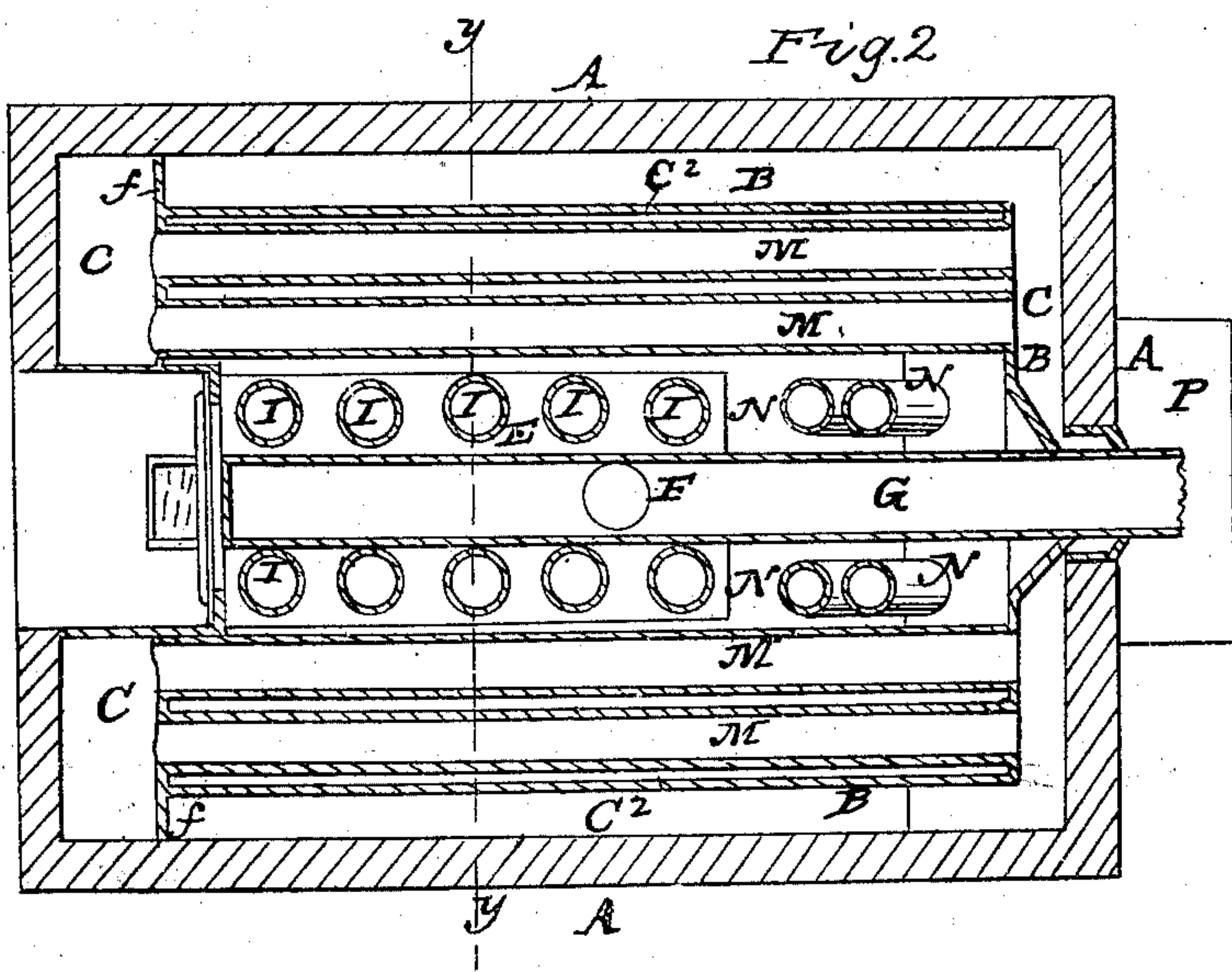
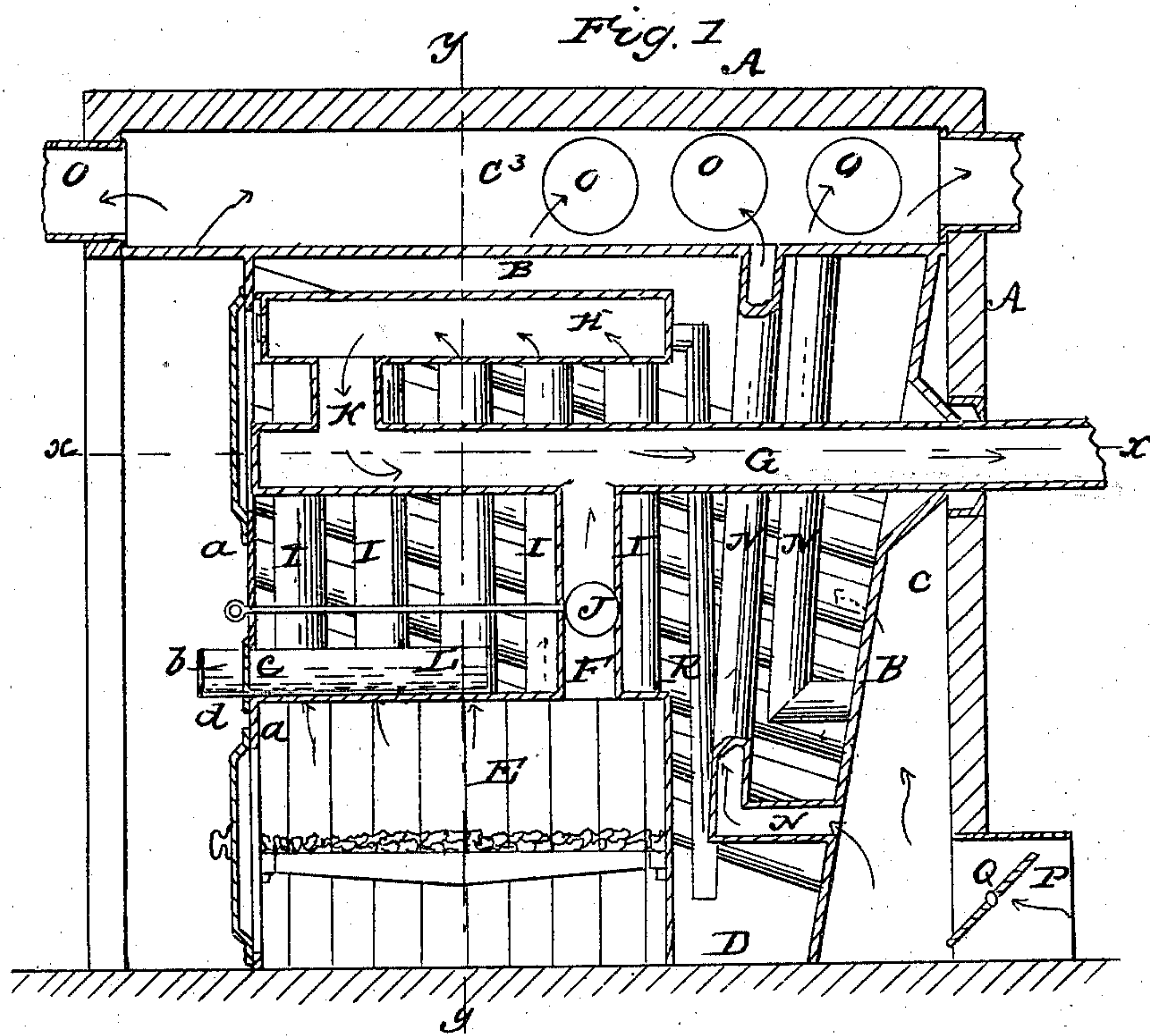


