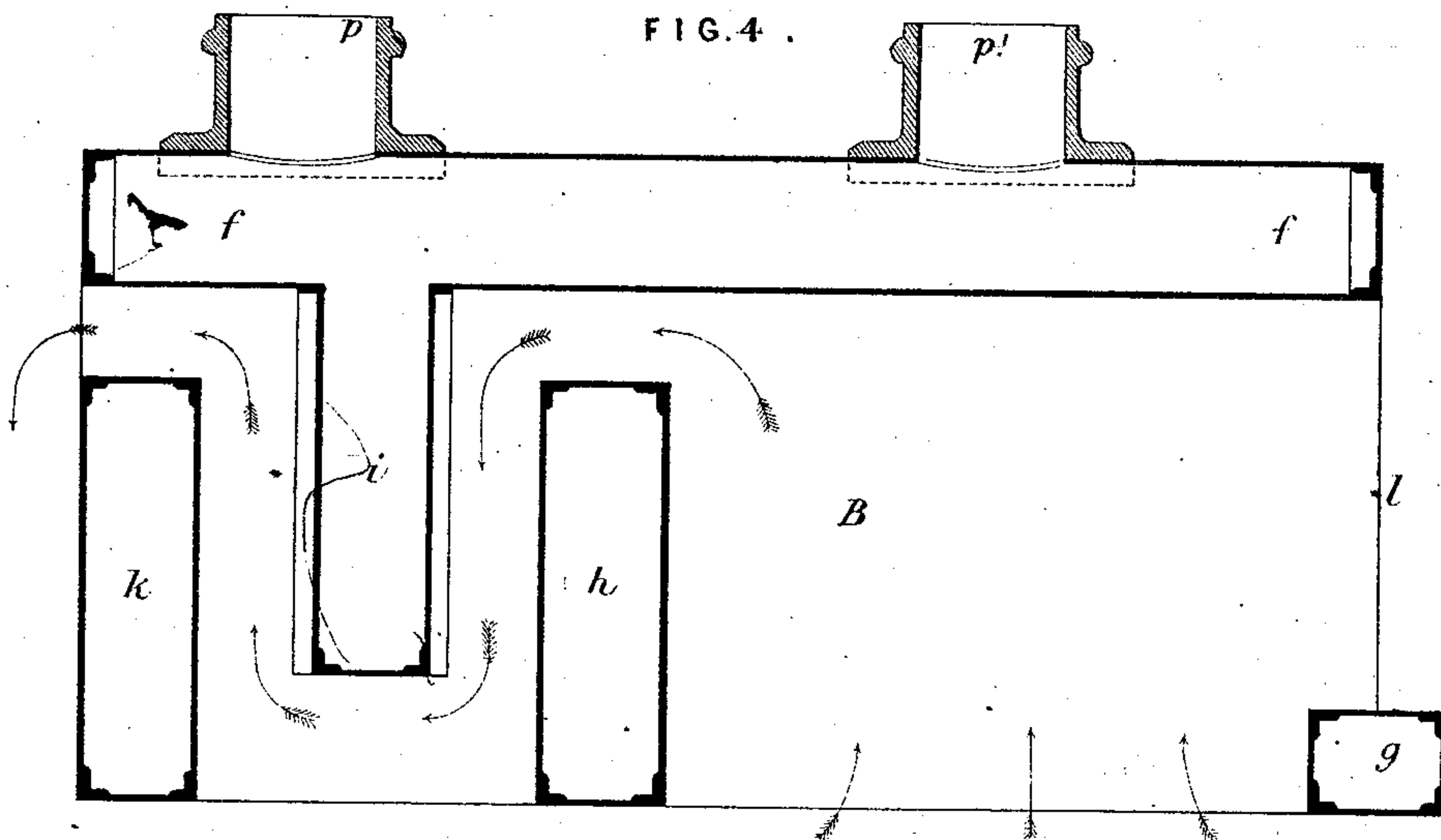
FIG. 3.



Witnesses,
Thomas Moore
E. M. Byrne

Inventor,
John Cowan

J. COWAN.
Apparatus for Heating Greenhouses, &c.
No. 157,276. Patented Dec. 1, 1874.



Witnesses;
Thomas Moore
E. M. Byrne

Inventor;
John Cowan

UNITED STATES PATENT OFFICE.

