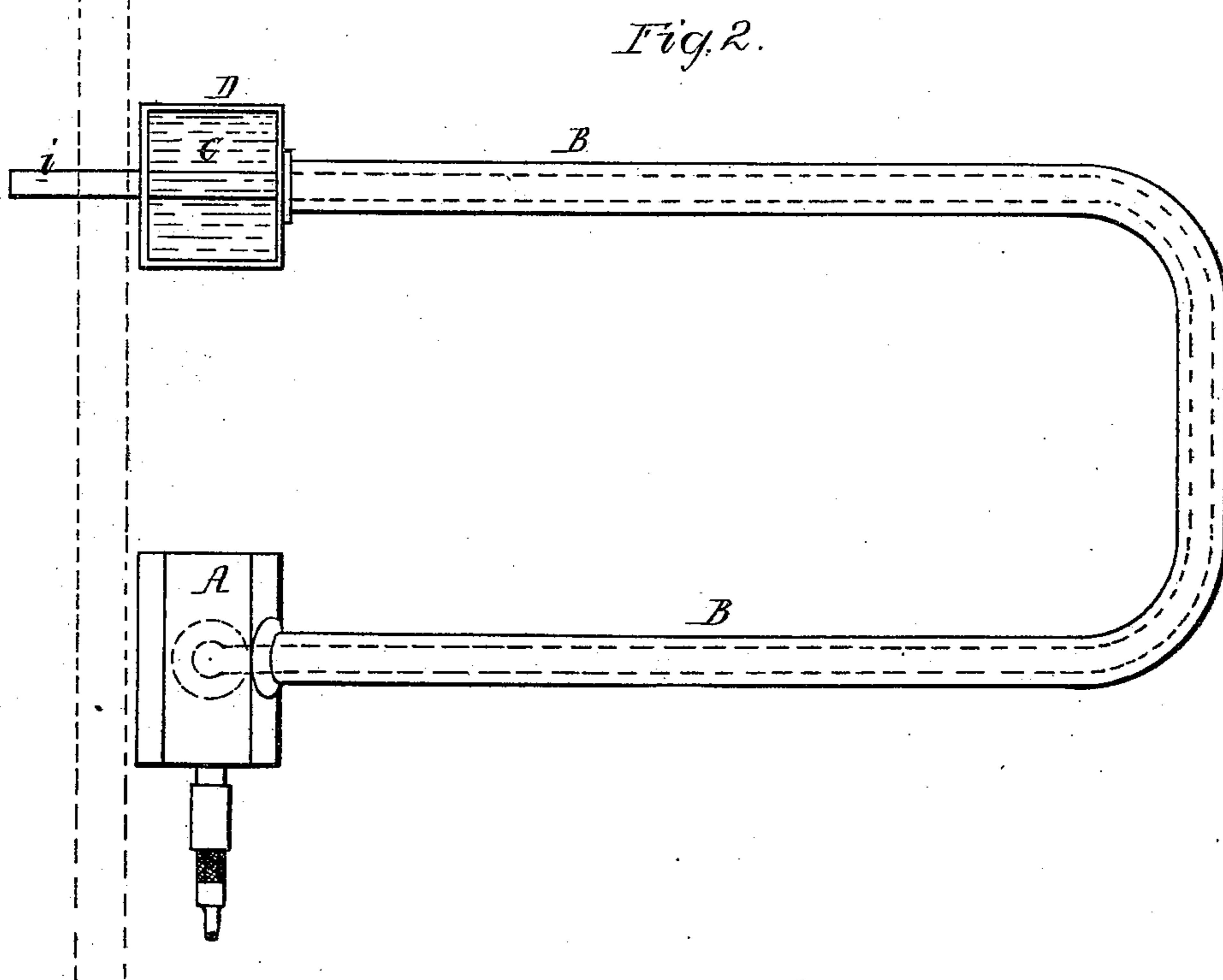
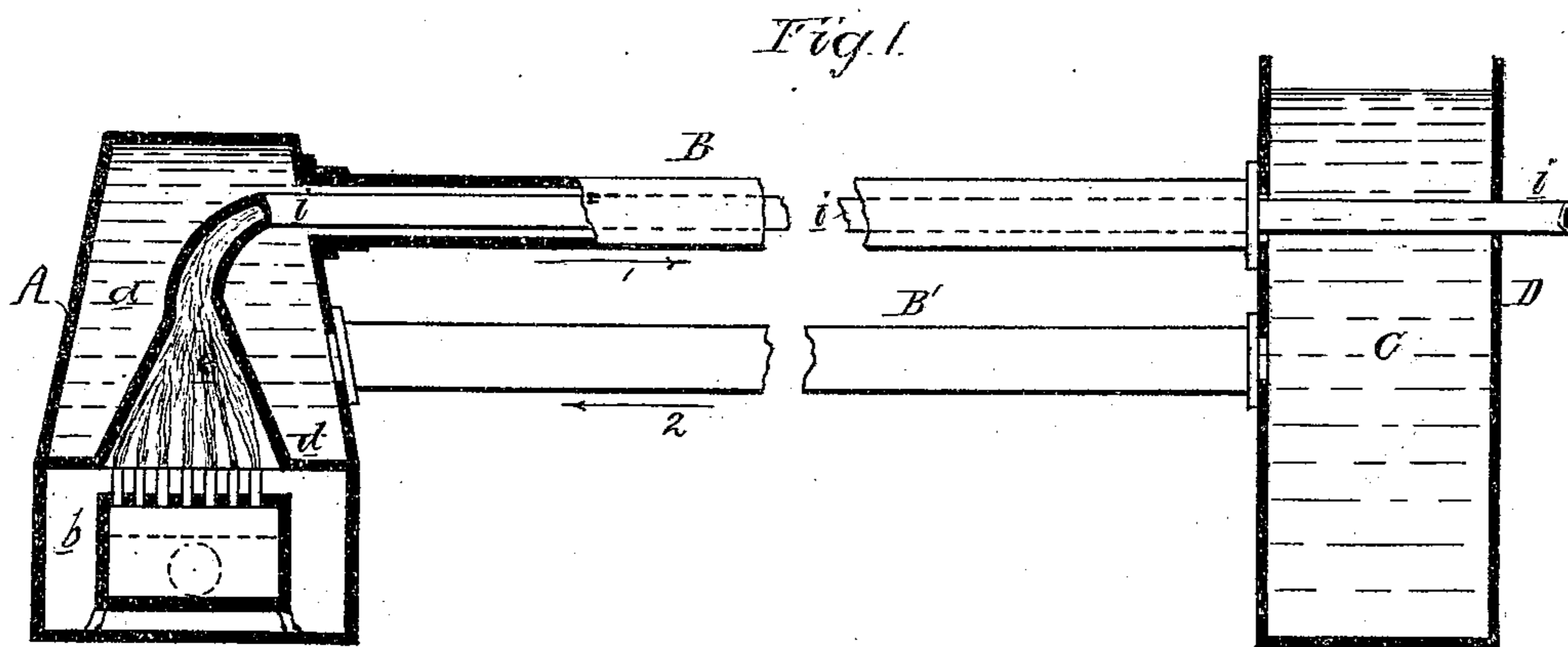