H. G. BULKLEY.
Steam Heating Apparatus.

No. 21,185.

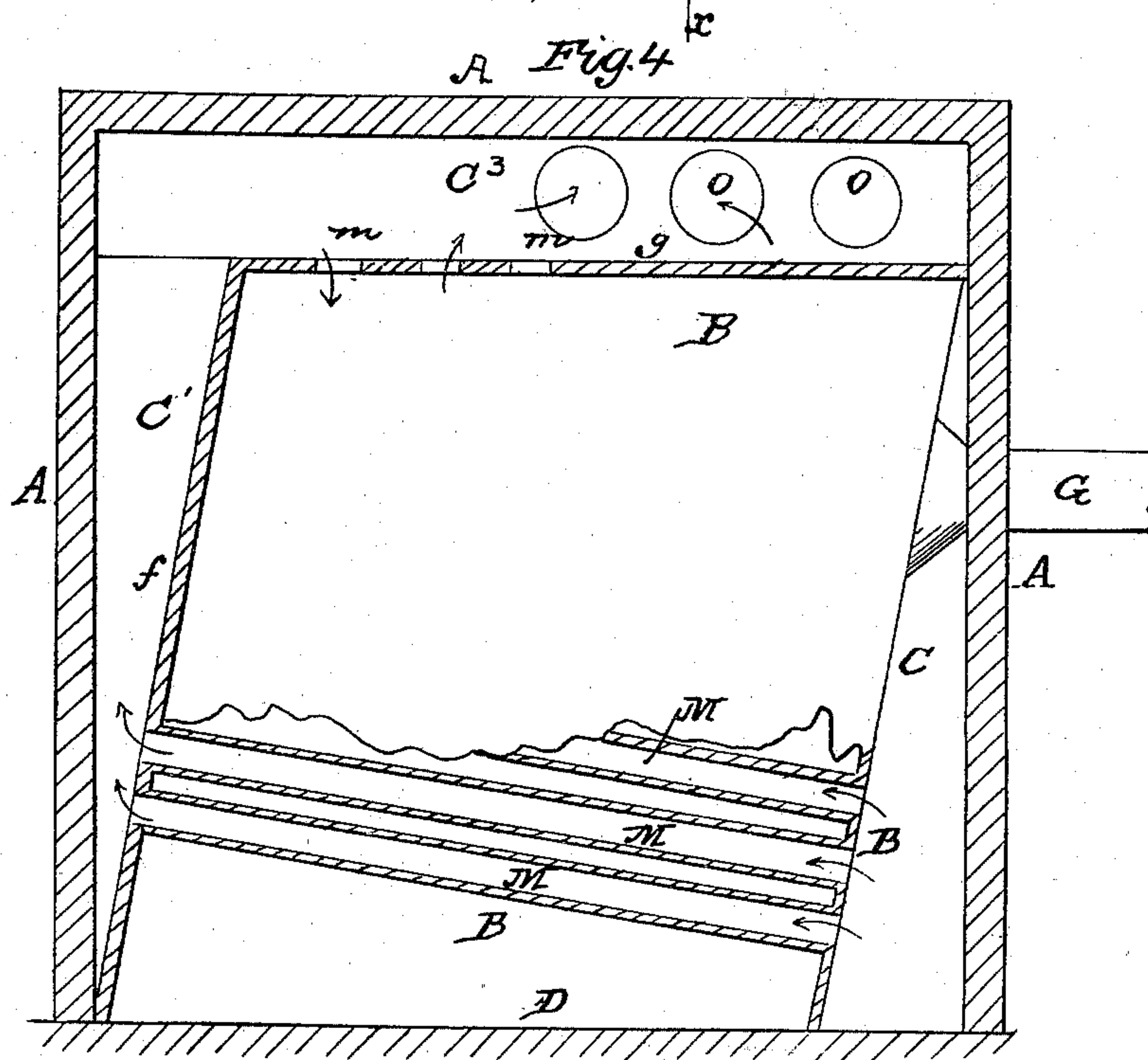