JOHN COWAN, OF DROMORE, KENMARE, IRELAND.

IMPROVEMENT IN APPARATUS FOR HEATING GREEN-HOUSES, &c.

Specification forming part of Letters Patent No. **157,276**, dated December 1, 1874; application filed June 11, 1873.

To all whom it may concern:

Be it known that I, JOHN COWAN, of Dromore, Kenmare, in the county of Kerry, Ireland, a subject of the Queen of Great Britain, have invented or discovered new and useful Improvements in Apparatus for Heating Green-Houses and Horticultural and other Buildings; and I, the said JOHN COWAN, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof—that is to say—

This invention has for its object improvements in apparatus for heating green-houses and horticultural and other buildings. For this purpose I utilize the waste heat of a lime-kiln by placing in the flame, at the mouth thereof, the boiler of a hot-water apparatus, and from this boiler I lead pipes through the buildings to be warmed, and the water which has become heated in the boiler circulates in the pipes, the heated water leaving the boiler at or near the top, and the water which has become cooled by flowing through the circuit of pipes being returned to the boiler at or near the bottom. By this arrangement the cost of the fuel consumed will be fully repaid in the value of the lime manufactured, and a large range of horticultural buildings may be heated without any cost for fuel, and with less attention than the furnace of a hot-water apparatus commonly requires.

The boiler I prefer to employ is of a  or saddle form. There is a hole through the bottom water-space corresponding with the mouth of the kiln, and a mid feather or bridge over which the flame passes and then descends. The heat from the kiln escapes at the back of the boiler, which is closed with the exception of an opening left for this purpose in the lower part, and then is led by external flues around the exterior of the boiler. The front of the boiler is fitted with a door closing the mouth by which the kiln is fed.

In order that my said invention may be most fully understood and readily carried into

effect, I will proceed to describe the drawings hereunto annexed.

Figure 1 is an elevation, Fig. 2 is a transverse and vertical section, and Fig. 3 is a longitudinal section, of apparatus for heating green-houses and horticultural buildings arranged according to my invention. Fig. 4 represents a central longitudinal section of the boiler upon a larger scale.

A is a lime-kiln. B is a hot-water boiler, and C C are circulating-pipes. Referring to the parts more in detail, *a* is the chamber of a kiln for lime-burning. Its horizontal section is circular; so is the containing-wall *b* of the chamber. It is built of fire-brick or stone, with a backing, *c*, of sand, and outside this a filling of rough broken stone or other material of cubical form. *d* is an arched recess, giving access to the drawing and lighting hole *l* at the foot of the chamber *a*. This hole may conveniently be about nine inches square, so that it will admit a shovel easily. Over the top or mouth of the chamber *a* a boiler is set. The main water-space *f* of the boiler is of saddle form; and there are also transverse water-spaces *g*, *h*, *i*, and *k*. The boiler is so set over the mouth of the chamber *a* that the heat and flame from it rise between the water-spaces *g* and *h*. The opening at *l* is provided with a door, *l'*, which is closed except while the kiln is being charged, so that the draft is compelled to pass over the water-space *h*, under *i*, and over *k*, and so it arrives at the flues *m*, (see Figs. 2 and 3,) which are built on the outside of the boiler, and on either side of it. At the front of the boiler, the draft rises from the flues *m* into the flue *n*, which returns over the top, and so enters the chimney *o*. *p p'* and *q q'* are cast-iron sockets bolted onto the boiler. They receive the ends of the pipes by which the green-houses or horticultural or other buildings are heated, and these should be as near to the boiler as may be convenient.

The hot water flows out of the boiler at *p* and *p'*, and circulates in two separate systems of pipes until it re-enters the boiler at *q* and *q'*.

The arrangement shown in the drawings is

competent to heat three thousand feet of four-inch pipe.

Having now described the construction and operation of my invention, to which I have given the name of "Cowan's Heating Apparatus," I beg to state that I disclaim all other heating apparatus now in use.

What I claim is—

The combination, with a lime-kiln, of the

boiler B and circulating-pipes C, the said boiler arranged to permit the products of combustion from the kiln to circulate through and around the same, substantially as described.

JOHN COWAN.

Witnesses:

JNO. SHEW,

WILSON KING.