C. EZARD.
HEATING APPARATUS.

No. 178,751.

Patented June 13, 1876.



Witnesses
Harry Howson Jr.
Harry Smith

Charles Ezard
by his Attorneys
Howson and Son

UNITED STATES PATENT OFFICE.

CHARLES EZARD, OF BRADFORD, ENGLAND.

IMPROVEMENT IN HEATING APPARATUS.

Specification forming part of Letters Patent No. 178,751, dated June 13, 1876; application filed April 29, 1876.

To all whom it may concern:

Be it known that I, CHARLES EZARD, of Bradford, Manchester, England, have invented certain Improvements in Heating Apparatus, of which the following is a specification:

The object of my invention is to construct a cheap, simple, and effective heating apparatus for use in greenhouses, &c.; and this object I attain in the manner which I will now proceed to describe, reference being had to the accompanying drawing, in which—

Figure 1 is a longitudinal vertical section of one form of my improved heating apparatus, and Fig. 2 a plan view of a modified form of apparatus.

A is the casing, inclosing an upper chamber, *a*, and lower chamber *b*, the two being separated by a partition, *d*. The chamber *a* communicates, through two pipes, B B', with a water-chamber, C, contained within a casing, D, the water-level in this chamber being maintained at such a height that the chamber *a* is always full. The partition *d*, between the chambers *a* and *b*, is raised in the center, so as to form a conical chamber, *e*, communicating at the bottom with the chamber *b*, and at the top with the bent end of a tube, *i*, which passes through the upper pipe B, through the water-chamber C, and out through the wall of the apartment in which the heater is situated.

The heat is obtained from a gas or vapor stove, or oil or other lamp, of any desired construction, which is placed in the chamber *b*, immediately beneath the mouth of the chamber *e*, the products of combustion passing up through this chamber, and thence through the tube *i*, into the atmosphere. By thus compelling the products of combustion to take this extended course through a tube surrounded by the water to be heated, their heat is effectually utilized before they reach the point of exit. As the water in the chamber *a* becomes heated it ascends and passes into and through the pipe B, in the direction of the arrow 1, and into the water-chamber C. Cool water from the lower portion of the chamber C is thus induced to pass along the pipe B', in the direction of the arrow 2, and enters the chamber *a* at or near the bottom, where it is brought into contact with the highly-heated

casing of the chamber *e*, and, on becoming heated, rises and passes into the pipe B. A constant circulation of the water is thus insured, and a uniform heat imparted to the same.

Fig. 2 represents a modification of my invention, in which the heater A and water-chamber C are placed side by side at one end of the apartment to be heated, and connected by pipes which extend along both of the sides and the opposite end of the apartment.

The apparatus above described forms an effective and convenient heating device, which can be easily applied, can be readily adapted to rooms of different sizes by simply lengthening or shortening the tubes B B', and can be kept in operation at a less expense than an ordinary coal-fire.

When used for heating greenhouses my improved apparatus is much preferable to a coal-fire, inasmuch as it discharges no noxious gases having a deleterious effect on the plants.

Any number of pipes may be used for connecting the heater A and the water-chamber C, the number shown being used merely for convenience.

If desired, also, tubes *i* may extend through more than one of the water-pipes.

I wish it to be understood that I do not desire to claim, broadly, in a heating apparatus, a tube or tubes placed within a chamber or tube; but

I claim as my invention—

1. The combination of the casing A, containing the combustion-chamber *e* and surrounding water-chamber *a*, with two or more water-tubes, B B', one of which incloses the tube *i*, for the passage of the products of combustion, all substantially as described.

2. The combination of the water-chamber C and heating-chamber *a* with the connecting-pipes B B' and tube *i*.

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

CHARLES EZARD.

Witnesses:

WM. H. S. WATTS,
Solicitor, Manchester, England.

W. H. WALKER,
Solicitor's Clerk, Booth Street, Manchester.