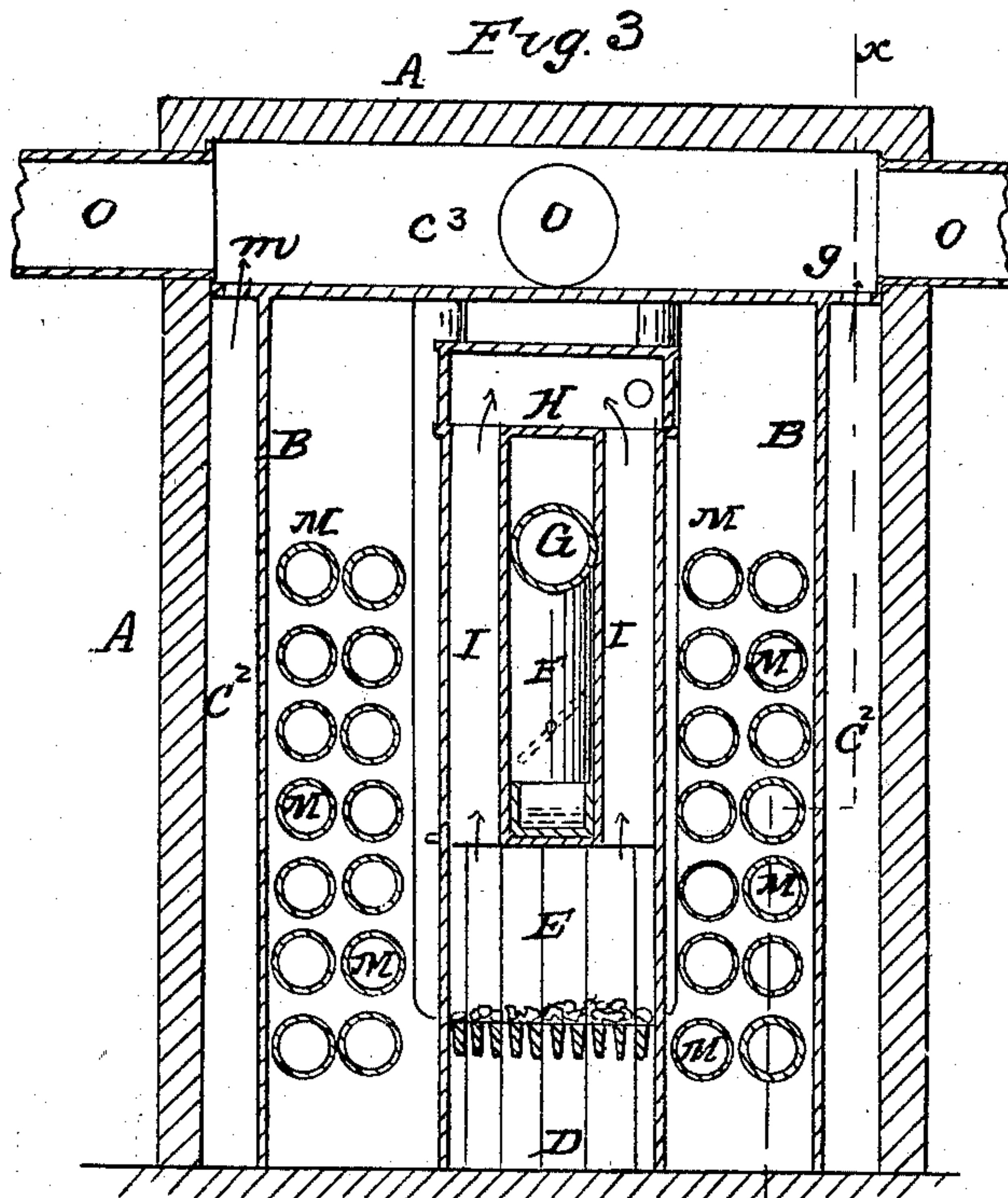
Patented Aug. 17, 1858.



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UNITED STATES PATENT OFFICE.

H. G. BULKLEY, OF KALAMAZOO, MICHIGAN.

STEAM-HEATING APPARATUS.

Specification of Letters Patent No. 21,185, dated August 17, 1858.

To all whom it may concern:

Be it known that I, HENRY G. BULKLEY, of Kalamazoo, in the county of Kalamazoo and State of Michigan, have invented a new and useful Improvement in Heating Air for Warming Houses or other Buildings or Apartments; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

My invention consists in heating air for warming houses, buildings or apartments by causing it to pass through pipes or passages, or chambers, which are wholly or partly surrounded by, or which wholly or partly surround a chamber containing superheated steam of a very limited pressure. The advantage to be derived from this system of heating air over that of causing it to pass over surfaces heated by direct exposure to the fire and heated products of combustion consists in the impossibility of heating the pipes or passages to such a degree as to effect any deoxygenation of the air or as to be in any danger of setting on fire the building or apartment in which it is used, both of which effects often result from the last mentioned method of heating, and the advantage over heating by ordinary steam is, that the heating surfaces can be more highly heated without dangerous pressure upon them and hence a less amount of surface is required.

Figure 1, in the accompanying drawing is a central vertical section of an air heating furnace constructed according to my invention. Fig. 2, is a horizontal section taken nearly in the plane indicated by the line x, x , in Fig. 1. Fig. 3, is a vertical section at right angles to Fig. 1, in the plane indicated by the line y, y , in Figs. 1 and 2. Fig. 4, is a vertical section parallel with Fig. 1, in or nearly in the planes indicated by the line Z, Z , in Fig. 3.

Similar letters of reference indicate corresponding parts in the several figures.

A, is the casing of the furnace which may be of cast or wrought iron or of brickwork, but is represented as of brickwork.

B, is the steam chamber arranged within the said casing with air passages $C, C', C'', C^2, C^2, C^3$, between its top and sides and the top and sides of the casing A. The bottom of this chamber is represented as being

closed by resting on the foundation D, of the furnace.

E, is the fire box arranged within the lower part of the steam chamber B, and provided with an upright smoke pipe or flue F, which connects with a horizontal pipe G, that extends through the rear of the casing A, to the chimney. The fire box has also a number of upright pipes I, I, leading from its crown into a box H, from which a pipe K, descends to the horizontal pipe G, the said pipes and box being all within the steam chamber. The pipe F, is fitted with a damper J, by which it can be opened to make a direct draft from the fire box through F, G, to the chimney, when the fire is first lighted in the fire box, or closed to compel the gaseous products of combustion to pass through the pipes I, I, box H, and pipe K, all of which as well as the pipe G, constitute radiators to heat the interior of the steam chamber B.

L, is an open pan which receives the water from which the steam employed is generated, said pan resting on the top of the fire box between the pipes I, I, and sliding like a drawer through the plate a, a , which constitutes part of the front of the steam chamber B, and also constitutes the front of the fire box, and which is left uncovered by the casing A. The pan L, when in place projects a little way through the front plate a, a , as shown at b , Fig. 1, to permit water to be poured into it whenever required, but the escape of steam in large quantities through b , is prevented so long as a very little water remains in the pan, by a plate c , which extends all across the pan and nearly to the bottom thereof and some distance above the top thereof, where it forms a continuation of a flange d , which extends around the exterior of the sides and bottom of the pan, and fits closely up to the plate a, a .

R, is a pipe, opening from the steam chamber into the box H, which as the said box communicates with the atmosphere prevents any considerable pressure of steam in the steam chamber B.

M, M, are air heating pipes extending right through the steam chamber from front to back in inclined positions.

N, N, are air heating pipes with elbows, extending from the rear passage C, to the upper passage C^3 . The rear air passage C, is separated from the upper passage C^3 , by

the top of the inclined back side of the steam chamber coming in contact with the rear wall of the casing A; and the side passages C², are separated from the top passage C³, by flanges *g, g*, on the steam chamber and from the front passages C', C', by flanges *f, f*, on the steam chamber.

P, is an inlet passage for the admission of fresh air to be heated, provided with a regulating valve Q.

O, O, are outlet apertures for the escape of the heated air to the place to be warmed.

The operation of the apparatus is as follows. Fire having been made in the fire box, and the damper closed, smoke and other volatile products of combustion take the course indicated by black arrows in Fig. 1, and radiators I, H, K, G, become highly heated and the water in the pan L, is converted into steam, which fills the chamber B, and is therein superheated by reason of the very large amount of exposed radiating surface heated by the fire and gaseous or volatile products of combustion, while any considerable degree of pressure in the said chamber is prevented by the escape pipe R. It is desirable however that the pressure in the said chamber should very slightly exceed that of the atmosphere in order that all parts of the chamber may be kept well filled with steam so as to cause all the air heating passages to be well and uniformly heated. The cold air entering at P, passes into the passage C, into contact with the heated surface of the rear of the steam chamber. From this passage some passes through the heating pipes M, M, and thence into the two passages C', C', and from thence over the heated surface of the front

of the chamber B, into the passage C³, which may be termed the disturbing chamber, while some passes through the side passages C², C², and over the heated side of the chamber and escapes from thence through holes *m, m*, in the flanges *g, g*, into the distributing chamber C³, and the rest passes directly through the heating pipes N, N, into the said chamber C³, in which it will be understood all the air is collected for distribution by the passages O, O. The chamber C³, is a heating chamber as well as a distributing chamber its bottom being the heated crown sheet of the steam chamber.

I will remark that though in the apparatus described the air heating passages and chambers are partly surrounded by and partly surround the superheated steam chamber, it is obvious the former may be entirely surrounded by, or entirely surround the latter, without changing the principle of operation.

I do not confine myself to any particular construction of the furnace or apparatus employed in carrying out my invention, but

What I claim as new and desire to secure by Letters Patent, is,

The surrounding of the air passages by a steam atmosphere to which heat is applied after the steam is generated, for the purpose of increasing the temperature of the steam without high pressure, for making a rapid safe, economical and wholesome heat substantially as specified.

HENRY G. BULKLEY.

Witnesses:

A. RANSOM,
DAVID A. McNAIR.